Report on the Implementation of the DeCyDe-4-IRIS Method and Tools at the Eastern Mediterranean Stakeholder Workshop

Athens, Greece

24 October 2014

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Isotech Ltd Environmental Research and Consultancy

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1. The aim of the IRIS- SES stakeholder workshops

Within project IRIS-SES 'Integrated Regional monitoring Implementation Strategy in the South European Seas', four regional stakeholder workshops are planned: one in the Western Mediterranean, one in the Central Mediterranean, one in the Eastern Mediterranean and one in the Black Sea. The aim of these workshops is to help make informed decisions about local and regional monitoring needs by establishing a two-way communication flow between the IRIS-SES project and the bodies responsible for MSFD monitoring.

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2. The Eastern Mediterranean Workshop

The first stakeholder workshop to be organized within IRIS-SES was the one for the Eastern Mediterranean, involving representatives from Cyprus, Greece and Turkey. The workshop was held in Athens, on 24 October, 2014.

There were three parts to the workshop: the preparatory phase, the development of the toolbox, and the workshop itself. Appendix A shows a schematic representation of each of these phases, whereas the rest of this chapter provides a more detailed description.

2.1. The preparatory phase

This phase was concerned with gathering (a) the relevant information and (b) identifying the most suitable stakeholders and key actors for participation in each workshop, through a dedicated stakeholder mapping exercise per country.

2.1.1. Gathering data and information

To gather the necessary information for the successful implementation of the workshop, Isotech developed factsheets regarding the monitoring of eutrophication (Descriptor 5) and contaminants (Descriptors 8 and 9). The factsheets (Appendix B) aimed to capture information regarding the parameters that are being measured for these Descriptors, the frequency of monitoring, the background and upper limits for each parameter as defined by national or European legislation, any scales used to assess Good Environmental Status (GES), indicative values for each parameter and the monitoring method used.

2.1.2. Identifying stakeholders and key actors

This part of the preparatory phase aim to identify the key stakeholders to be invited to the workshop. Using a stakeholder mapping approach, Isotech facilitated each partner in the identification of stakeholders and key actors in the Marine Strategy Framework Directive (MSFD) process.

2.1.2.1. The concept for stakeholders mapping in IRIS-SES

The aim of this mapping activity is to bring together and support active participation and commitment from the major groups of key actors and stakeholders in each country/ region, regarding the MFSD and the processes that are included in order to achieve GES.

Five major key actors and stakeholders groups are identified:

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- The "producers" of pollution
- The decision makers for "solutions"
- The implementing, inspecting and monitoring actors and authorities
- Civil society
- Media

2.1.2.2. The role of local IRIS partners

Local IRIS-SES partners will identify the key persons from each category (a more analytical and supportive category list follows) in their country. It is important to carefully select the representatives from the involved key actor/ stakeholder categories, to ensure that they will provide real site-specific input and expertise, and to be committed or willing to incorporate the new IRIS methods in their work/ processes. These stakeholders/ key actors will form the National IRIS Key Actors Group, which is the "core" group to assist in the implementation of the actions of IRIS and will support IRIS's aim for *sustainability of achievements*, through a close cooperation with the IRIS partners.

2.1.2.3. Indicative list of key actor/ stakeholder categories for IRIS-SES

1	Government and/or policy making	Local
		National
		Other
2	Inspectorates and monitoring bodies/ authorities	It is important to include representatives from the relevant bodies/ authorities responsible for inspecting the major sources of marine pollution. Their input is important.
3	Waste Water Management Councils/ Boards/ Authorities	
		Coastal tourism/ hotel industry

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4	Coastal and inland industry	Sewage treatment industries
		Farmers
		Energy industry
		Shipbuilding/ ship repairing industry
		other
5	Marine industry	Commercial fishing
		Shipping
		Off-shore industries
		Nautical tourism/ marine related tourism activities
		Aquaculture
		Other
6	Civil Society	NGO / SCO
		Professional Bodies
		Other
7	Media/ Awareness	Newspaper/ radio/ TV
		Online

The factsheets and the stakeholder mapping documents, together with a description of the DeCyDe-4-IRIS methodology for the workshops (Appendix C), were shared with the IRIS-SES partners in the Eastern Mediterranean countries of Cyprus, Greece and Turkey, at least two months ahead of the workshop. The partners were asked to complete the information in the factsheets, for one region within their country that would act as a pilot region, either using their

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own knowledge or experience or by contacting the relevant authorities in their countries. Likewise, the partners were asked to identify those stakeholders that could be invited to participate to the workshop. Due to the limited number of stakeholders that could be invited, emphasis was placed on selecting stakeholders that were involved with the MSFD monitoring and/or with decision-making regarding the MSFD monitoring.

2.2. The development of the DeCyDe-4-IRIS Toolbox

In preparation of the meeting, Isotech developed the DeCyDe-4-IRIS Toolbox, a suite of tools that were necessary for the implementation of the workshop, and comprising of: (1) the scoreboards for each region, (2) DeCyDe-4-IRIS Self-Assessment Tool (3) the source-pollutant matrix and (4) a list of possible abatement measures per sector.

2.2.1. The DeCyDe-4-IRIS scoreboards for each region

Using the information that each country provided in the factsheets, specifically the background and upper limits and any existing scales for assessing GES, Isotech developed the DeCyDe-4-IRIS Self-Assessment Tool. This excel-based scoreboard uses the approach of scoring through ranges, to help countries or regions within countries visualize the current situation with regards to meeting the goals of good environmental status. The ranges for the scoring are identified by a group of experts, based on national, EU and International Standards.

Figure 1 shows an extract from the self-assessment tool developed for Cyprus. These specific tables relate to Descriptor D5, eutrophication, and were developed based on the information that the Cypriot competent authority (Department of Fisheries and Marine Research) provided in the factsheets. For both the Nutrients and Phytoplankton categories, defined by the group of experts, scales/ranges are used to determine GES. Scores were assigned to each of these ranges/scales in order to help assess and provide a number to the current situation. The last column, entitled 'Indicator Score', automatically calculates the average of all the parameters that describe each of the categories (e.g. for 'Nutrients', the Indicator Score is calculated as the average of the scores for 'Phosphates', 'Nitrates' and 'Ammonia').

Each of the developed DeCyDe-4-IRIS Self-Assessment Tools (one per country) contains three tabs: one for the assessment of eutrophication such as the one that appears in Figure 1, a similar

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one for the assessment of contaminants, and one that summarizes the obtained scores and provides the total score for that particular country or region.

D5 - EUTROPHICATION

1	Nutrients	Units	Scoring Ranges				Indicator Score
	1. Phosphates	µM	>0.68	0.14-0.68	0.07-0.14	<0.07	9.00
			1	4	7	10	
						10	
	2. Nitrates	µM	>1.19	0.65-1.19	0.62-0.65	<0.62	
			1	4	7	10	
						10	
	3. Ammonia	µM	>2.2	1.05-2.2	0.55-1.05	<0.55	
			1	4	7	10	
					7		

2	Phytoplankton	Units	Scoring Ranges					Indicator Score
	1. Chlorophyll α	µg/l	>2.21	0.6-2.21	0.4-0.6	0.1-0.4	<0.1	7.00
			1	3	5	7	10	
						7		

Figure 1 Extract from the DeCyDe-4-IRIS Self-Assessment Tool developed for Cyprus.

2.2.2. The source-pollutant matrix

As the name suggests, the source-pollutant matrix (Figure 2) is an excel-based matrix that, for each of the parameters that characterize Descriptors 5 and 8/9 identifies the main sources of pollution, based on literature and bibliographic references. The matrix is to be used alongside the completed self-assessment tool to assist decision-makers and stakeholders to identify the most likely pollution sources (main polluting sectors) for each of the parameters where the self-assessment tool demonstrated that there was room for improvement.

	Pollutant											
	PO_4	NO_3	NH_4	PAHs	PCBs	Pesticides	Cu	Zn	Cd	Pb	Hg	^{137}Cs
Municipal Waste	X	X	X	X	X	X	X	X	X	X		
Industrial Waste	X	X	X	X	X		X	X	X	X	X	X
Farming Incl. Aquaculture	X	X	X									
Agriculture	X	X	X			X	X					
Shipping	X	X	X	X			X			X		

Figure 2 The DeCyDe-4-IRIS source-pollutant matrix.

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2.2.3. The list of abatement measures

Isotech's group of experts also developed a list of possible abatement measures for each of the main sectors that could result in the discharge of pollutants related to Descriptors 5, 8 and 9 in the marine environment. Mapping the sources of pollutants and identifying solutions/measures per source is very challenging. The DeCyDe-4-IRIS approach aims to assist decision makers to easily pick out those measures that could be implemented in their country or region, based on the previous identification of main pollutant sources (section 2.2.2). The developed Abatement Measures List appears in Appendix D.

2.3. The DeCyDe-4-IRIS workshop

2.3.1. Structure and aims

The Eastern Mediterranean DeCyDe-4-IRIS workshop took place at Hotel Philippos in Athens, on 24 October 2014.

The DeCyDe-4-IRIS workshops are structured on group work and have three distinct but interrelated stages, aiming to:

- Guide the partners through the Self Assessment process;
- Identify the gaps, problems and needs of their country/region with regards to eutrophication and contaminants monitoring
- Discuss on possibilities of joint monitoring
- Improve coordination among neighboring countries.
- Discuss possible abatement measures for the improvement of GES

2.3.2. Attendees

A total of seven invited stakeholders and decision-makers attended the workshop: two from Cyprus, two from Turkey and three from Greece, representing the national bodies responsible for the monitoring of the MSFD descriptors as well as the bodies responsible for decision-making regarding the MSFD. The workshop took place back-to-back with the ARCADIS EU-MED-MSFD Coordination and Alignment Meeting D (CAM D), therefore several of the stakeholders that had participated at the CAM D meeting, also stayed to observe the DeCyDe-4-IRIS

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workshop. Additionally, the workshop was attended by several IRIS-SES partners. The full list of participants appears in Appendix E.

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3. The DeCyDe-4-IRIS Eastern Mediterranean workshop outcomes

3.1. Outputs from the DeCyDe-4-IRIS Self-Assessment Tools

To begin with, the DeCyDe-4-IRIS Self-assessment tools for each country were completed in plenary, so that all the participants could become familiar with the process and experience the ease with which the assessment takes place. A few important issues to take into consideration were identified at this stage:

1. The DeCyDe-4-IRIS Self-Assessment Tool is only as robust as the information presented in the factsheets completed by each country, as its development is completely based on this information. Therefore, countries are required to ensure that all the data in the factsheets are accurate.
2. The Tool is site and case specific. Therefore, the information and data presented in the factsheets must relate to a specific site/location e.g. for Greece, it would make sense to have one factsheet for a specific area of the Aegean, or for the Ionion or the Thermaikos etc. This would ensure that the decision-makers would be able to identify at a glance sites/locations with specific problems. This would be difficult to assess if the factsheets contain information for the entire country.
3. It would be useful for the decisions makers if there was a certain type of 'warning' system, when particularly low scores are recorded for one parameter, which reveal danger, e.g. low mercury score, meaning high mercury concentration, which is highly dangerous to public health. This would ensure that decision makers are immediately alerted to the problem, and would avoid the 'masking' of the problem if all the other parameters that define a descriptor receive high scores.

