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10th Meeting of the Ecosystem Approach Coordination Group

Istanbul, Türkiye, 11 September 2023

Agenda Item 5: New/Updated IMAP Assessment Criteria

2023 Mediterranean Quality Status Report/Executive Summary

UNEP/MAP
Athens, 2023

Note by the Secretariat

The present version of the 2023 MED QSR report was prepared under the leadership of the Ecosystem Approach Correspondence Groups (CORMONs and COR ESA) with technical support from the Secretariat and its MAP Components. In line with a number of related decisions taken by COP21 (December 2019) and COP22 (December 2021) the thematic chapters of the 2023 MED QSR were reviewed by a number of CORMONs Meetings, namely the Meetings of CORMON Pollution (1-2 March 2023), CORMON Marine Litter (3 March 2023), CORMON Coast and Hydrography (28-29 March 2023), CORMON Biodiversity and Fisheries (9-10 March 2023), COR ESA (30 March 2023), and the Integrated CORMONs (27-28 June 2023).

The integrated 2023 MED QSR report was presented during the Integrated Meeting of the Ecosystem Approach Correspondence Groups on Monitoring (CORMONs) (Athens, Greece, 27-28 June 2023). The report provides assessment findings for core IMAP Ecological Objectives, namely: Biodiversity (EO1, Benthic Habitats, Cetaceans, Monk Seal, Marine Turtles, Marine Birds), Non-indigenous Species (EO2), Fisheries (EO3), Pollution (Contaminants (EO9 and Eutrophication EO5), Coast and Hydrography (Alteration of hydrographical conditions (EO7) and Coastal ecosystems and landscapes (E08), Marine Litter (EO10) and Energy including underwater noise (EO11).

After the Integrated CORMONs Meeting, the Secretariat has worked in revising/updating the horizontal chapters of the 2023 MED QSR with a view of its enhancement and completion for submission to the EcAp Coordination Group, including its Executive Summary.

It is to be noted that while the Meeting of the Integrated CORMONs did approve the proposed measures for pollution, marine litter, coast and hydrography, biodiversity and fisheries, as well as one (1) measure for underwater noise (already included in the present draft of the executive summary), it did not have the mandate to approve the remaining two (2) measures for underwater noise given these measures are related to management modes aimed at the reduction of underwater noise and the use of the Best Available Technologies and Best Environmental Practices, which include policy and financial implications which do not fall under the mandate of the Meeting of Integrated CORMONs.

The Secretariat is thus bringing these two (2) measures (listed hereunder in grey) to the kind consideration of the 10th EcAp Coordination Group to advise whether they could be included in the present version of the Executive Summary:

"b) Implement International and Regional management measures to reduce underwater noise

1. *Further to the above there is a need to implement measures to prevent, reduce, and mitigate underwater noise emissions, taking into account well developed guidance (e.g. CMS, IMO, Oceans, ACCOBAMS, eyc), including the following:*
    - *a) Promote the application of vessel speed reductions by supporting for example ship speed limits in the proposed North-Western Mediterranean Particularly Sensitive Sea Areas (PSSA);*
    - *b) Address the issue of anthropogenic noise in the marine environment, including cumulative effects;*
    - *c) Integrate the issue of anthropogenic noise in management plans for marine protected areas and avoid or minimize producing noise in MPAs, and in areas containing critical habitat of cetaceans likely to be affected by man-made noise;*
    - *d) Apply the precautionary approach and envisage the appropriate mitigation measures, including a provision of expert review by specialists and a provision of the action to be taken if unusual events, such as atypical mass strandings, occur;*

e) Support NETCCOBAMS that would be a crucial tool for monitoring a compliance of the agreed measures, such as vessel speed, mapping temporal and geographical distribution and abundance of whales with comparable data on shipping routes and densities.

c) Apply Best Available Technologies and Best Environmental Practices

2. *For marine traffic, the following noise related technologies and BATs should be applied:*
   a) *Minimize cavitation, e.g., better maintenance and optimizing the propeller design;*
   b) *Slow steaming or reduce ship speed;*
   c) *Implement underwater noise management plans developed for individual vessels.*
3. *For seismic air gun surveys, the following technologies and BATs should be applied:*
   a) *Quieting technologies, and controlled sound source, like Marine Vibroseis, tailor-made to the specific environmental conditions and without the damaging sharp rise time of air guns;*
   b) *Mitigation measures (avoiding sensitive areas and times and not proceeding in conditions of poor visibility, such as at night).”*

The structure of the 2023 MED QSR Report reflects the structure of the Mid-Term-Strategy of UNEP/MAP for 2016-2021, which started with the pollution theme.

