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EUROPEAN UNION
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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, Giordano Giorgi



giordano.giorgi@isprambiente.it
loredana.manfra@isprambiente.it

Online Workshop, 28th April 2020

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**

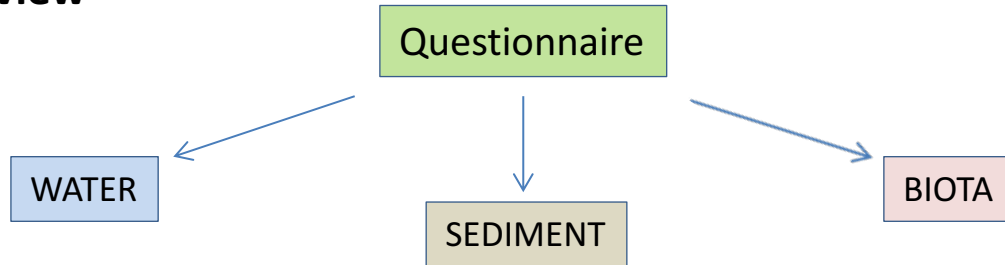
- matrix characteristics
- measurement units
- sampling procedures
- sample storage
- methods of analysis
- quantification limit (LOQ)

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

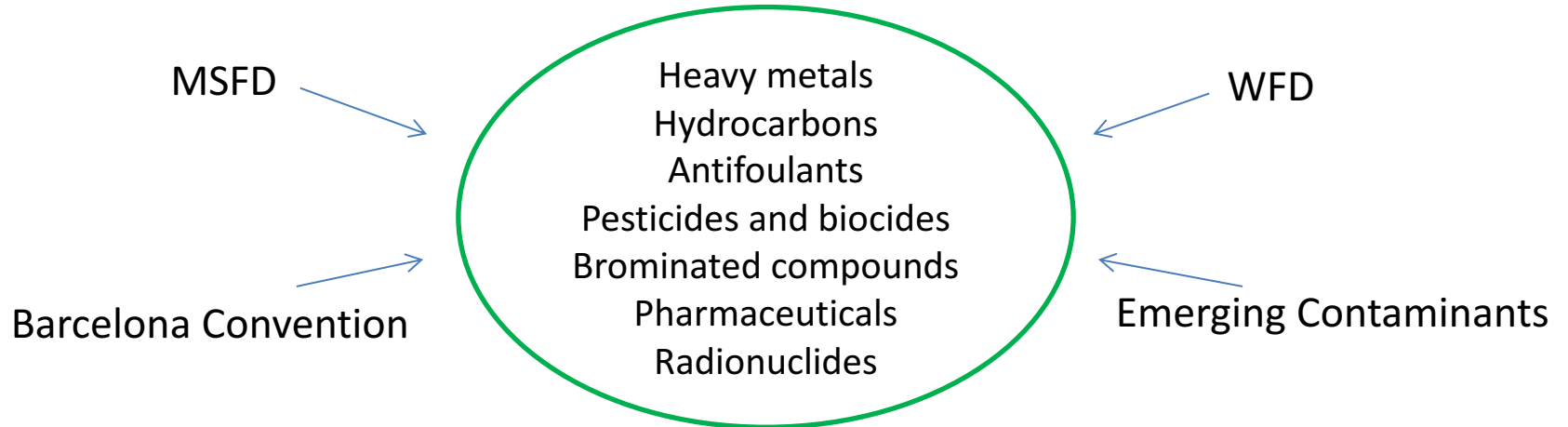
- dataset format check
- metadata completeness
- Additional data needs

WP 1 Relevant results:

T1.1.1 – Protocol review



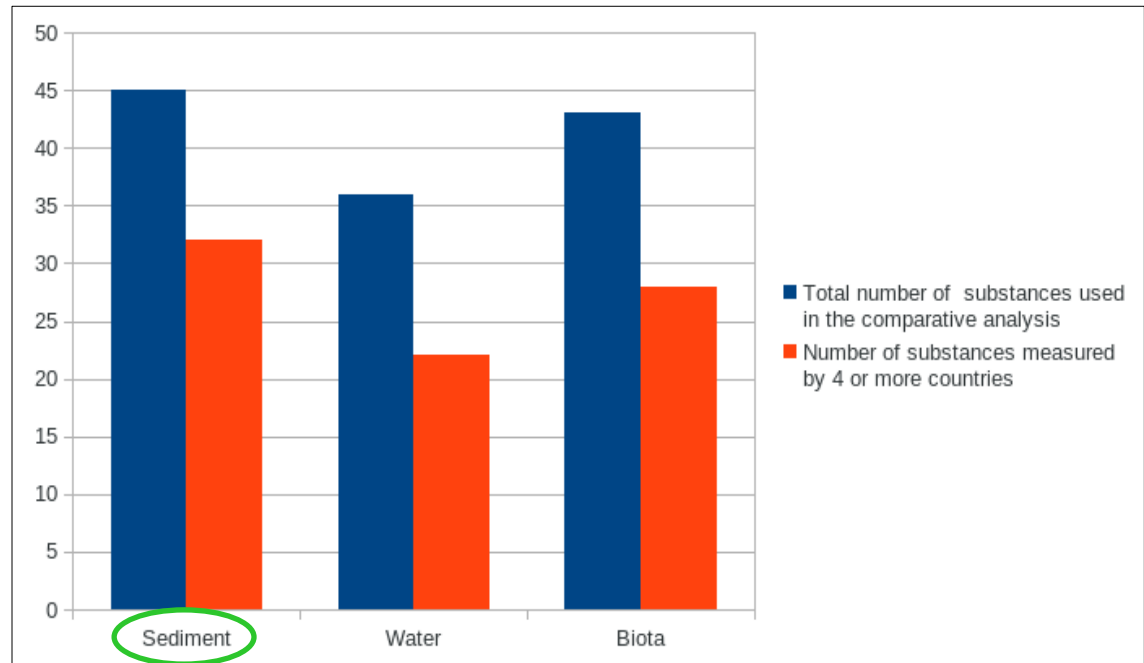
Substances considered for the analysis of monitoring protocol



WP 1 Relevant results:

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

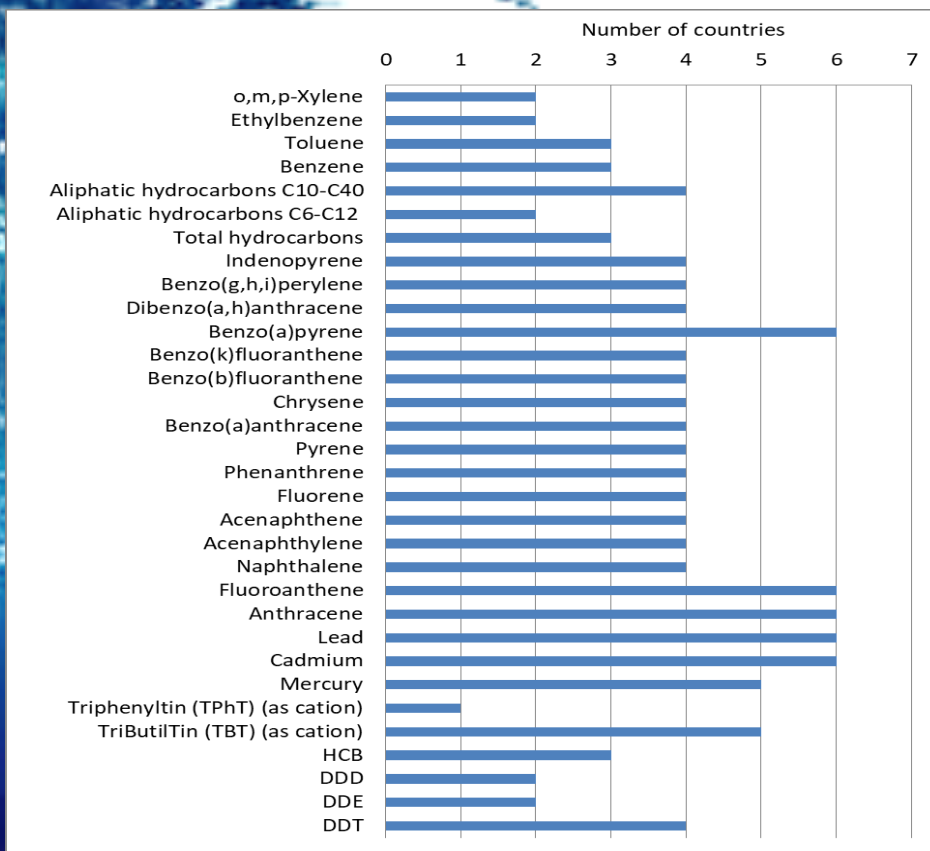
- **LOQ values** differing of 1-3 orders of magnitude
- Poor information on **accuracy** and **reproducibility**
- **Pharmaceuticals** and **radionuclides** – not monitored