3.2. Outputs from the identification of monitoring gaps and needs

Following the completion of the self-assessment tools, the stakeholders from each country were asked to identify the monitoring needs for their country and present them in plenary. Stakeholders were encouraged to use the DeCyDe-4-IRIS Self-assessment tools for their country, since they provided an overview of what is being measured and how.

The following monitoring requirements/gaps were identified:

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For Greece:

- The need to take into account the natural geology of an area, as well as other natural processes (e.g. volcanic activity etc.) when deciding on background values for contaminants in sediments.
- The need to increase the frequency of chlorophyll a measurements to at least once per month.

For Turkey:

- A gap in monitoring contaminants in biota was identified.

For Cyprus:

- There is a gap in monitoring of contaminants in large pelagic fish, as monitoring of contaminants in biota is only done for the species *Mullus barbatus* at the moment.
- There is a need to identify the source of macroalgal blooms. Their development remains a mystery especially since they appear in such oligotrophic conditions. A possible suggestion to address this gap is to carry out isotope studies with ^{15}N tracers.

3.3. Outputs from the identification of collaboration opportunities

The next part of the workshop required participants from different countries to sit together and discuss possible collaboration opportunities regarding MSFD monitoring. The following collaboration opportunities between Cyprus, Greece and Turkey were identified:

1. The development of an algorithm and associated satellite imaging for chlorophyll and sea grass mapping e.g. *poseidonia oceanica* medows. This could be a cooperation opportunity between 3-4 countries. However, it was noted that at this stage this can be done on a research basis but cannot be applied to MSFD monitoring just yet, as it is a long-term procedure that would require pilot projects, presentations at conferences, validation etc. Some concerns regarding the cost-effectiveness of this method were also raised.

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2. The use of common infrastructures, e.g. gliders, network of buoys for Central and Eastern Mediterranean, argofloats, etc. could be promoted, as the cost would be shared between countries and therefore the data would also be shared.
3. The participants stated that it was important to agree on common procedures among countries, rather than just on joint monitoring programs, as this would allow comparability among the results.
4. Although near-shore monitoring is well developed in most cases, offshore monitoring is mostly non-existent. Therefore, the participants suggested that it would be interesting to pursuit offshore joint monitoring opportunities, particularly for mature descriptors as it can be cost effective. As an initiative this can start from the Regional Sea Conventions and/or DG Environment.
5. Additionally, Descriptors with major gaps were identified as a good place to start cooperation, as collaborating countries can set up common monitoring programs, acquire common infrastructure and share resources.
6. The stakeholders identified a gap in the information of available inventories, therefore they suggested that it was important to have an inventory of the infrastructure that each country uses and that could be used for joint monitoring. One example given was to collate information on research vessels in the Eastern Mediterranean.

In addition to the identified joint monitoring opportunities, the workshop participants also noted that the different legal obligations among EU and non-EU members (neighbouring countries) pose a collaboration problem.

3.4. Outputs regarding proposed abatement measures

The last part of the workshop saw the participants of each country sitting back together and identifying the main pollution sources and most applicable abatement measures for their countries. This was done in a two step approach. In step one, the participants from each country identified the main sources of pollution via the source-pollutant matrix and in step 2 they reviewed the possible abatement measures for each identified source and selected those most applicable for their country.

The proposed abatement measures for Cyprus were:

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- Re-circulated systems to the 3 existing aquaculture hatcheries to minimize nutrient flow.
- Promote organic agriculture to minimize nutrient entering the marine environment.
- Develop and promote good agricultural practices to minimize the use of fertilizers.

The proposed abatement measures for Turkey were:

- Avoid leaching of mining waste.
- Promote organic agriculture and decrease pesticide usage.
- Turn to renewable energy sources.

Finally, the proposed abatement measures for Greece were:

- Connect the many absorption pits (mainly in small villages) to the sewage system and to a wastewater treatment plant.
- Recreate buffer zones for wastewater.
- Separate industrial waste from municipal waste.
- Relocate aquaculture operations, which are now too close to the coast.
- Provide training for farmers and raise awareness to promote crop rotation and organic farming*.
- Avoid copper antifoulants on boats and prohibit the disposal of wastewater from very small boats.

*Note: Traditionally, crop rotation was a common practice in the Mediterranean. However, at EU level there are no incentives to promote crop rotation, but instead there are incentives to grow certain crops intensively.

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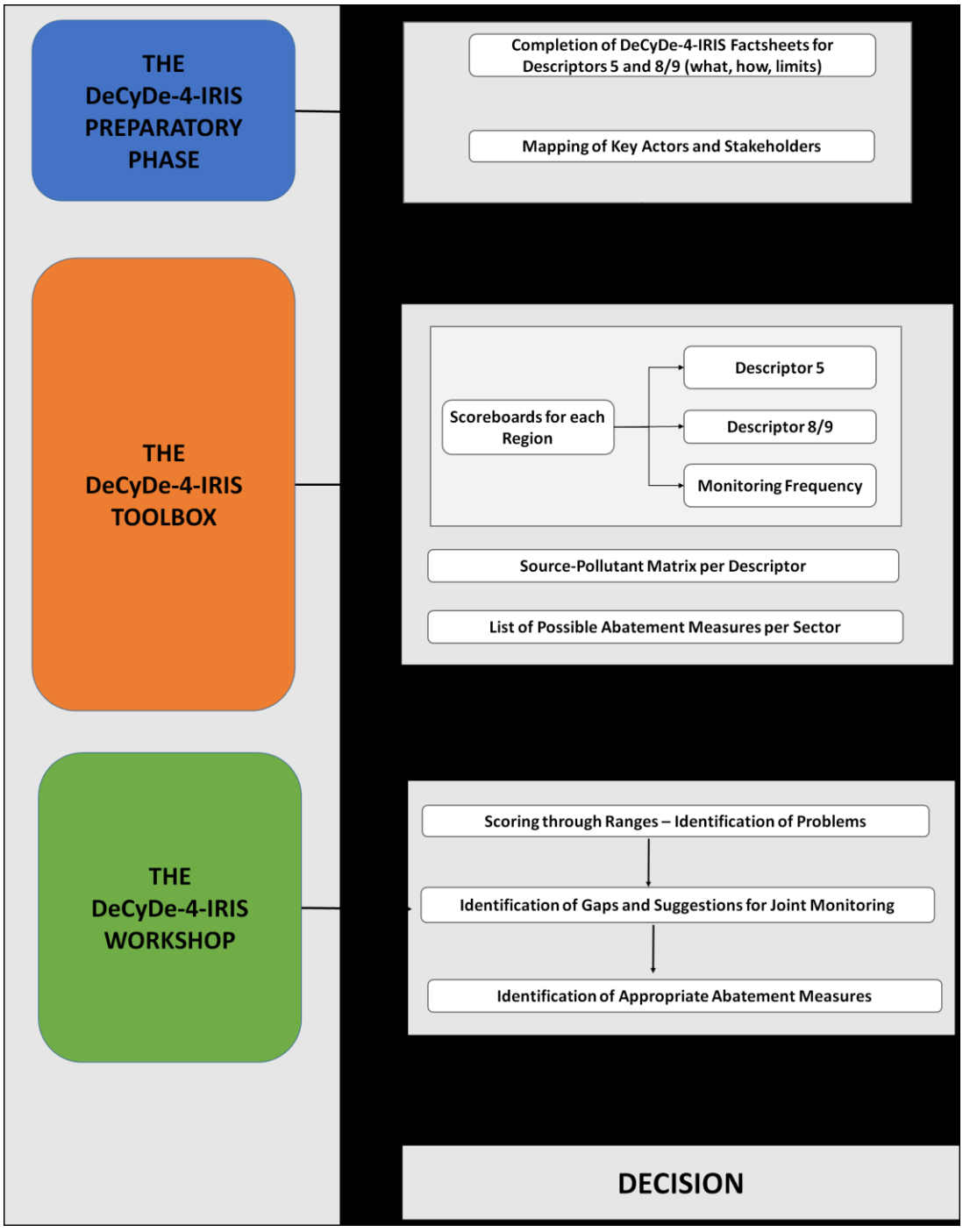
Appendix A – Schematic Representation of the DeCyDe-4-IRIS Workshops



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Appendix B – The DeCyDe-4-IRIS Completed Factsheets for the Eastern Mediterranean Countries

ACTIVITY 3: SELF-ASSESSMENT TOOL FOR ASSESSING GES FOR EUTROPHICATION AND CONTAMINANTS

Country	CYPRUS
Region	EASTERN MEDITERRANEAN
Neighboring Regions	
Partner	DATA SUBMITTED BY DFMR

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FACTSHEET 1: Eutrophication - Nutrients

<table>
<tr><td>Descriptor</td><td colspan="5">D5 Eutrophication</td></tr>
<tr><td>Indicator</td><td colspan="5">Nutrients</td></tr>
<tr><td>Parameters</td><td colspan="5">The parameters for nutrients include nitrogen and phosphorus compounds, ammonia and sediment organic matter.
In the table below, please add all the parameters that are being monitored <u>AND</u> for which there are available monitoring data. Add the most characteristic parameters for our region first.
For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).
<table>
<tr><th>Parameter</th><th>Background Level</th><th>Upper Limit</th><th>Unit</th><th>Monitoring Frequency</th></tr>
<tr><td>Phosphates</td><td></td><td>0,14</td><td>µmol/l</td><td>12</td></tr>
<tr><td>Nitrates</td><td></td><td>0,65</td><td>µmol/l</td><td>12</td></tr>
<tr><td>Nitrites</td><td></td><td></td><td>µmol/l</td><td>12</td></tr>
<tr><td>Ammonia</td><td></td><td>1,05</td><td>µmol/l</td><td>12</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Comments regarding background and upper limits</td><td colspan="5">Please state whether there are areas where the background level is higher or lower than that stated above

</td></tr>
<tr><td>Indicative values</td><td colspan="5">For each of the above parameters please give indicative values, as measured by your country’s monitoring plan
<table>
<tr><th>Parameter</th><th>Indicative value</th></tr>
<tr><td>Phosphates</td><td>0,02</td></tr>
<tr><td>Nitrates</td><td>0,39</td></tr>
<tr><td>Nitrites</td><td>0,08</td></tr>
<tr><td>Ammonia</td><td>0,68</td></tr>
<tr><td></td><td></td></tr>
</table></td></tr>
</table>

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<table>
<tr><td>Method</td><td>Please state the method used for measuring for each parameter and determining the above values
<table>
<tr><th>Parameter</th><th>Method used</th></tr>
<tr><td>Phosphates</td><td>Spectrophotometrically – Segmented Flow Analysis (SFA)</td></tr>
<tr><td>Nitrates</td><td>Spectrophotometrically – Segmented Flow Analysis (SFA)</td></tr>
<tr><td>Nitrites</td><td>Spectrophotometrically – Segmented Flow Analysis (SFA)</td></tr>
<tr><td>Ammonia</td><td>Spectrophotometrically – Segmented Flow Analysis (SFA)</td></tr>
<tr><td></td><td></td></tr>
</table></td></tr>
<tr><td>Scales to assess GES</td><td>For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.
<table>
<tr><th>Parameter</th><th>Oligotrophic</th><th>L.mesotrophic</th><th>H.mesotrophic</th><th>Eutrophic</th></tr>
<tr><td>Phosphates</td><td><0.07</td><td>0.07-0.14</td><td>0.14-0.68</td><td>>0.68</td></tr>
<tr><td>Nitrates</td><td><0.62</td><td>0.62-0.65</td><td>0.65-1.19</td><td>>1.19</td></tr>
<tr><td>Ammonium</td><td><0.55</td><td>0.55-1.05</td><td>1.05-2.2</td><td>>2.2</td></tr>
</table>
PAGOU K., Eutrophication related monitoring tasks and WFD for coastal waters in Greece.