In this regard the Secretariat’s view is to recommend the restructuring of the 2023 MED QSR and its Executive Summary in line with the order of the Ecological Objectives (i.e., EO1, EO2, EO3, EO7-EO8, EO5-EO9, EO10, EO11).

The Executive Summary is built extracting text from the 2023 MED QSR in a concise manner, keeping in mind: (a) the need for balanced narrative text to the extent possible among all Ecological Objectives; (b) the nature of this document is meant for policy makers; and (c) that respective technical details are presented at the 2023 MED QSR.

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List of Abbreviations / Acronyms

ADR	Adriatic Sea sub-region
AEGS	Aegean Sea sub-division
AEL	Aegean and Levantine Seas sub-region
ALBS	Alboran Sea sub-division
B	Biota
BAT	Best available technology
BAC	Background Assessment Concentration
BC	Background Concentration
BDL	Below Detection Limit
BEP	Best environmental Practice
BV	Baseline Values
CAS	Central Adriatic Sea sub-division
CEN	Central Mediterranean Sea sub-region
Chl *a*	Chlorophyll a
CI	Common Indicator
CM	Central Mediterranean
COP	Conference of the Parties
CORMON	Correspondence Group on Monitoring
COR ESA	Correspondence Group on Economic and Social Analysis
COVID	Coronavirus disease
CP	Contracting Party
CRM	Certified Reference Material
CWMS	Central Western Mediterranean Sea sub-division
DIN	Dissolved Inorganic Nitrogen
DPSIR	Driver-Pressure-State-Impact-Response Framework
DRY WT	Dry weight
EAC	Environmental Assessment Criteria
EC	European Commission
EM	Eastern Mediterranean
EMODnet	European Marine Observation and Data Network
EO	Ecological Objective
ERL	Effect range low
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FDil	Dilution factor
GES	Good Environmental Status
GFCM	General Fisheries Commission for the Mediterranean
G_*mean*	Geometric mean
G/M	Good/Moderate Boundary
GEF	Global Environment Facility
HCB	Hexachlorobenzene
H/G	High/Good Boundary
IAEA/MESL	Marine Environmental Studies Laboratory of the International Atomic Energy Agency
ICZM	Integrated Coastal Zone Management
ILC	Inter-Laboratory comparison
IMAP	Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria
IMAP-IS	IMAP Information System
IMO	International Maritime Organization

ITA	International Tourist Arrival
Log	Logarithm
MAP	Mediterranean Action Plan
MB	*Mullus barbatus*
MCSD	Mediterranean Commission on Sustainable Development
MED	Mediterranean
MedECC	Mediterranean Experts on Climate and environmental Change
MED POL	Programme for the Assessment and Control of Marine Pollution in the Mediterranean Sea
MED QSR	Mediterranean Quality Status Report
MG	*Mytilus galloprovincialis*
MHW	Marine Heatwaves
MSFD	Marine Strategy Framework Directive
NAS	North Adriatic Sea sub-division
NEAT	Nested Environmental status Assessment Tool
NIS	Non-indigenous species
NOAA	National Oceanic and Atmospheric Administration
OSPAR	Convention for the Protection of the Marine Environment for the North-East Atlantic
OWG	Online Working Group
PAHs	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
REMPEC	Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea
SAS	South Adriatic Sea sub-division
SAU	Spatial Assessment Units
SPI	Science-Policy Interface
TM	Trace metals
TP	Total Phosphorus
TYRS	Tyrrhenian Sea
UNEP	United Nations Environment Programme

1. Introduction

1. Further to the initial assessment of the status of the marine environment provided in the first-ever Quality Status Report for the Mediterranean (2017 MED QSR,), progress was achieved by preparing the 2023 MED QSR using the findings of the Integrated Monitoring and Assessment Programme (IMAP) implemented for the period 2017-2023. Compared to the 2017 MED QSR, the 2023 MED QSR benefited from a substantive improvement in terms of thematic and spatial data coverage. However, for some Common Indicators, due to data inhomogeneity, and uneven data availability and distribution, it was not possible to obtain GES assessment. The thematic assessments were provided by applying the GES and alternative environmental assessment methodologies ensuring the combined use of (i) available quality-assured datasets reported by the Contracting Parties through the IMAP Info System and (ii) relevant scientific literature.

