



**Interreg**   
**ADRION** ADRIATIC-IONIAN

European Regional Development Fund - Instrument for Pre-Accession II Fund

**HarmoNIA**



# Harmonization and Networking for contaminant assessment in the Ionian and Adriatic Seas

**Harmonization of monitoring of contaminants and Environmental Impact Assessment (EIA) in the ADRION region: offshore challenges**

## **Strategy for Harmonized Monitoring**

Daniela Berto, Malgorzata Formalewicz,  
Claudia Gion, Loredana Manfra, Benedetta Trabucco,  
Giordano Giorgi

[giordano.giorgi@isprambiente.it](mailto:giordano.giorgi@isprambiente.it)

[loredana.manfra@isprambiente.it](mailto:loredana.manfra@isprambiente.it)

[benedetta.trabucco@isprambiente.it](mailto:benedetta.trabucco@isprambiente.it)



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## WP 1 Coordinator: ISPRA

## WP 1 Objectives in ADRION region

Harmonization of monitoring of contaminants and Environmental Impact Assessment (EIA) in the ADRION region procedures

T1.1 - monitoring & assessment of contaminants in the marine environment

T1.2 - environmental impact assessment (EIA) of offshore platforms

T1.3 - monitoring & decommissioning of offshore platforms



Communication C2.1.1  
Harmonized proposal for monitoring & assessment of marine contaminants

Strategy T1.4  
Regional strategy for harmonized monitoring & assessment of marine contaminants

## WP 1 Relevant results:

### T1.1 - Harmonized monitoring & assessment of contaminants in the marine environment

#### **Deliverable T1.1.1** → **Protocol review of analytical QA/QC**

- Distribution and collection of questionnaire to Partners
  - Comparative analysis of answers to questionnaires
  - Review of analytical and methodological protocols

#### **Deliverable T1.1.2** → **Harmonization of sampling procedures and analytical methods**

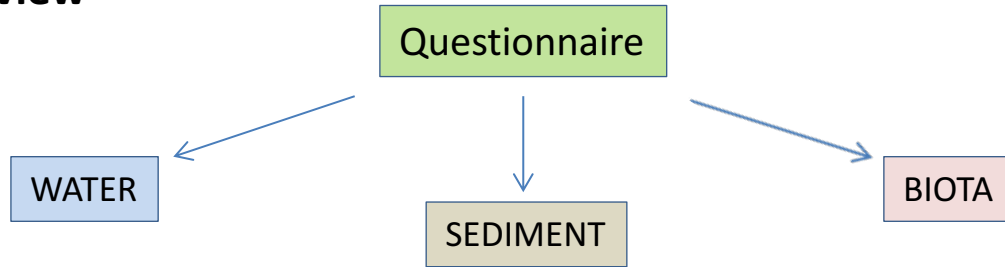
- matrix characteristics
- units of measurements
- sampling procedures
- sample storage
- methods of analysis
- limit of quantification (LOQ)

#### **Deliverable T1.1.3** → **Data sets QA/QC procedures**

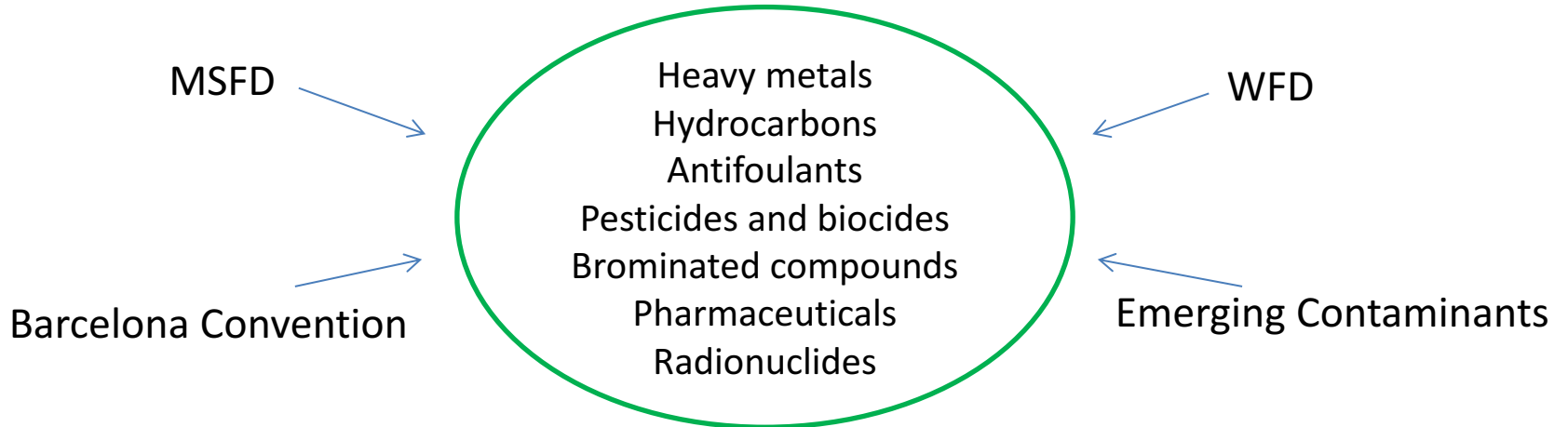
- dataset format check
- metadata completeness
- additional data needs

