PERSEUS

POLICY-ORIENTED MARINE ENVIRONMENTAL RESEARCH IN THE SOUTHERN EUROPEAN SEAS

Summer School Anavissos

"Supporting Monitoring in the Mediterranean Sea towards GES"

Milestone Nr. 40

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Responsible	Sofia Reizopoulou (HCMR)		
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	Confidential, only for members of the consortium (CO)		

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BACKGROUND

PERSEUS
POLICY-ORIENTED MARINE ENVIRONMENTAL RESEARCH IN THE SOUTHERN EUROPEAN SEAS

The PERSEUS project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration

SAVE THE DATE > 8-12 June 2015

PERSEUS SUMMER SCHOOL 2015

"Supporting Monitoring in the Mediterranean towards GES"

PERSEUS Project organises the **'PERSEUS Summer School 2015'** and invites policy-makers, scientific and policy advisors of the UNEP/MAP Monitoring Correspondence Group (CORMON Group) to participate.

The purpose of the Summer School is to assist countries, to develop, design and implement an effective monitoring (both in terms of science and cost) for the needs of the Marine Strategy Framework Directive (MSFD) and Ecosystem Approach (EcAp).

The Summer School will provide a platform for examples and tools from more advanced plans focusing on non-EU countries. The aim is to 'assist' non-EU countries to harmonize their efforts, learn from past experience and join efforts in developing joint monitoring schemes across the Mediterranean.

The PERSEUS Summer School 2015 will take place at the HCMR premises: 46,7 km Athens Sounio ave., 19013, Anavyssos, Attiki, Greece.

Hellenic Center for Marine Research (HCMR),
Anavyssos,
Athens - Greece.

Registration:
By Invitation only.

You are welcome to download the draft agenda of the Summer School and the Summer School Report (once it is published) from PERSEUS project website :
http://www.perseus-net.eu
under the section of Scientists / Notice Board / Summer School

For more information please contact **Dr. S. Reizopoulou**
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SCOPE

This is a PERSEUS milestone under the task of Work package 8 and with the responsibility of the HCMR partners. The overall contribution of the 2nd PERSEUS summer school that took place in Anavissos, Greece is to support the policy makers that deal directly with the implementation of the Marine Strategy Framework Directive, its indicators and the assessment of marine waters at regional scale towards a Good Environmental Status (GES) which is not yet fully defined on how to be achieved. Therefore, the summer school aimed on the interaction of scientists participating as lecturers regarding the key indicators on the 11 MSFD descriptors using current scientific practices, and the students coming from organizations that have to apply the MSFD towards GES.

SUPPORTING MONITORING IN THE MEDITERRANEAN SEA TOWARDS GES

During the dates of this event 8-12 of June 2015, the summer school was hosted at the premises of the Hellenic Centre for Marine Research (HCMR), located in Anavissos, Greece. The school had also the assistance and participation of the UNEP/MAP Monitoring Correspondence Group (CORMON).

1. INTRODUCTION

PERSEUS aims to design and create an effective and innovative research governance framework able to engage scientists, policy-makers and the public, thereby reaching a shared understanding and informed decision-making based on sound scientific knowledge, with particular reference not only to the MSFD, but also to the relevant features of the Integrated Maritime Policy, the Common Fisheries Policy, the Global Monitoring for Environment and Security, the SES Regional Sea Conventions, the UNEP/Mediterranean Action Plan and the Black Sea Commission.

PERSEUS's main objectives are to:

1. Identify the interacting patterns of both natural and human-derived pressures on the SES and proceed with the assessment of their impact on the marine ecosystems;
2. Develop tools for the evaluation of the environmental status using existing and upgraded monitoring and modelling capabilities;
3. Implement the principles and objectives put forward in the MSFD and promote them across the SES – emphasis on non-EU areas;
4. Develop a framework for future implementation of adaptive policies and management schemes.

PERSEUS summer schools falls under objective 3 especially through the promotion of the MSFD across The SES.

2. PERSEUS COURSE

2.1 Focus of the Course

PERSEUS focus from the beginning has been to assist in the implementation of the MSFD by identifying monitoring gaps, driving more scientific research towards that direction and proposing through its specific objectives and with the interaction with stakeholders and policy makers a program of measures that would allow to reach a state of good environmental conditions. Therefore, the invited speakers of the summer school were of a scientific background and people that have worked with the descriptors of the MSFD and the "pupils" of the school were key players for applying the principles of the MSFD in their countries.

This approach is a teaching, learning interaction leading to a Q&A interaction of both speakers and invitees aiming to have concrete solutions and conclusions towards the MSFD strategy and the road to GES.

2.2 Course Content

Dr Papathanassiou has welcomed everyone to the summer school by saying a few words on the HCMR premises and showing a short 5 minutes video of the center. A tour de table followed in order to have a first idea of the participants group.

