QuietMED – Joint programme on noise (D11) for the implementation of the Second Cycle of the MSFD in the Mediterranean Sea.

Deliverable

D2.1. Report on lessons learned of national 2012 assessment and GES definition.

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Abstract

This document is the Deliverable "D2.1. Report on lessons learned of national 2012 assessment and GES definition" of the QUIETMED project funded by the DG Environment of the European Commission within the call "DG ENV/MSFD Second Cycle/2016". The QUIETMED project aims to enhance cooperation among Member States (MS) in the Mediterranean Sea to implement the Second Cycle of the Marine Directive and in particular to assist them in the preparation of their MSFD reports by 2018 through: i) promoting a common approach at Mediterranean level to update GES and Environmental targets related to Descriptor 11 in each MS marine strategies ii) development of methodological aspects for the implementation of ambient noise monitoring programs (indicator 11.2.1) iii) development of a joint monitoring programme of impulsive noise (Indicator 11.1.1) based on a common register, including gathering and processing of available data on underwater noise.

This public document presents a review and comparison of the national implementations. It is based upon the in-depth assessment of national reports on good environmental status, environmental targets and monitoring programmes. It relies also on the update by the project partners of the work conducted so far at national levels.

This review confirms disparities among member states' approaches in GES definition. This disparity is on the one hand due to the wide scope of definitions which extend from pressure-based to risk-based and response-based definitions. It is also due on the other hand to the lack of scientific knowledge which has lead Member states to stick to the pressure indicators even for more elaborate definitions, which generally makes quite unrealistic to proof the achievement of the GES at risk or response level.

A review of environmental targets definitions is also presented with respect to their general objectives. Most targets aim to regulate activities or pressures. Another significant part of them refers to monitoring. Finally, a fewer number deal with filling the scientific knowledge gap for underwater noise management. There is also a siginificant disparity among members states environmental target definitions. This is an expected consequence of the disparity of the GES definition. This is also the consequence of the large scope of the role of environmental targets. In general, the environmental targets are not SMART enough and in particular not specific and not measurable enough.

Lastly, the monitoring programs among QuietMED partnership have been compared. The comparison, which includes an update of the programs technical requirements, tends to show that the level of coherence has been improved since the in-depth assessment and already seems to be satisfactory. In particular, all monitoring programs in the QuietMED partnership include impulse sound monitoring, continuous sound monitoring and ambient noise measurements. The main recommendations done by TG noise are generally taken into account into the technical specifications of the programmes in particular in the establishment of impulsive sounds registers. It is also noticeable that a monitoring network of more than twenty stations will be progressively set up at the Mediterranean region. This should provide a good regional cover which can also been completed by opportunistic data or by mobile observatories. Several noise mapping tools have already been developed or have been prototyped.

As a conclusion, the disparity of national approaches, which impacts on the other items of the MSFD especially the assessment of marine waters and the setting of environmental targets, needs to be decreased to improve the level of coherency. In a general way, the lessons learned from the first cycle implementation are that GES definition are either elaborated as "aspiration kinds" unlikely to be reached either as a "delineation" of the directive with few added value and without a sufficient level of ambition. A possible way to improve both consistency and coherency of the national GES definitions would be to find a compromise between these two extremes by a convergence of definition at the risk levels.

Concerning monitoring programs, a sufficient level of coherency is already achieved but there are still a possible optimization in particular regarding the technical specifications. Possible improvements lie in an optimization of the monitoring strategies (spatial resolution, long term monitoring positions, data sharing, ambient noise models benchmarking,…). In terms of environmental and anthropogenic activity data, which are critical in sound mapping, a possible improvement lies in a better link between others EU policies and projects for instance to feed models with EU referenced data set (as for instance for AIS and VMS data). In addition, a particular attention has to be paid for neighboring subregions to ensure coherency and relevance in cross-border assessments.

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List of Abbreviations

ACCOBAMS	Permanent Secretariat of the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area
CTN	Centro Tecnológico Naval y del Mar
EC	European Commission
ET	Environmental Targets
EU	European Union
FORTH	Foundation for Research and Technology - Hellas
IDA	In-Depth Assessment
IEO	Instituto Español de Oceanografía
IOF	Institute of Oceanography and Fisheries
ISPRA	Instituto Superiore per la Protezione e la Ricerca Ambientale
IZVRS	Inštitut za vode Republike Slovenije
MS	Member State
MSFD	Marine Strategy Framework Directive
SMART	Specific Measurable Achievable Realistic Time-bound
TGN	Technical Group on Noise
UoM	The Conservation Biology Research Group, the University of Malta
UPV	Universitat Politècnica de València

1. Introduction

The European Maritime Strategy Framework Directive 2008/56/EC requires that the Member States of the European Union achieve and maintain good Environmental Status in European waters by the year 2020 (European Commission, 2008). The operational implementation of the directive is adaptive and is reviewed every six years. It includes five main items which are:

- The assessment of marine waters state (article 8),
- The determination of the Good Environmental Status (GES, article 9),
- The establishment of Environmental Targets (ET, article 10),
- The establishment and implementation of a monitoring program (article 11),
- The establishment and implementation of a program of measures (article 13).

The directive gives a list of qualitative descriptors on which the GES is based upon. The eleventh descriptor (D11), deals with the introduction of energy in the marine environment by human activities. It states that the "*introduction, including underwater noise, must be at levels that do not adversely affect the environment*". In this regard, the MSFD recognizes underwater noise as a marine pollution.

The compliance of the national marine strategies with the Directive requirements is formally assessed by the European Commission through a reporting process done by MS competent authorities (article 12). The results of the assessment are made available to the public. The first lessons learned from the assessment of the first cycle implementation of the MSFD are a general lack of coherence within the European Union, leading to "*as many GES as Members States*" (European Commission, 2014).

On the basis of the first cycle assessment, the European Commission has made recommendations in the aim to improve the level of coherency for the second cycle which starts in 2018. For this purpose, the 2008 directive has been amended (European Commission, 2017) and the 2010 decision has been revised (European Commission, 2017). Assessment and reporting guidances are also proposed for testing to members states (Walmsley, Weiss, Claussen, & Connor, 2017) (European Commission, 2017). Furthermore, the European Commission highlights the necessary reinforcement of the cooperation between Member States and the need for a better connection between national strategies and the Regional Sea Conventions strategies.

The QUIETMED Project is funded by DG Environment of the European Commission within the call "DG ENV/MSFD Second Cycle/2016". This call funds the next phase of MSFD implementation, in particular to achieve regionally coherent, coordinated and consistent updates of the determinations of GES, initial assessments and sets of environmental targets by July 2018, in accordance with Article 17(2a and 2b), Article 5(2) and Article 3(5) of the Directive.

The QUIETMED project aims to enhance cooperation among Member States (MS) in the Mediterranean Sea to implement the Second Cycle of the Marine Directive and in particular to assist them in the preparation of their MSFD reports by 2018 through: i) promoting a common approach at Mediterranean level to update GES and Environmental targets related to Descriptor 11 in each MS marine strategies ii) developing the methodological aspects for the implementation of ambient noise monitoring programs (indicator 11.2.1) iii) developing a

monitoring programme of impulsive noise (Indicator 11.1.1) based on a common register, including gathering and processing of available data on underwater noise. The Project has the following specific objectives:

- Achieve a common understanding and GES assessment (MSFD, Article 9) methodology (both impulsive and continuous noise) in the Mediterranean Sea;
- Develop a set of recommendations to the MSFD competent authorities for reviewing national assessment made in 2012 (MSFD, Article 8) and the environmental targets (MSFD, Article 10) of Descriptor 11- Underwater Noise in a consistent manner taking into account the Mediterranean Sea Region approach;
- Develop a common approach to the definition of thresholds at the Mediterranean Sea level (in link with TG Noise future work and revised decision requirements) and impact indicators;
- Coordinate with the Regional Sea Convention (the Barcelona Convention) to ensure the consistency of the project with the implementation of the Ecosystem Approach Process (EcAp process);
- Promote and facilitate the coordination of underwater noise monitoring at the Mediteranean Sea level with third countries of the region (MSFD Article 6), in particular through building capacities of non-EU Countries and taking advantage of the ACCOBAMS-UNEP/MAP cooperation related to the implementation of the EcAp process on underwater noise monitoring;
- Recommend methodology for assessments of noise indicators in the Mediterranean Sea basin taking into account the criteria and methodological standards defined for Descriptor11 (Decision 2010/477/EU, its revision and guidelines).
- Establish guidelines on how to perform sensor calibration and mooring to avoid or reduce any possible mistakes for monitoring ambient noise (D11C2). These common recommendations should allow traceability in case the sensor give unexpected results and help to obtain high quality and comparable data.
- Establish guidelines on the best signal processing algorithms for the pre-processing of the data and for obtaining the ambient noise indicators;
- Implement a Joint register of impulsive noise (D11C1) and hotspot map at Mediterranean Sea Region level by impulsive noise national data gathering and joint processing.
- Enhance collaboration among a wide network of stakeholders through the dissemination of the project results, knowledge share and networking.