# WP 1 Relevant results:

## T1.1.1 – Protocol review



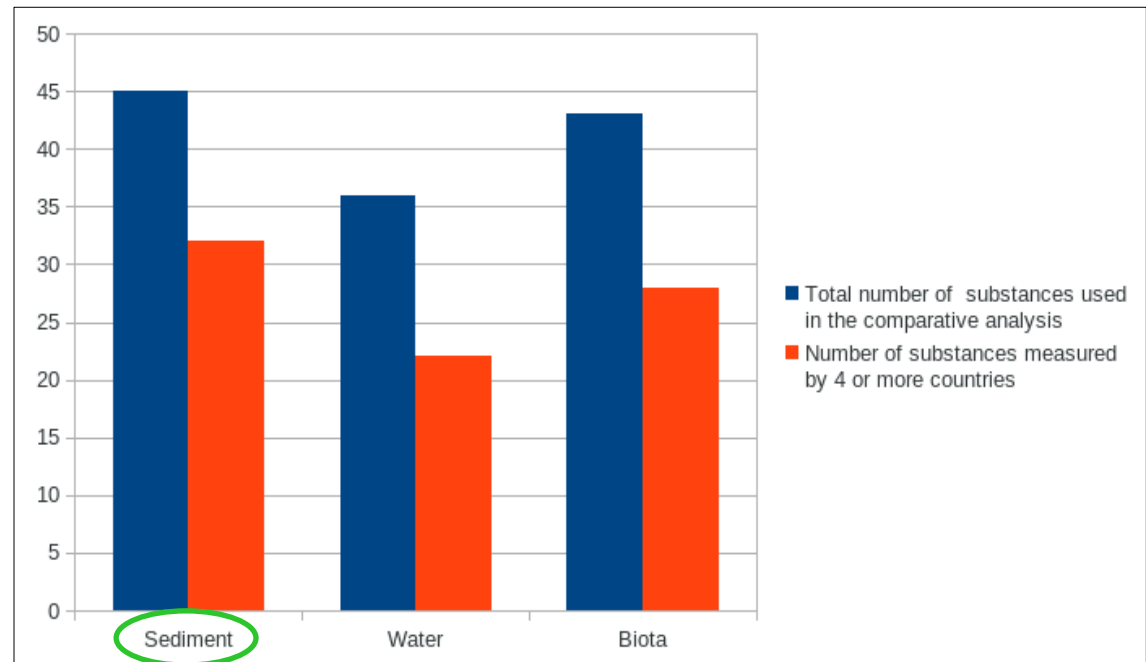
Substances considered for the analysis of monitoring protocol



## WP 1 Relevant results:

### T1.1.1 – Protocol review: large heterogeneity and need for harmonization

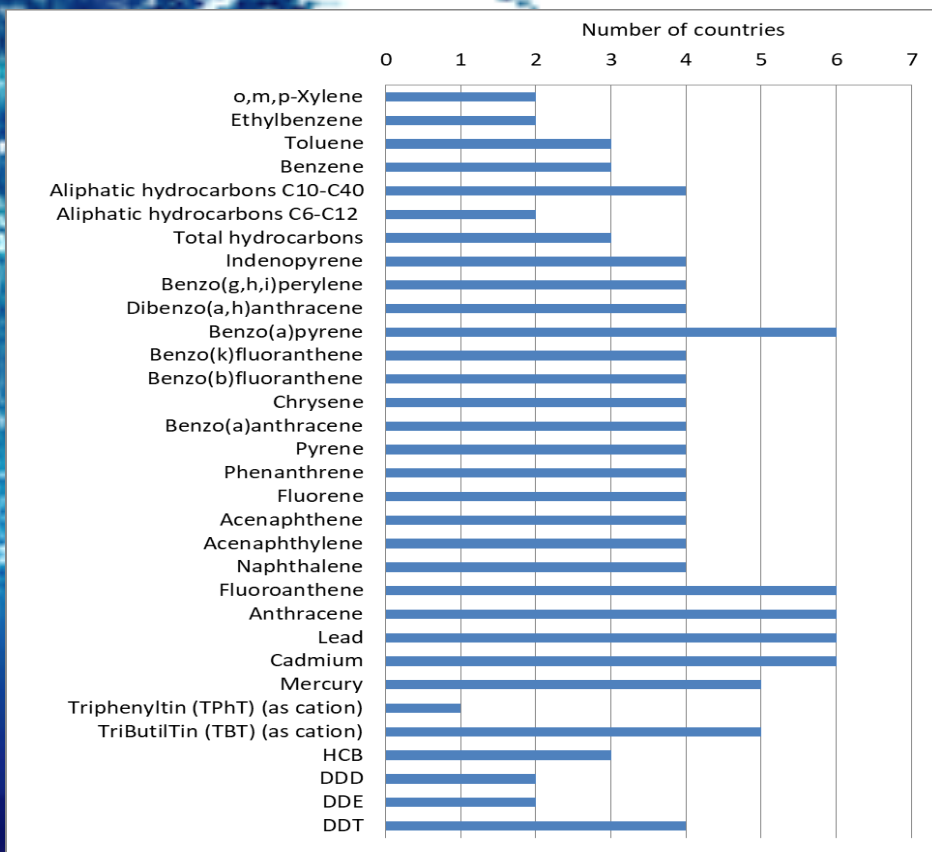
- **LOQ values** differing of 1-3 orders of magnitude
- Poor information on **accuracy** and **reproducibility**
- **Pharmaceuticals** and **radionuclides** – not monitored



Highest percentage of contaminants measured

# WP 1 Relevant results:

## T1.1.1 – Protocol review: WATER matrix



### Harmonised approach:

#### Water sample type and sampling methods:

- total water sample for pesticides and biocides, antifoulants and hydrocarbons
- filtered sample for heavy metals

Storage: some common methods for pesticides and biocides and heavy metals

Analytical method: some common methods for antifoulants, heavy metals, hydrocarbons and physical parameters