Day 1

The opening session of the course gave to the participants a broad overview on the summer school course as well an overview of the PERSEUS project, its tasks and results. Further on, the two conventions that of the Mediterranean (UNEP/MAP) and that of the Black Sea (BSC) have briefed the participants on the monitoring that both regions are currently working on specifying on some descriptors and indicators. Additionally, the Ecosystem Approach of UNEP has already added to the implementation of the monitoring activities in the Mediterranean.

Comments and questions of this day

Comments were made on the usefulness of the presentations, and how much the information collected by the Barcelona and Bucharest conventions could be assessed and if it is currently available. For example, MEDPOL online system is not open to everyone.

Figure 1: Opening of the summer school.

Day 2

The following session on the second day of the summer school has focused on the development of the monitoring "indicators" and monitoring needs. Therefore, most of the presentations on this day dealt with the most well studied indicators for the Med. and Black Sea, such as eutrophication, contaminants, marine litter, biodiversity,

Comments and questions of this day

Some issues were raised during the discussions of that day.

For marine litter and fisheries:

Regarding marine litter there are transboundary issues indicating the difficulty of the countries to set target and fulfill the MSFD requirements so it is necessary to locate the source and act on the source. The same problem exists for marine reserves, where they come from local sources. Regarding the monitoring of this descriptor, there is the question on which data are more valid, voluntary or scientific or both.

Therefore it is needed to harmonise the data and have some initiative. Merging and coordination of NGOs could help. In terms of skills, there is no apparent problem with voluntary data, for example at national level in France, these data support NGOs.

Regarding Fisheries, their assessment is based on catchment data, however, it doesn't take biomass into account, and this could not be considered as regular monitoring. The uncertainty in this descriptor arises from the environmental parameters (conditions). Measurements of the trend in mortalities should be taken into account. Increasing awareness for fisheries is a key issue.

Non-Indigenous Species & Eutrophication

Models are used for the physical transfer of species, temperature and transfusion of the them and could be a monitoring tool for non-indigenous species. In Italy, 12 ports are monitored for non-indigenous species (NIS). However, the frequency of the monitoring is not enough and there are not enough data in ports. A further suggestion goes into monitoring hotspot areas however, it is difficult to acquire permission and as a consequence a rapid assessment on the docks is carried out.

Indigenous species issue could not be regulated at EU level and therefore it is necessary for scientific effort to focus on their detection and propose a program of measures. There is a distinct differentiation of NIS around the Mediterranean. but increased research efforts has aided in further detection and report of species.

There is a tendency/movement to reconsider and rewrite Descriptor 2 of the MSFD, however no decisions have been taken yet. Cost-effectiveness of monitoring scheme needs to be considered so not to model alien unicellular organisms or other alien organisms as it is necessary to concentrate on specific species rather than on everything. UNEP/MAP through their Action Plan have taken into consideration the invasion of the species through the Suez Canal as it is an important factor for the entrance of species in the Mediterranean together with climate change and ships ballast waters.

- How can monitoring can lead to policy options? The only and most appropriate way to reduce eutrophication is to know the hotspots, thus identify the pressures and act on the pressures. For example, do not use fertilisers, use sewage treatment, especially in the summer when the population increases even in the northern Mediterranean and reduce the use of fertilisers.

- In the Ospar region what is the % of fertilisers? How much do we need to reduce them by? There is a limit for nitrate. Apply the directives to reduce eutrophication. There is also the atmospheric deposition of nutrients to monitor submarine groundwater discharge.

For the policy and measures of Alien species: the IMO should take care of Ballast water and policymakers should ensure the directives are enforced, i.e. those of IMO and the Aquaculture Directives. There are two solutions: 1. To ensure that the ballast waters are treated to avoid carrying alien species, 2. If alien species are carried in ballast water, then introduce alien species to the food web by creating consumption fisheries.

Invasive Alien Species Index (suggestions):

- Populated by invasive species of high impact.

- Measured criteria in the habitat and use modeling data in the species. There is a need to distinguish the potential areas of distribution to the vulnerable areas of distribution in the Mediterranean.

Eutrophication Thresholds: Are the indexes not satisfactory? Primary production and oxygen consumption change but chlorophyll is not a good proxy for eutrophication.

Therefore need to:

a. Use data to define thresholds

b. Primary production is a rate, not an accumulation biomass.

Biological Diversity & Benthic Communities

Two main things to look at in relation to biodiversity a risk assessment/analysis and the cost effectiveness of the MSFD monitoring.

For biological diversity, 2-3 million are available by the UK government on MPAs, for high resolution mapping. It is unclear however of what resolution is needed in order to have effective mapping.