To achieve its objectives, the project is divided in 5 work packages which relationships are shown in Figure 1.

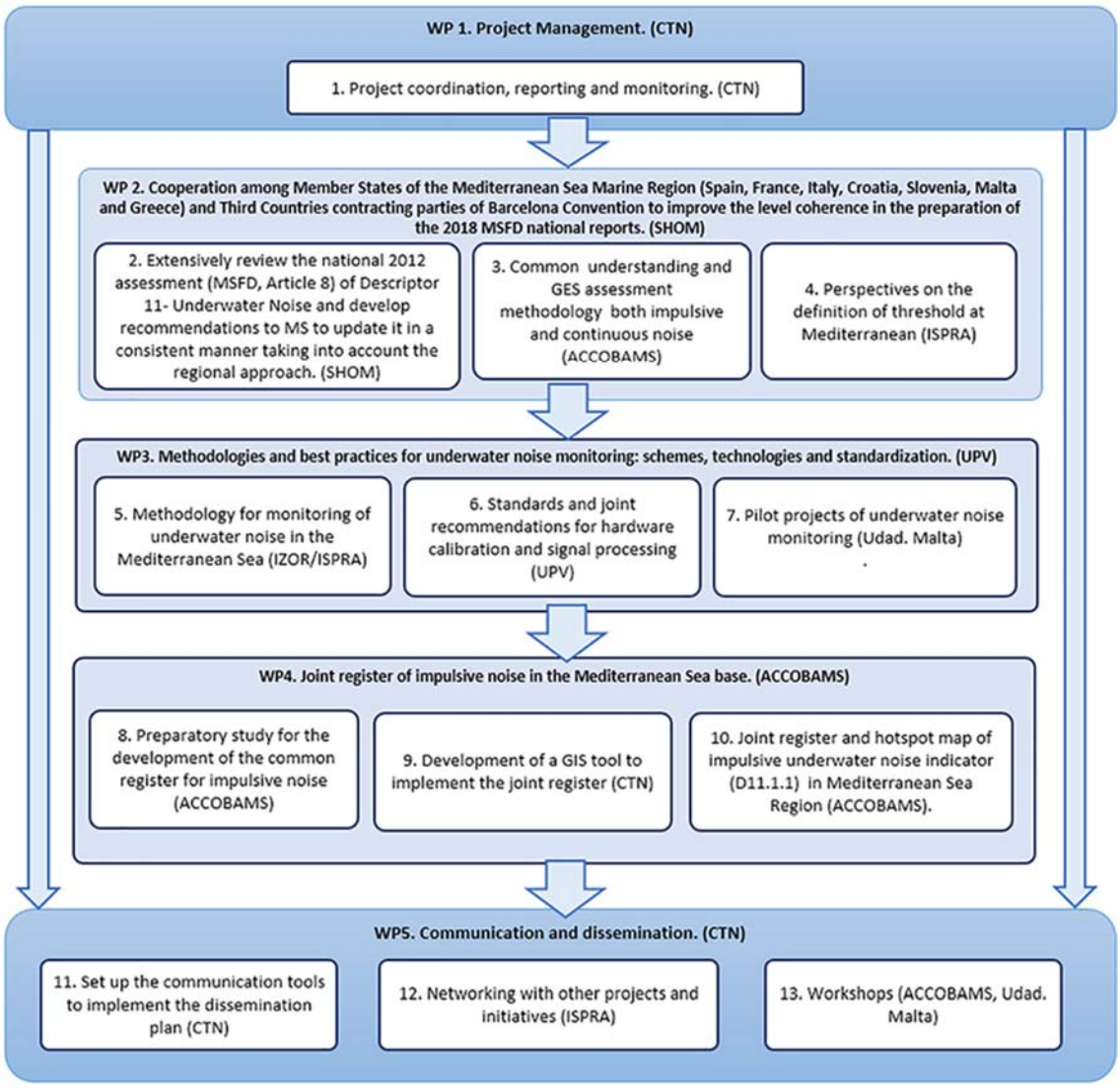

Figure 1: Work Plan Structure

The project is developed by a consortium made up of 10 entities coordinated by CTN and it has a duration of 24 months starting on January 2017. It is important to note that the project will be carried out in close communication and collaboration with other European and regional initiatives (in particular with the TG Noise) to avoid effort duplication.

The second work package of the QuietMED project is dedicated to the establishment of a common understanding framework. Its objective is to overcome the issues on methodologies as pointed out in the In Depth assessment and ensure a minimum level of coherence through a common understanding with ad hoc rules and guidance (Palialexis *et al.*, 2014). This work packages relies on three key actions:

- Action 2 aims to provide a detailed state of art of the national approaches and compares the implementation of the first cycle. The goal of this action is to update the work carried out so at national levels and disseminate it into the consortium. Based upon this review, it is possible to compare approaches and identify convergence and divergence points;

- Action 3 aims to build a share vision of the GES definition and achievement in each member state. Such a share vision will enable to draw a common understanding of GES definition and assessment methods.. It will be enriched by the vision of other countries involved in the Mediterranean Action Plan of the Barcelona Convention.
- The action 4 is devoted to establish thresholds which are necessary to ensure the effectiveness of the maritime strategies. This action will lead to recommendations in setting thresholds which have to be applied to assess the “sonic” good environmental status and define or update measurable environmental targets.

This report is the deliverable of the action 2 described above. It presents a review of the national implementations. This review is based upon the reporting carried out in 2012 (initial assessment, good environmental status, and environmental targets -respectively articles 8, 9, 10) and in 2015 (monitoring program, article 11). It relies on the in-depth assessment ordered by the European Commission in regards of the article 12. It relies also on the update of the work conducted so far at national levels and it focuses on the technical implementation with the aim to improve the technical coherency in the future.

The report is organized as follows. After this introduction, the first part briefly recalls the methodology and materials used for the analysis. The second part present a comparison between the national approaches with a focus on the approaches carried out in the QuietMED consortium member states. The main conclusions and recommendations are listed in the final part.

2. Materials

The first step of the analysis has consisted in establishing a compared state-of-art based on the assessment work carried out by Milieu Ltd and JRC for the European Commission. The state-of-art was done at the EU level in order to have a better understanding and overview of the disparity of national approaches at the EU level and not only for the Mediterranean.

In a second step, the partners in QuietMED consortium have updated and/or completed the state-of-art when relevant. The aim is to get a more actual understanding and comparison of the national strategies at the Mediterranean level by taking into account the progress made since the 2012 reporting. In practise, upgraded information has been compiled from a set of summary documents and from other open sources (Table 1). This enabled partners to exchange information which may not have been initially reported for formal reasons or timing constraints.

Finally, the last step has consisted in comparing the national approaches mainly in terms of methodology[1] in order to focus on the disparity in the technical implementation between national approaches and hopefully better understand how to improve coherency in the future.

[1] The assessment conducted by the European Commission under article 12 has taken into account form criteria (e.g. quality of reporting), methodological criteria (e.g. consistency of approaches) and integration criteria (compatibility and connections with existing policies).

Author(s)	Title	Year	Range
European Commission	Report from the commission to the council and the European Parliament The first phase of implementation of the MSFD The European Commission Assessment and Guidance, COM(2014) 97 final, 20.02.2014, 10p.	2014	EU
European Commission	Report from the commission to the council and the European Parliament, The first phase of implementation of the MSFD The European Commission Assessment and Guidance, Commission Staff working document SWD(2014) 49 accompanying report COM(2014) 97 final.	2014	EU
European Commission	Report from the commission to the council and the European Parliament Assessing Member States' monitoring programmes under the MSFD, COM(2017) 3 final, 16.01.2017.	2017	EU
European Commission	Report from the commission to the council and the European Parliament Assessing Member States' monitoring programs under the MSFD. Commission Staff working document SWD(2017) 1 final accompanying COM(2017) 3 final.	2017	EU
JRC	In-Depth Assessment of the EU Member States' Submissions for the Marine Strategy Framework Directive under articles 8, 9 and 10, report EUR 26473	2014	EU
Milieu Ltd	Article 12 Technical Assessment of the MSFD 2014 reporting on monitoring programs: Mediterranean Regional Report, Prepared by Milieu Ltd Consortium	2015	MED
Milieu Ltd	Article 12 Technical Assessment of the MSFD 2012 obligations: Mediterranean Sea Prepared by Milieu Ltd Consortium	2014	MED
Milieu Ltd	Article 12 Technical Assessment of the MSFD 2012 obligations: BE, BG, CY, DE, DK, EE, EL, ES, FI, FR, IE, IT, LT, LV, NL, PT, RO, SE, SI, UK 20 Reports, Prepared by Milieu Ltd Consortium	2015	MS
Milieu Ltd	Article 12 Technical Assessment of the MSFD 2014 reporting on monitoring programmes : BE, BG, CY, DE, DK, EE, ES, FI, FR, HR, IE, IT, LT, LV, NL, PT, RO, SE, SI, UK 20 Reports, Prepared by Milieu Ltd Consortium	2015	MS
Taroudakis M. et al.	Working document (for QUIETMED consortium members only) WP2-Activity 2 State-of-art of national approaches – Greece	2017	EL
Ortega N. & Sanchez M.	Working document (for QUIETMED consortium members only) WP2-Activity 2 State-of-art of national approaches - Spain	2017	ES
Stéphan Y.	Working document (for QUIETMED consortium members only) WP2-Activity 2 State-of-art of national approaches – France	2017	FR
Vukadin P.	Working document (for QUIETMED consortium members only) WP2-Activity 2	2017	HR

	State-of-art of national approaches – Croatia		
Popit A. et al.	Working document (for QUIETMED consortium members only) WP2-Activity 2 State-of-art of national approaches - Slovenia	2017	SI
ERA	https://era.org.mt/en/Pages/MSFD.aspx	2017	MT
Maccarrone, V., et al.,	An Italian proposal on the monitoring of underwater noise: Relationship between the EU Marine Strategy Framework Directive (MSFD) and marine spatial planning directive (MSP), Ocean & Coastal Management (2015), http:// dx.doi.org/10.1016/j.ocecoaman.2015.07.006	2015	IT

Table 1 : Reference document list used for the analysis.