### Poor information on:

- pesticides and biocides
- antifoulants
- physical parameters

**Certified reference materials** – poorly used  
**Intercalibration** – low participation

# WP 1 Relevant results:

## T1.1.1 – Protocol review: SEDIMENT matrix

**Most frequently measured:**

- hydrocarbons
- heavy metals
- pesticides and biocides
- antifoulants

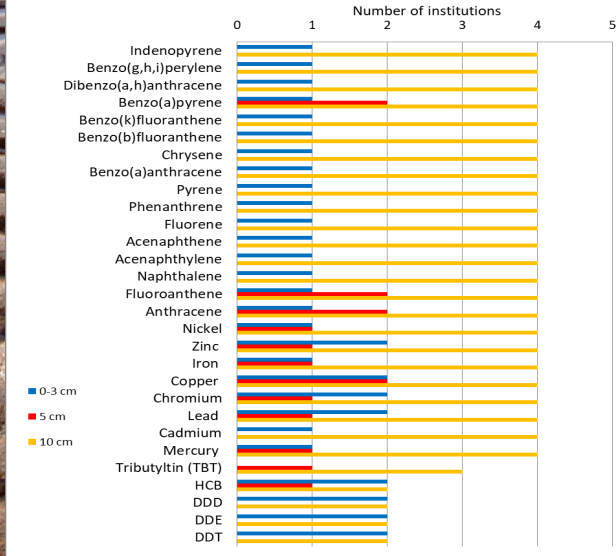
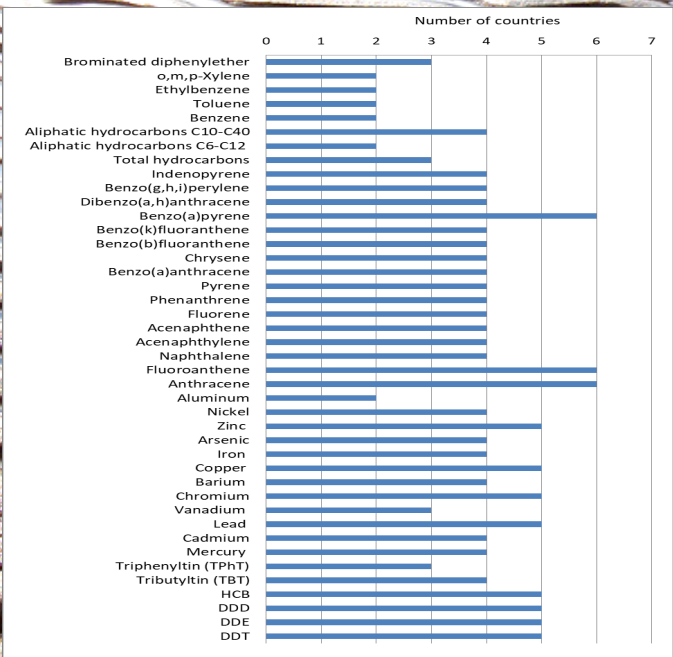
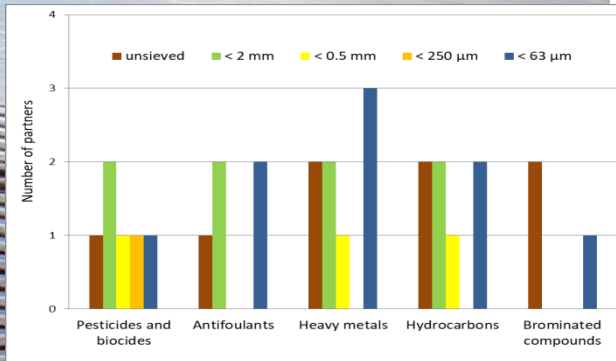
**High heterogeneity:**

- grain size of sampled sediment
- thickness of sediment samples

**Sampling devices:**  
 Box corer > grab samplers > gravity corer

**Overall lack of harmonization:**

- storage
- method of analysis
- detection limit
- quantification limit
- reference materials
- intercalibration exercises





# WP 1 Relevant results:

## T1.1.1 – Protocol review: BIOTA matrix

### Most frequently measured:

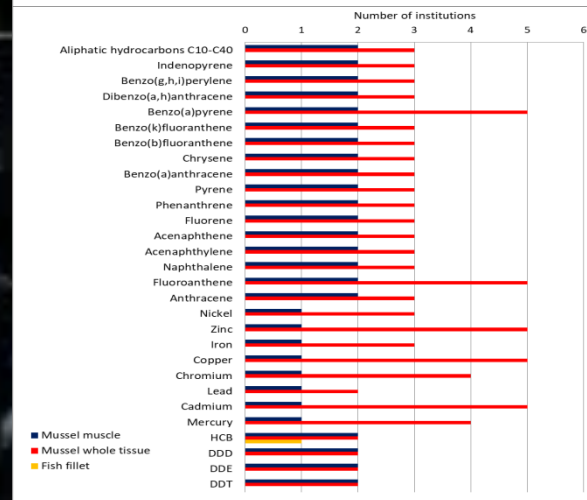
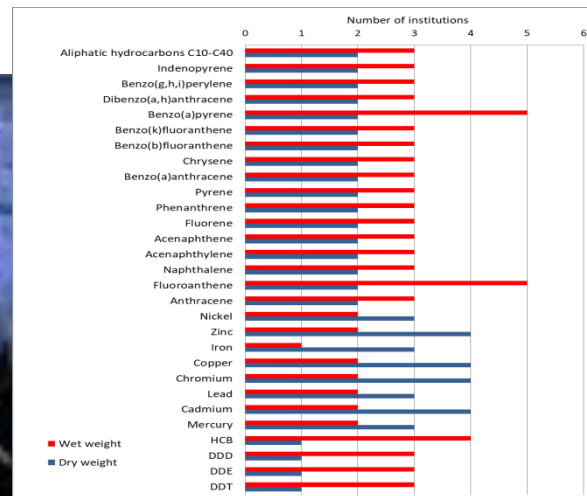
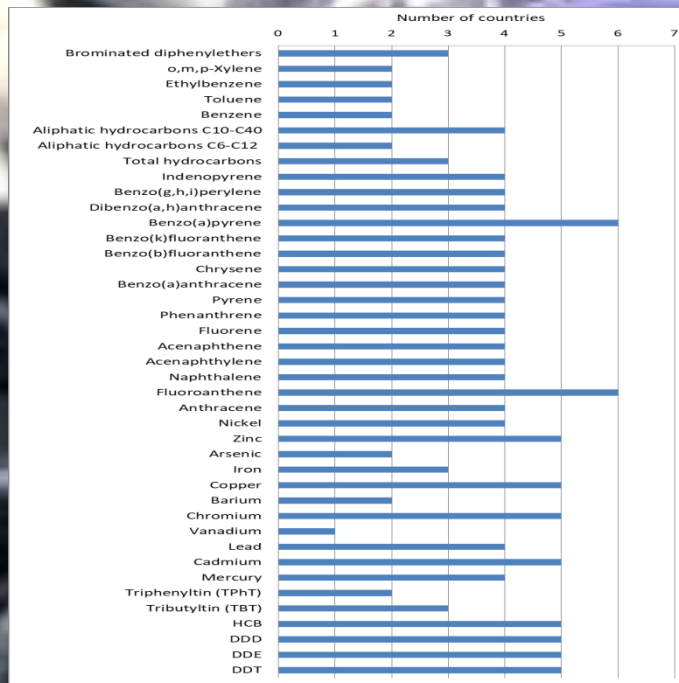
- pesticides
- heavy metals
- hydrocarbons