It is a DG Mare priority to have EU Clean Seas by 2020 (also mentioned at the European Maritime Day that took place on the (28-29 May)) so the Commission will provide some funding for mapping.

Is a common approach (like the Barcelona Convention) best or is it better to develop different indices across the Mediterranean and then to calibrate?

At UNEP/MAP the focus is on a common approach, trying to sort out methodological assessment and give flexibility to sub-regional differences.

Ocean acidification/diversity is an issue that has been neglected. Arguments are that maybe it should be included but it is a subject not easily addressed through the MSFD descriptors.

UNEP/MAP: There is no indicator for acidification right now, as it is a lot of work to develop it and to implement it is almost impossible. We recognize the importance however. There is an initial phase of implementation of indicators for 3 years and all parties can recommend an indicators. Contracting parties can recommend indicators and their methodologies. Indicators can be introduced after 2016, after the three year implementation period.

There is a lack on the indicators of climate change (e.g. acidification) and the indicators on ecosystem functioning. It is necessary to make progress (e.g. DEVOTES tool - some models test climate change in the DEVOTES tool).

UNEP: There is an ongoing work related to climate change, e.g. with IPCC.

There are no data at national level for pH for acidification assessment.

Day 3

The 3rd day in the morning lectures focused on the examples and suggestions regarding the monitoring at EU projects and at countries national level. The presentations were followed by four parallel sessions where participants were divided into two groups of Eastern and Western Mediterranean and each team followed one of the four sessions to be taught at a time. The sessions focused in teaching the "students" of four tools from three projects (See Annex I). Participants had the ability to use their own data and laptops to download or use online the tools and learn their usability.

Comments and questions of this day

In the morning session comments were made especially on the monitoring of whales using satellite imaginary. This technique could have some remote differentiation of the species (e.g Orcas could be distinguished) but it has been mostly used in the UK for sperm whales. To use archive images it would be less costly than defining your area and acquiring satellite images.

For sperm whales a 15km area is enough to scan but the technique would not work in open water but in coastal ones. There is also a possibility with resolution images to be able to identify calves.

Furthermore, this technique could be used as a joined act together with NGOs in order to design a very good monitoring procedure. NGOs could provide the sightings sites and their experience on the subject.

Already satellite providers already give data freely for purposes such as natural disasters, etc. Therefore, it is good not to think at national boundaries but beyond.

For the abundance of the species, it is necessary to have 2 or more imagery to have good estimates.

Finally, the two most important indicators that could be looked at through this technique are the abundance and the distribution of the species. Then, the environmental parameters could be added. Having the abundance over time could be assist in defining trends.

For the joint monitoring that was presented the same day in the morning session a top-down control is considered more appropriate. In the Mediterranean the member states are not always neighboring so it is difficult to realize a joint monitoring in order to use common approach and procedures and this is also due to political reasons. Together with the non-classical ways to do monitoring (satellite, models, platforms) it would be good to have an inventory of vessels in each area. Even though in the Mediterranean there is a good satellite coverage, in the Black Sea there are identified gaps. Both basins need to use existing data in a cost-effective way, and especially regarding the Ecosystem Approach (EcAp) of UNEP/MAP. Additionally, it would be good to involve managers, coordinators, and stakeholders but need not to constantly communicate with them, but only once.

A conclusion of the day is that the MSFD approach in similar to the EcAp approach but the member states should involve the Non-EU countries despite the funding activities that are still an issue.

Day 4

The presentations of that day focused on the tools that could be utilized for monitoring purposes in the Mediterranean Sea. Therefore, this sessions discussions were on integrated observing systems such as platforms having integrated sensor systems, Argo floats, gliders, etc and including the potential of using models for the assessment of the marine ecosystem. Finally, there was the presentation of a management tool for fisheries (PERSEUS result), the Vessel Monitoring System (VMS).

In the afternoon of the same day the two groups divided on day 3, had to come together and prepare one presentation each regarding the usefulness of the summer school (lectures and tools) and prepare the joint monitoring plans (JMPs) that they would suggest with the knowledge they gained throughout the course.

Comments and questions of this day

Most comments were on the modeling part where issues such as the integration of water mass formations were discussed. For the purposes of the models it is best not to use average values as they could be misleading but use variables instead. For the development of a new modeling system, more variables are needed (not just chlorophyll) such as zooplankton, and other biological parameters.

Day 5

The final day the groups presented the two JMPs presentations. Furthermore, a document was asked by the two leaders of the groups on JMPs and a raw draft of it is found in Annex IV. All presentations are also available upon requested from PERSEUS MO.

2.3 Course Outcome

The summer school attained a high level both on the participants but also on the lecturers that briefed them throughout the course and who encompassed high teaching qualifications. We acknowledged the fact that there was enthusiasm from the participants part especially on the 3rd day where the monitoring tools where presented engaging into a fruitful conversation among them. The full participants list could be found in Annex II.