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

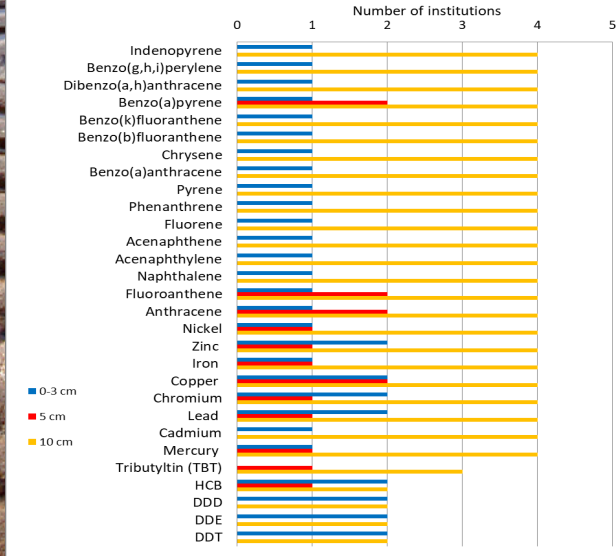
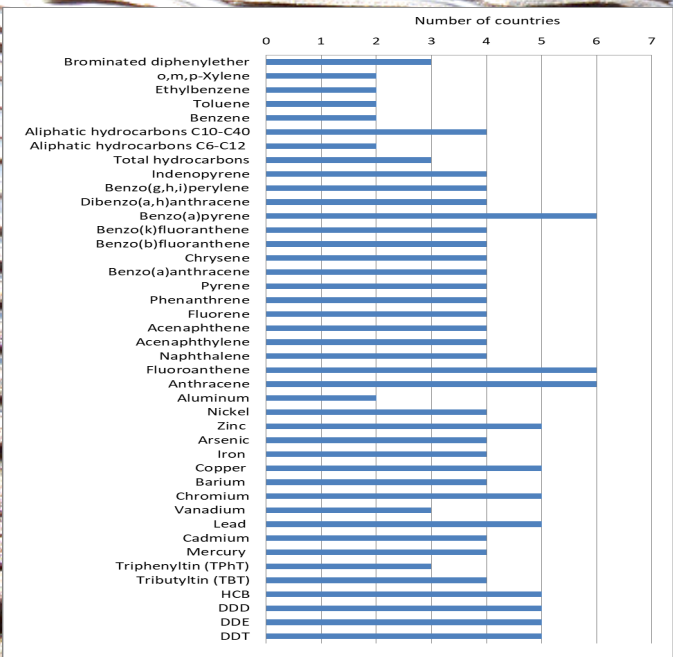
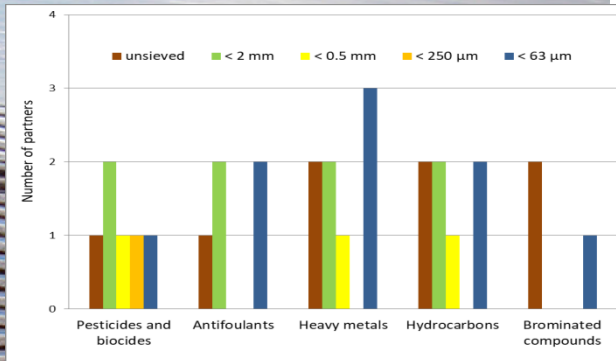
High heterogeneity:

- 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:

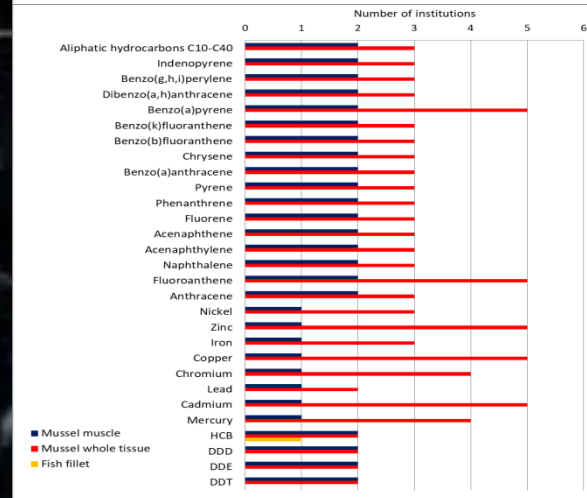
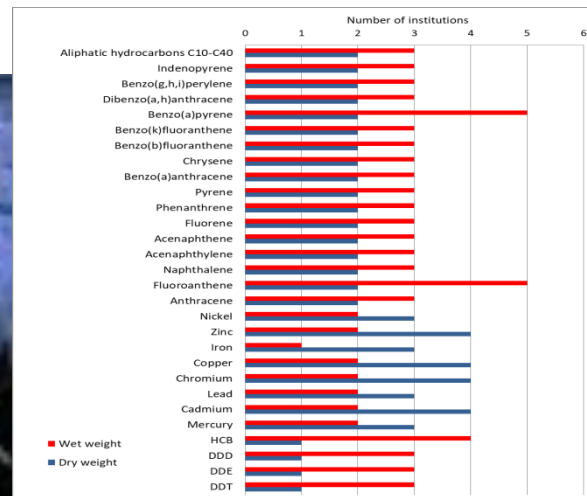
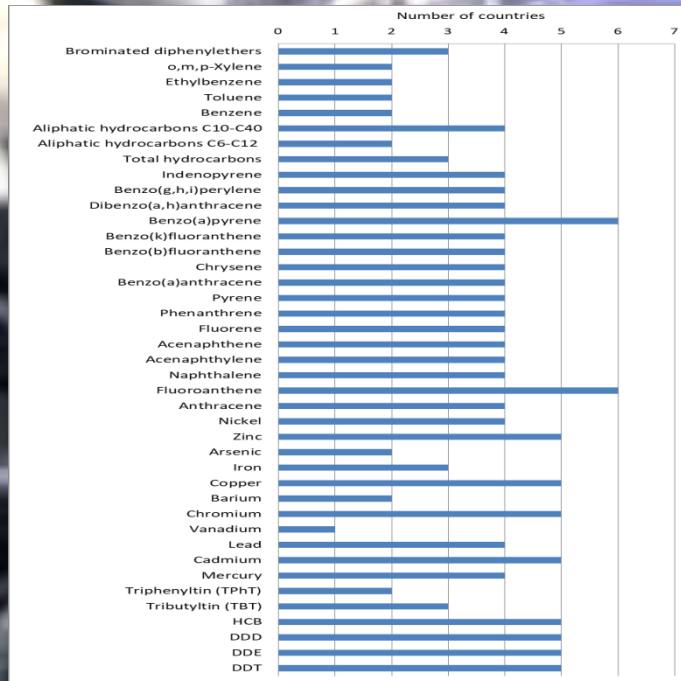
- pesticides
- heavy metals
- hydrocarbons

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



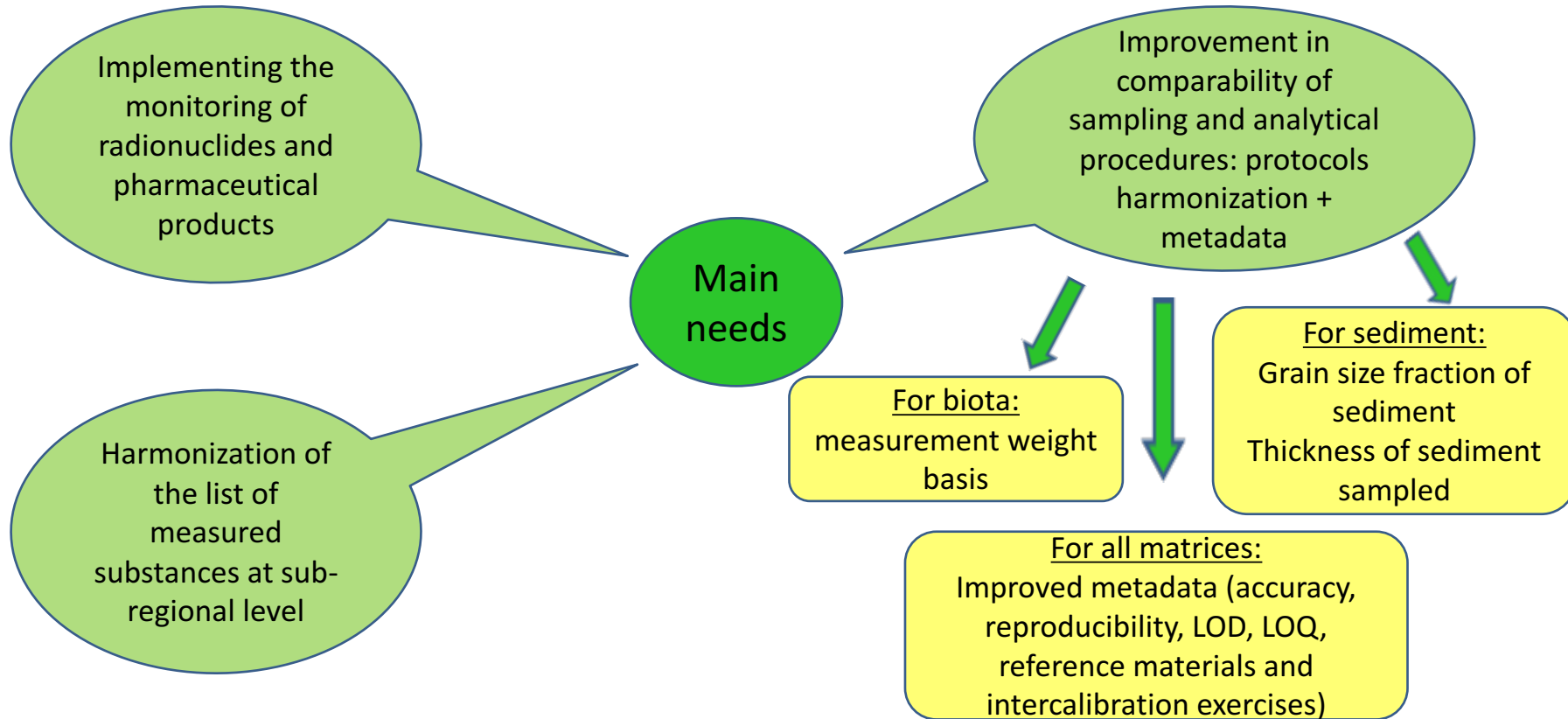
WP 1 Relevant results:

T1.1.1 – Protocol review: Gaps and needs

Are the monitoring protocols in the ADRION region comparable?

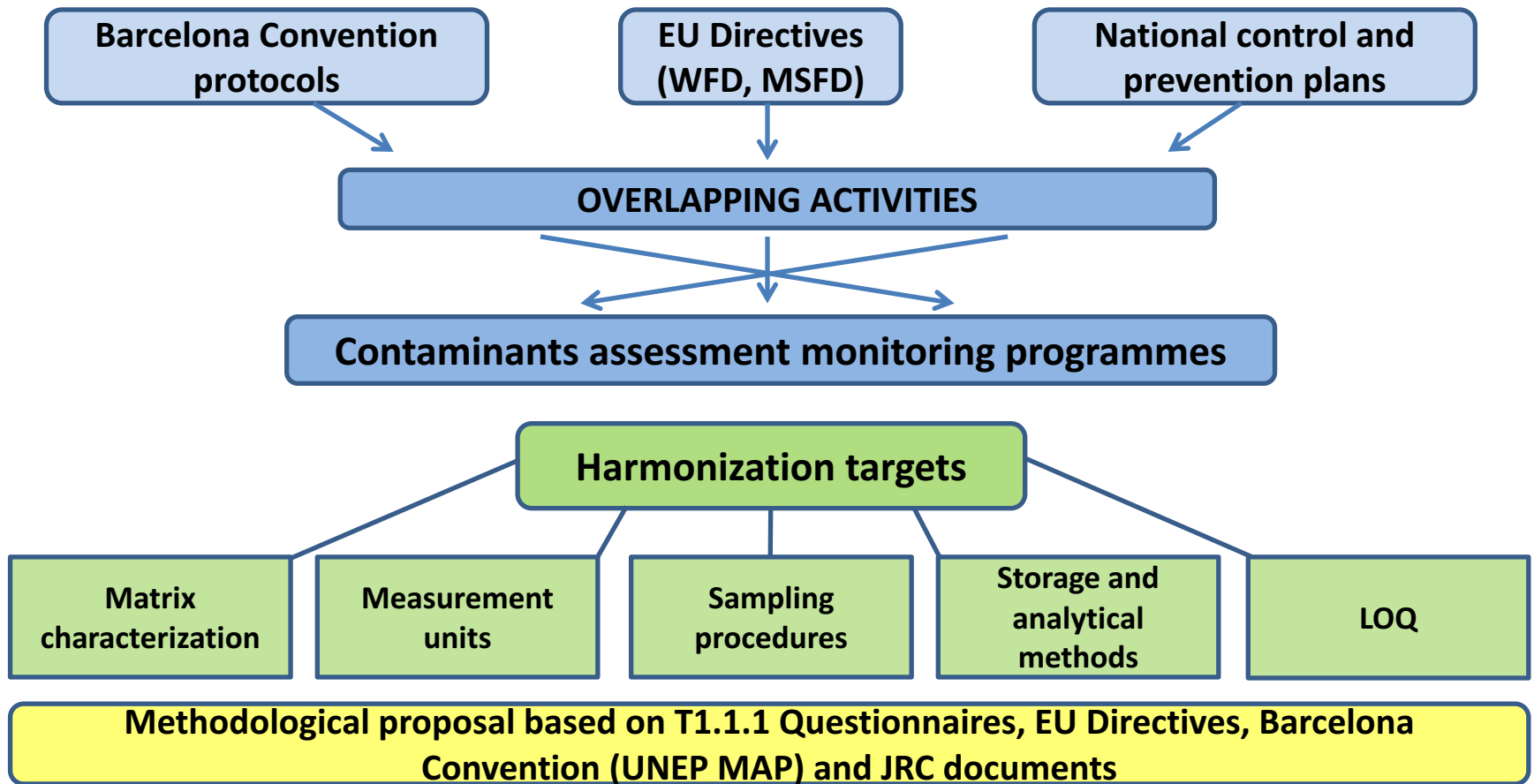
NO!