### Commonalities:

- measurement weight basis
- analysed species – predominantly *Mytilus galloprovincialis*

### Heterogeneity:

- Number of replicates
- Storage
- LOD
- LOQ
- Analytical methods (commonalities only for PAHs)
- Reference materials
- Intercalibration exercises





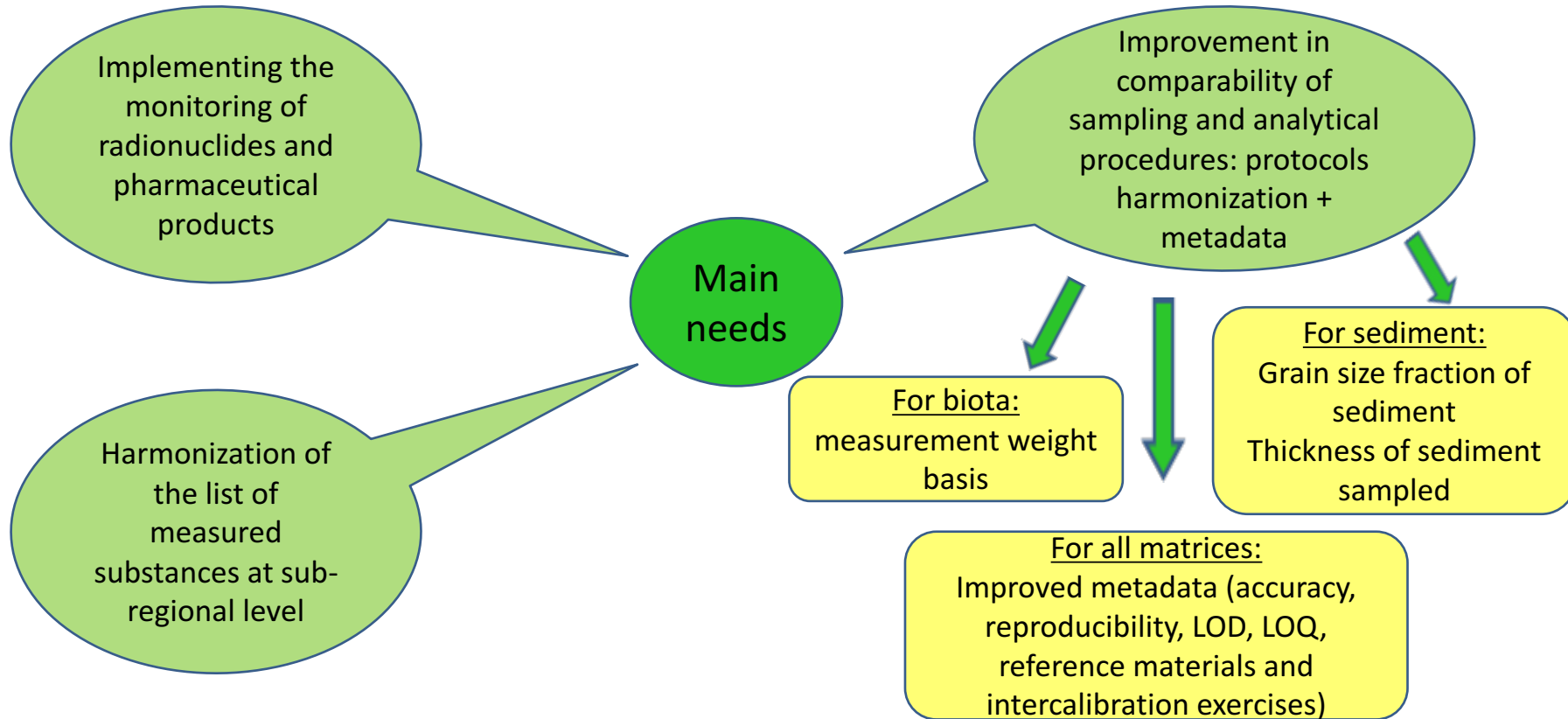
# WP 1 Relevant results:

## T1.1.1 – Protocol review: Gaps and needs

Are the monitoring protocols in the ADRION region comparable?