The format of the course assisted into having a Q&A approach and this synergistic approach together with the lecturers and the course organizers contributed into making all into yet again another successful event.

Besides the training of the key players, the main outcome are the JMP proposals and the agreement of the participants on them dealing with the monitoring issues in the Mediterranean and Black Sea basins.

2.4 Participants perspective

In order to receive a feedback from all participants that attended the course, a questionnaire was handed out into them either printed or electronically (where necessary) having a scoring associated to the lectures and tools, to self-evaluation, to organization, but also having an input for additional comments and an overall course rating. In Annex III all ratings could be observed. In general all were from good to excellent and especially on the overall rating on lectures (70% very good), the level of comprehension (89% very good) and the increased ability to carry out monitoring

(69% very good). Additionally all comments were useful, especially the ones that assist into improving such workshops in relation to their content (practical vs theoretical) and the materials provided (background information on the schools specific topics).

3. SOCIAL PROGRAM

The social program involved an Ice Breaking Reception and an excursion at Sounio monument. The reception was held at the Hotel where the participants stayed in (Hotel EDEN, Mavro Lithari) where participants had the chance to meet with each other and enjoy several local nibbles accompanied by wine and ouzo. On the 4th day, an excursion to Sounio monument (Figure 2), was organized.

Excursion to Sounio

Figure 2: Sounio monument.

In Figure 2 the temple of Poseidon in Sounio is shown. Cape Sounion is found about 70 km to the south-east of Athens, on the southernmost tip of Attica peninsula. According to the myth, this is the site where Aegeus, king of Athens, fell into the sea because of a misunderstanding. Theseus, the son of Aegeus, had traveled to Crete to kill Minotaur, the legendary monster who lived in the palace of Knossos, and to release Athens from the obligation to send seven boys and seven girls every year to the king of Crete, only to be eaten by Minotaur. Theseus thus had said to his father that if he killed Minotaur, he would hoist a white sail on the return home. Theseus indeed killed Minotaur and was returning to Athens safe and well but unfortunately, he forgot to hoist white sail and had a black sail on his mast. Aegeus saw the black sail from Cape Sounion and believed that his son was dead. His despair made him fall into the sea and, later on, the Athenians gave the sea his name, the Aegean Sea.

Source: www.greeka.com

Figure 3: Participants at sunset in the monument.

The participants after touring Cape Sounio and the temple of Poseidon (Figure 3), had dinner at a nearby restaurant with the opportunity to enjoy typical seafood and enjoy the local cuisine.

Annex I: Agenda

AGENDA

PERSEUS Summer School

" Supporting Monitoring in the Mediterranean Sea towards GES"

8-12 June 2015

Venue: Hellenic Centre for Marine Research,
Anavissos (Amphitriti Room)

Day 1 **Monday 8 JUNE 2015**

13:30 **Bus from Eden Hotel to HCMR premises (place of venue)**

13:45 – 14:30 **Registration**

Current status of monitoring under MSFD and EcAp

Chair: E. Papathanassiou

		Speakers
14:30-14:45	Welcome	
14:45-15:00	Tour de Table from the Participants.	
15:00-15:30	Introduction to the Summer School	N. Streftaris, HCMR, Greece
15:30-16:00	Presentation of PERSEUS	E. Papathanassiou, HCMR, Greece
16:00-16:30	**Coffee break**	
16:30-17:00	Monitoring in the Mediterranean under MSFD	M. Morgantin, CORILA, Italy
17:00-17:30	Monitoring in the Mediterranean: The added value of EcAp implementation	T. Hema, UNEP/MAP
17:30-18:00	Monitoring in the Black Sea (BSIMAP)	I. Makarenko, Black Sea Commission
19:00	**Ice Breaking Reception (EDEN Hotel-Mavro Lithari)**	

Day 2 **Tuesday 9 JUNE 2015**

Development of Monitoring 'indicators' Presentation of monitoring needs

Chairs: G. Gurban & L. Giannoudi

		Speakers
09:00-09:30	Noise	M. Andre, UPC, Spain
09:30-10:00	Marine litter	F. Galgani, IFREMER, France
10:00-10:30	Contaminants and pollution impact	N. Bihari, Institut Rudjer Boskovic, Croatia
10:30-11:00	Fisheries	V. Vassilopoulou, HCMR, Greece
11:00-11:30	Discussion	
11:30-12:00	**Coffee break**	
12:00-12:30	Non-indigenous species	A. Zenetos, HCMR, Greece
12:30-13:00	Eutrophication	K. Pagou, HCMR, Greece
13:00-13:30	Discussion	
13:30-15:00	**Lunch**	
15:00-15:30	Biological Diversity	M. Frost, Marine Biological Association, UK
15:30-16:00	Food web	H. Teixeira, JRC, Italy
16:00-16:30	**Coffee break**	
16:30-17:00	Biological Diversity (macroalgae)	P. Panayotidis, HCMR, Greece
17:00-17:30	Benthic communities	M. Simboura, HCMR, Greece
17:30-18:00	Discussion	