3. Comparative review of national approaches

3.1. General overview

As pointed by the assessment work, the first lesson learned from the initial cycle implementation is that there is a very large panel of national approaches which can be very different both on their form and on their content. Thus, national strategies extend from GES definitions close to the terms of the 2010 decision (European Commission, 2010) to more elaborate definitions including activity regulation, ecologic or even economic issues. This has led to a general lack of comparability of the approaches which has made the results of the assessment of the D11 descriptor quite diverse as shown in Table 2. However, the review of the reasons and justification shows that the assessment is also dependent on formal reasons. Also, some definitions or other items have been corrected afterward but the assessment has not been formally upgraded. This is why the action 2 of the QuietMED project and consequently the following in this report, focuses on the comparison of updated information as described in Table 1 and tries to highlight the differences and the similarities which are likely to impact technically on the level of coherency, independently from formal criteria.

MS	GES			Monitoring		Region
	Assessment	Definition	Targets	GES	Target	
CY						MEDITERRANEAN
EL						
ES						
FR						
HR						
IT						
MT						
SI						
BE						ATLANTIC OF THE NORTH-EAST
DE						
DK						
ES						
FR						
IE						
NL						
PT						
SE						
UK						
BG						BLACK SEA
RO						
EE						BALTIC SEA
DE						
DK						
FI						
LT						
LV						
SE						
Assessment legend per item						
	NOK	POK	OK	Not assessed		

Table 2 : Overview of the 2012 in-depth assessment for Descriptor 11. Concerning the Initial Assessment, GES and environmental targets definition the criterion in the assessment is the adequacy to the directive requirements. Adequacy can be achieved (OK), partially achieved (POK) or unachieved (NOK). Concerning the monitoring programs, the criterion is the coverage ensurance of the monitoring needs for the progress towards the achievement of GES and environmental targets. Coverage can be full, partial or void (see national assesments reports for further details). "Not assessed" means that the assessments has not been possible due to late or lacking reporting or EU joining after 2012 in the case of HR). Updates have been made availaible since as refered to in Table 1 and APPENDIX.

3.2. Analysis per item

3.2.1. Definition of the good environmental status

3.2.1.1. Comparison

The comparison of the GES definition is based upon the national approaches as compiled in Appendix, table A1. Concerning member states involved in the QuietMED consortium, the definition have been updated when relevant. For the other definitions, they are taken from the national assessment reports published by Milieu Ltd as referred in Table 1.

The national GES definitions are scaled in regards of their level of elaboration Definitions directly inspired by the wording of the MSFD directive and the 2010 decision as considered as pressure-based definition. Definitions based on the identification of risks either at generic level either expressed as specific issues (e.g. communication masking) are considered as Risks-based definition. At last, definitions which include the regulation of noise generating activities are considered as Response-based definitions, in reference to DPSIR[2] assessment framework.The categorization of national definitions by region is displayed in Figure 2. National GES definitions can be done using several statements or characteristics belonging to different level of elaboration.

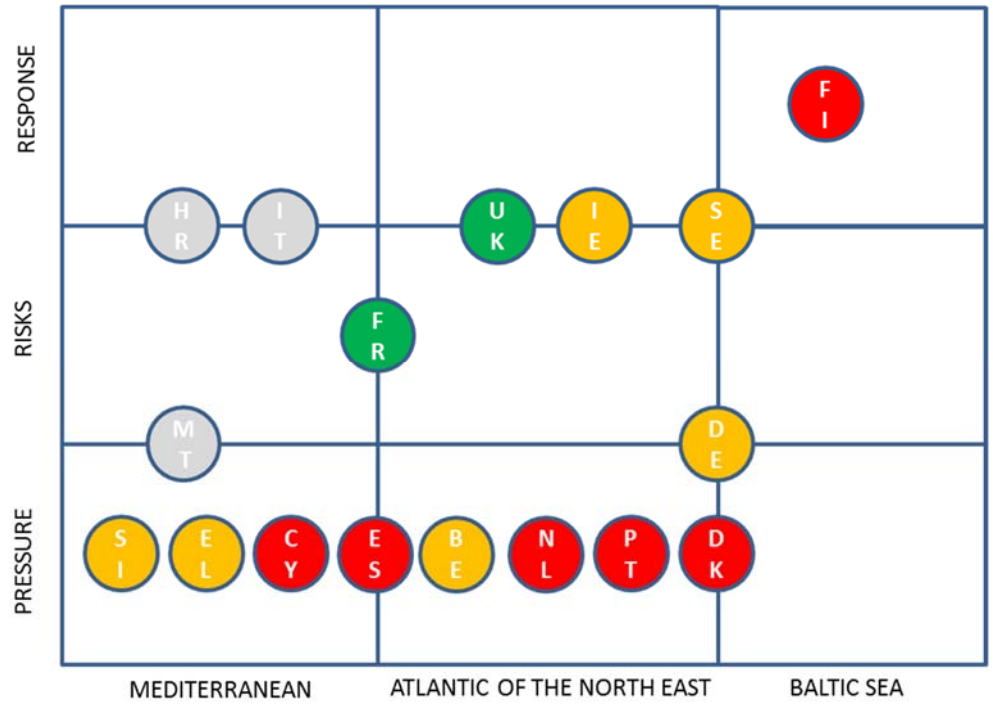

Figure 2 : Overview of GES national definition depending of their level of elaboration (the color legend refers to the assessment as in Table 2). Definitions in the Mediterranean have been categorized in their updated version among the QuietMED partnership. For the other regions, definition are taken from the original assessment reports.

[2] Drivers- Pressure – State – Impact - Response

As expected, it can be seen a certain disparity among national definitions. As far as the Mediterranean region is concerned, Croatia and Italy[3] has included activity regulation in the definition. France and Malta have defined the GES at the risk level but with different level of generality. France has defined three qualitative ecological issues (namely communication masking, over mortality and visits to ecological functional areas). The Maltese definition is generic at the impact level on key species. Finally, Greece[4], Spain, Slovenia and Cyprus have based their definition on the wording of D11 in the directive. The disparity in national definition at the Mediterranean level also appears in the other regions. The categorization in Figure 2 reflects quite well the regional coherency assessment in (European Commission, 2014, p. 67) which assess as moderate the level of coherency in the Mediterranean and low in the Nort-East Atlantic and in the Baltic sea. For the latter, the Finnish definition is the only one among all definitions which includes not only activity regulation but also the economical concern.

A second step of analysis of the disparity between national approaches is the level of integration of the definition (granularity at the descriptor, criteria and indicator levels). The analysis among the Mediterranean region Member States is shown in Figure 3. It can be seen that member states, even those who have opted for a risk or response based definition, rely only on the decision pressure criteria and indicators to assess their GES. Malta acknowledges a gap of knowledge and does not define formally indicators. None of the member states has defined thresholds nor even baseline levels.