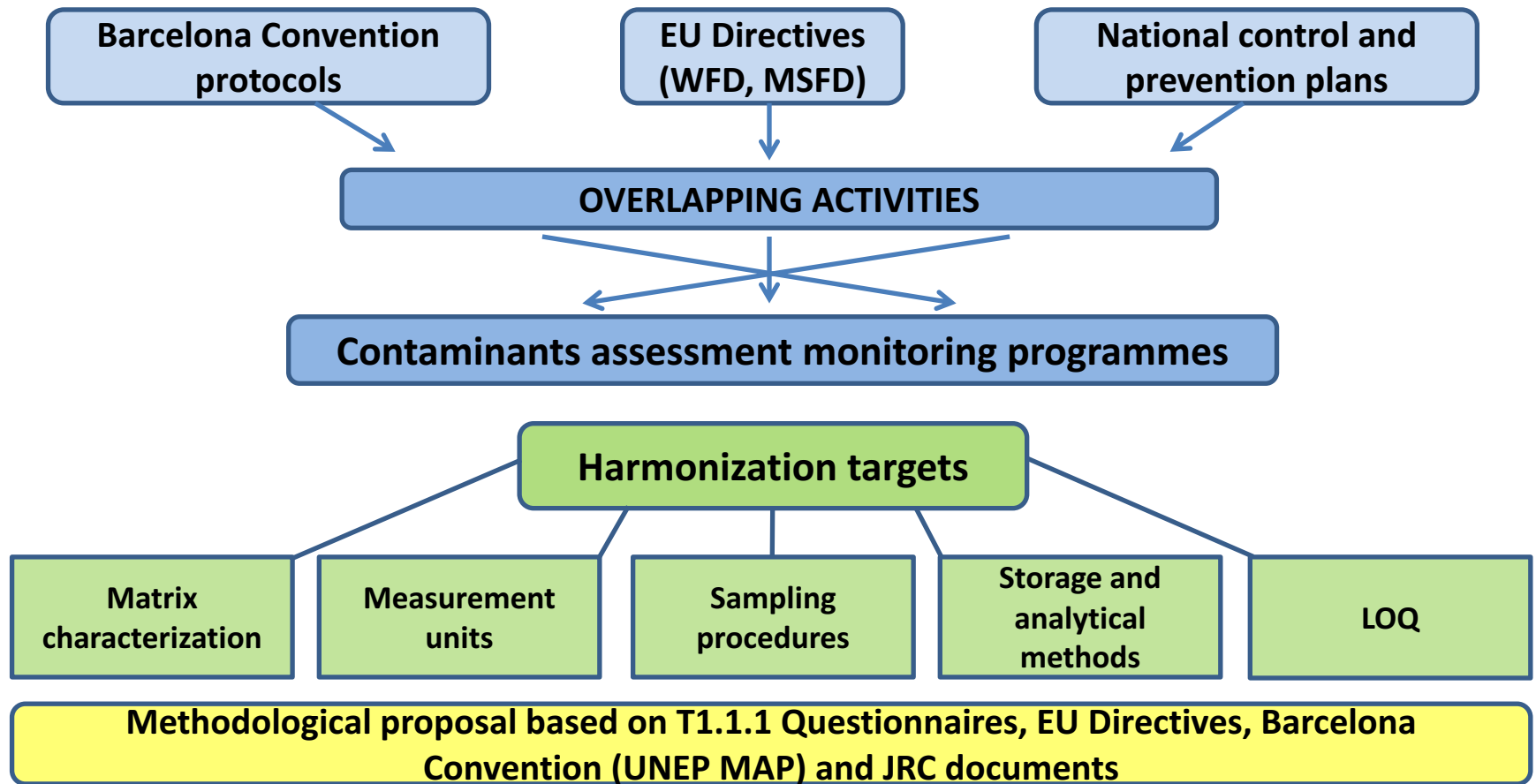
**NO!**

**Clear need of a common protocol!**



## WP 1 Relevant results:

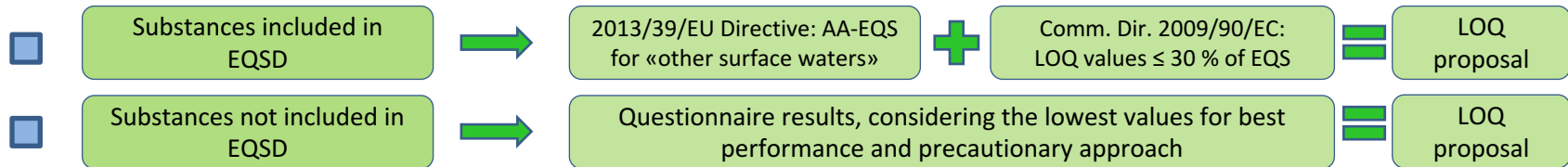
### T1.1.2 – Methodological proposal for harmonized sampling procedure and analytical methodologies



# WP 1 Relevant results:

## T1.1.2 – Methodological proposal for harmonized sampling procedure and analytical methodologies: WATER matrix

LOQ proposal methodology:



Contaminant group	Units	Sampling methods	Storage	Method of Analysis
Pesticides and biocides	µg/l	no filtration	4 °C, darkness	GC-MS
Antifoulants	µg/l (as cation)	no filtration	acidification, 4 °C, darkness	GC-MS
Pharmaceuticals	µg/l	no filtration	-20 °C	SPE-LC-MS-MS
Heavy metals (mercury)	µg/l	filtration 0,45 µm	acidification, 4 °C	CV-ASS
Heavy metals (cadmium and lead)	µg/l	filtration 0,45 µm	acidification HNO3, SPE pre-concentration	voltammetry/ ICP-MS
Hydrocarbons (PAHs and aliphatic C <sub>10</sub> -C <sub>40</sub> )	µg/l	no filtration	extraction with n-hexane on board/ 4 °C without preservative, darkness	GC-MS / HPLC-FLD *
Hydrocarbons (BTEX and aliphatic C <sub>6</sub> -C <sub>12</sub> )	µg/l	no filtration	4 °C, ammonium bisolphate addition	GC-MS
Radionuclides	Bq/l	no data	no data	no data
Physical parameters	**	CTD probe in-situ measurement	in-situ measurement	CTD probe

Certified reference materials for water matrix are few – the participation in intercalibration exercises is recommended !



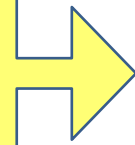
\* GC-FID for total hydrocarbons and aliphatic hydrocarbons C<sub>10</sub>-C<sub>40</sub>

\*\* Dissolved oxygen [%], Salinity [PSU], Temperature [°C], Transmittance [%], Fluorescence [mg/m<sup>3</sup>]

# WP 1 Relevant results:

## T1.1.2 – Methodological proposal for harmonized sampling procedure and analytical methodologies: SEDIMENT matrix

- No threshold values for contaminants in sediment in MSFD and WFD
- No national threshold values for sediment in ADRION region, except for Italy (Italian Decree 172/2015)



LOQ proposal based on:

T.1.1.1  
Questionnaires

References:  
Med BACs, US-ERL,  
TEL, AA-EQS (Italian)

Contaminant group	Units	Grain size	Sampling method	Thickness of sampled sediment [cm]	Storage	Method of Analysis
Pesticides and biocides	µg/kg	< 2 mm	box corer	0 - 2	frozen at -20 °C, freeze-dried sediment stored at 4 °C	GC-ECD
Antifoulants	µg/kg (as cation)	< 2 mm	box corer	0 - 2	frozen at -20 °C, freeze-dried sediment stored at 4 °C	GC-MS
Pharmaceuticals	µg/kg	< 2 mm	box corer	0 - 2	frozen at -20 °C, freeze-dried sediment stored at 4 °C	-
Heavy metals	mg/kg	< 2 mm	box corer	0 - 2	frozen at -20 °C, freeze-dried sediment stored at 4 °C	ICP-MS
Hydrocarbons	µg/kg	< 2 mm	box corer	0 - 2	frozen at -20 °C, freeze-dried sediment stored at 4 °C	GC-MS *
Brominated compounds	µg/kg	< 2 mm	box corer	0 - 2	frozen at -20 °C, freeze-dried sediment stored at 4 °C	GC-MS
Radionuclides	Bq/kg	-	-	-	-	-
Organic matter	%	< 2 mm	box corer	0 - 2	frozen at -20 °C, freeze-dried sediment stored at 4 °C	**
Grain size analysis	%	unsieved	box corer	0 - 2	4 °C	mechanical sieving
Water content	%	unsieved	box corer	0 - 2	4 °C	gravimetric