PAGOU K., SIOKOU-FRANGOU I. & PAPATHANASSIOU E. (2002). Nutrients and their ratios in relation to eutrophication and HAB occurrence. The case of Eastern Mediterranean coastal waters. Second Workshop on "Thresholds of Environmental Sustainability: The case of nutrients", 18-19 June 2002, Brussels, Belgium.

IGNATIADES, L., VOUNATSOU, P. & KARYDIS, M., 1992. A possible method for evaluating oligotrophy and eutrophication based on nutrient concentration scales. Mar. Poll. Bull., 24: 238-243.</td></tr>
</table>

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FACTSHEET 2: Eutrophication - Phytoplankton

<table>
<tr><td>Descriptor</td><td colspan="5">D5 Eutrophication</td></tr>
<tr><td>Indicator</td><td colspan="5">Phytoplankton</td></tr>
<tr><td>Parameters</td><td colspan="5">The parameters for phytoplankton include chlorophyll a, primary production, macroalgae and phytoplankton.
In the table below, please add all the parameters that are being monitored <u>AND</u> for which there are available monitoring data. Add the most characteristic parameters for our region first.
For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).
<table>
<tr><th>Parameter</th><th>Background Level</th><th>Upper Limit</th><th>Unit</th><th>Monitoring Frequncy</th></tr>
<tr><td>Chlorophyll-a</td><td></td><td>0,1</td><td>µg/l</td><td>12</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
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</table></td></tr>
<tr><td>Comments regarding background and upper limits</td><td colspan="5">Please state whether there are areas where the background level is higher or lower than that stated above</td></tr>
<tr><td></td><td colspan="5"></td></tr>
<tr><td>Indicative values</td><td colspan="5">For each of the above parameters please give indicative values, as measured by your country’s monitoring plan
<table>
<tr><th>Parameter</th><th>Indicative value</th></tr>
<tr><td>Chlorophyll-a</td><td>0,1</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
</table></td></tr>
<tr><td>Method</td><td colspan="5">Please state the method used for measuring for each parameter and determining the above values</td></tr>
</table>

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<table>
<tr><td></td><td>Parameter</td><td>Method used</td></tr>
<tr><td></td><td>Chlorophyll-a</td><td>EPA Method 445.0 Fluorometric determination</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Scales to assess GES</td><td colspan="2">For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.</td></tr>
<tr><td></td><td colspan="2">Eutrophication Scale Chlorophyll-α (μg l^{-1}) Ecological Status (WFD)
<table>
<tr><td>Oligotrophic</td><td><0.1</td><td>High</td></tr>
<tr><td>Lower Mesotrophic-1</td><td>0.1-0.4</td><td>Good</td></tr>
<tr><td>Lower Mesotrophic-2</td><td>0.4-0.6</td><td>Moderate</td></tr>
<tr><td>Upper mesotrophic</td><td>0.6-2.21</td><td>Poor</td></tr>
<tr><td>Eutrophic</td><td>>2.21</td><td>Bad</td></tr>
</table>
Harmonization of eutrophication scale (according to KARYDIS, 1999 and PAGOU et al., 2002) and ecological status in WFD, according to SIMBOURA et al., 2005.</td></tr>
</table>

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FACTSHEET 3: Eutrophication - Other

<table>
<tr><td>Descriptor</td><td colspan="5">D5 Eutrophication</td></tr>
<tr><td>Indicator</td><td colspan="5">Other</td></tr>
<tr><td>Parameters</td><td colspan="5">The parameters for other characteristics include Secchi depth and dissolved oxygen concentration.
In the table below, please add all the parameters that are being monitored <u>AND</u> for which there are available monitoring data. Add the most characteristic parameters for our region first.
For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).
<table>
<tr><td>Parameter</td><td>Background Level</td><td>Upper Limit</td><td>Unit</td><td>Monitoring Frequency</td></tr>
<tr><td>Dissolved oxygen</td><td></td><td></td><td>mg/l</td><td>12</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
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</table></td></tr>
<tr><td>Comments regarding background and upper limits</td><td colspan="5">Please state whether there are areas where the background level is higher or lower than that stated above</td></tr>
<tr><td></td><td colspan="5"></td></tr>
<tr><td>Indicative values</td><td colspan="5">For each of the above parameters please give indicative values, as measured by your country’s monitoring plan
<table>
<tr><td>Parameter</td><td>Indicative value</td></tr>
<tr><td>Dissolved oxygen</td><td>6,92</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
</table></td></tr>
<tr><td>Method</td><td colspan="5">Please state the method used for measuring for each parameter and determining the</td></tr>
</table>

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	above values	
	Parameter	**Method used**
	Dissolved oxygen	OxyGuard Handy Gamma with salinity compensation.
Scales to assess GES	For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.	

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FACTSHEET 4: Contaminants – In Water

<table>
<tr><td>Descriptor</td><td colspan="5">D8/D9 Contaminants</td></tr>
<tr><td>Indicator</td><td colspan="5">In water</td></tr>
<tr><td>Parameters</td><td colspan="5">The parameters for contaminants in water include synthetic substances (e.g. PAHs, PCBs, pesticides etc), non-synthetic substances (e.g. metals such as Cu, Cd, Hg etc), petroleum hydrocarbons and radionuclides.
In the table below, please add all the parameters that are being monitored <u>AND</u> for which there are available monitoring data. Add the most characteristic parameters for our region first.
For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).
<table>
<tr><th>Parameter</th><th>Background Level</th><th>Upper Limit</th><th>Unit</th><th>Monitoring Frequency</th></tr>
<tr><td>Hg</td><td></td><td>0,05</td><td>µg/l</td><td>12</td></tr>
<tr><td>Cd</td><td></td><td>0,2</td><td>µg/l</td><td>12</td></tr>
<tr><td>Pb</td><td></td><td>7,2</td><td>µg/l</td><td>12</td></tr>
<tr><td>Ni</td><td></td><td>20</td><td>µg/l</td><td>12</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Comments regarding background and upper limits</td><td colspan="5">Please state whether there are areas where the background level is higher or lower than that stated above</td></tr>
<tr><td></td><td colspan="5"></td></tr>
</table>

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<table>
<tr><td rowspan="11">Indicative values</td><td colspan="2">For each of the above parameters please give indicative values, as measured by your country’s monitoring plan</td></tr>
<tr><td>Parameter</td><td>Indicative value</td></tr>
<tr><td>Hg</td><td>0,3 (LOQ 0,1)</td></tr>
<tr><td>Cd</td><td>0,07 (LOQ 2009-2012 0,1, LOQ 2013 1,0)</td></tr>
<tr><td>Pb</td><td>0,46 (LOQ 2009-2012 0,2, LOQ 2013 2,0)</td></tr>
<tr><td>Ni</td><td>0,5 (LOQ 2009-2012 0,2, LOQ 2013 4,0)</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="15">Method</td><td colspan="2">Please state the method used for measuring for each parameter and determining the above values</td></tr>
<tr><td>Parameter</td><td>Method used</td></tr>
<tr><td>Hg</td><td>AAS Cold Vapor</td></tr>
<tr><td>Cd</td><td>ICP/MS</td></tr>
<tr><td>Pb</td><td>ICP/MS</td></tr>
<tr><td>Ni</td><td>ICP/MS</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="2">Scales to assess GES</td><td colspan="2">For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.</td></tr>
<tr><td colspan="2">Directive 2013/39/EC</td></tr>
</table>

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FACTSHEET 5: Contaminants – In Sediment

<table>
<tr><td>Descriptor</td><td colspan="5">D8/D9 Contaminants</td></tr>
<tr><td>Indicator</td><td colspan="5">In sediment</td></tr>
<tr><td rowspan="4">Parameters</td><td colspan="5">The parameters for contaminants in sediments include synthetic substances (e.g. PAHs, PCBs, pesticides etc), non-synthetic substances (e.g. metals such as Cu, Cd, Hg etc), petroleum hydrocarbons and radionuclides.
In the table below, please add all the parameters that are being monitored <u>AND</u> for which there are available monitoring data. Add the most characteristic parameters for our region first.
For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).</td></tr>
<tr><td>Parameter</td><td>Background Level</td><td>Upper Limit</td><td>Unit</td><td>Monitoring Frequency</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Comments regarding background and upper limits</td><td colspan="5">Please state whether there are areas where the background level is higher or lower than that stated above</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td rowspan="4">Indicative values</td><td colspan="5">For each of the above parameters please give indicative values, as measured by your country’s monitoring plan</td></tr>
<tr><td>Parameter</td><td colspan="4">Indicative value</td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td rowspan="4">Method</td><td colspan="5">Please state the method used for measuring for each parameter and determining the above values</td></tr>
<tr><td>Parameter</td><td colspan="4">Method used</td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td rowspan="2">Scales to assess GES</td><td colspan="5">For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.</td></tr>
<tr><td colspan="5"></td></tr>
</table>

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FACTSHEET 5: Contaminants – In Biota