2. The Mediterranean Sea: environmental characteristics, socioeconomics:

2. The Mediterranean is a semi-enclosed sea located between Africa, Asia and Europe and is bordered by twenty-one countries. It is connected to the Atlantic through the Strait of Gibraltar, to the Black Sea through the Strait of Dardanelles, and to the Red Sea through Suez Canal. According to the Barcelona Convention, the Mediterranean Sea is “bounded to the West by the meridian passing through Cape Spartel lighthouse, at the entrance of the Straits of Gibraltar, and to the East by the southern limits of the Straits of the Dardanelles between Mehmetcik and Kumkale lighthouses”.

3. The most striking feature of the underwater geomorphology of the Mediterranean Sea is the presence of abrupt submarine canyons linking the coastal areas to the deep sea. They facilitate exchanges between coastal waters and deep waters. The presence of numerous islands is another striking characteristic of the Mediterranean. According to some reports there are about ten thousand islands in the Mediterranean, most of them are in the Aegean Sea.

4. The average annual sea surface temperature in the Mediterranean show strong gradients from west to east and from north to south, as well as a strong seasonal variation between 10 and 28°C, reaching 30°C in summer. The deep waters of the Mediterranean have a constant temperature around 13°C with an average salinity of 38‰. The evaporation water losses are partially compensated by the rivers that flow into the Mediterranean and a surface current from the Black Sea. The main compensation of evaporation losses is provided by a continuous inflow of surface water from the Atlantic Ocean through the Strait of Gibraltar. The current it generates is the main driver of the water circulation in the Mediterranean. It flows eastward along the southern coasts of the western basin, then across the Sicily Strait and continues along the southern coasts of the eastern basin.

5. With a low amplitude of semi-diurnal tides (30-40 cm), except for the northern Adriatic and the Gulf of Gabès where it can reach up to 150 and 180 cm, respectively, the Mediterranean Sea is considered a medium microtidal sea by global ocean standards.

6. In terms of nutrients, the Mediterranean is among the most oligotrophic oceanic systems. The most eutrophic waters are located on the north shore in the western basin and Adriatic at the mouth of the large rivers Rhone, Ebro and Po. However, riverine nutrient inputs are relatively low, as most river systems discharging in the Mediterranean Sea are small. The main source of nutrients in the Mediterranean lies in the inflowing Atlantic surface waters at the level of the Gibraltar Strait.

7. Home to 17,000 species of fauna and flora representing respectively 7.5% and 18% of the world’s marine flora and fauna, the Mediterranean Sea is a hotspot of biodiversity. The species diversity of the Mediterranean, although unevenly distributed between the eastern and western basins, is higher than in most other regions of the world, due to the geological history of this sea, its close communication with the Atlantic and its position at the junction of three continents: Europe, Asia and Africa which make it a melting pot of biodiversity.

8. The uniqueness of the Mediterranean biotope comes from a combination of morphological, chemical and biotic characteristics reflected by the presence of certain ecosystem building species and assemblages. The meadows formed by *Posidonia oceanica* and the bioconcretions of the coralligenous assemblages are among the most important marine ecosystems of the Mediterranean Sea.

9. Non-indigenous species (NIS) are increasingly present in the Mediterranean Sea generating significant changes in the fauna and flora composition, mainly in the eastern Mediterranean. The NIS in the Mediterranean Sea are linked to four main pathways of introduction: the corridors, shipping (ballast waters and hull fouling), aquaculture, and aquarium trade. Corridors are the most important pathway of introduction (33.7%) followed by shipping (29%) and aquaculture (7.1%).

10. The Mediterranean region climate is characterized by mild winters and hot and dry summers. From the West, the Atlantic Ocean regimes have a great intra-seasonal and interannual variability influences in the Mediterranean reaching mainly the northeast part of the Mediterranean land and sea, whilst the Eastern and Southern climatic regimes provide the characteristics of the southern Mediterranean areas.