**Grain size: <2 mm**  
In sandy sediments < 63µm would be negligible fraction

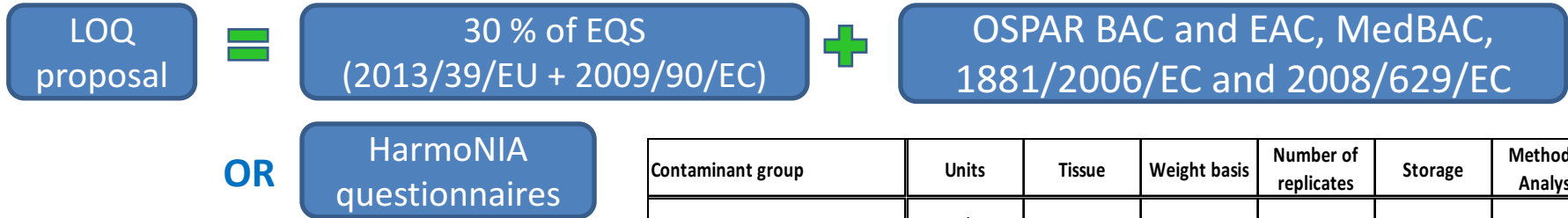
**Thickness of sediment sample: 0-2 cm**  
Possibly even less + deposition rate study



\* GC-FID for total hydrocarbons and aliphatic hydrocarbons C<sub>10</sub>-C<sub>40</sub>  
 \*\* CHN for Total organic carbon, gravimetric for Loss on ignition

# WP 1 Relevant results:

## T1.1.2 – Methodological proposal for harmonized sampling procedure and analytical methodologies: BIOTA matrix



Additional improvements proposal:

- Biometric measurements of organisms analysed
- Isotopic analysis for trophic level definition

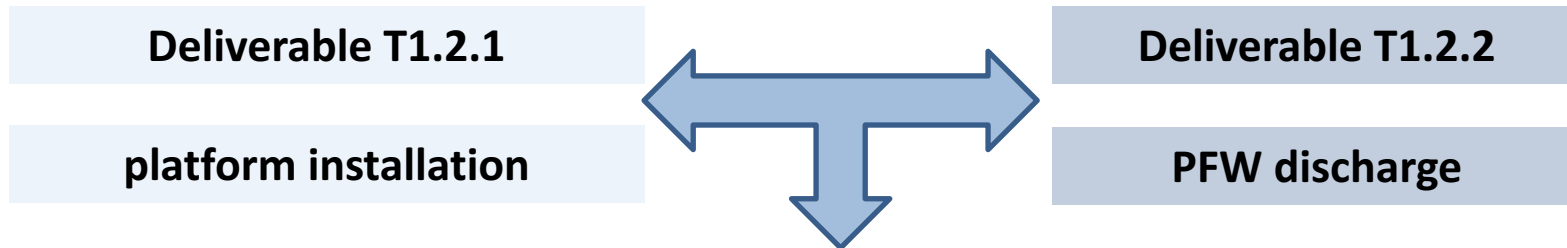
Contaminant group	Units	Tissue	Weight basis	Number of replicates	Storage	Method of Analysis
Pesticides and biocides	µg/kg	total sample	wet weight	3	frozen at -20 °C	GC-ECD
Antifoulants	µg/kg (as cation)	total sample	wet weight	3	frozen at -20 °C	GC-MS
Pharmaceuticals	µg/kg	total sample	wet weight	3	frozen at -20 °C	-
Heavy metals (mercury)	mg/kg	total sample	wet weight	3	frozen at -20 °C	CV-ASS
Heavy metals (cadmium and lead)	mg/kg	total sample	wet weight	3	frozen at -20 °C	ICP-OES
Hydrocarbons (PAHs and BTEX)	µg/kg	total sample	wet weight *	3	frozen at -20 °C	GC-MS
Hydrocarbons (total and aliphatic C <sub>10</sub> -C <sub>40</sub> )	µg/kg	total sample	wet weight *	3	frozen at -20 °C	GC-FID
Brominated compounds	µg/kg	total sample	wet weight	3	frozen at -20 °C	GC-ICPMS
Lipid content	%	total sample	wet weight	3	frozen at -20 °C	gravimetric
Water content	%	total sample	wet weight	3	frozen at -20 °C	gravimetric

\* dry weight for aliphatic hydrocarbons C<sub>6</sub>-C<sub>12</sub> and C<sub>10</sub>-C<sub>40</sub>