Clear need of a common protocol!



WP 1 Relevant results:

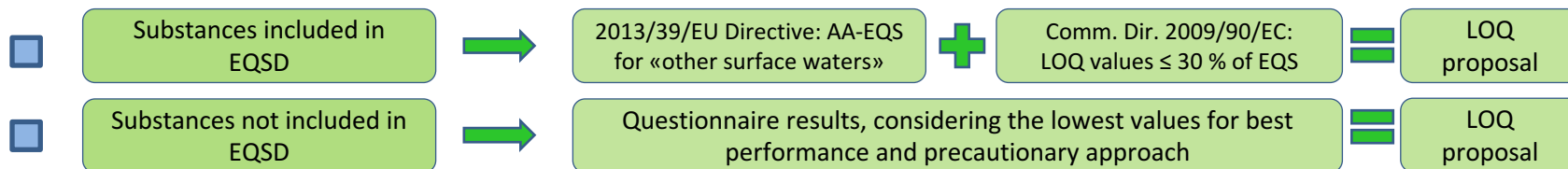
T1.1.2 – Methodological proposal for harmonized sampling procedure and analytical methodologies



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 HNO ₃ , SPE pre-concentration	voltammetry/ ICP-MS
Hydrocarbons (PAHs and aliphatic C ₁₀ -C ₄₀)	µg/l	no filtration	extraction with n-hexane on board/ 4 °C without preservative, darkness	GC-MS / HPLC-FLD *
Hydrocarbons (BTEX and aliphatic C ₆ -C ₁₂)	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 !



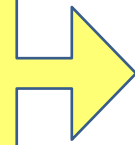
* GC-FID for total hydrocarbons and aliphatic hydrocarbons C₁₀-C₄₀

** Dissolved oxygen [%], Salinity [PSU], Temperature [°C], Transmittance [%], Fluorescence [mg/m³]

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

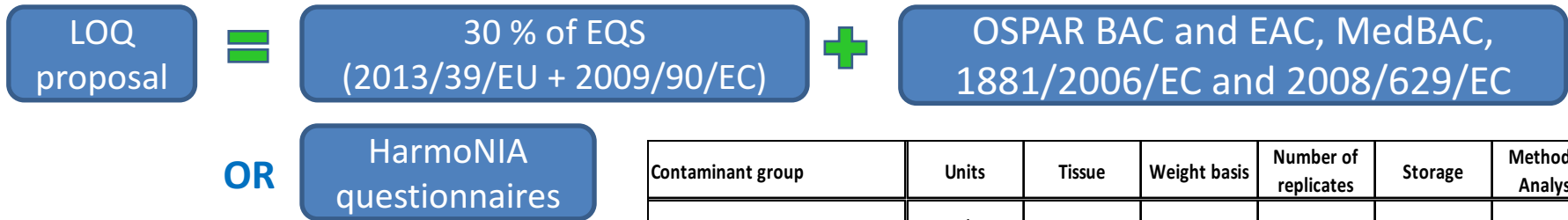
Thickness of sediment sample: 0-2 cm
Possibly even less + deposition rate study

* GC-FID for total hydrocarbons and aliphatic hydrocarbons C₁₀-C₄₀
** 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