11. Climate change is exacerbating already existing vulnerabilities in the Mediterranean region. In its Sixth Assessment Report, the IPCC concluded that “during the 21st century, climate change is projected to intensify throughout the region. Air and sea temperature and their extremes (notably heat waves) are likely to continue to increase more than the global average (high confidence)”. Over the last three decades, marine heatwaves (MHWs) in the Mediterranean Sea have caused mass-mortality events in various marine species, and critical losses for seafood industries. The maximum intensity, frequency and duration of MHWs have all increased on average over the Mediterranean Sea since 1993. However, over the 1993–2019 period, the number of MHWs showed an inhomogeneous spatial distribution in the entire Mediterranean Sea, with a lower number of events per year in the south-eastern Mediterranean Sea and slightly more events in the western Mediterranean Sea, especially in the north-western area, as well as the Adriatic Sea. In the future, MHWs may undermine many benefits and services that Mediterranean ecosystems normally provide, such as food, maintenance of biodiversity, and regulation of air quality.

12. Sea water acidification is another impact of Climate Change on the Mediterranean Sea where water surface pH has decreased by -0.08 units since the beginning of the 19th century, similar to the global ocean, with deep waters exhibiting a larger anthropogenic change in pH than the typical global ocean deep waters because ventilation is faster. Nutrient enrichment causes eutrophication and may provoke harmful and toxic algal blooms, trends which will likely increase. Harmful algal blooms may cause negative impacts on ecosystems (red-tide, mucilage production, anoxia) and may present serious economic threats for fisheries, aquaculture and.

13. The Coastal and marine ecosystems of the Mediterranean provide valuable services to human well-being and are the basis for many economic sectors such as tourism, fisheries, maritime transport, etc. All of these activities modify - at least temporarily - the marine and/or coastal environment.

14. Population growth is acting in the Mediterranean as a multiplier of pressures on the coastal and marine environment. In 2021, the population of the Mediterranean countries reached 531.7 million, increasing by close to 20 million people in only 3 years between 2018 and 2021. An overall increase of 41.4% was recorded between 1990 and 2021, while decade-on-decade growth accelerated (from a rate of 12.5% between 1990 and 2000, to 13.5% between 2000 and 2010 and 17.2% for the last decade). However, decreases in population (on a year-by-year basis) have been recorded for some time sequences or the entire period since 2000 in some of the Mediterranean countries. Some periodic population decreases during the last 20 years can be correlated with periods of conflicts and crises.

15. Human-caused pressures on the coastal and marine environment are stemming from unsustainable production and consumption patterns, and a growing population multiplies these pressures. Fluctuations of population generally impact the weight of overall pressures on the coastal and marine environment, at varying levels depending on the per capita environmental footprint.

16. Current consumption and production patterns in the Mediterranean are characterised by high resource consumption combined with low recycling rates and unsatisfactory waste management. They are unsustainable overall and lead to considerable environmental degradation in the Mediterranean region, including land take and degradation, water scarcity, noise, water and air pollution, biodiversity loss and climate change.

17. Mediterranean countries consume approximately 2.5 times more natural resources and ecological services than the region's ecosystems can provide. The gap between the Mediterranean and the world averages remained substantial: an Ecological Footprint[1] of 3.4 global hectares per capita is found in the Mediterranean, as compared to 2.8 globally in 2018.

18. The relationship between maritime economic activities and the Mediterranean marine and coastal environment is characterised by impact and dependence. The maritime economy can foster the development of sustainable practices for livelihoods that depend on the sea and its resources. At the same time, if not properly managed, it can have environmental impacts that cause marine and coastal ecosystem degradation and hinder achievement of good environmental status (GES). In turn, degraded marine and coastal ecosystems provide fewer economic opportunities for those activities that depend on healthy ecosystems (fisheries, tourism, etc.).

19. In most Mediterranean countries, the regulation of maritime activities, whether through the implementation of international legislation, compliance and enforcement is still not at the level to allow the maritime economy to make a significant contribution to a sustainable blue economy. This economic "openness" stands in contrast with the biological semi-closed character of the Mediterranean Sea (water renewal time of around 80 years). The fragmentation of policies, coupled with the lack of a national maritime transport system policy, within countries, and the lack of ratification of international maritime instruments and standards, and the associated uneven implementation, compliance and enforcement including sanction measures among countries when these countries have ratified the se instruments and standards are challenges that need to be overcome if maritime activities are to be a major pillar in a sustainable regional blue economy.