## WP 1 Relevant results:

### T1.2 - Harmonized Environmental Impact Assessment (EIA) of offshore platforms

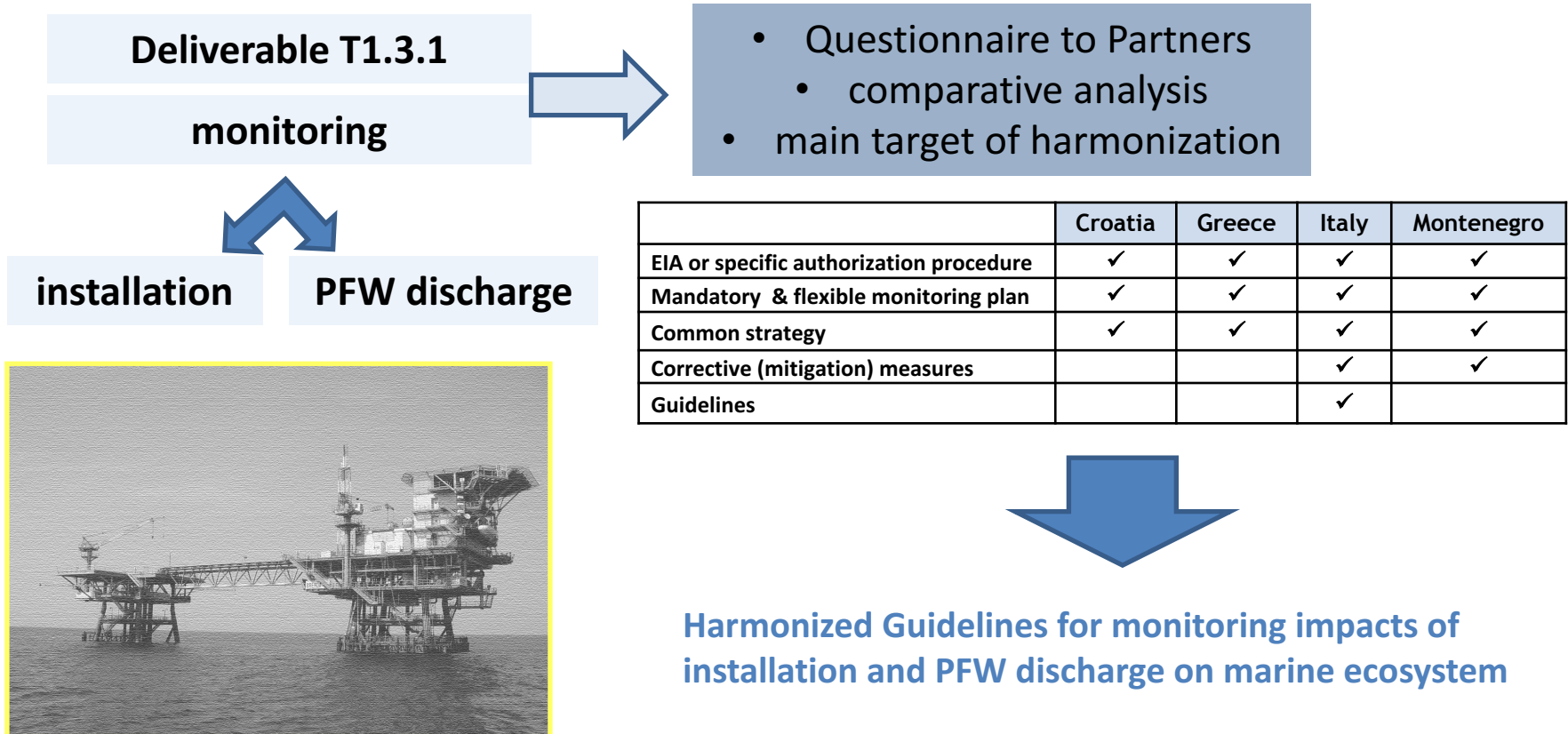


- EIA questionnaire to Partners
  - Comparative analysis
- Main targets of harmonization

	Albania	Croatia	Greece	Italy	Montenegro	Slovenia
Offshore platform presence	✓	✓	✓	✓		
Installation EIA	✓	✓	✓	✓	✓	✓
PW discharge EIA		✓	✓		✓	
EIA report guidelines	✓		✓		✓	✓
PW discharge legislation	✓	✓		✓	✓	
PW discharge monitoring guidelines				✓		
Gas production restrictions with respect coastline & AMP		✓		✓	✓	

# WP 1 Relevant results:

## T1.3 - Harmonized Monitoring & decommissioning of offshore platforms

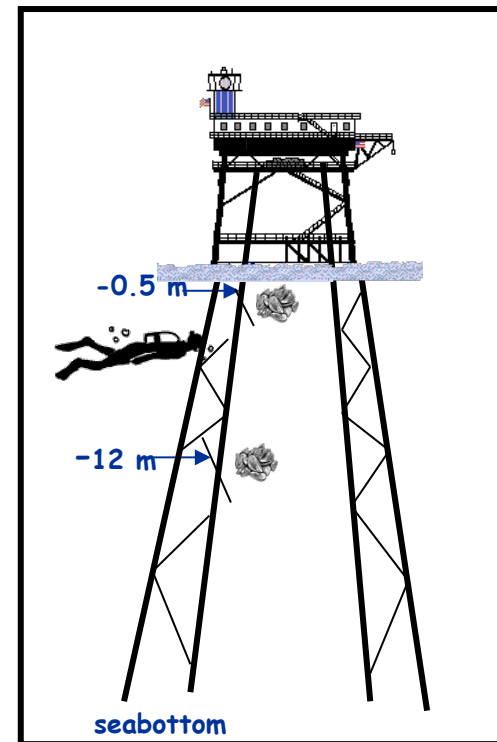
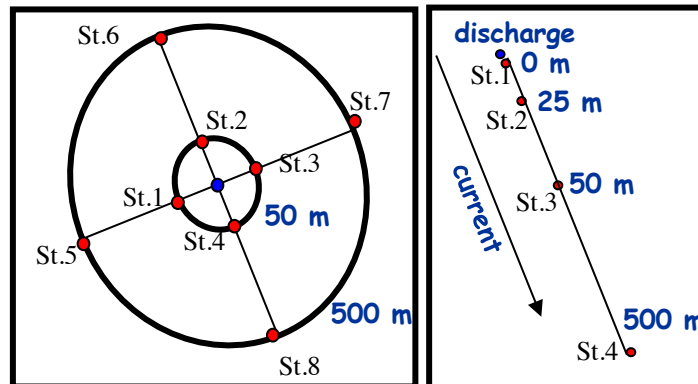


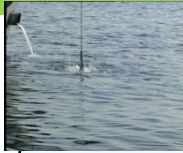


# WP 1 Relevant results:

## T1.3 - Harmonized Monitoring & decommissioning of offshore platforms

- area close to the platform
- sampling: pre-, during-, post-installation/PFW discharge
- radial sampling for installation impact, linear sampling along transect for PFW discharge
- water, sediment, biota
- list of recommended parameters to monitor
- 1-2 campaigns/year