<table>
<tr><td>Descriptor</td><td colspan="5">D8/D9 Contaminants</td></tr>
<tr><td>Indicator</td><td colspan="5">In biota</td></tr>
<tr><td>Parameters</td><td colspan="5">The parameters for contaminants in biota include synthetic substances (e.g. PAHs, PCBs, pesticides etc), non-synthetic substances (e.g. metals such as Cu, Cd, Hg etc), petroleum hydrocarbons and radionuclides.
In the table below, please add all the parameters that are being monitored <u>AND</u> for which there are available monitoring data. Add the most characteristic parameters for our region first.
For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).
<table>
<tr><th>Parameter</th><th>Background Level</th><th>Upper Limit</th><th>Unit</th><th>Monitoring Frequency</th></tr>
<tr><td>Hg</td><td></td><td>20</td><td>µg/kg</td><td>1</td></tr>
<tr><td>Cd</td><td></td><td></td><td>µg/kg</td><td>1</td></tr>
<tr><td>Pb</td><td></td><td></td><td>µg/kg</td><td>1</td></tr>
<tr><td>2,2’,3,4,4’,5,5’-heptachlorobiphenyl (CB180)</td><td></td><td></td><td>µg/kg</td><td>1</td></tr>
<tr><td>2,2’,3,4,4’,5’-hexachlorobiphenyl (CB138)</td><td></td><td></td><td>µg/kg</td><td>1</td></tr>
<tr><td>2,2’,4,4’,5,5’-hexachlorobiphenyl (CB153)</td><td></td><td></td><td>µg/kg</td><td>1</td></tr>
<tr><td>2,2’,4,5,5’-pentachlorobiphenyl (CB101)</td><td></td><td></td><td>µg/kg</td><td>1</td></tr>
<tr><td>2,2’,5,5’-tetrachlorobiphenyl (CB52)</td><td></td><td></td><td>µg/kg</td><td>1</td></tr>
</table>
</td></tr>
</table>

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	2,4,4'-trichlorobiphenyl (CB28)			µg/kg	1
	Aldrin			µg/kg	1
	alpha-HCH			µg/kg	1
	Arochlor 1254			µg/kg	1
	Arochlor 1260			µg/kg	1
	beta-HCH			µg/kg	1
	DDD, o, p'			µg/kg	1
	DDD, p, p'			µg/kg	1
	DDE, o, p'			µg/kg	1
	DDE, p, p'			µg/kg	1
	DDT, o,p'			µg/kg	1
	DDT, p,p'			µg/kg	1
	Dieldrin			µg/kg	1
	Endrin			µg/kg	1
	gamma-HCH (Lindane)			µg/kg	1
	Heptachlor		0,0067	µg/kg	1
	Heptachloroepoxide			µg/kg	1
	Hexachlorobenzene (HCB)		10	µg/kg	1
	Hexachlorobutadiene (HCBD)		55	µg/kg	1
	Lindane (gamma-HCH)			µg/kg	1

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Comments regarding background and upper limits	Please state whether there are areas where the background level is higher or lower than that stated above	
Indicative values	For each of the above parameters please give indicative values, as measured by your country's monitoring plan	
	Parameter	**Indicative value**
	Hg	91
	Cd	Below limit of quantification
	Pb	Below limit of quantification
	2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	Below limit of quantification
	2,2',3,4,4',5'-hexachlorobiphenyl (CB138)	Below limit of quantification
	2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	Below limit of quantification
	2,2',4,5,5'-pentachlorobiphenyl (CB101)	Below limit of quantification
	2,2',5,5'-tetrachlorobiphenyl (CB52)	Below limit of quantification
	2,4,4'-trichlorobiphenyl (CB28)	Below limit of quantification
	Aldrin	Below limit of quantification
	alpha-HCH	Below limit of quantification
	Arochlor 1254	Below limit of quantification

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	Arochlor 1260	Below limit of quantification
	beta-HCH	Below limit of quantification
	DDD, o, p'	Below limit of quantification
	DDD, p, p'	Below limit of quantification
	DDE, o, p'	Below limit of quantification
	DDE, p, p'	Below limit of quantification – 50
	DDT, o,p'	Below limit of quantification
	DDT, p,p'	Below limit of quantification
	Dieldrin	Below limit of quantification
	Endrin	Below limit of quantification
	gamma-HCH (Lindane)	Below limit of quantification
	Heptachlor	Below limit of quantification
	Heptachloroepoxide	Below limit of quantification
	Hexachlorobenzene (HCB)	Below limit of quantification
	Hexachlorobutadiene (HCBD)	Below limit of quantification
	Lindane (gamma-HCH)	Below limit of quantification
Method	Please state the method used for measuring for each parameter and determining the above values	
	Parameter	**Method used**
	Hg	AOAC-Official Method 983.20.Mercury (Hg) in fish. Hg is determined by CVAAS (Cold vapor Atomic Absorption Spectroscopy).
	Cd	AOAC-Official Method 999.10 Lead (Pb), Cadmium (Cd) etc in Foods. Cd is determined by GFAAS (Graphite furnace

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		Atomic Absorption Spectroscopy).
	Pb	AOAC-Official Method 999.10 Lead (Pb), Cadmium (Cd) etc in Foods. Pb is determined by GFAAS (Graphite furnace Atomic Absorption Spectroscopy).
	2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	2,2',3,4,4',5'-hexachlorobiphenyl (CB138)	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	2,2',4,5,5'-pentachlorobiphenyl (CB101)	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	2,2',5,5'-tetrachlorobiphenyl (CB52)	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	2,4,4'-trichlorobiphenyl (CB28)	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	Aldrin	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	alpha-HCH	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	Arochlor 1254	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	Arochlor 1260	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	beta-HCH	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	DDD, o, p'	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.

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	DDD, p, p’	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	DDE, o, p’	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	DDE, p, p’	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	DDT, o,p’	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	DDT, p,p’	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	Dieldrin	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	Endrin	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	gamma-HCH (Lindane)	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	Heptachlor	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	Heptachloroepoxide	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	Hexachlorobenzene (HCB)	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	Hexachlorobutadiene (HCBD)	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
	Lindane (gamma-HCH)	Samples are extracted in hexane using soxtec technique and determined by GC-MS/MS.
Scales to assess GES	For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.	
	Directive 2013/39/EC	

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ACTIVITY 3: SELF-ASSESSMENT TOOL FOR ASSESSING GES FOR EUTROPHICATION AND CONTAMINANTS

Country	Greece
Region	
Neighboring Regions	
Partner	UoA

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FACTSHEET 1: Eutrophication - Nutrients

Descriptor	**D5 Eutrophication**
Indicator	**Nutrients**
Parameters	The parameters for nutrients include nitrogen and phosphorus compounds, ammonia and sediment organic matter. In the table below, please add all the parameters that are being monitored **AND** for which there are available monitoring data. Add the most characteristic parameters for our region first. For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).

Parameter	**Background Level**	**Upper Limit**	**Unit**	**Monitoring Frequency**
Nitrate	<0.62	<1.00	µg-atN L^{-1}	3 times per year
Ammonium	<0.55	<1.05	µg-atN L^{-1}	3 times per year
Phosphate	<0.07	<0.5	µg-atP L^{-1}	3 times per year

Comments regarding	Please state whether there are areas where the background level is higher or lower than that stated above

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<table>
<tr><td>background and upper limits</td><td colspan="2">At present, the background level is exceeded in some areas as are Thermaikos and Amvrakikos Gulf, Elefsis bay, Maliakos gulf . The upper limits are those proposed in implementation of the Water Framework Directive according to Karydis et al (1999). For GES thresholds according to IAs were used a combination of criteria set by Karydis et al (1999) and Wasmund (2001)</td></tr>
<tr><td rowspan="7">Indicative values</td><td colspan="2">For each of the above parameters please give indicative values, as measured by your country’s monitoring plan</td></tr>
<tr><td>Parameter</td><td>Indicative value</td></tr>
<tr><td>Nitrate</td><td>0.634±0.025 µmol/L (mean for 2012-2013)</td></tr>
<tr><td>Ammonium</td><td>0,385±0,402 µmol/L (mean for 2012-2013)</td></tr>
<tr><td>Phosphate</td><td>0,04 µmol/L (mean for 2012-2013)</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="7">Method</td><td colspan="2">Please state the method used for measuring for each parameter and determining the above values</td></tr>
<tr><td>Parameter</td><td>Method used</td></tr>
<tr><td>Nitrate</td><td>Stickland & Parsons 1977</td></tr>
<tr><td>Ammonium</td><td>Koroleff, 1970</td></tr>
<tr><td>Phosphate</td><td>Murphy & Riley 1962</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Scales to assess GES</td><td colspan="2">For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.

Karydis et al (1999) and Wasmund (2001)</td></tr>
</table>

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FACTSHEET 2: Eutrophication - Phytoplankton

<table>
<tr><td>Descriptor</td><td colspan="5">D5 Eutrophication</td></tr>
<tr><td>Indicator</td><td colspan="5">Phytoplankton</td></tr>
<tr><td>Parameters</td><td colspan="5">The parameters for eutrophication include chlorophyll a, primary production, microalgae and phytoplankton.

In the table below, please add all the parameters that are being monitored <u>AND</u> for which there are available monitoring data. Add the most characteristic parameters for our region first.

For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).</td></tr>
<tr><td></td><td>Parameter</td><td>Background Level</td><td>Upper Limit</td><td>Unit</td><td>Monitoring Frequncy</td></tr>
<tr><td></td><td>Chlorophyll a</td><td>0.1</td><td>0.4</td><td>µg L^{-1}</td><td>Three times per year</td></tr>
<tr><td></td><td>phytoplankton</td><td>$6*10^3$</td><td>$1.5*10^5$</td><td>Cells L^{-1}</td><td>Three times per year</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Comments regarding background and upper limits</td><td colspan="5">Please state whether there are areas where the background level is higher or lower than that stated above</td></tr>
<tr><td colspan="5">At present, the background level is exceeded at some areas as are Thermaikos, Amvrakikos Gulf, Elefsis bay. The upper limits are those proposed in implementation of the Water Framework Directive (Karydis 1999, Simboura et al 2005, MEDGIG) which were used to define GES in the MSFD. Background and indicative values are referred exclusively to euphotic layer of coastal waters</td></tr>
<tr><td>Indicative values</td><td colspan="5">For each of the above parameters please give indicative values, as measured by your country’s monitoring plan</td></tr>
</table>

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	Parameter	**Indicative value**
	Chlorophyll a	0.049±0.01 to 2.572±0.09 μg L^{-1}
Method	Please state the method used for measuring for each parameter and determining the above values	
	Parameter	**Method used**
	Chlorophyll a	Holm-Hansen et al. (1965)
	Phytoplankton	Utermohl 1958
Scales to assess GES	For each parameter, please state the predefined scale that is used to assess progress towards GES, if any. Simboura et al 2005, MEDGIG (for chl-a) Karydis et al 1999, national assessment method for phytoplankton	

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FACTSHEET 3: Eutrophication - Other

<table>
<tr><td>Descriptor</td><td colspan="5">D5 Eutrophication</td></tr>
<tr><td>Indicator</td><td colspan="5">Other</td></tr>
<tr><td>Parameters</td><td colspan="5">The parameters for eutrophication include secchi depth and dissolved oxygen concentration.

In the table below, please add all the parameters that are being monitored <u>AND</u> for which there are available monitoring data. Add the most characteristic parameters for our region first.