Day 3 **Wednesday 10 JUNE 2015**

Existing Projects and Examples of Monitoring: Space, time and Effort

Chair: N. Streftaris

		Speakers
09:00-09:30	Joint Monitoring Plans in Mediterranean -IRIS	K. Pagou, HCMR, Greece
09:30-10:00	MedSea Checkpoint	S. Reizopoulou, HCMR, Greece
10:00-10:30	Discussion	
10:30-11:00	**Coffee break**	
11:00-11:30	Scales of Monitoring	S. Reizopoulou, HCMR, Greece
11:30-12:00	Monitoring whales from space	P. Fretwell, BAS, UK
12:00-13:00	Discussion	
13:00-14:00	**Lunch**	

Tools for designing Monitoring (introduction, demonstration and application)

The following four sessions will run in parallel by dividing the participants into 3 groups (East Med, Central Med & West Med).

Each team will be rolling from one session to the next.

Participants will have hands on training on how to use the tool and apply it, in case specific studies.

- Participants are asked to bring their own laptop. They could also bring their own data, if

they wish, to test them against the different tools in this session.

14:00-18:30	Integration among Descriptors tested across indicators within D6 under PERSEUS Project. Working examples (1hour: cyclical for the 4 groups)	N. Simboura, HCMR, Greece
	DEVOTES innovative tools in assessing GES (1hour: cyclical for the 4 groups)	H. Teixeira, JRC, Italy
	Coffee break (16:00-16:30)	
	The GIS tool for Joint Monitoring Planning, developed under the IRIS-SES Project. Case studies: eutrophication and contaminants (1hour: cyclical for the 4 groups)	A. Karageorgis & P. Drakopoulou, HCMR, Greece
	Using the PERSEUS AMP tool (1hour: cyclical for the 4 groups)	M. Skourtos & A. Kontoyanni, AUA & UoWM, Greece

Day 4 **Thursday 11 June 2015**

Tools that can be utilized for Monitoring in the Mediterranean Sea

Chair: S. Reizopoulou

09:00 - 09:30	Integrated observing systems in the Med: Can they be used for monitoring?	J. Tintore, SOCIB, Spain
09:30-10:00	Vessel Monitoring System: A management tool for monitoring fisheries activities in the Med	S. Kavadas, HCMR, Greece
10:00-10:30	Assessing the potential of Modelling in the Med	M. Zavatarelli, UniBO, CONISMA, Italy
10:30-11:00	**Coffee break**	
	Developing monitoring plans across the Mediterranean workshop Three groups: Western, Central and Eastern Mediterranean ***Chair and rapporteurs proposed by each of the group***	
11:00-13:00	Workshop on Joint monitoring plans. Preparation of presentations. *(Each Group will wrap up contributions from previous day(s) and prepare 3 presentations on joint monitoring plans in the Western, Central and Eastern Mediterranean) for the following day. The group of "experts and teachers" can do the same for the whole basin.*	
13:00-14:30	**Lunch**	
14:30-17:00	Preparation of the presentations for eastern, central, western Mediterranean groups (for the next morning).	
19:00 From Hotel	Excursion to Sounion / **Dinner at Sounion**	

Day 5 **Friday 12 June 2015**

Monitoring plans across the Mediterranean

Chair: E. Papathanassiou

10:00-11:30	Presentations on proposals for JMPs Presentation by the 3 groups and the group of 'experts'	
11:30-12:00	**Coffee break**	
12:00-13:00	Discussion & Conclusions	
13:00	End of the Meeting	
13:00-14:00	**Lunch**	

Scientific & Organizing Committee:

E. Papathanassiou, HCMR, Greece
N. Streftaris, HCMR, Greece
T. Hema, UNEP/MAP, Greece
G. Gurban, UNEP/MAP, Greece
L. Giannoudi, HCMR, Greece
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A. Drago, UoM, Malta
S. Reizopoulou, HCMR, Greece
M. Kimigeli, HCMR, Greece
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Annex II:

List of participants are in alphabetical order. Those in Bold are the lectures and those not are the students (policy makers)

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"Supporting Monitoring in the Mediterranean towards GES"
8-12 June 2015 Anavyssos

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Annex III

Evaluation of the 2nd Summer School of PERSEUS project, "SUPPORTING MONITORING IN THE MEDITERRANEAN TOWARDS GES", HCMR, Anavyssos, 8-12 June 2015