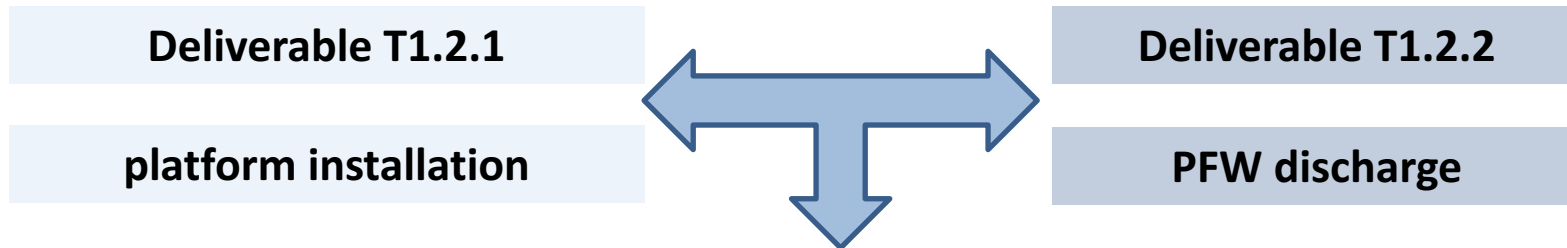
Contaminant group	Units	Tissue	Weight basis	Number of replicates	Storage	Method of Analysis
Pesticides and biocides	µg/kg	total sample	wet weight	3	frozen at -20 °C	GC-ECD
Antifoulants	µg/kg (as cation)	total sample	wet weight	3	frozen at -20 °C	GC-MS
Pharmaceuticals	µg/kg	total sample	wet weight	3	frozen 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 ₁₀ -C ₄₀)	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 C₆-C₁₂ and C₁₀-C₄₀



WP 1 Relevant results:

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

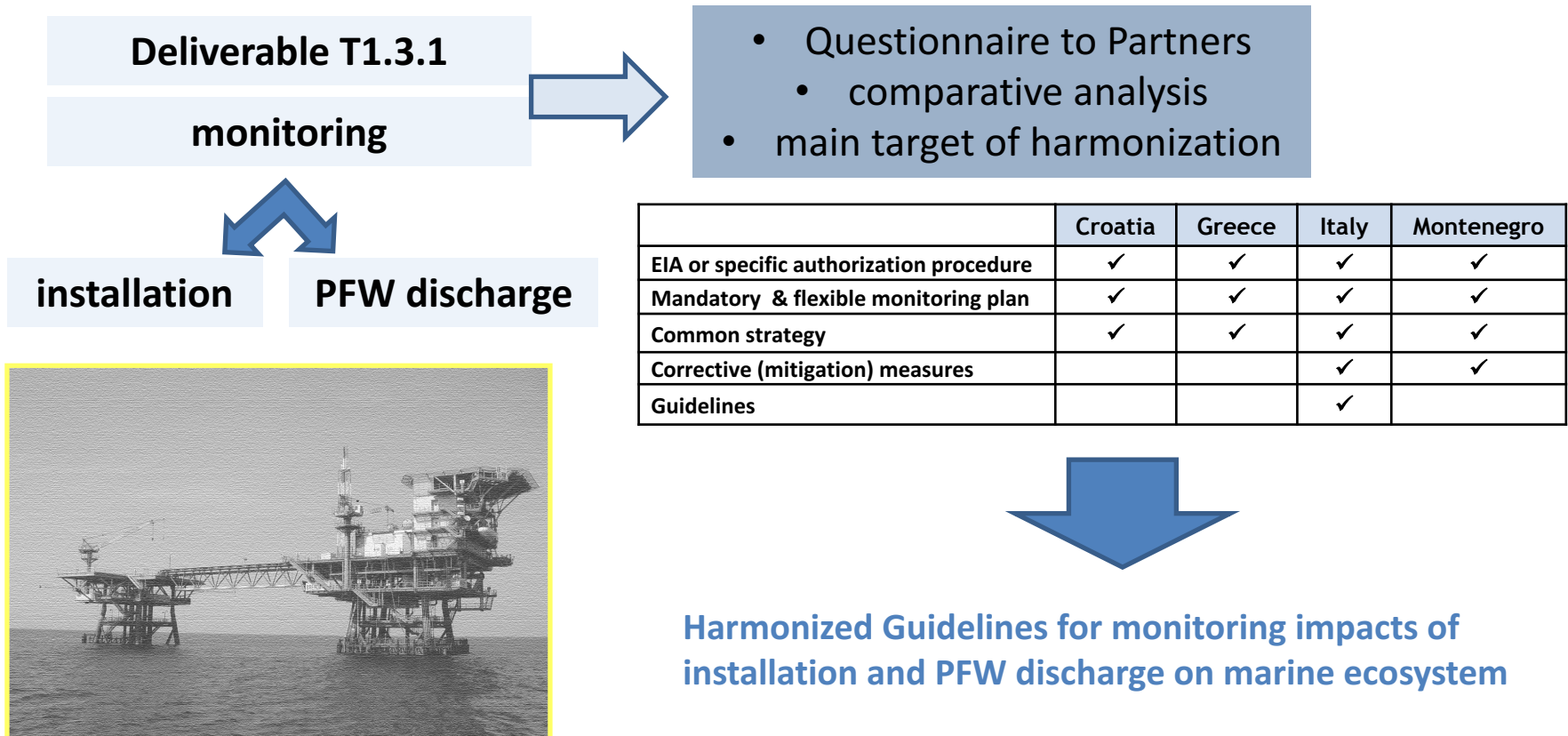


- EIA questionnaire to Partners
 - Comparative analysis
- Main targets of harmonization

	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:

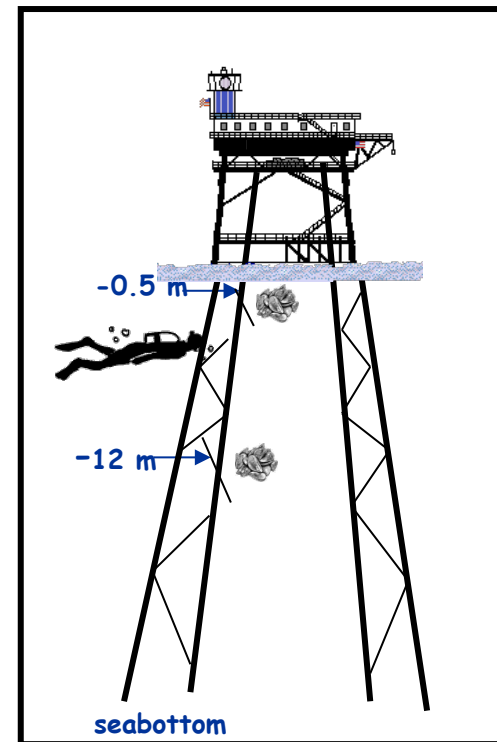
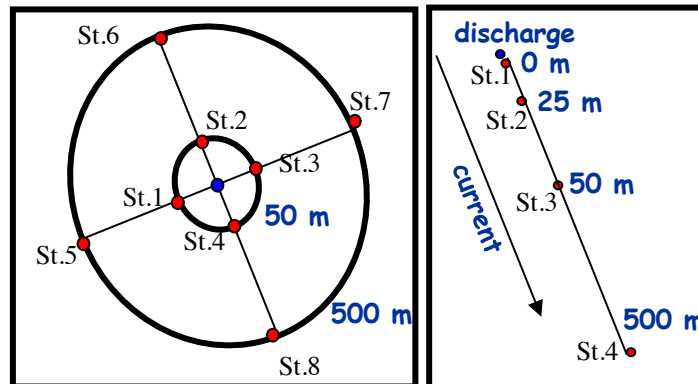
T1.3 - Harmonized Monitoring & decommissioning of offshore platforms



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

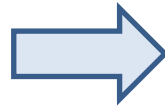
<p><i>Water column</i> salinity, temperature, density, pH, transmittance, turbidity, fluorescence (chlorophyll), dissolved oxygen, current, nutrients, suspended matter, total hydrocarbons, aliphatic hydrocarbons, BTEX, phenols, ecotoxicological assays, passive sampling, PFW dispersion model</p>	<p><i>Water 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 > C12, hydrocarbons < C12, diethylene glycol, other declared additives, PAHs, phenols, ecotoxicological assays, radionuclides (²²⁶Ra, ²²⁸Ra, ²¹⁰Pb in certain cases, also ²²⁸Th)</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
 - common procedures for basin level assessment
 - inter-calibration exercises
 - monitoring of emerging pollutants

- NEEDS:**
- a common protocol of analytical procedures
 - a monitoring of additional pollutants
 - a sub-regional harmonization of the list of measured chemical substances
 - a harmonized procedure for data comparing

OUTPUT



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

- GAPS:**
- definition of threshold values (MSFD vs. Barcelona Conv.)
 - MSFD: EQS based on ecotoxicological studies
 - Barcelona Convention: EAC and BAC based on monitoring datasets

- NEEDS:**
- harmonize monitoring data sets
 - revise EQSD & BAC/EAC considering such harmonized data sets and ecotoxicological studies
 - compare BAC/EAC & EQSD threshold values
 - produce a list of threshold values

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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HarmonIA



Thank you for your attention!