For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).
<table>
<tr><th>Parameter</th><th>Background Level</th><th>Upper Limit</th><th>Unit</th><th>Monitoring Frequency</th></tr>
<tr><td>Secchi depth</td><td>-</td><td>*</td><td>m</td><td>Three-four months</td></tr>
<tr><td>Oxygen concentration</td><td>-</td><td>*</td><td>Percentage of saturation</td><td>Three-four months</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td rowspan="2">Comments regarding background and upper limits</td><td colspan="5">Please state whether there are areas where the background level is higher or lower than that stated above</td></tr>
<tr><td colspan="5">*There not is an upper limit established for these parameters or a background level</td></tr>
<tr><td>Indicative</td><td colspan="5">For each of the above parameters please give indicative values, as measured by your</td></tr>
</table>

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<table>
<tr><td rowspan="5">values</td><td colspan="2">country’s monitoring plan</td></tr>
<tr><td>Parameter</td><td>Indicative value</td></tr>
<tr><td>Secchi depth</td><td>2.5 – 22.5 m</td></tr>
<tr><td>DO</td><td>Usually >4.25 mL/L</td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="5">Method</td><td colspan="2">Please state the method used for measuring for each parameter and determining the above values</td></tr>
<tr><td>Parameter</td><td>Method used</td></tr>
<tr><td>Secchi depth</td><td>In situ measurement with Secchi disc</td></tr>
<tr><td>Oxygen concentration</td><td>Winkler</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Scales to assess GES</td><td colspan="2">For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.

Non-applicable</td></tr>
</table>

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FACTSHEET 4: Contaminants – In Water

<table>
<tr><td>Descriptor</td><td colspan="5">D8/D9 Contaminants</td></tr>
<tr><td>Indicator</td><td colspan="5">In water</td></tr>
<tr><td>Parameters</td><td colspan="5">The parameters for contaminants include synthetic substances (e.g. PAHs, PCBs, pesticides etc), non-synthetic substances (e.g. metals such as Cu, Cd, Hg etc), petroleum hydrocarbons and radionuclides.
In the table below, please add all the parameters that are being monitored <u>AND</u> for which there are available monitoring data,placing the most characteristic parameters first.
For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).</td></tr>
<tr><td></td><td>Parameter</td><td>Background Level</td><td>Upper Limit</td><td>Unit</td><td>Monitoring Frequency</td></tr>
<tr><td></td><td>Cd</td><td>0.05</td><td>0.5</td><td>µg/l</td><td>2 times a year</td></tr>
<tr><td></td><td>Hg</td><td>0.05</td><td>0.5</td><td>µg/l</td><td></td></tr>
<tr><td></td><td>Cu</td><td>0.5</td><td>10</td><td>µg/l</td><td></td></tr>
<tr><td></td><td>Pb</td><td>0.5</td><td>10</td><td>µg/l</td><td></td></tr>
<tr><td></td><td>Zn</td><td>1</td><td>100</td><td>µg/l</td><td></td></tr>
<tr><td></td><td>Total PAHs</td><td>0.1</td><td>5</td><td>µg/l</td><td></td></tr>
<tr><td></td><td>Total PCBs</td><td>0</td><td>0.1/100</td><td>µg/lng/l</td><td></td></tr>
<tr><td></td><td>Pesticides</td><td>0</td><td>0.1/100</td><td>µg/l ng/l</td><td></td></tr>
<tr><td></td><td>^{137}Cs</td><td>1.5</td><td>20</td><td>Bq/m^3</td><td>One-off</td></tr>
<tr><td>Comments regarding background and upper limits</td><td colspan="5">Please state whether there are areas where the background level is higher or lower than that stated above</td></tr>
<tr><td></td><td colspan="5">We regard background level values to be that of the open sea.
Coastal areas present higher background level values due to pressures.
Upper limits are set taking into consideration ecotoxicological tests and measured values.
Regarding upper limits, higher values are measured in Thermaikos Gulf, Kavala gulf, Pagasitikos Gulf, Saronikos Gulf and Milos island.</td></tr>
<tr><td>Indicative values</td><td colspan="5">For each of the above parameters please give indicative values, as measured by your country’s monitoring plan</td></tr>
<tr><td></td><td colspan="2">Parameter</td><td colspan="3">Range / Indicative value</td></tr>
<tr><td></td><td colspan="2">Cd</td><td colspan="3">0.001-0.8 / 0.02 µg/l</td></tr>
</table>

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	Hg	0.01-1,.1 / 0.01 µg/l
	Cu	0.06-4.6 / 0.8 µg/l
	Pb	0.02-4.1 / 0.5 µg/l
	Zn	0.75-70 / 2.5 µg/l
	Total PAHs	0.01-2.77µg/l / 0.68 µg/l
	Total PCBs	0.1-2 ng/l / 1.35 ng/l
	Pesticides	0,1-7,7 ng/l / 1,16 ng/l
	Cs 137	2-16,5 bq/m3 / 6,8 bq/m3
Method	Please state the method used for measuring for each parameter and determining the above values	
	Parameter	**Method used**
	Cd, Cu, Pb, Zn	Resin pre-concentration, and measured by GFAAS or FAAS.
	Hg	Gold trap amalgamation and atomic fluorescence spectrometry (CVAFS) detection.
	PAHs	Liquid-liquid or Solid phase extraction Measurement by GC-MS or HPLC
	137Cs	Gamma – spectrometry system, HpGe Detector.
Scales to assess GES	For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.	

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FACTSHEET 5: Contaminants – In Sediment

<table>
<tr><td>Descriptor</td><td colspan="5">D8/D9 Contaminants</td></tr>
<tr><td>Indicator</td><td colspan="5">In sediment</td></tr>
<tr><td>Parameters</td><td colspan="5">The parameters for contaminants include synthetic substances (e.g. PAHs, PCBs, pesticides etc), non-synthetic substances (e.g. metals such as Cu, Cd, Hg etc), petroleum hydrocarbons and radionuclides.
In the table below, please add all the parameters that are being monitored <u>AND</u> for which there are available monitoring data. Add the most characteristic parameters for our region first.
For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).
<table>
<tr><th>Parameter</th><th>Background Level</th><th>Upper Limit</th><th>Unit</th><th>Monitoring Frequency</th></tr>
<tr><td>Cd</td><td>0.1</td><td>5.0</td><td>mg/kg</td><td>Once a year/one-off</td></tr>
<tr><td>Cr</td><td>20</td><td>300</td><td>mg/kg</td><td></td></tr>
<tr><td>Cu</td><td>10</td><td>100</td><td>mg/kg</td><td></td></tr>
<tr><td>Pb</td><td>10</td><td>120</td><td>mg/kg</td><td></td></tr>
<tr><td>Hg</td><td>0.01</td><td>0.70</td><td>mg/kg</td><td></td></tr>
<tr><td>Ni</td><td>20</td><td>60</td><td>mg/kg</td><td></td></tr>
<tr><td>Zn</td><td>40</td><td>380</td><td>mg/kg</td><td></td></tr>
<tr><td>137Cs</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Total PAHs</td><td>0.2/200</td><td>15/15000</td><td>mg/kg/ µg/kg</td><td></td></tr>
<tr><td>Total PCBs</td><td>0</td><td>0.02/20</td><td>µg/g dw/ µg/kg dw</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Comments regarding background and upper limits</td><td colspan="5">Please state whether there are areas where the background level is higher or lower than that stated above</td></tr>
<tr><td></td><td colspan="5">We regard background level values to be that of the open sea.
Coastal areas present higher background level values due to pressures.
Upper limits are set taking into consideration ecotoxicological tests and measured values.
Regarding upper limits, higher values are measured in Patraikos Gulf, North Evoikos and Antikyra.</td></tr>
<tr><td>Indicative</td><td colspan="5">For each of the above parameters please give indicative values, as measured by your country’s monitoring plan</td></tr>
</table>

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values	**Parameter**	**Range / Indicative value**
	Cd	0.01-1.3 / 0,2 mg/kg
	Pb	4.2- 194 / 51 mg/kg
	Cu	0.5- 60.6 / 34,2 mg/kg
	Hg	0.01- 1.3/ 0.22 mg/kg
	Zn	8.5 – 193 / 105 mg/kg
	Cr	7,3-482/ 137 mg/kg
	Ni	1,6-278/ 91,2 mg/kg
	137 Cs	18,6-52,5 bq/kg / 40,8
	Total PAHs	0.8-10.300 µg/kg / 226 µg/kg
	Total PCBs	0.2-75,58 µg/kg dw / 4.82 µg/kg dw
Method	Please state the method used for measuring for each parameter and determining the above values	
	Parameter	**Method used**
	Cu, Zn, Cd, Pb	Digestion with concentrated acids (HF, HNO_3), measured using FAAS, or GFAAS.
	Cu, Zn, Pb	X-ray Fluorescence
	Hg	Microwave digestion, Measurement by CV-AAS
	PAHs	Soxhlet extraction, measurement by GC-MS or HPLC
	PCBs	Soxhlet extraction, measurement by GC-MS or HPLC
	^{137}Cs	Gamma spectrometry system comprising an HPGe detector
Scales to assess GES	For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.	

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FACTSHEET 6: Contaminants – In Biota

Descriptor	**D8/D9 Contaminants**
Indicator	**In biota**
Parameters	The parameters for contaminants include synthetic substances (e.g. PAHs, PCBs, pesticides etc), non-synthetic substances (e.g. metals such as Cu, Cd, Hg etc), petroleum hydrocarbons and radionuclides. In the table below, please add all the parameters that are being monitored **AND** for which there are available monitoring data. Add the most characteristic parameters first. For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year). Note: To convert ww to dw use a conversion factor of 2.5 (approximate).

Parameter	**Background Level**	**Upper Limit**	**Unit**	**Monitoring Frequency**
Mussels				2 times a year
Pb	0.16	1.5	mg/kg ww	
Cd	0.12	1	mg/kg ww	
Hg	0.01	0.5	mg/kg ww	
benzo (A) pyrene	0	0.010	mg/kg ww	
PCBs	0	0.03	mg/kg ww	
^{137}Cs		1250	Bq/kg	
Mullus Barbatus				
Pb	0.025	0.3	mg/kg ww	
Cd	0.025	1	mg/kg ww	
Hg	0.035	1	mg/kg ww	
benzo (A) pyrene	0	0.002	mg/kg ww	
PCBs	0	0.45	mg/kg ww	
^{137}Cs		1250	Bq/kg	One-off

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Comments regarding background and upper limits	Please state whether there are areas where the background level is higher or lower than that stated above			
	The measurements are conducted on bivalves and fish that are destined for human consumption, so there is no clear indication on the fisheries they originate from. However, considerably higher values have been measured in Saronikos gulf.			
Indicative values	For each of the above parameters please give indicative values, as measured by your country's monitoring plan			
	Parameter	**Range / Indicative value**		
	Mussels			
	Pb	0.84-4.31 / 2.5 µg/g dw		
	Cd	0.04-3.22 / 0.6 µg/g dw		
	Hg	0.05-0.63 / 0.2 µg/g dw		
	137 Cs	0.1-1.23bq/kg /		
	PAHs	25-640 µg/kg dw/ 279 µg/kg dw		
	PCBs	2.5-36.45 µg/kg dw / 12.8 µg/kg dw		
	Mullus barbatus			
	PCBs	0.3-5.62 µg/kg dw/ 0.6		
	Pb	0.04-16 µg/g dw/ 0.54		
	Cd	0- 4.11µg/g dw/ 0.413		
	Hg	0.003-6.15 µg/g dw / 0.55		
	137 Cs	Not available		
Method	Please state the method used for measuring for each parameter and determining the above values			
	Parameter	**Method used**		
	Hg	Microwave digestion determination by cold vapour atomic absorption spectrophotometry (CV-AAS)		
	Pb, Cd	Ttreatment with concentrated nitric acid and measured by GFAAS or FAAS.		
	PAHs	Soxhlet extraction, measurement by GC-MS or HPLC		
	^{37}Cs	measurements of 137Cs by direct, low-background high-resolution Ge gamma spectrometry		
Scales to assess GES	For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.			