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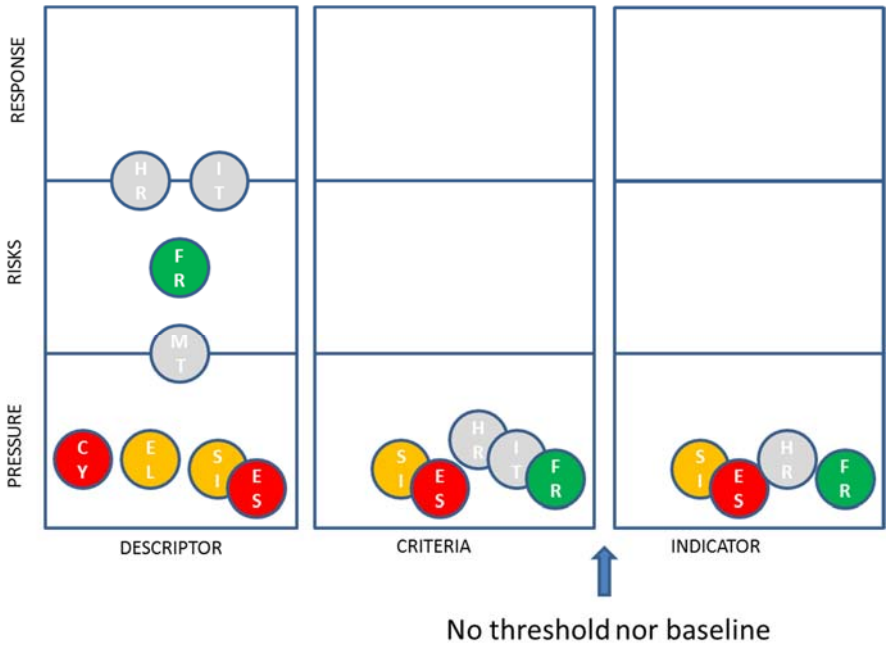

Figure 3 : Level of granularity of national definition vs. conceptual level of definition (colour legend same as in Table 2).

[3] Note that the Initial definition for Italy and Croatia was at the pressure level but they have been updated in this review.

[4] Greece also reported a response-based definition in the paper report (see appendix, table A1).

3.2.1.2. Discussion

The goal of the previous analysis is to present a comparison of national approaches in the aim to improve their coherency and consistency. The results of the previous analysis are in line with the conclusion of the In–Depth assessment carried out in the first cycle. In particular, the scale of GES definition seems to reflect relatively well the level of coherence in the different region. On the other hand, the granularity analysis illustrates the drastic lack of knowledge which has lead member states either to stick to the wording of the 2010 decision either at the descriptor level or at the criteria and/or indicator level, even for more “elaborate” definitions.

The general lines to improve coherency at the regional level are explicitly given in the revised decision (European Commission, 2017), which brings new elements about collaboration at the European level and about the establishment of thresholds. In particular, the expectation that the threshold values should reflect the potential risks to the marine environment tend to promote the idea that the GES should be defined at the risk level, consistently with thresholds. The thresholds have to be defined through a collaborative process under the Common Implementation Stategy auspices. However, the decision acknowledges the fact that the process should lead to specific thresholds relevant to a region, subregion or subdivision. In this context, a practical solution could be that MS agree on guidances for GES definition (e.g. indicator and/or criteria thresholds and how to apply them) and the logical need to adapt these thresholds to lead to a GES definition which account for subregional particularities (scales, species or other specific ecosystems) in setting the threshold values, as pointed out in (Walmsley, Weiss, Claussen, & Connor, 2017).

3.2.2. Definition of the environmental targets

3.2.2.1. Comparison

The comparison of the environmental target (ET) definition is based upon the national approaches compiled in table A2 in the Appendix. As for the GES definition, the environmental targets definition concerning member states involved in the QuietMED consortium have been updated when relevant. For the other definitions, they are taken from the national assessment reports published by Milieu Ltd. Environmental targets have been categorized regarding their general objectives (see Table 3 for a focus on the environmental targets defined by member states for the Mediterranean region, and Figure 4 for the general rating at the EU level). Most targets aim to regulate activities or pressures. Another significant part of them refers to monitoring. Finally, a fewer number deal with filling the scientific knowledge gap for noise underwater noise management. In this analysis, we have retained only targets dedicated to noise. We are not referring to education or dissemination targets which are most of the time transverse to several descriptors.

MS	Environmental target general objectives		
	Regulation	Monitoring	Knowledge
EL	1		
ES	B.1.9		B.3.4
FR	D.2		
HR		36, 37	
IT		11.1, 11.2	
MT			1
SI	11.1	11.2	11.3

Table 3 : classification of environmental targets definition among the QuietMED partnership (see table A2 in appendix for the list of targets).

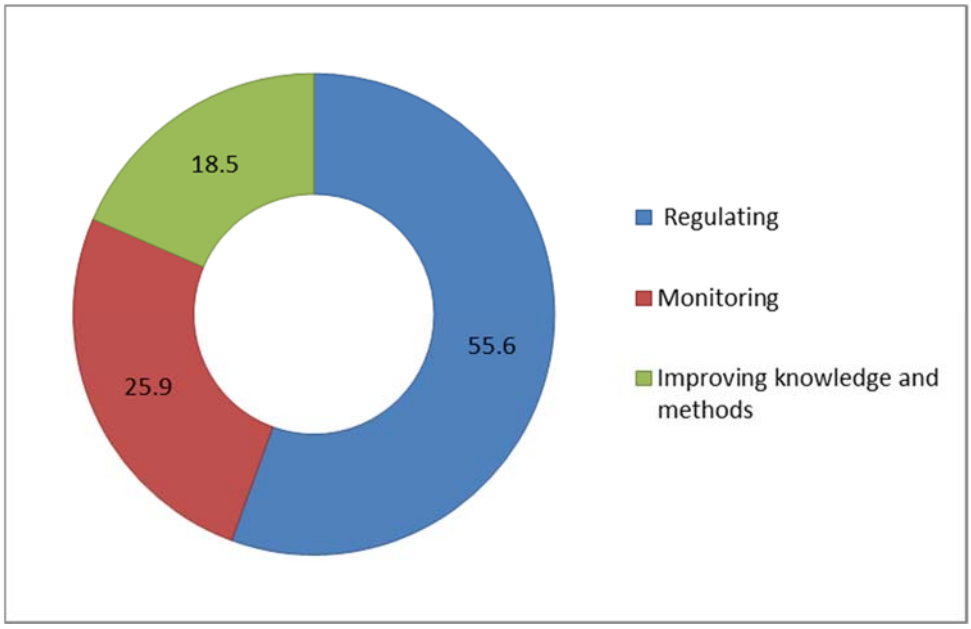

Figure 4 : Segmentation of environmental targets defined by all member states for cycle 1 following their objectives (figures in %).

3.2.2.2. Discussion

The level of coherence in environmental targets among MS involved in the QuietMED project has been assessed moderate in the technical assessment (Milieu Consortium Ltd, 2014). There is indeed a significant disparity between environmental targets, in the Mediterranean as rather generally at the European level. This is is partly due to the difference in the 2012 national GES definitions, which impacts on the definition of the environmental targets. This is also probably due to a certain degree of freedom left to MS (e.g. indicative list in Annexe IV of the Directive), which has led to significant differences in the national definition of environmental targets. As an example among others, establishing a registry for impulsive noise emission can be seen as an environmental target by a number of members States whereas it is seen as a technical action in

line with the monitoring program by others or a measure to be set for others. If the commission assessment (European Commission, 2014), recognized that the environmental target definition is diverse, the main reproach is that they are generally not SMART enough and in particular not specific and not measurable enough (Milieu Consortium Ltd, 2014). It is probably possible to improve the level of coherency in environmental targets definition with a better harmonization of the role of environmental targets in national implementations. However, the environmental targets definition is closely dependant of each MS operational implementation and the role of noise experts and the opportunity to cooperate between transboundary subregions in the process of defining the environmental targets can be highly variable from a member state to another.

3.2.3. Monitoring programs

3.2.3.1. Comparison

The comparison of the monitoring programs is based upon the national reports as compiled in Table A3 in the Appendix). Concerning member states involved in the QuietMED consortium, the definition has been updated when relevant. For the other programs, they are taken from the national assessment reports published by Milieu Ltd.

The contents of the monitoring programs among QuietMED partnership are relatively coherent. They generally take into account the TG Noise recommendations (Dekeling etal., 2014) both on the establishment of a register and on noise monitoring. In particular, the global coherence is ensured by the inclusion of three subprograms related to in situ noise measurement, traffic monitoring and impulse sound register. The compared analysis in Table 4 shows an overview of the progress of the monitoring program implementation.

SP	Items		EL	ES	FR	HR	IT	MT	SI
Impulsive sounds	National register		Draft	RS1	SP2	Draft			[5]
	Frequency range		TGN	TGN	TGN	TGN	TGN	TGN	TGN
	Thresholds								
	Spatial resolution			5' x 5'	15'x15'	Tbd	Tbd		Tbd
	Spatial cover			Full	Full	Full	Full		Tbd
	Update				Year	Tbd			Tbd
	Monitored parameters				OSPAR				Tbd
Continuous sounds (activities)	National database				SP1				Tbd
	Maritime traffic		MaT	ACT5.1	LLI				[6]
	Other (dragage, forage, oil,,,...)			ACT8					Tbd
Continuous sounds (ambient noise)	National database			RS2	SP3				[5, 7, 8]
	Monitoring points	permanent	5	7	4	4	11		1
		Opp./mob.	gliders		Gliders+drifts				Tbd
	Frequency range				10 Hz-20 kHz	10 Hz-10 k-kHz			6.3 Hz – 20 kHz
	Mapping		[9]		CABAT[10]				,5 7
Env. Target				OP					

Legend	
	(pre)operational
	In development
	Expected
	Not scheduled

Abbreviations	
CABAT	CAlcul du Bruit Ambiant de Trafic (*trafic ambiant noise model*)
LLI	Loyd's List Intelligence
MaT	Marine Traffic
OP	Objectivos Operativos (operational objectives)
OSPAR	Oslo-Paris
RS	Ruido Submarino (*Underwater noise*)
SP	Sous-Programme (sub-program)
Tbd	To be defined
TGN	Technical group on Noise

Table 4 : Compared vision of the monitoring programs structure and current implentation among the QuietMED partnership.