1. Lectures & Tools Evaluation

	Poor	Average	Above average	Very good	Excellent
Degree to which the scientific subjects were covered			20%	40%	40%
Academic level of the lectures				50%	50%
Prevention of thematic overlap among lectures			10%	50%	40%
Level of comprehension				89%	11%
Level of discussion between lecturers and participants			10%	60%	30%
Sufficient duration of lectures			30%	30%	40%
Overall rating of the lectures				70%	30%

Which Session did you find most useful?	AMP TOOLS	3
	NOISE	1
	FISHERIES	1
	DEVOTE TOOLS	1
	GIS TOOLS	1
	ECAP/MAP	1
	MONITORING IN THE MEDITERRANEAN SEA	1
	MONITORING IN THE BLACK SEA	1
	SESSION (DAY2) DEVELOPMENT OF MONITORING INDICATORS	2
Which Summer School lecture(s) did you find most interesting?	AMP TOOLS	4
	MONITORING IN THE MEDITERRANEAN SEA	4
	FISHERIES	1
	MONITORING WHALES FROM	2

	SPACE	
	NOISE	4
	SESSION (DAY 4) TOOLS THAT CAN BE UTILIZED FOR MONITORING IN THE MEDITERRANEAN SEA	1
	MODELLING IN THE MED	1

2. Self-Evaluation

	Poor	**Average**	**Above average**	**Very good**	**Excellent**
Ability to understand			10%	90%	
Gaining new knowledge and experience			40%	30%	30%
Increase the ability to carry out monitoring		22%	11%	67%	
Exposure to techniques directly applicable to my career			10%	90%	
Additional comments	❖ I think that it would have been helpful to provide literature or make an introductory presentation on GES and descriptors. ❖ Understanding ability varied depending on the specific subjects of lectures. Useful new info, but limited applicability potential in my country due to limitation of human and financial resources and expertise. ❖ I was missing the background of the 11 descriptors.				

3. Organization

	Poor	**Average**	**Good**	**Very good**	**Excellent**
Information provided prior to Summer School opening			10%	70%	20%
Summer School duration			40%	30%	30%
Structure of the schedule			40%	20%	40%
Secretariat support			11%	22%	67%
Meals during lectures				50%	50%
Meals at the hotel		10%	30%	30%	30%
Hotel accommodation	10%	30%	30%		30%

Extra-curricular activities			20%	10%	70%
Overall organisation			20%	30%	50%
Additional comments	❖ Well done!!! When's the next workshop? ❖ I would add fruits/veg. for coffee break.				

4. Additional Comments

	Yes	**No**	**I do not know**
Have you gained knowledge and experience from the Summer School?	100%		
Did it help you improve your networking – make new acquaintances?	100%		
Do you think the course will be useful for your career?	80%		20%
Have you attended another Summer School before?	44%	56%	
What was the most impressive feature of the Summer School?	❖ Each of the organizers and lecturers were polite and successful. ❖ The beach bar. ❖ Organization coverage of different topics. ❖ New advanced knowledge. Excellent organization and hospitality. ❖ Dinner at Sounion, all the lectures and activities. ❖ Some lectures. ❖ Good exchange of expertise among teachers and participants. Excellent atmosphere.		
What suggestions do you have towards improving the PERSEUS Summer School on monitoring?	❖ Provide literature on UNEP-MAP directive and GES to read before the summer school. ❖ More hands on activities. ❖ More time devoted on practical issues and exercises to meet real challenges Med countries face. ❖ Perhaps making it shorter. Increasing practical activities. ❖ Each country to present its own monitory program. ❖ On site demonstration of new tools can be utilized for monitorings. ❖ More comparability of results among the different sub regions.		

Any other comments	❖ Thanks for your kind invitation! ❖ More time for (some) presentations. Not all presentations were equally useful. ❖ Everybody was very nice and friendly and very helpful. ❖ The number of participants was ideal to promote good interaction and discussion, which was very enlightening.

Overall Rating

	Poor	**Average**	**Above average**	**Very good**	**Excellent**
Overall Rating of the course			20%	30%	50%

Annex IV

Joint Monitoring Proposals from the two Groups involved in the PERSEUS Summer school "Tools for designing monitoring sessions"

Group 1:

Workshop on Joint monitoring plans in the Mediterranean:
Report on the output of Group 1

An Integrated Monitoring and Assessment Programme in the Mediterranean has been drafted by the UNEP-MAP Secretariat and is being discussed within CORMON group of the EcAp process (UNEP(DEPI)/MED WG.411/3).