20. Over the past 50 years (1970 – 2019), the number of international tourist arrivals (ITAs) to Mediterranean countries increased by a factor of seven: from around 58 million in 1970 (161 in 1995, 246 in 2005) to 408 million in 2019. During the past decade (2010 – 2019), a cumulative increase of ITAs to the Mediterranean countries was 43.2% and in 2019, close to one third (27.8%) of the global ITAs were recorded in the Mediterranean[2].

21. The economic impact of tourism is strong: contribution of tourism and travel to GDP has been estimated at USD 943.4 billion, with 18.4 million direct and indirect jobs across the region in 2019. However, the COVID-19 crisis halved the GDP from tourism and travel in the Mediterranean, causing a loss of 3.1 million jobs. Indeed, in 2020, tourism was severely affected by COVID-19 pandemic and the number of ITAs decreased by more than two thirds; a moderate recovery was seen in 2021, with total number of ITAs reaching 45.5% of the 2019 level.

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[1] The Ecological Footprint measures how much biocapacity humans demand, and how much is available. It does not address all aspects of sustainability, nor all environmental concerns. Biocapacity is the area of productive land available to produce resources or absorb carbon dioxide waste, given current management practices. Global hectares (gha) is a unit of world-average bioproductive area, in which the Ecological Footprint and biocapacity are expressed.
[2] Data on tourism specifically related to the Mediterranean coastal region is generally not available and data presented here refers to national data (all marine façades included for countries with multiple marine façades).

22. Agriculture is a strategic sector in most Mediterranean countries. The main impacts of agriculture on the marine environment are due to the runoff of nutrients and agrochemicals into the sea. Disaggregation of the impact from different sources of land-based pollution is difficult and there is no quantitative data concerning the effect of agriculture on the environment of the Mediterranean Sea. The runoff of inorganic nitrogen and phosphorus fertilizers leads to eutrophication, which in turn negatively impacts coastal and marine ecosystems. The runoff and infiltration of pesticides into the sea affect the marine environment at a slower pace by bioaccumulation higher up the food chain.

23. In 2020, fertilizer consumption in kg/ha of arable land ranged from 7 kg/ha to 473 kg/ha, with half of the Mediterranean countries being above and half of the Mediterranean countries being below the world average fertilizer consumption of 146 kg/ha of arable land.

24. Fisheries, including aquaculture, is another important economic sector in the Mediterranean where a variety of capture fishery and aquaculture techniques are employed at different scales, including industrial, semi-industrial and small-scale fisheries, as well as industrial and small-scale farming. Four out of five fishing vessels in the Mediterranean are small-scale vessels[3] which are the predominant fleet segment in all Mediterranean fishing sub-regions, in particular in the Eastern and Central Mediterranean. Another important fleet segment are trawlers and beam trawlers, accounting for 7.9% of the total, predominantly used in the Western Mediterranean and the Adriatic; purse seiners and pelagic trawlers make up 5.5% of the fleet.

25. The wider economic impact of fisheries along the value chain in the region, including direct and indirect as well as induced effects, is estimated to be 2.6 times the value at first sale. In the Mediterranean, revenue from small-scale fisheries makes 29% of the total; however, in some countries (e.g., Cyprus, France, Greece, Lebanon, Morocco, Slovenia), small-scale fisheries account for as much as 50% of the total revenue.

26. According to FAO, total employment onboard fishing vessels in the Mediterranean was near 202,000 in 2018. Approximately one third of these jobs are linked to fishing in the Western and Eastern Mediterranean sub-regions; the Central Mediterranean accounts for 24% of the total number of jobs, and the Adriatic Sea sub-region for 9%. Estimates from previous analyses (for example by the World Bank, FAO and WorldFish) suggest that non-vessel-based jobs employ almost 2.5 times as many people as those onboard vessels. On average, employment onboard fishing vessels represents around 0.1% of total coastal populations.