[5] Deželak F., Čurović L. and Jenko J. (2015b) Strokovne podlage za vzpostavitev sistema nadzora nad podvodnim hrupom v skladu z Direktivo o morski startegiji (Direktiva 2008/56/ES), končno poročilo, Institute of Occupational Safety for the Institute of Water of the Republic of Slovenia, 17 p.p.

[6] http://www.balmas.eu/balmas-tools/balmas-gis

[7] Deželak F. and Čurović L. (2015) Izdelava strokovnih podlag za vzpostavitev sistema nadzora nad podvodnim hrupom v skladu z Direktivo o morski startegiji (Direktiva 2008/56/ES), Institute of Occupational Safety for the Institute of Water of the Republic of Slovenia, 92 p.p.

[8] Peterlin M. and Zupancic G. (2016) Vsebine vezane na obvladovanje podvodnega hrupa, Inštitut za vode Republike Slovenije.

[9] www.iacm.forth.gr/shipnoise

[10] F. Le Courtois, B. Kinda, J.-M. Boutonnier, Y. Stéphan, and O. Sarzeaud, "Statistical ambient noise maps from traffic at world basin scales," in *Proceedings of the Institute of Acoustics*, 2016, vol. 38, p. Pt. 3.

3.2.3.2. Discussion

The technical assessment done by the commission states a moderate level of coherence in the monitoring programs the Mediterranean Region (Milieu Ltd Consortium, 2015, p. 48). The present analysis, which includes an update of the programs technical requirements, tends to show that the level of coherence has been improved. In particular, most of monitoring programs in the QuietMED partnership include or plan to include impulse sound monitoring, continuous sound monitoring and ambient noise measurements. The main recommendations done by TG noise are now generally taken into account into the technical specifications of the programs in particular in the establishment of impulsive sounds registers. For the latter, it can be highlighted that progress have been made since the reporting and a regional register are available or under developement at ICES and ACCOBAMS. It must be emphasized that MS should take benefit of this and avoid duplicating effort by following the norms already established for impulsive noise register under the auspice of TG Noise, by preferably using the ones already available and free to access, or at least by adopting the same structure and vocabularies to make sure national registers will be fully compatible with regional registers. It is also noticeable that a monitoring network of more than twenty stations will be progressively set up at the Mediterranean region. This should provide quiet a good regional cover which could also be completed by opportunistic data or by mobile observatories (Figure 6)

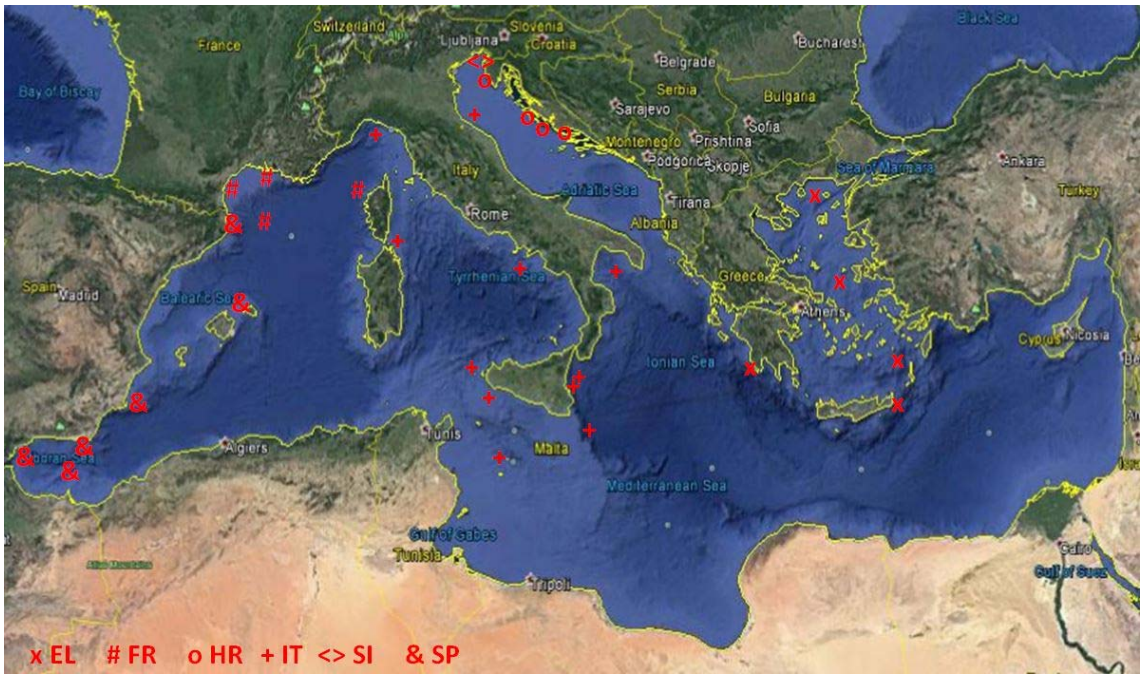

Figure 5: Planned position of the MSFD noise observatories compiled from national monitoring programmes.

A few mapping tools have already been developed or have been prototyped.

The remaining difficulties to achieve a fully coherent approach at the regional level may lie in technical specifications as:

- the resolution of the register, as well as its contents which may differ from a member state to another. The resolution in the register may be an issue since it can impact the assessment of the spatial extend of the impulsive sound pressure as proposed for

criterion D11C1 in the revised decision. This implies that the spatial unit (mesh) used in the register must be consistent with the acoustic disturbation footprints which includes the propagation conditions and the source characteristics;

- The number and value of ambient noise frequencies to monitor which are also subject to debate since these frequencies should be adapted to the geographical environment (especially for stations in very shallow waters) and also adapted to ecological issues that they need to address. If GES is defined as risks to be managed, the frequency range need to be adapted to cover ecosystems based on the most sensitive species which is compliant with the revised directive which leaves the choice of monitoring other frequency bands than the 63 Hz and 125 Hz 1-third octave band. However, monitoring frequency ranges which are not dominated by maritime traffic noise is not trivial since it requires to filter out natural biological or geophysical sound.
- Lastly, the use of ambient noise models, fed with environmental data and anthropogenic activity data, which probably have to be standardised and benchmarked to avoid “steps” in neighbouring sub regional assessments. To this purpose, the possibility for MS to share stations at the boundaries can be practical.

4. Conclusion and recommendations

The report presents a review of the national implementation of the first cycle of the MSFD in the Mediterranean region among the QuietMED partnership. The results aim to help to improve coherency and consistency of approaches in order to define a common understanding framework, GES which is the final goal of the WP2 in the QuietMED project.

4.1. Main conclusions

In this review, the multiple member states definition have been categorized into pressure-based definitions, risk-based definitions and response-based definitions. Secondly they have been compared with respect to their level of integration of criteria and indicators. The conclusions of the review confirm disparities among member states' approaches at the EU level as well as the Mediterranean level. Some members states include the regulation of activities as a condition to achieve GES. Others define the GES at the pressure level whereas some others define it at the impact and risk level. Whatever the definition level, the assessment relies on pressure criteria and indicators due to the lack of knowledge.

Such disparity in the GES definition other items of the MSFD especially the setting of environmental targets, which appear also to be disparate. The major part of the environment targets aims to regulate activities and pressure. Else, a quarter of the targets address monitoring actions. The remaining targets tend to improve tools, methods and knowledge. Such a diversity leads to a lack of comparability. Above all, the main drawbacks of environmental targets in the first cycle are their lack of "SMART-ability".

Finally, the review of progress made in the specifications and implementation of monitoring programs shows that the level of coherency has been improved since the technical assessment conducted prior to 2015. In particular, the monitoring programs are in line with TG Noise recommendations even if some technical specifications need to be further discussed to ensure a full coherency at the region level.

4.2. Work opportunities to improve the coherency among the QuietMED partnership

For the second cycle, the Members States have to come up with or revise their national GES definition and environmental targets at short term. Expectation from the EU commission is that a better coherency among the states is achieved. The QuietMED project addresses this requirement through activity 3 which aims to define a common understanding.

In recent guidances both for reporting and assessment, the EC gives a formal framework which tend to improve the compatibility of MS approaches. An example of general framework, inspired by these guidances, is given in Figure 6.