### Monitoring of the impact of PFW discharge

### Monitoring of the impact of the offshore platform installation

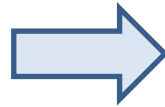
<p><i>Water column</i>                      salinity, temperature, density, pH, transmittance, turbidity, fluorescence (chlorophyll), dissolved oxygen, current, nutrients, suspended matter, total hydrocarbons, aliphatic hydrocarbons, BTEX, phenols, ecotoxicological assays, passive sampling, PFW dispersion model</p>	<p><i>Water column</i>                      current, temperature, salinity, density, turbidity, dissolved oxygen, chlorophyll (fluorescence), pH, suspended matter, transmittance, BTEX, total hydrocarbons, aliphatic hydrocarbons, phenols, passive sampling</p>
<p><i>Sediment</i>                      macroscopic (visual and descriptive) analysis, grain size, total organic carbon (TOC), total hydrocarbons, aliphatic hydrocarbons, BTEX, polycyclic aromatic hydrocarbons (PAHs), metals, phenol, ecotoxicological assays</p>	<p><i>Sediment</i>                      grain size, percentage of humidity, specific gravity, metals (Hg, Cd, Pb, As, total Cr, Cu, Ni, Zn, Mn, Al and Fe), total hydrocarbons, PAHs, butyltin compounds (tributyltin, dibutyltin, monobutyltin), total organic matter, total nitrogen and phosphorus, total organic carbon, microbiological parameters (total and fecal coliforms, fecal streptococci), ecotoxicological assays, others (e.g. Se, Ba, V), BTEX, phenols</p>
<p><i>Biota</i>                      (by catching <i>M. galloprovincialis</i> individuals on the platform legs or mussel cages)                      lipid content, total hydrocarbons, aliphatic hydrocarbons, BTEX, polycyclic aromatic hydrocarbons (PAHs), metals</p>	<p><i>Biota</i>                      (by catching platform leg mussels/polychetes)                      metals (Hg, Cd, Pb, As, total Cr, Cu, Ni, Zn, and Fe) others (e.g. Ba, Se, V), IPA, butyltin compounds (tributyltin, dibutyltin, monobutyltin), fat content, biomarkers, fish assemblages analysis, macrozoobenthic community analysis, visual census of cetaceans</p>
<p><i>PFW</i>                      pH, total suspended matter, temperature, total nitrogen, nutrients, sulphates, sulphides, chlorides, salinity, metals, mineral oils, total organic carbon (TOC), dissolved organic carbon (DOC), particulate organic carbon (POC), biochemical oxygen demand (BOD5), organic aromatic solvents, aliphatic hydrocarbons &gt; C12, hydrocarbons &lt; C12, diethylene glycol, other declared additives, PAHs, phenols, ecotoxicological assays, radionuclides (<sup>226</sup>Ra, <sup>228</sup>Ra, <sup>210</sup>Pb in certain cases, also <sup>228</sup>Th)</p>	<p><i>Sea bottom</i>                      bathymetry and morphology</p>

## WP 1 Relevant results:

### T1.3 - Harmonized Monitoring & decommissioning of offshore platforms

**Deliverable T1.3.2**

**decommissioning**



- questionnaire
- comparative analysis
- protocol review

	Croatia	Greece	Italy	Montenegro
Existing platforms	✓	✓	✓	
National legislation	✓	✓	✓	✓
Guidelines			✓	
Forbidden abandonment	✓	✓	✓	✓
EIA for removal	✓	✓	✓	✓
Monitoring during removal	✓	✓	✓	✓
Restoration measures		✓	✓	✓
Partial removal, alternative use (re-use)	✓	✓	✓	
EIA for re-use		✓	✓	

## WP 1 Relevant results:

### T1.1 - Harmonized monitoring & assessment of contaminants in the marine environment

COMMUNICATION

C2.1.1

Harmonized proposal for monitoring & assessment of marine contaminants

#### GAPS:

- threshold values for sediment
- common thresholds relevant to the MSFD & Barcelona Convention
- common procedures for basin level assessment
- inter-calibration exercises
- monitoring of emerging pollutants

#### NEEDS:

- common protocol of sampling and analytical procedures
- monitoring of additional pollutants
- sub-regional harmonization of the list of measured chemical substances
- harmonized procedure to compare monitoring data

## WP 1 Relevant results:

OUTPUT

T1.4

Regional strategy for harmonized monitoring & assessment of marine contaminants

### GAPS:

Different approach for monitoring and assessment

- WFD:
  - Chemical status based EQSD threshold values on priority substances ('one-out-all-out') for territorial water (12 nmiles)
  - River Basin Specific pollutants
- MSFD
  - Territorial water: WFD
  - Beyond territorial water: regional cooperation to establish threshold values for priority substances and/or additional contaminants (EQS based on ecotoxicological studies)
- Barcelona Convention
  - Background Assessment Concentration based on monitoring datasets and literature
  - Environmental Assessment Criteria based on statistical analysis and literature

### Actions Needed:

Short-term 2020-2021

- Collect and harmonize monitoring data sets and made available on a common data management platform
- Review of ecotoxicological studies to properly define EQS
- Suggest a specific EQSD threshold value process at EU level dedicated to coastal and marine environment
- Estimate natural background concentrations based on robust and reliable data sets
- Produce a joint and coherent list of parameters and their environmental quality standards (EQS) and compare with BAC/EAC from UNEP/MAP to revise them to assure consistency at Mediterranean basin.

Long-term 2022-2024

- Agree and adopt a coherent monitoring protocol for biota and sediment matrix
- Implement an effective joint monitoring programme at the Mediterranean level on contaminants
- Propose and adopt a harmonized set of threshold values for contaminants
- Define and implement a Programme of Measures based on risk assessment and socio-economic analysis at Mediterranean level

## WP 1 conclusions

### Monitoring & assessment of marine contaminants

- a common protocol of analytical procedures
- a monitoring of additional pollutants
- a harmonized list of measured chemical substances
- a harmonized procedure of data comparing

### Offshore challenges

- ratification of the Offshore Protocol
- a task force of ADRION experts for offshore questions
- a harmonized monitoring for offshore impacts
- a list of recommended parameters to monitor in case of installation and PFW discharge

**Agree and implement a regional strategy!**





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Thank you for your attention!