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ACTIVITY 3: SELF-ASSESSMENT TOOL FOR ASSESSING GES FOR EUTROPHICATION AND CONTAMINANTS

Country	Turkey
Region	Mediterranean
Neighboring Regions	Aegean Sea-Marmara-Black Sea
Partner	TUBITAK

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FACTSHEET 1: Eutrophication - Nutrients

<table>
<tr><td>Descriptor</td><td colspan="5">D5 Eutrophication</td></tr>
<tr><td>Indicator</td><td colspan="5">Nutrients</td></tr>
<tr><td>Parameters</td><td colspan="5">The parameters for nutrients include nitrogen and phosphorus compounds, ammonia and sediment organic matter.
In the table below, please add all the parameters that are being monitored <u>AND</u> for which there are available monitoring data. Add the most characteristic parameters for our region first.
For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).
<table>
<tr><th>Parameter</th><th>Background Level</th><th>Upper Limit</th><th>Unit</th><th>Monitoring Frequency</th></tr>
<tr><td>PO4_P</td><td><s>0,11</s> (0,04)*</td><td></td><td>µM</td><td rowspan="6">1986-1997: 2-4/yr
1999-2004: 1/yr
2005-06:3/yr
2007-08:5/yr
2009: 3/yr
2010: 1/yr</td></tr>
<tr><td>NO3+NO2_N</td><td><s>1,22</s> (0,36)*</td><td>(1)</td><td>µM</td></tr>
<tr><td>NO2_N</td><td><s>0,40</s> (0,14)*</td><td></td><td></td></tr>
<tr><td>NH4_N</td><td><s>2,35</s> (0,64)*</td><td>(1)</td><td>µM</td></tr>
<tr><td>SiO2</td><td><u>2,46</u> (1,66)*</td><td>-</td><td>µM</td></tr>
<tr><td>TP</td><td><s>0,44</s> (0,31)*</td><td>0,48 (2)</td><td>µM</td></tr>
</table></td></tr>
<tr><td rowspan="2">Comments regarding background and upper limits</td><td colspan="5">Please state whether there are areas where the background level is higher or lower than that stated above</td></tr>
<tr><td colspan="5">Background values were obtained as average for surface waters (0-10m) having salinity values >38.5 (not under the direct impact of river flows) for whole Mediterranean Turkish territorial area to represent the whole year during 1986-2010 (n=1400 records). However, number of data representing the winter season is much less than spring-autumn period. Also #ofdata for eastern Mediterranean is more than the #ofdata for the Eastern Tr-coast.
*In parenthesis, the median (50%) values of the above data set is presented and recommended as background values because the average values include the domestic influence especially in Mersin Bay (where #ofdata is more) hence artificially increase the background values.

(1): NO3+NO2+NH4<5 µM,
(2): TP<0,5 µM.
According to the national legislation(2009): For surface waters at oligotrophic conditions</td></tr>
<tr><td>Indicative values</td><td colspan="5">For each of the above parameters please give indicative values, as measured by your country’s monitoring plan</td></tr>
</table>

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<table>
<tr><td></td><td>Parameter</td><td>Indicative value</td></tr>
<tr><td></td><td>PO4_P</td><td>0,02-0,19 (min.value - 90% percentile value)</td></tr>
<tr><td></td><td>NO3+NO2_N</td><td>0,02-3,44 (min.value - 90% percentile value)</td></tr>
<tr><td></td><td>NO2_N</td><td>0,02-1,08 (min.value - 90% percentile value)</td></tr>
<tr><td></td><td>NH4_N</td><td>0,04-5,05 (min.value - 90% percentile value)</td></tr>
<tr><td></td><td>SiO2</td><td>0,01-5,08 (min.value - 90% percentile value)</td></tr>
<tr><td></td><td>TP</td><td>0,03-0,68 (min.value - 90% percentile value)</td></tr>
<tr><td>Method</td><td colspan="2">Please state the method used for measuring for each parameter and determining the above values</td></tr>
<tr><td></td><td>Parameter</td><td>Method used</td></tr>
<tr><td></td><td>PO4_P</td><td>Colorimetric : Grasshoff et al. 1983, S.M. 4500-P : 2005 G</td></tr>
<tr><td></td><td>NO3+NO2_N</td><td>Colorimetric : Grasshoff et al. 1983, S.M. 4500-P : 2005 G</td></tr>
<tr><td></td><td>SiO2</td><td>SM 4500-SiO2 C 21. 2005</td></tr>
<tr><td></td><td>TP</td><td>Persulfate oxidation- colorimetric : Grasshoff et al. 1983, S.M. 4500-P : 2005 G</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Scales to assess GES</td><td colspan="2">For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.</td></tr>
<tr><td></td><td colspan="2">Initially 10percentil of data is excepted as reference value and the ref+50% deviation is the target value for GES. Expert judgement for this region is also used.
<table>
<tr><th></th><th>NO3+NO2</th><th>NO2-N</th><th>NH4</th><th>PO4</th><th>TP</th><th>Si</th></tr>
<tr><td>Ref: 10% percentile</td><td>0,08</td><td>0,03</td><td>0,07</td><td>0,02</td><td>0,11</td><td>0,79</td></tr>
<tr><td>GES:10%+0.5(10%)</td><td>0,12</td><td>0,045</td><td>0,105</td><td>0,03</td><td>0,17</td><td>1,185</td></tr>
<tr><td>Expert</td><td><0,55</td><td><0,15</td><td><0,4</td><td><0,08</td><td><0,4</td><td>>0,8</td></tr>
</table></td></tr>
</table>

Reference to the Project:

TUBITAK-MRC and MoEU-GDEM (2014). Marine and Coastal Waters Quality Determination and Classification Project (DeKoS). ÇTÜE 5118703, Report No. ÇTÜE.13.155 (Final Report), February 2014, Gebze-Kocaeli, Turkey.

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FACTSHEET 2: Eutrophication - Phytoplankton

<table>
<tr><td>Descriptor</td><td colspan="5">D5 Eutrophication</td></tr>
<tr><td>Indicator</td><td colspan="5">Phytoplankton</td></tr>
<tr><td>Parameters</td><td colspan="5">The parameters for nutrients include chlorophyll a, primary production, microalgae and phytoplankton.
In the table below, please add all the parameters that are being monitored <u>AND</u> for which there are available monitoring data. Add the most characteristic parameters for our region first.
For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).
<table>
<tr><th>Parameter</th><th>Background Level</th><th>Upper Limit</th><th>Unit</th><th>Monitoring Frequncy</th></tr>
<tr><td>Chl-a</td><td><s>0,98</s> (0,46)</td><td>-</td><td>µg/L</td><td rowspan="5">1986-1997: 2-4/yr
1999-2004: 1/yr
2005-06:3/yr
2007-08:5/yr
2009: 3/yr
2010: 1/yr</td></tr>
<tr><td rowspan="4">Phytoplankton is also monitored however values are not set. Diatom/flagellate ratios, new sps as well as harmful sps are recorded</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td rowspan="2">Comments regarding background and upper limits</td><td colspan="5">Please state whether there are areas where the background level is higher or lower than that stated above</td></tr>
<tr><td colspan="5">Background values were obtained as average for surface waters (0-10m) having salinity values >38.5 (not under the direct impact of river flows) for whole Mediterranean Turkish territorial area to represent the whole year during 1986-2010 (n=1400 records). However, number of data representing the winter season is much less than spring-autumn period. Also #ofdata for eastern Mediterranean is more than the #ofdata for the Eastern Tr-coast.
*In parenthesis, the median (50%) values of the above data set is presented and recommended as background values because the average values include the domestic influence especially in Mersin Bay (where #ofdata is more) hence artificially increase the background values.</td></tr>
<tr><td>Indicative values</td><td colspan="5">For each of the above parameters please give indicative values, as measured by your country’s monitoring plan
<table>
<tr><th>Parameter</th><th>Indicative value</th></tr>
<tr><td>Chl-a</td><td>0.01-2,67 (min.value - 90% percentile value)</td></tr>
</table></td></tr>
</table>

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<table>
<tr><td rowspan="2"></td><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="7">Method</td><td colspan="2">Please state the method used for measuring for each parameter and determining the above values</td></tr>
<tr><td>Parameter</td><td>Method used</td></tr>
<tr><td>Chl - a</td><td>GF/F, Acetone extraction , spectrophotometric</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Scales to assess GES</td><td colspan="2">For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.

<table>
<tr><td></td><td>Chl-a</td></tr>
<tr><td>Ref: 10% percentile</td><td>0,07</td></tr>
<tr><td>GES: 10%+0.5(10%)</td><td>0,105</td></tr>
<tr><td>Expert</td><td><0,6</td></tr>
</table>
</td></tr>
</table>

Reference to the Project:

TUBITAK-MRC and MoEU-GDEM (2014). Marine and Coastal Waters Quality Determination and Classification Project (DeKoS). ÇTÜE 5118703, Report No. ÇTÜE.13.155 (Final Report), February 2014, Gebze-Kocaeli, Turkey.

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FACTSHEET 3: Eutrophication - Other

<table>
<tr><td>Descriptor</td><td colspan="5">D5 Eutrophication</td></tr>
<tr><td>Indicator</td><td colspan="5">Other</td></tr>
<tr><td rowspan="7">Parameters</td><td colspan="5">The parameters for nutrients include secchi depth and dissolved oxygen concentration. In the table below, please add all the parameters that are being monitored <u>AND</u> for which there are available monitoring data. Add the most characteristic parameters for our region first.
For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).</td></tr>
<tr><td>Parameter</td><td>Background Level</td><td>Upper Limit</td><td>Unit</td><td>Monitoring Frequency</td></tr>
<tr><td>SDD</td><td></td><td></td><td></td><td></td></tr>
<tr><td>DO</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Comments regarding background and upper limits</td><td colspan="5">Please state whether there are areas where the background level is higher or lower than that stated above</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td rowspan="7">Indicative values</td><td colspan="5">For each of the above parameters please give indicative values, as measured by your country’s monitoring plan</td></tr>
<tr><td>Parameter</td><td colspan="4">Indicative value</td></tr>
<tr><td>SDD</td><td colspan="4">Not properly covered by monitoring plan</td></tr>
<tr><td>DO</td><td colspan="4"></td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td rowspan="3">Method</td><td colspan="5">Please state the method used for measuring for each parameter and determining the above values</td></tr>
<tr><td>Parameter</td><td colspan="4">Method used</td></tr>
<tr><td>SDD</td><td colspan="4">Secchi disk</td></tr>
</table>

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	DO	Winkler method
Scales to assess GES	For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.	
	Expert view: - GES target for SD would be >7m. - GES target for subsurface (bottom or lower layer) waters would be >75% They are proposed for coastal (not open, oligotrophic sea) >38.5 salinity waters.	