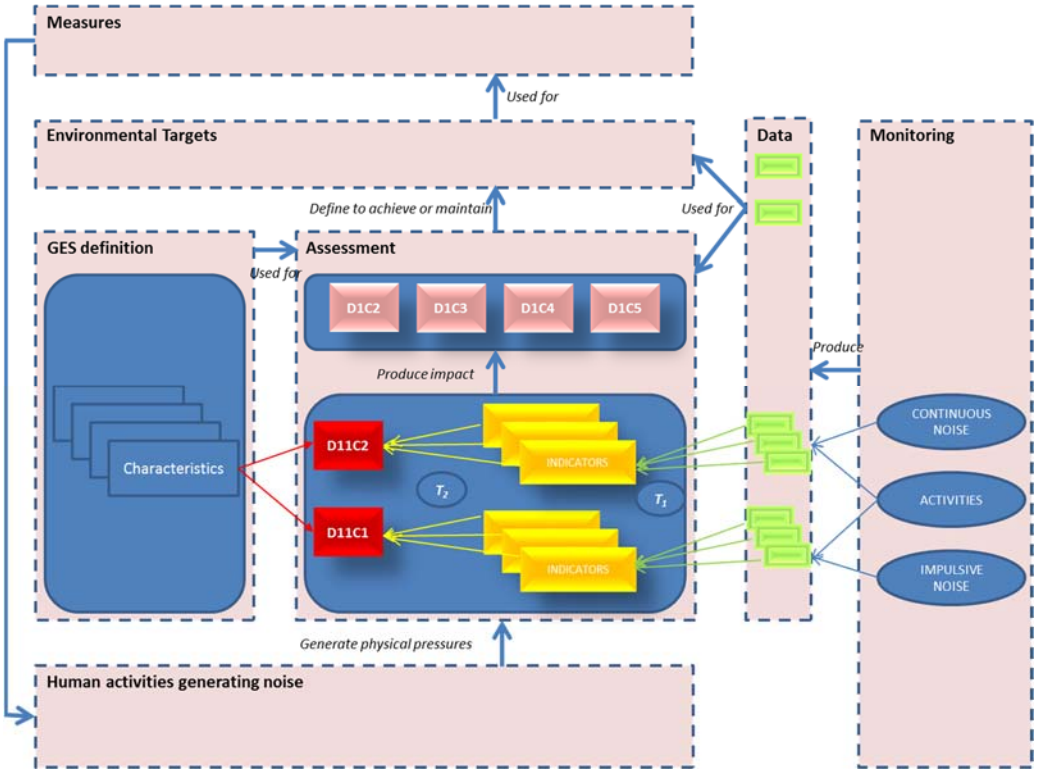

Figure 6 : A general approach of D11 implementation cycle (adapted from (Walmsley, Weiss, Claussen, & Connor, 2017) and (European Commission, 2017). "T_1" and ""T_2" refer to integration level where thresholds should be set.

4.2.1. GES definition

In a general way, the lessons learned from the first cycle implementation and the in-depth assessment are that GES definitions are either elaborated as "aspiration kinds" unlikely to be reached or as a "delineation" of the directive with little added value and without a sufficient level of ambition (European Commission, 2014, p. 6). A possible way to find a compromise between these two "extremes" is that MS defines GES as risks to be addressed and include characteristics dealing with management and regulation of drivers into the environmental targets definition and the program of measure (response level in the DPSIR approach).

To improve comparability, a catalogue of risks to be managed (e.g. masking, over mortality, disturbance, harassment, …) could be agreed at the Mediterranean level. Each MS could then identify which risks are relevant at the national level regarding its prevailing noise pressures, sensitive species or any other specificities. The definition of GES needs also to be consistent with the biodiversity descriptor in particular in terms of species and maritime regional unit of assessment.

4.2.2. Assessment

The revised decision and the guidance recommendations that MS are encouraged to test in the second cycle assessment require the establishment of thresholds at indicator and criteria levels.

This is is a critical issue which needs to be addressed at the EU level. The action 4 of the quietMED project, aims to be contributive to the reflection that will be conducted at the EU levels.

For both criteria (impulsive and continuous noise), thresholds need to address the three aspects of noise pressure i.e. level, spatial extend and temporal extend. This implies to establish thresholds at two level of integration (see T_1 and T_2 in Figure 6). The first level needs to define acceptable noise level for such or such risks (e.g. masking, auditory trauma,….). The second level needs to define acceptable scale and temporal extend (e.g. % of the sub region on which acceptable noise levels are achieved). Despite of the encouraging progress, establishing thresholds is still challenging. Until a sufficient level of knowledge on state and impact is available and thresholds agreed at the EU levels, precautionary thresholds, baseline levels and trends should be set at the national levels as specified in the revised decision (European Commission, 2017).

The increasing effort of systematic observations thanks to the monitoring programs implementation suggests that observation data on abundance and distribution of noise sensitive species should become more and more frequent. The use of statistical -correlation between D11 and D1 indicators and criteria is a possible way to build relevant impact indicators For the next cycles, the possibility to cross-correlate D1 and D11 indicators at least to a minimum extend (some sub region or subdivision, some sensitive species whenever data set are available and relevant) is to be studied as a complement of impact indicators based upon the behavioral response of species.

4.2.3. Environmental targets

The main lesson learned from the first cycle assessment is that the environmental targets are not SMART enough. Defining environmental targets specifically related to risks in the GES definition should help to achieving a better level of coherency between members states.

It has also been shown that environmental targets embrace a wide scope. The comparability of the national approaches could benefit from reducing this scope , probably by focusing on their link with measures, as shown in Figure 6. In any case, collaboration and exchanges at least at the sub regional levels are needed to ensure coherency and efficiency of regulation.

4.2.4. Monitoring and data

Concerning monitoring programmes, a sufficient level of coherency is already achieved but there is still a possible optimization in particular regarding the technical specifications. Possible improvements lie in an optimization of the monitoring strategies (spatial resolution, long term monitoring positions, data sharing, ambient noise models benchmark, …). In terms of environmental and anthropogenic activity data, which are critical in sound mapping, a possible improvement lies in a better link between others EU policies and projects for instance to feed models with EU referenced data set (as for instance for maritime surveillance data). In addition, a peculiar attention has to be paid for neighboring subregions to ensure coherency and relevance in cross-border assessments

5. APPENDIX

MS	GES national definition	Region
CY	The marine environment of Cyprus is considered to be in good environmental status by the year 2020 if the introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.	MEDITERRANEAN
EL	*(2012 paper version) An ecosystem is in Good Environmental Status when:* *- There is adequate management of human activities that introduce noise into the marine environment to not induce significant long-term impacts on species populations and the main functional groups* *- The activities introducing low frequency sound do not pose a significant risk to marine organisms and the main functional groups* (Updated) Energy introduced into the marine environment, including noise is kept at levels that do not have adverse effects on marine organisms	
ES	The impulsive noise of high, medium and low frequency and continuous low frequency noise introduced in the marine environment by human activities have no adverse effects on the marine ecosystems. Criterion 11.1: Distribution in time and place of high, loud and mid frequency impulsive sounds Indicator 11.1.1 Proportion of days and their distribution within a calendar year over areas of a determined surface, as well as their spatial distribution, in which anthropogenic sound sources exceed levels that are likely to entail significant impact on marine animals measured as Sound Exposure Level (in dB re 1µPa^2.s) or as peak sound pressure (in dB re 1µPapeak) at one metre, measured over the frequency band 10 Hz to 10 kHz. Criterion 11.2: Continuous low frequency sound Indicator 11.2.1 Trends in the ambient noise level within the 1/3 octave bands 65 and 125 Hz (centre frequency) (re 1µPa RMS; average noise level in these octave bands over a year) measured by observation stations and/or with the use of models if appropriate.	
FR	Good environmental status is achieved when the following conditions are cumulatively met: - The detection and communication capabilities of whales are not affected by anthropogenic noise disturbance -Visits to ecologically functional areas by species sensitive to noise disturbance is preserved - Direct or indirect incidental mortality due to anthropogenic noise disturbance is marginal Criterion 11.1: Temporal and spatial distribution of high-frequency impulsive sounds, low frequency and medium frequency Indicator 11.1.1 Proportion, distribution on a calendar year, in areas of a given surface, and spatial distribution of days when anthropogenic sound sources exceed levels that can have a significant impact on marine animals, measured as the form of noise exposure levels (in dB re 1µPa2.s) or levels	