At the last CORMON meeting (30 March – 1 April 2015), common needs and challenges, interlinkages between the various ecological objectives, common indicators and their monitoring and assessment needs have been addressed in detail in break-out groups (sub-clusters), focusing on monitoring and assessment specifics of biodiversity and fisheries, pollution and litter and coast and hydrography. There is already, for most elements of the Draft Monitoring and Assessment Programme, a common understanding of and a general agreement on what has to be monitored and associated ecological objectives. The specific task that has been given to the participants of the PERSEUS Summer School was to develop a proposal to move from an 'integrated' monitoring to a 'joint' monitoring programme. The present document reports the proposal by the participants belonging to Group 1

Monitoring according to the EcAp approach encompasses several and quite diverse elements, that could be divided into 'state' and pressure' monitoring elements as in Figure 1.

State related elements	Pressure related elements
Monitoring of hydrographical properties	*Monitoring the occurrence of non-indigenous species*
Monitoring phyto and zooplankton	*Monitoring on commercial exploitation of fish, cephalopods and shellfish*
Monitoring of birds	*Monitoring of eutrophication*
Monitoring of marine mammals	*Monitoring of contaminants*
Monitoring of reptiles	*Monitoring of contaminants in fish and fish products*
Monitoring of benthos	*Monitoring of litter*
Monitoring of fish, cephalopods and shellfish	*Monitoring of underwater noise*
Monitoring food webs	

Figure 1 - Main monitoring elements in the draft Integrated Monitoring and Assessment Programme of UNEP-MAP EcAp.

A joint monitoring programme could have the following advantages: i) improve the quality of the data, ii) reduce costs of monitoring, iii) increase the spatial coverage, iv) enhance cooperation among Mediterranean countries.

The elements of a monitoring programme that may be shared include, but are not limited to, methods, assessment tools, facilities, modeling and remote sensing data, cruises.

Quality of the data could be improved by sharing methods and assessment tools, by performing intercalibration exercises and training activities, by sharing the specifics of the information flow, etc. Costs could be abated if vessels/facilities/equipment for selected activities/measurements are shared (i.e. gliders, buoys, laboratory instruments, etc.) and knowledge of modeling and remote sensing data is shared. The latter could also increase the spatial coverage of the data beyond the waters of national jurisdiction. Indeed, joint monitoring cruises, especially among neighboring countries, could abate costs and increase spatial coverage. An example could be a cross-Adriatic cruise with transects from the west to the east side of the Adriatic, covering eutrophication monitoring and some biodiversity indicators.

It is proposed that a gap analysis on availability of methods and assessment tools, of proper facilities (research vessels, equipments, labs) to carry out the monitoring and analysis, of know-how on modeling and remote sensing data is being carried out by Contracting Parties. Such analysis could be carried out within each of the sub-clusters of EcAp (biodiversity and fisheries, pollution and litter, coast and hydrography), with the necessary contribution of a sub-cluster on socio-economic analysis.

Once the gaps have been identified, they could be addressed on a sub-regional basis or at a larger scale, depending on the type of gap.

As a preliminary indication, before a proper gap analysis is being carried out, the table below (Figure 2) highlights which monitoring activities may be better candidates for joint monitoring cruises.

State related elements	Pressure related elements
Monitoring of hydrographical properties	Monitoring the occurrence of non-indigenous species
Monitoring phyto and zooplankton	Monitoring on commercial exploitation of fish, cephalopods and shellfish
Monitoring of birds	Monitoring of eutrophication
Monitoring of marine mammals	Monitoring of contaminants
Monitoring of reptiles	Monitoring of contaminants in fish and fish products
Monitoring of benthos	Monitoring of litter
Monitoring of fish, cephalopods and shellfish	Monitoring of underwater noise
Monitoring food webs	

Figure 2 - Suitability of joint monitoring activities in the Mediterranean Sea. Green: high; orange: medium; white: low.

The monitoring elements in green are those for which the assessment is needed at large scale, i.e. at the regional scale for large cetaceans, at the sub-regional scale for small cetaceans, birds, seals, turtles, most fish, etc. In orange, the elements that may need to be assessed at a smaller scale (i.e. benthos, litter, NIS) and/or for which a high level of expertise is needed, such as for monitoring underwater noise. In this latter case, a strong collaboration among contracting parties to share knowledge and technologies is envisaged, and joint monitoring could be carried out among 2 or more Contracting parties. In white, monitoring activities that could be carried out at the national level, with some local exception, such as monitoring eutrophication, phytoplankton and zooplankton in the Adriatic Sea.

Group 2:

Workshop on Joint monitoring plans in the Mediterranean:
Report on the output of Group 2

Due to the transboundary character of the marine environment a common understanding and approach is required by the MSFD to ensure a regionally coherent assessment of the environmental status and definition of GES, as well as in setting environmental targets and developing the related monitoring programmes to measure progress towards GES (based on 11 descriptors).