27. Total marine aquaculture production (including Türkiye’s Black Sea production) approached one million (994,623) tonnes in 2020 with average annual growth rates of 6.8% and a cumulative increase of around 90% between 2010 and 2020. Marine aquaculture output was not negatively affected by the COVID-19 pandemic: production in 2020 increased by 13.2% compared to 2019.

28. Other economic activities (maritime transport, oil and gas activities, underwater cables and pipelines, etc.) can function independently from the state of the marine environment while generating heavy impacts to the marine environment. The Mediterranean Sea being located at the crossroads of three major maritime crossings[4] constitutes an important transit and trans-shipment area for international shipping, as well as a realm for Mediterranean seaborne traffic (movement between a Mediterranean port and a port outside the Mediterranean) and short sea shipping activities between Mediterranean ports. Despite covering less than 1% of the world’s oceans, the Mediterranean Sea

[3] Including small-scale vessels 0–12 m with engines using passive gear; polyvalent vessels 6–12 m; and small-scale vessels 0–12 m without engines using passive gear. Polyvalent vessels are all vessels using more than one gear type, with a combination of passive and active types of gear, none of which are used for more than 50 percent of the time at sea during the year.

[4] Strait of Gibraltar, opening into the Atlantic Ocean and the Americas; the Suez Canal, a major shipping gateway which connects to Southeast Asia via the Red Sea; and the Dardanelles Strait, leading to the Black Sea and Eastern Europe/Central Asia.

accounted for more than a fifth (21-22%) of global shipping activity measured by the annual number of port calls, and around 9% of the annual container port throughput in recent years. The Western Mediterranean and the Aegean-Levantine Sea are the busiest parts of the basin.

29. The Mediterranean region is facing crucial challenges linked to the use of natural resources, in particular water, as well as energy products.

30. The total primary energy demand in the Mediterranean equalled 1,021 Mtoe[5] in 2018 and 1,030 Mtoe in 2019, with an overall increase of around 45% compared to 1990. In 2020, a decrease of around 9% was recorded due to the effects of the COVID-19 pandemic, bringing primary energy demand down to 938 Mtoe. Shares of coal and oil in the total primary energy demand had a downward trend over the past three decades. The most significant uptake of renewables has been recorded in power generation, while the share of renewable sources is still very low in end-use sectors, especially in industry and transport. In 2020, renewable energy technologies made up 43% (686 GW) of the total power generation capacity, deployed predominantly in the North Mediterranean countries. Nevertheless, the development of renewable capacity was very fast in the South and East where it nearly tripled over the period 2005 – 2020.

31. The Mediterranean region is recognised as one of the most water-challenged regions in the world. The pre-existing water scarcity is being aggravated by population growth, urbanization, growing food and energy demands, pollution, and climate change. According to FAO, total freshwater withdrawals in the Mediterranean countries were at the level of 290 billion m^3 in 2019 with irrigated agriculture as the most water-demanding sector accounting for nearly 80% in most of the south and east Mediterranean countries. Besides freshwater withdrawals, a total of 6.6 billion m^3 of treated wastewater is used across the region, and desalination of sea water is developing[6] in many countries on all rims of the Mediterranean.

32. The 2023 MED QSR provides an analysis of the main socio-economic components that influence the Mediterranean coastal and marine environment , based on available data from a number of different sources, such as UN system, other international organisations, and relevant scientific articles. However, the absence of a comprehensive monitoring system of socio-economic characteristics and of the sustainability of economic activities makes it difficult to establish clear links between the quality status of the Mediterranean Sea and the social and economic pillars of sustainable development. While information on demographic, economic and employment has been collected, literature review did not adequately inform the level of environmental and social sustainability of human activities that impact the coastal and marine environment. A knowledge gap remains in measuring to what extent human activities are compatible or in line with the objective of achieving GES and clear sustainability indicators of human activities are generally lacking.

[5] Million tons of oil equivalent.
[6] Desalination is the process of removing salts from water. A by-product of this process is toxic brine which can degrade coastal and marine ecosystems unless treated. For every litre of potable water produced, about 1.5 litres of liquid polluted with chlorine and copper are created in most desalination processes. The toxic brine depletes oxygen and impacts organisms along the food chain when released into the sea. Desalination also comes with a high energy demand. Using renewable energy sources for desalination can be an option to mitigate carbon emissions stemming from desalination.