	of peak acoustic pressure (in dB re 1µPapeak) at one meter on the frequency band 10 Hz to 10 kHz. The indicator consists of the proportion, distribution on a calendar year, and spatial distribution of days when distribution of noise emitted by pulsed sources in the frequency range 10 Hz to 10 kHz at a level beyond the upper thresholds recognised noise by species, as identified on the basis of statements of work or activity reports. Criterion 11.2: The continuous low frequency Indicator 11.2.1 Trends in the ambient noise level in octave bands 63 and 125 Hz (center frequency) [re 1µPa RMS, average noise level in these octave bands over a year], measured by stations observation and / or by means of models, where appropriate. The trend indicator is the average annual low frequency noise in two bands normalized frequencies (called third octave band 63 and 125 Hertz), expressed in dB, measured on observation stations and / or evaluated using models generated by maritime coastal and deep-sea shipping, nautical activities using noise emitters, e.g. oil and gas exploration, and sea construction sites or works generating noise.	
HR	**Initial characteristics of good environmental status for Descriptor 11 (Underwater noise)** Both, loud, low and mid frequency impulsive sounds and continuous low frequency sounds introduced into the marine environment through human activities do not have adverse effects on marine ecosystems: Human activities introducing loud, low and mid frequency impulsive sounds into the marine environment are managed to the extent that no significant long term adverse effects are incurred at the population level or specifically to vulnerable/threatened species and key functional groups. Continuous low frequency sound inputs do not pose a significant long term adverse effects at the population level or specifically to vulnerable/threatened species and key functional groups. Indicator 11.1.: Proportion of days and their distribution within a calendar year over areas of a determined surface, as well as their spatial distribution, in which anthropogenic sound sources exceed levels that are likely to entail significant impact on marine animals measured as Sound Exposure Level (in dB re 1µPa2.s) or as peak sound pressure level (in dB re 1µPa peak) at one metre, measured over the frequency band 10 Hz to 10 kHz Indicator 11.2.: Trends in the ambient noise level within the 1/3 octave bands 63 and 125 Hz (centre frequency) (re 1µPa RMS; average noise level in these octave bands over a year) measured by observation stations and/or with the use of models if appropriate.	

IT	G 11.1 The levels of impulsive sounds of high intensity at low and medium frequency, introduced in the marine environment through human activities, are such that do not cause long-term adverse effects on marine ecosystems, and human activities that introduce these sounds are regulated and managed so that they have no significant impact in the long term on marine species at the population level. G 11.2 The levels of continuous sounds at low frequency introduced in the marine environment through human activities are such that do not cause long-term adverse effects on marine ecosystems and are such that do not present a risk of any perceptual or behavioural impacts on marine species at the population level.	
MT	Adverse effects of underwater noise on key species groups are minimised to the extent possible	
SI	11.1 The temporal and spatial distribution of impulsive noises at high, low and medium frequencies do not have significant adverse effects on marine organisms. 11.1.1 Continuous low frequency sound (ambient noise) does not have significant adverse effect on marine organisms.	
BE	D11. Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment. GES for underwater noise would be achieved if: (1) Impulsive sounds and regional sound budgets do not adversely impact marine organisms (2) Loud, low and mid frequency impulsive sounds and continuous low frequency sounds introduced into the marine environment through human activities do not have adverse effects on marine ecosystems	ATLANTIC OF THE NORTH-EAST
DE	11.1. A good environmental status is achieved when the noise budget of the German North Sea [Baltic Sea] does not adversely affect the living conditions of animals. All human activities causing noise may therefore not significantly impact the marine environment of the North Sea [Baltic Sea]. Possible basis for the description of a good status are noise measurements during sea construction activities […]. Temporary noise entries in the form of pulse-like signals should comprehensively not cause physical damage in marine organisms. This means, according to current knowledge, that a temporary threshold shift (TTS) occurs at a SEL of 164 dB re 1microPa2s (unweighted) with an associated SPL of 199 dB (peak-peak) re 1microPa with porpoises. In the future these sound entries must be considered cumulatively to account for multiple sound input and different entry sources. Especially in protected areas and taking into account the occurrence of affected species and disturbance-sensitive times, a significant disturbance of the marine fauna should be avoided. For porpoises currently no threshold to determine a significant interference exists. However, it can be assumed on the basis of acoustic and visual studies that impulsive underwater noise from sound events from a SEL of 136 dB re 1microPa2s leads to disturbances in the form of evictions (BfN in development). This value was derived from observed expulsion radii. Avoiding reactions of porpoises were confirmed in playback experiments. 11.2. A good environmental status is achieved when the noise budget of the German North Sea [Baltic Sea] does not adversely affect the living	

	conditions of animals. All human activities causing noise may therefore not significantly impact the marine environment of the North Sea [Baltic Sea]. Possible basis for the description of a good status are measurements of background sound levels (see Table 11 of the GES North Sea [Baltic Sea]). Natural sound sources such as wind and wave movements form the background noise in the sea. Continuous human sound entries, mainly from shipping, are added to the natural "acoustic landscape". Further, temporary pulse-like noise entries, such as from ramming activities result in the increase of the temporarily sound exposure in a marine area. To what extent a reduction has to be made in order to prevent adverse effects on marine organisms has to be decided on the basis of findings on the marine area-specific background noise level, due to continuous, in particular low-frequency broadband noise.	
DK	D11.1. The introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment (Criterion D11.1.1)	
ES	Cf MED	
FR	Cf MED	
IE	D11. Loud, low and mid frequency impulsive sounds and continuous low frequency sounds introduced into the marine environment through human activities do not have adverse effects on marine ecosystems: - Human activities introducing loud, low and mid-frequency impulsive sounds into the marine environment are managed to the extent that no significant long-term adverse effects are incurred at the population level, or specifically to vulnerable / threatened species and key functional groups. - Continuous low frequency sound inputs do not pose a significant risk to marine life at the population level, or specifically to vulnerable / threatened species and key functional groups.	
NL	D11. Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment. Loud, low and mid frequency sounds and continuous low frequency sounds introduced into the marine environment through human activities do not have adverse effects on marine ecosystems.	
PT	D11. GES is achieved when the introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.	
SE	D11 Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment. 11.1 Activities that create sound levels sufficiently high to cause adverse effects on individual populations or ecosystems are limited in time and space. 11.2 Underwater noise from ships must not give rise to long-lasting adverse effects on biological diversity and ecosystems	
UK	D11. Loud, low and mid frequency impulsive sounds and continuous low frequency sounds introduced into the marine environment through human activities do not have adverse effects on marine ecosystems: (1)Human activities potentially introducing loud, low and mid frequency impulsive sounds into the marine environment are managed to the extent that no significant long term adverse effects are incurred at the population	

	level or specifically to vulnerable/threatened species and key functional groups. (2) Continuous low frequency sound inputs do not pose a significant risk to marine life at the population level, or specifically to vulnerable/threatened species and key functional groups e.g. through the masking of biologically significant sounds and behavioural reaction	
EE	Not defined	BALTIC SEA
DE	Cf ATL	
DK	Cf ATL	
FI	D11. Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment 11.1. The degree of impulsive and continuing noise caused by human activities is not increasing and is at a level that do not exceed natural noise levels nor cause harmful effect on the ecosystems and do not cause economic harm to the coastal and marine industry	
LT	Not defined	
LV	Not defined	
SE	Cf ATL	

Table A 1: List of national 2012 GES definition. The definition for member states involved in the QuietMED consortium have been updated if relevant

MS	Definition of the environmental targets	Region
CY	Not defined	MEDITERRANEAN
EL	Environmental target: Control of energy levels and noise, so that they do not adversely affect the marine environment. Associated indicator: The measurement of underwater noise and assessment of impact on species populations and the main functional groups.	
ES	B.1.9. Ensure that the levels of underwater noise do not cause significant impacts in the marine biodiversity. Associated indicator: Registered cases of noise impact on marine biodiversity.B.3.4. Improve knowledge on underwater noise and other energy inputs into the marine environment, as well as on their impacts on marine biodiversity. Associated indicator: number of studies and projects about this subject	
FR	Target D. Maintain or restore populations of marine mammals in a good state of conservation Target D.2 Limit the acoustic disturbances to marine mammals by anthropogenic activities Associated indicator: Temporal and spatial distribution of underwater noise Associated indicator: Trend of the ambient noise level Associated indicator: Number of deaths of large cetaceans from acoustic disturbance by the total number of deaths of cetaceans identified	
HR	Target 36: Establish a registry to record, assess and manage the distribution and timing of anthropogenic sound sources measured over the frequency band 10 Hz to 10 kHz, exceeding the energy source level as proposed in Monitoring Guidance (Report EUR 26555 EN, 2014) Target 37: Monitor trends (by measurement stations) in the ambient noise level within the 1/3 octave bands 63 and 125 Hz (centre frequency) as proposed in Monitoring Guidance (Report EUR 26555 EN,2014)	
IT	Target 11.1 (connected to the GES 11.1) A National Register of impulsive sounds that takes into account all the human activities that introduce impulsive sounds in the range 10 Hz - 10 kHz in the marine environment is created and implemented. Indicator 11.1.1: realization and implementation of a national register covering all the human activities that introduce impulsive sounds in the range 10 Hz - 10 kHz in the marine environment. Indicator 11.1.2: number of human activities that introduce impulsive sounds in range 10 Hz - 10 kHz in the marine environment included in the register on the total of approved facilities. Target 11.2 (connected to the GES 11.2) A "baseline level" is defined for continuous sounds at low frequency ("ambient noise") in the three marine sub-regions. Indicator associated 11.2.1: definition of "baseline level" for continuous sounds to low frequency ("ambient noise") in the three marine subregions Indicator associated 11.2.2: sound levels expressed in dB RMS re1µPa detected at the monitoring stations and noise maps compiled for the subregions	
MT	To work towards building capacity in the field of underwater noise through inter alia knowledge gain on key species groups which may be	