Within the Barcelona Convention framework**,** the EcAp**-**MED project, conducted by MAP Coordination Unit, aims at supporting UNEP/MAP to implement the decisions regarding the application of the ecosystem approach in the Mediterranean in full synergy and coherence with the implementation of the MSFD. Although, the MSFD and EcAp processes are running in parallel and considerable efforts have been made to ensure a coordinated approach on the establishment of the national monitoring programmes.

Currently it seems that these monitoring programs are similar in some respects, but in many others they are unique and difficult to compare. Thus, the primary aims of an international monitoring program would be to provide a more holistic view of the Mediterranean Sea environmental status by standardizing methods and inter-calibrating data. Such data sets would enable highlighting the trans-boundary processes taking place between all the different environments in the Mediterranean Sea, whether in the territorial waters of one country or the adjacent high seas as well as deep sea habitats that have been studied very little previously. In the following we provide a rough outline of what such a monitoring program would consist of.

Aims and objectives of the International Monitoring Program

1. Follow climate change trends and impacts.
2. Distinguish between anthropogenic pressures and natural variations.
3. Establish baseline conditions for the entire basin.
4. Provide body of data to enable the understanding of processes and impacts by *ad-hoc* research programs. For instance characterize the impact of invasive species, climate change and other anthropogenic pressures on indigenous species and habitats.
5. Develop a versatile hydrodynamic, biogechemical and ecological modeling tool for use by the scientific community and policy makers of partner and non-partner countries. Such a tool would provide a scientific for assessing both local and regional climate change impacts as well as scientific basis for development that may have basin scale effects, e.g. gas and oil drilling and extraction (spills), doubling of the Suez Canal.
6. Promote international collaboration between the countries that are sharing the same sea.
7. Inform management and assessments.

Knowledge Gaps

1. After reviewing and assessing the existing body of literature and data identify the knowledge gaps and needs.
2. Basic mapping – habitats, bathymetry, pollutant gradients, other sediment characteristics, in particular for the southern part of the Mediterranean and offshore areas.
3. Limited coverage of noise measurements.
4. Limited coverage of litter measurements.
5. Biological components including offshore birds, cetaceans and reptiles, inshore and deep sea fish communities, and deep sea benthic communities.

Monitoring Methodology

1. Specific methodology to fill knowledge gaps.
2. Standardization of existing data.
3. Intercalibration of methods.
4. Adopt standard protocols for sampling, measuring, data analysis and reporting of key core variables (see below).
5. Use state of the art automated measuring platforms and best available practices for sample analysis.
6. Report raw data to a coordinating body.
7. Modeling of Hydrodynamic, biogeochemical and ecological parameters for the whole basin.
8. After calibration and validation run scenarios (detailed below) and adjust monitoring program accordingly to optimize trends and impacts identification and monitoring.

Core variables for monitoring

1. Physical – Temperature, salinity, bathymetry, sea level, waves, currents, optical properties, bottom characterization, surface and air temperature, benthic habitats.
2. Chemical – dissolved oxygen, pH and/or PCO_2 (continuous), DIC, total alkalinity, nutrients, contaminants, methane.
3. Biological – Ocean color, chlorophyll a, Bacterial and Primary production, pathogens, biological effects of contaminants, phytoplankton, macro algae, angiosperms, zooplankton, fish, invertebrates, mammals, reptiles, sea birds, non indigenous species…
4. References – UKIMON, USIOOS.

Pressures monitoring

1. Shipping - satellite
2. Fisheries – each partner in their EEZ (if proclaimed)[1]
3. Gas and oil platforms – each partner in their EEZ (if proclaimed)

[1] The Mediterranean states seem reluctant to proclaim an EEZ. Morocco, Egypt, and Croatia have proclaim EEZ but still are in the negotiations part.

4. Nutrient and contaminant loads – each partner in their own EEZ
5. Unique habitat loss – each partner in their own EEZ.
6. Marine litter – each partner in their own EEZ
7. Noise – each partner in their own EEZ and a number of hydrophones at key locations in the area of the high seas.
8. Introduction of non-indigenous species – each partner in their own EEZ.
9. Aquaculture – each partner in their own EEZ.
10. While not technically a pressure it is important to monitor the major inlets and into the Mediteranean Sea, and passages/straits within it, e.g. Gibraltar Strait, The Sicilian Strait, Dardanelles, Suez Canal, Nile Delta, Strait of Otranto etc… These will provide important inputs and constraints for the HD and biogeochemical models.

Expected outcomes of the monitoring program

1. Central standardized data base.
2. Reduce knowledge gaps.
3. Trans-national current state assessment (Baseline) for the entire Mediterranean using measurements and models.
4. Assess present and future levels of anthropogenic pressures and climate change on the entire Mediterranean.
5. Recommendations for adjustment and optimization of the monitoring program.
6. Scenario assessments based on models for effectiveness of marine protected areas (coastal and open water), gas blow outs at relevant sites.
7. Inform future research.


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