3. UNEP/MAP-Barcelona Convention: Vision, Goals, and Ecological Objectives

33. The regional cooperation for the Mediterranean Sea started in 1975 when the Mediterranean Action Plan (MAP) was launched as the first Regional Seas Programme within the framework of the United Nations Environment Programme (UNEP). A year later, in 1976, the countries bordering the Mediterranean adopted the Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention), thus providing MAP with a legal basis constituting a framework allowing the Contracting Parties to unite their efforts for the preservation of the Mediterranean Sea as a common heritage of the peoples of the region.

34. Following a first period during which the efforts within MAP were mainly oriented to address pollution issues, the action under the Barcelona Convention has evolved towards a broader approach aimed at protecting and enhancing the Region's marine and coastal environment in line with a sustainable development vision. In this context, building on the global momentum created by the landmark 1992 Rio Conference, the MAP Coordinating Unit facilitated a consultation process that led to the adoption by the Contracting Parties, in June 1995, of the Action Plan for the Protection of the Marine Environment and the Sustainable Development of the Coastal Areas of the Mediterranean (MAP Phase II) and the amended Barcelona Convention, renamed “Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean”.

35. The alignment with the Sustainable Development orientation was reinforced in 2016 when the Barcelona Convention Contracting Parties adopted the Mediterranean Strategy for Sustainable Development (MSSD) 2016-2025. The MSSD provides an integrative policy framework and a strategic guiding document for all stakeholders and partners to translate the 2030 Agenda for Sustainable Development at the regional, sub regional and national levels. The Strategy is built around the following vision: A prosperous and peaceful Mediterranean region in which people enjoy a high quality of life and where sustainable development takes place within the carrying capacity of healthy ecosystems. This is achieved through common objectives, strong involvement of all stakeholders, cooperation, solidarity, equity and participatory governance. Thirty-four indicators have been agreed in relation to the following six objectives:

a. Ensuring sustainable development in marine and coastal areas
b. Promoting resource management, food production and food security through sustainable forms of rural development
c. Planning and managing sustainable Mediterranean cities
d. Addressing climate change as a priority issue for the Mediterranean
e. Transition towards a green and blue economy
f. Improving governance in support of sustainable Development

36. In 2021, the Contracting Parties adopted the UNEP/MAP Medium-Term Strategy 2022-2027 (MTS) (Decision IG.25/1, COP22, Antalya, Türkiye)as a key strategic framework for the development and implementation of the Programmes of Work of UNEP/MAP. It aims at achieving transformational change and substantial progress in the implementation of the Barcelona Convention and its Protocols, also providing a regional contribution to relevant Global processes[7].

37. Today, the legal and institutional framework put in place over the years by the Contracting Parties to the Barcelona Convention have become an efficient cooperation instrument to which all the riparian countries adhere, despite the challenging geopolitical circumstances prevailing in the region. By adopting, in 2021, the UNEP/MAP Medium-Term Strategy (MTS 2022-2027), the Contracting Parties to the Barcelona Convention and its Protocols, agreed to orient their collaboration during the period 2022-2027 towards the following vision: “*Progress towards a healthy, clean, sustainable and climate*

[7] In particular the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs), the UN Decade on Ecosystem Restoration, the UN Decade of Ocean Science for Sustainable Development and the UNEP’s Medium-Term Strategy 2022-2025, approved at UNEA-5 in February 2021.

resilient Mediterranean Sea and Coast with productive and biologically diverse marine and coastal ecosystems, where the 2030 Agenda for sustainable development and its SDGs are achieved through the effective implementation of the Barcelona Convention, its Protocols and the Mediterranean Strategy for Sustainable Development for the benefit of people and nature". To this end, the Contracting Parties decided to further strengthen their collaboration to reach a dual long-term goal:

a) the achievement and maintenance of Good Environmental Status (GES) of the Mediterranean Sea and Coast, and
b) achieving sustainable development through the SDGs and living in harmony with nature.

38. In 2012, the Contracting Parties adopted 11 Mediterranean Ecological Objectives (EO) to achieve good environmental status (GES).

4. Assessment Findings, Key Messages and Measures:

Ecological Objective 5 (EO5): Human-induced eutrophication is prevented, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters
Common Indicator 13: Concentration of key nutrients in water column.
Common Indicator 14: Chlorophyll-a concentration in water column.