Reference to the Project:

TUBITAK-MRC and MoEU-GDEM (2014). Marine and Coastal Waters Quality Determination and Classification Project (DeKoS). ÇTÜE 5118703, Report No. ÇTÜE.13.155 (Final Report), February 2014, Gebze-Kocaeli, Turkey.

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FACTSHEET 4: Contaminants – In Water

NOT MESURED

Descriptor	**D8/D9 Contaminants**				
Indicator	**In water**				
Parameters	The parameters for nutrients include synthetic substances (e.g. PAHs, PCBs, pesticides etc), non-synthetic substances (e.g. metals such as Cu, Cd, Hg etc), petroleum hydrocarbons and radionuclides. In the table below, please add all the parameters that are being monitored **AND** for which there are available monitoring data. Add the most characteristic parameters for our region first. For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).				
	Parameter	**Background Level**	**Upper Limit**	**Unit**	**Monitoring Frequency**
Comments regarding background and upper limits	Please state whether there are areas where the background level is higher or lower than that stated above				
Indicative values	For each of the above parameters please give indicative values, as measured by your country's monitoring plan				
	Parameter	**Indicative value**			
Method	Please state the method used for measuring for each parameter and determining the above values				
	Parameter	**Method used**			
Scales to assess GES	For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.				

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FACTSHEET 5: Contaminants – In Sediment

DATA ON ORGANIC CONTAMINANTS IS SCARCE. NEEDS FURTHER DATA ANALYSIS.

Descriptor	**D8/D9 Contaminants**				
Indicator	**In sediment**				
Parameters	The parameters for nutrients include synthetic substances (e.g. PAHs, PCBs, pesticides etc), non-synthetic substances (e.g. metals such as Cu, Cd, Hg etc), petroleum hydrocarbons and radionuclides. In the table below, please add all the parameters that are being monitored **AND** for which there are available monitoring data. Add the most characteristic parameters for our region first. For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).				
	Parameter	**Background Level**	**Upper Limit**	**Unit**	**Monitoring Frequency**
	Cd (dry weight)	110		µg/kg	1 / yr
	Hg (dry weight)	216		µg/kg	1 / yr
	Pb (dry wt)	33		mg/kg	1 / yr
	Zn (dry wt)	110		mg/kg	1 / yr
	Cr (dry wt)	155		mg/kg	1 / yr
	Cu (dry wt)	55		mg/kg	1 / yr
Comments regarding background and upper limits	Please state whether there are areas where the background level is higher or lower than that stated above				
	Average for 1999 and 2003-2009. Annual samplings for whole TR-MED.				
Indicative values	For each of the above parameters please give indicative values, as measured by your country's monitoring plan				
	Parameter	**Indicative value**			

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	Cd	13-586 (min – max values, dry wt, µg/kg)
	Hg	4 - 1100 (min – max values, dry wt, µg/kg)
	Pb	3,4-132 (min – max values, dry wt, mg/kg)
	Zn	4 - 1505 (min – max values, dry wt, mg/kg)
	Cr	1 – 1001 (min – max values, dry wt, mg/kg)
	Cu	3,4 – 963 (min – max values, dry wt, mg/kg)
Method	Please state the method used for measuring for each parameter and determining the above values	
	Parameter	**Method used**
	All metals	UNEP RMs : RM-26, RM-27, RM-29, RM31, RM-39
Scales to assess GES	For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.	
	Sediment quality criteria has to be developed for GES and non-GES.. Not done yet. So, we used in DeKoS (our national Project, 2011-2013) ERL and Enrichment Factor assessments.	

Reference to the Project:

TUBITAK-MRC and MoEU-GDEM (2014). Marine and Coastal Waters Quality Determination and Classification Project (DeKoS). ÇTÜE 5118703, Report No. ÇTÜE.13.155 (Final Report), February 2014, Gebze-Kocaeli, Turkey.

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FACTSHEET 5: Contaminants – In Biota

FISH (MB) WAS MONITORED DURING 1999-2007 ONLY AT 3 TRAWL ST IN THE N-EAST MED. DO NOT REPRESENT THE WHOLE AREA.

2011-TODAY MONITORING PROGRAMME HAS A BETTER COVERAGE.

<table>
<tr><td>Descriptor</td><td colspan="5">D8/D9 Contaminants</td></tr>
<tr><td>Indicator</td><td colspan="5">In biota</td></tr>
<tr><td rowspan="4">Parameters</td><td colspan="5">The parameters for nutrients include synthetic substances (e.g. PAHs, PCBs, pesticides etc), non-synthetic substances (e.g. metals such as Cu, Cd, Hg etc), petroleum hydrocarbons and radionuclides.
In the table below, please add all the parameters that are being monitored <u>AND</u> for which there are available monitoring data. Add the most characteristic parameters for our region first.
For each of these parameters, please give the background level (the yearly average naturally occurring concentration) the upper limit (as set by national or European legislation), as well as the units that these are measured in, and the monitoring frequency (per year).</td></tr>
<tr><td>Parameter</td><td>Background Level</td><td>Upper Limit</td><td>Unit</td><td>Monitoring Frequency</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Comments regarding background and upper limits</td><td colspan="5">Please state whether there are areas where the background level is higher or lower than that stated above</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td rowspan="4">Indicative values</td><td colspan="5">For each of the above parameters please give indicative values, as measured by your country’s monitoring plan</td></tr>
<tr><td>Parameter</td><td colspan="4">Indicative value</td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td rowspan="4">Method</td><td colspan="5">Please state the method used for measuring for each parameter and determining the above values</td></tr>
<tr><td>Parameter</td><td colspan="4">Method used</td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td rowspan="2">Scales to assess GES</td><td colspan="5">For each parameter, please state the predefined scale that is used to assess progress towards GES, if any.</td></tr>
<tr><td colspan="5"></td></tr>
</table>

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Appendix C – The DeCyDe-4-IRIS Participatory self assessment method towards GES and MSFD integrated monitoring.

C.1. Introduction – concept

In order to serve the needs for GES of MSFD, and have a strategic role in the decision making process, the DeCyDe-4 method has been adapted to IRIS-SES needs and the DeCyDe-4-IRIS method and toolbox has been developed. The aim is threefold:

- To develop a strategic decision support method and framework that supports the decision makers and the stakeholders to understand and justify the main issues that are involved in the process of decision-making and the trade-offs between different decision alternatives.
- To enhance experts and key actors involvement and create an engagement toolbox and
- To develop a self- assessment tool for GES and integrated monitoring efforts, supporting IRIS's aim for *sustainability of achievements*. The tool will remain in operation and be part of the monitoring process, after the end of the project.
- To develop a set of guidelines on implementable abatement measures that can be considered in countries' strategic roadmap/ action plan, in their policies for implementing MFSD, towards GES.

The DeCyDe-4-IRIS method was developed for two descriptors (5 and 8/9), and will be implemented at the regional level during the two IRIS regional stakeholder meetings (one for the Mediterranean and one for the Black Sea) that will be held during the project.

C.2. Implementing DeCyDe-4-IRIS method

The process of the implementation of the DeCyDe-4-IRIS method in IRIS regional workshops consists of the following three successive parts, from A to C. It is important to ensure that the participants in the regional stakeholder meetings are able to provide real site specific input and expertise, and will be committed to incorporate the new methods and suggestions in their work/ processes:

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C.2.1 PART A: Preparatory phase

Partners will be asked to be prepared for the workshop, in order to maximize the impact of the workshop outcomes. Two documents will be sent to the partners at least one month before the workshop: the factsheets for descriptors 5 and 8/9 and the stakeholder mapping, as described below. Partners will complete them and will send the completed, site specific documents to ISOTECH prior to the meeting, in order to set up the score board for each partner country, as described in part B of this document.

1. ***The DeCyDe-4-IRIS factsheets for Descriptors 5 and 8/9***: at least one month before each of the regional stakeholder workshop, the participating partners will receive certain factsheets that they will have to complete, regarding eutrophication and contaminants. Using these factsheets, partners will need to provide information on eutrophication and contaminant parameters that are being measured in specific region(s) in their country. Partners will be required to choose regions that are neighboring to other partner countries. The information that partners will have to report appears in the attached factsheet and includes:
    a. what is being monitored (adding the 5 most important parameters at the top),
    b. How, i.e. the method of monitoring
    c. what is the baseline concentration in the particular region, what is the upper level set by national or European legislation and what are indicative values recorded in that specific region.

It is important to keep in mind, that the information required here should be brief and representative.

2. ***Mapping of key actors and stakeholders***: The list of the DeCyDe-4-IRIS key actor and stakeholder categories that have an important role in MFSD descriptor monitoring and the target of GES, has been prepared and will be sent to the partners that will attend each of the regional stakeholder workshops. The partners should identify people that fall within those specific categories. The stakeholder/ key actors "blend" list will form part of the discussion during Part D of the regional workshops, aiming to identify possible

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problems and needs when trying to involve stakeholders. It is thus important that the partners communicate with the people whom they will identify as national stakeholders/ key actors, in order to have a real idea of their reactions, suggestions, and needs. The stakeholders/ key actors will form the national IRIS stakeholder group, which will play an important role for the implementation and sustainability of IRIS outcomes.

C.2.2 PART B: The DeCyDe-4-IRIS toolbox:

1. ***The DeCyDe-4-IRIS "score board":*** Based on the ***existing situation***, that will be derived from the DeCyDe-4-IRIS factsheets in each region, i.e. the parameters that have been identified as important for each descriptor, and the background and upper levels recorded in the factsheets, Isotech will deduct the "ranges" that will be used in the self-assessment tool, aiming at GES. The DeCyDe-4-IRIS score boards will be developed and set up for each country for the specific region which will be identified by the partners on the factsheets, in order to be ready during the IRIS Regional Workshop to work with this tool. Apart from addressing the GES, the scoreboards will include the frequency of monitoring per country/region, per parameter, per descriptor, in order to provide regional participants with more tools to promote cooperation in descriptors monitoring.

2. **The *Source-pollutant Matrix*** per descriptor
    a. The ***Source-pollutant Matrix***, will be developed for each descriptor. The matrix will address the main sources of pollutants for each of the descriptor parameters. It will be used alongside the self-assessment tool to assist decision-makers and stakeholders to pinpoint possible causes for underperformance.