	adversely affected by this pressure and streamlining of MSFD requirements in terms of underwater noise in licensing and permitting procedures.	
SI	Target 11.1: Regulation of sectors and/or activities which emit impulsive sound. Target 11.2: Planning of measures needed to achieve good status will be based on monitoring data, which will be launched in 2014. On that basis, the baseline and threshold values will be determined. Target 11.3: To develop methods and approach for monitoring underwater noise at the level of the sub-region	
BE	Target 48: The level of anthropogenic impulsive sound is less than 185 dB re 1 µPa (zero-to-peak SPL) at 750m from the source Associated indicator: The level of anthropogenic impulsive sound at 750m from the source. Target 49: No positive trend in the yearly mean ambient noise level within the 1/3 octave bands 63 and 125 Hz. Associated indicator: The yearly mean ambient noise level within the 1/3 octave bands 63 and 125 Hz.	ATLANTIC OF THE NORTH-EAST
DE	UZ6. Seas not affected by human applications of energy: To achieve the good status of Descriptor 11, the following operational objectives have to be applied for the target 'Seas unaffected by human energy inputs': 1) A human noise input by pulse-like signals and shock waves does not lead to physical injury (e.g. temporary hearing threshold shift by harbor porpoises) and to any significant disturbance of the marine organisms. Associated indicators: compliance with already existing or to be established threshold values (for the frequency, noise signal characteristics (SPL; SEL etc.) residence time and particle movement) and Associated indicator: degree and frequency of damages and disturbance of marine organisms. Associated indicator: noise sources and biological effects 2) Entries due to continuous noise, especially low-frequency broadband noise in space and time have no adverse effects. Examples are significant interference (expulsion from habitat masking of biologically relevant signals, etc.) and physical damage to marine organisms. Since shipping dominates the continuous noise records, the reduction of the shipping noise on the background levels is a specific operational objective. Same indicators as 1). Associated indicator: Noise monitoring by a representative number of stationary monitoring stations within each marine region.	
DK	Target 44: Activities that give rise to the introduction of impulsive sound into the marine environment and that are assessed to result in negative impacts are carried out with relevant mitigation measures or are scheduled during periods of the year or within geographic areas where potential damage to marine organisms is limited. Associated indicator: Sound exposure levels and sound pressure levels for impulsive sounds are being monitored Associated indicator: Registration of the number of days with impulsive sounds from selected human activities	
ES	Cf MED	

FR	OE_ATL_opeD11.1 Limit the acoustic disturbances due to maritime activities acounting for ecosystems sensitivity Associated indicators : OE_ATL_ope_D11.1.1 : indicators D11.1.1 & D11.2.1 (cf EC decision) OE-ATL_opeD11.2 Limit the acoustic disturbances by acting on maritime spaces organization as well as on periods, levels and durations of underwater acoustics emissions accounting for ecosystems sensitivity Associated indicators: OE_ATL_ope_D11.2.1 : indicators D11.1.1 & D11.2.1 (cf EC decision)	
IE	Not defined	
NL	Target 11a: Individual cases: preventing harmful effects on the ecosystem, particularly on marine fauna, resulting from specific activities such as pile-driving and seismic surveys Associated indicator: Distribution in time and space of loud impulse noises with a low or medium frequency Target 11b: Background noise and accumulation of effects on populations or at the ecosystem level: targets in 2018, when more knowledge has been gathered	
PT	Target 1: Elaborate a study that evaluates the necessary conditions and resources to the installation and operation of underwater acoustic noise monitoring devices.	
SE	Not defined	
UK	Target 1 (Interim): To establish a 'noise registry' to record, assess, and manage the distribution and timing of anthropogenic sound sources measured over the frequency band 10 Hz to 10 kHz, exceeding the energy source level 183 dB re 1 $\mu Pa^2 m^2 s$; or the zero to peak source level of 224 dB re 1 $\mu Pa^2 m^2$ over the entire UK hydrocarbon licence block area. Associated Indicator: Information (e.g. date, time, activity, duration, source level, licensing block) on any noise source. Target 2 (Interim): surveillance indicator to monitor trends in the ambient noise level within the 1/3 octave bands 63 and 125 Hz (centre frequency) (re 1µPa RMS; average noise level in these octave bands over a year) measured by observation stations. Associated Indicator: Information (e.g. date, time, activity, duration, source level, licensing block) on any noise source.	
EE	Target 28. Loud, low and medium frequency impulse sounds do not cause remarkable deviations in habitat quality of marine life. Associated indicator: Frequency of occurrence of strong, short impulse noise Target 29. Permanent low frequency sound does not cause remarkable negative deviations. Associated indicator: Trend in continuous low frequency noise	BALTIC SEA
DE	Cf ATL	
DK	Cf ATL	
FI	Target 38: The intermediate aim is to describe the level of noise and the harm caused by the noise to organisms in Finnish marine areas and the	

	final aim is to reduce, if needed, the underwater noise such that it is not harmful for the marine organisms. Associated indicator: The proportion of days, annually and regionally, when human induced noise exceeds such levels that are likely to have a significant impact on marine organisms; Associated indicator: The change of noise over time.	
LT	Not defined	
LV	Not defined	
SE	Cf ATL	

Table A 2 List of environmental targets definition. The definition for member states involved in the QuietMED consortium have been updated if nedeed.

MS	Content of national monitoring programs				
	State	Id	Type	parameters to be monitored	Cover
CY	Underwater noise	MALCY-D11-01	P	Underwater ambiant noise, e.g. from shipping, underwater acoustic equipment (one continuous station in a high risk area) Intensity and temporal frequency of underwater noise	sparse 10 % spatial cover, coastal and territorial waters
EL	Draft only (not include in the 2014 asessment) – updated from Taroudakis et al., 2017)				
ES	Acute underwater noise	MWEES-ESAL-RS-1_RuidoImpulsivo	P	Impulsive underwater noise	Full
	Diffuse underwater noise	MWEES-ESAL-RS-2_RuidoAmbiente	P	Continuous underwater noise	Sparse
	seabased mobile activities	MWEES-ESAL-5_Navegacion	A	Maritime traffic, (also designated anchoring areas, number of ships sunk as a result of boating accidents)	Full
	activities with permanent infrastructures or structural changes	MWEES-ESAL-ACT-8_Hidrocarburos MWEES-LEBA-ACT-8_Hidrocarburos	A	Exploratory wells, power extracted hydrocarbons, sealed bottom surface	Full
	operational objectives	MWEES-ESAL-OP_ObjetivosOperativos MWEES-LEBA-OP_ObjetivosOperativos	ME	Variable according to indicators	Full
FR	Diffuse underwater noise - distribution, frequency and levels (UPDATE : ENVISIA)	MOFR-D11_Bruit-1-Emissions_Continues	A	Intensity of activity of maritime activity, Spatial distribution/extent of activity, Temporal changes in activity, Type of activity (within broad category of, e.g.	Full

				fisheries, tourism/recreation) UPDATE : multi source of trafic data as AIS, Lloyd's, Opportunistic and static information on vessels (length, type)	
	Acute underwater noise - distribution, frequency and levels (UPDATE : refered to as SIRENE)	MOFR-D11_Bruit-2-Emissions_ImpulsivesAcute	A	Intensity of activity, Spatial distribution/extent of activity, Temporal changes in activity, Type of activity (within broad category of, e.g. fisheries, tourism/recreation CORRECTION geophysical survey, mine clearance, piling, research and technology) UPDATE : the national impulsive sound register is named “SIRENE”	Full
	Other (UPDATE : refered to as MAMBO)	MOFR-D11_Bruit-3-Bruit_Ambiant	P	Intensity and temporal frequency of underwater noise	Sparse (UPDATE : 4 points for continuous monitoring, opportunistic elsewhere)
HR	Acute underwater noise - distribution, frequency and levels	MADHR-D11-01 – noise registry	A	Intensity and temporal frequency of underwater noise	All
	Diffuse underwater noise - distribution,	MADHR-D11-02 – ambient noise	P	Seabed habitats - all Water column habitats - all	Sparse (4 points)

	frequency and levels			All Functional groups Intensity and temporal frequency of underwater noise	
IT	Impulsive sound of high intensity of mid and low frequency	SPr 7.1	A	noise register for impulsive sounds	Full
	Continuous low frequency sound	SPr 7.2	P	ambient noise	Sparse
MT	Draft only (not include in the 2015 asessment) – updated from ERA, 2017)				
SI	Draft only (not include in the 2015 asessment) – updated from Popit et al., 2017)				

Table A 3 : Contents of the 2015 national monitoring programs in the Mediterranean The contents for member states involved in the QuietMED consortium have been updated when relevant.