3. **The list of *Abatement Measures*** per source/industrial sector
    a. Mapping the sources of pollutants and the identification of solutions/measures per source of pollution is a very challenging perspective, which is not part of IRIS tasks. A general list of possible Abatement Measures is developed through DeCyDe-4-IRIS and used here, as a tool. The Abatement Measures list will be used by together with the Source-pollutant Matrix to provide with a framework that supports the decision makers and the stakeholders to understand and justify

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the main issues that are involved in the process of decision-making and the trade-offs between different decision alternatives.

C.2.3 PART C: The DeCyDe-4-IRIS Regional Workshop

Part C of the methodology will be implemented during the IRIS Regional Workshop. Stakeholders and decision makers are expected to participate to IRIS-SES regional workshops.

Each workshop will last about 4 hours. The collective opinions of these partners (key actors and stakeholders) as per the gaps and needs in monitoring and the possible implementation of abatement measures towards GES, will be drafted into a report, to be presented to the Commission as part of IRIS-SES strategic suggestions.

The workshops are structured on group work and will have **three** distinct but interrelated stages, aiming to:

- Guide the partners through the Self Assessment process;
- Identify the gaps, problems and needs of their country/region with regards to eutrophication and contaminants monitoring
- Discuss on possibilities of joint monitoring
- Improve coordination among neighboring countries.
- Discuss possible abatement measures for the improvement of GES

Step 1:

The DeCyDe-4-IRIS self-assessment tool - Scoring through ranges to identify the problems: To start off the workshop, the participants will be asked to form "regional groups", i.e. groups with participants from their neighboring countries/regions. Using the information submitted in the factsheets according to their country and using the DeCyDe-4-IRIS self-assessment tool developed for each region/country and the factsheets, in which indicative concentrations of parameters were recorded, they will score their country/region. The scores of individual countries/regions will be discussed among the regional groups and major differences will be identified and discussed. Where scores are lower than the average, a discussion on the possible

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reasons will help identify the problems in specific regions or countries. Each group will present their outcomes to the plenary.

Step 2:

Gaps in cooperation in MSFD descriptors monitor - proposals on how to improve joint monitoring possibilities: having their self assessment tools filled and discussed the participants will be asked again to go back to their groups for the second DeCyDe-4-IRIS workshop:

a. what are the monitoring/measurement needs in each country and what are the common ones for the region. Each participant will be given 1 post-it on which to write the major need according to their opinion. Then each group will identify the common needs of their group.
b. Following the same procedure as in point (a) above, the participants will be asked to identify possible collaboration opportunities (i.e. whether the monitoring scheme of one country/region could be expanded to include another country/region and fill in a monitoring gap, joint use of infrastructure etc).

The groups will then be asked to report this back to plenary.

The results from activities (a) and (b) will be collected and grouped according to their category (i.e. whether they regard infrastructure, policy etc) and if possible their region and will be reported.

Step 3:

Abatement Measures: This part of the workshop starts with an open discussion on the source-pollutant relationships, using the source pollutant matrix as a tool. Then the participants will again go back to their groups and will be asked to identify 1-2 possible measures, from the Abatement Measures List, that can be implemented per source/ per descriptor, in their region. Each group will report to plenary. This part of the workshop will provide with a useful strategic tool: possible implementable abatement measures will be identified by the decision makers/ stakeholders themselves in cooperation with their counterparts from the neighbouring countries. The result of this innovative and participatory part of the workshops will form a guideline for promoting specific actions towards GES.

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C.3. Scope and expected outcomes of the DeCyDe-4-IRIS Workshop

The DeCyDe-4-IRIS workshop will enable key actors, decision makers and stakeholders to:

1. **Introduce in their activities a self-assessment process:** with the use of the self-assessment tool, partners will be able to "score" their country/region with regards to meeting GES for Descriptors 5 and 8/9, monitor their progress over time and test the effects of any changes in monitoring and management to their overall score. Easily identify which parameters need to be improved in order to increase their overall score.
2. **Record the challenges and opportunities to improve regional cooperation for the implementation of the Marine Strategy Monitoring Schemes**. Provide with the experts opinion on monitoring gaps and needs and ideas on how-to improve joint monitoring actions on MFSD descriptors;
3. **Formulate a strategic guideline, with specific and implementable abatement measures that will support MFSD target of GES**

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Appendix D – Proposed Abatement Measures to Improve the Environmental Status Related to Eutrophication (D5) and Contaminants (D8/D9)

Source 1: Municipal Waste

A. Sewage

1. Absorption pits
2. Sewerage system with primary wastewater treatment and discharge in the sea
3. Sewerage system with secondary wastewater treatment and discharge in the sea
4. Sewerage system with tertiary wastewater treatment and discharge in the sea
5. Sewerage system with primary wastewater treatment and use of treated water for agricultural or other purposes
6. Sewerage system with secondary wastewater treatment and use of treated water for agricultural or other purposes
7. Sewerage system with tertiary wastewater treatment and use of treated water for agricultural or other purposes
8. Sewerage system with tertiary wastewater treatment and additional nutrient minimization techniques
9. Place emergency outfalls for wastewater treatment plans away from the coast
10. Return of treated water to main users
11. In coastal hotels:
    a. Minimize the use of chemical fertilizers on grass and green spaces
    b. Replace chemical fertilizers with low release organic soil conditioners (e.g. compost)
    c. Establish private water desalination plants
    d. Secure the diversion of sewage from the sea by:
        i. Establishing connections with the sewerage system
        ii. Implementing private tertiary treatment stations with controlled use of water on-site
        iii. Storage in watertight tanks and transfer to a central treatment station
12. Other (please specify)

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B. Other Municipal Discharges

1. Avoid the direct discharge of rainwater to rivers and the sea
2. Create artificial reef ponds/ buffer zones or other areas of vegetation
3. Replace materials that release pollutants e.g. PAHs, heavy metals (from e.g. asphalt, petrol) with other less harmful alternatives
4. Other (please specify)

Source 2: Industrial Waste

1. Separate waste streams to ensure the proper management of each stream
2. According to the waste stream, the following methods can be applied:
    a. Reuse in other operations
    b. Material recovery
3. Pre-treatment of wastewater and transfer to a central municipal wastewater treatment plant
4. Central industrial wastewater treatment plant in industrial zones
5. Private wastewater treatment plants
6. Watertight evaporation ponds, or watertight tanks that will hold the wastewater until it is ready to be transported to a wastewater treatment plant
7. Limit emissions through stricter legislation and practical measures e.g. new equipment that minimizes PAH emissions from diesel central heating engines
8. Other (please specify)

Source 3: Farming including aquaculture

1. Apply automatic control and feeding systems-codes-technologies in farming – aquaculture
2. Periodically or permanently transfer aquaculture cages to a significant distance from the coast
3. Reduction of hatcheries wastewater polluting load through managerial, or/and technological interventions

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4. Construct watertight evaporation tanks for the diversion of liquid-solid farming waste from surface runoff
5. Anaerobic digestion at the central and private level
6. Other waste treatments (e.g. soil conditioners etc.)
7. Rainwater control on farming units
8. Use appropriate material and carry out due studies for watertight evaporation tanks
9. Other (please specify)

Source 4: Agriculture

1. Promote organic agriculture
2. Apply a good agricultural practice code, complimented by a certification process
3. Training-Awareness Raising campaigns on proper agricultural care for the reduction of chemical/synthetic fertilizers and/or the gradual use of slow release organic soil conditioners (e.g. compost)
4. Prohibit the use of chemical fertilizers to end nitrification (protected EU areas)
5. Use alternative crops with limited fetilisation requirements
6. Promote crop rotation with appropriate crops/species
7. Other (please specify)

Source 5: Shipping – Nautical Tourism and Energy (hydrocarbon exploration and mining)

1. Avoid copper based antifoulants
2. Provide incentives for technical modifications / changes to ship engines to improve combustion and reduce emissions
3. Impose stricter ship emission limits
4. Prohibit the disposal of wastewater from boats, regardless of boat size
5. Implement an indirect fee system
6. Other (please specify)

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Appendix E – List of Participants at the Eastern Mediterranean DeCyDe-4-IRIS Workshop

n/n	Name	Institute	Country
1	Antonis Petrou	AP Marine Environmental Consultancy Ltd	Cyprus
2	Argyrou Marina	Ministry of Agriculture, Natural Resources and Environment	Cyprus
3	Basset Alberto	UNISALENTO (Universitá del Salento)	Italy
4	Boicenco Laura	NIMRD (National Institute of Marine Research and Development "Grigore Antipa")	Romania
5	Cozzoli Francesco	UNISALENTO	Italy
6	Dassenakis Manos	UoA (University of Athens)	Greece
7	Drakopoulou Paraskevi	HCMR (Hellenic Centre for Marine Research)	Greece
8	Ebru Olgun	Environment and Urbanization Expert Ministry of Environment and Urbanization of Turkey	Turkey
9	Foden Mary	OSPAR Commission	
10	Francisco Alemany	IEO (Instituto Español de Oceanografía)	Spain
11	Giannoudi Louisa	HCMR	Greece
12	Golumbeanu Mariana	NIMRD	Romania
13	Hacer Selamoğlu Çağlayan	Environment and Urbanization Expert Ministry of Enviroment and Urbanization of Turkey	Turkey
14	Johanna Karhu	HELCOM (Baltic Marine Environment Protection Commission)	
15	Juan Bellas	IEO	Spain
16	Kamberi Eleni	HCMR	Greece
17	Karageorgis Aris	HCMR	Greece
18	Kavadas Stefanos	HCMR	Greece
19	Kyriakidou Chara	HCMR	Greece
20	Lalliotou Barbara	YPEKA (Ministry of Environment, Energy and Climate Change)	Greece

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21	Lazar Luminita	NIMRD	Romania
22	Loizides Michael	ISOTECH Ltd Environmental Research and Consultancy	Cyprus
23	Loizidou Xenia	ISOTECH Ltd Environmental Research and Consultancy	Cyprus
24	Louropoulou Evangelia	UoA	Greece
25	Makarenko Irina	Black Sea Commission	
26	Moncheva Snejana	IO BAS (Institute of Oceanography – Bulgarian Institute of Sciences)	Bulgaria
27	Orthodoxou Demetra	ISOTECH Ltd Environmental Research and Consultancy	Cyprus
28	Pagou Kalliopi	HCMR	Greece
29	Panagiotidis P.	HCMR	Greece
30	Papathanassiou Evangelos	HCMR	Greece
31	Paramana Theodora	UoA	Greece
32	Reizopoulou S.	HCMR	Greece
33	Simboura Nomiki	HCMR	Greece
34	Spanu Alina	NIMRD	Romania
35	Streftaris Nikos	HCMR	Greece
36	Tsangaris Catherine	HCMR	Greece
37	Vassilopoulou	HCMR	Greece
38	Vosniakos Fokion	B.EN.A (Balkan Environmental Association), Alexander Technological Educational Institute of Thessaloniki	Greece
39	Maina Irida	HCMR	Greece
40	Laiaki Maria	HCMR	Greece
41	Gurban Gyorgyi	UNEP (United Nations Environment Programme)	

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