Ecological Objective 9 (EO9): Contaminants cause no significant impact on coastal and marine ecosystems and human health
Common Indicator 17: Concentration of key harmful contaminants measured in the relevant matrix (biota, sediment, seawater).
Common Indicator 18: Level of pollution effects of key contaminants where a cause and effect relationship has been established.
Common Indicator 19: Occurrence, origin (where possible), extent of acute pollution events (e.g. slicks from oil, oil products and hazardous substances), and their impact on biota affected by this pollution.
Common Indicator 20: Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood.
Common Indicator 21: Percentage of intestinal enterococci concentration measurements within established standards.

Ecological Objective 11 (EO11): Noise from human activities cause no significant impact on marine and coastal ecosystems
Candidate Indicator 26: Proportion of days and geographical distribution where loud, low, and mid-frequency impulsive sounds exceed levels that are likely to entail significant impact on marine animals
Candidate Indicator 27: Levels of continuous low frequency sounds with the use of models as Appropriate.

The Aegean – Levantine Sea Sub-region

Aegean Sea Sub-division

39. **EO 5 - CI 13 (DIN – Dissolved inorganic nitrogen and TP – total phosphorus) and CI 14 (Chla – Chlorophyll a):** Available literature indicates the presence of drivers and pressures with impacts related to eutrophication in the two areas found in non-good status in the present assessment, i.e., in the 1 non-good status subSAUs out of 16 subSAUs, as elaborated in 3.1.3. The non-good status in the Izmir province is related to the Izmir Bay and the southern coast of the province. Drivers that could impact eutrophication are: i) urban wastewater discharge, although many treatment plants were put into operation; ii) agriculture; iii) riverine discharge: Küçük, Menderes, Bakırçay and Gediz rivers, as the most important rivers of the Aegean Region. The main tributary of the Gediz River ,and the main streams feeding it, are considered to be under pressure in terms of point and diffuse pollution; iv) tourism; v) port operations: Izmir Port is the largest port in Turkeye after Mersin Port and vi) aquaculture. There are 66 fish farms, and 8 mussel farms operating on the coasts of İzmir province. In addition, available literature indicates the presence of drivers and pressures with impacts related to eutrophication in other areas of the AEGS which were classified in non-good status in the present assessment (see below assessment findings), for example, the Saronikos Gulf and Elfesis Bay, with extensive urbanization, industry and port activities and the Thermaikos Gulf impacted by agricultural discharges from the heavily polluted Axios River, and fish and shellfish mariculture.

40. **EO 9 – CI 17 (TM, Σ_{16}PAHs, Σ_5PAHs and Σ_7PCBs in sediments):** Using CHASE+, the AEGS was classified as in-GES for TM in sediments when the contribution of the two very limited affected areas (Elfesis Bay and inner Saronikos Gulf and area near Aliaga and Yenisakran) were not taken into account (see below assessment findings). It was not possible to classify the AEGS sub-division for Σ_{16} PAHs due to insufficient data while for Σ_5 the AEGS was classified as non-GES. It was not possible to classify the AEGS regarding Σ_7 PCBs in sediments due to insufficient data.

41. Regarding TM in sediments, one of the very limited non-GES area was the Elfsis Bay/ inner Saronikos Gulf. Drivers and pressures in the area are extensive urbanization (metropolitan areas of Athens), Port activities and maritime traffic (Piraeus port), Industries located in the coastal area of the Elefsis Bay, such as oil refineries, steel and cement industries, and shipyards, Discharges of wastewater treatment plant. TM pollution decreased from 1999 to 2018 in some areas due to environmental policy enforcement combined with technological improvements by big industrial polluters (Karageorgis et al., 2020 and references therein). A second limited non-GES area was near Aliaga and Yenisakran. Possible drivers and pressures are port operations, industry, tourism and agriculture Further to input provided by Turkiye, the possible drives and pressures are mapped in the expanded area of the Balıkesir district and the Izmir province, where stations were classified as non-GES in this assessment. Those include: i) Urban waste water pressure due to increased population during the touristic summer seasons; ii) Port operations: Izmir Port is the largest port in Turkiye after Mersin Port; iii) Aquaculture is also present at some locations along the coast; iv) Agriculture also generates some pressures; v) Riverine inputs where the main streams generate pressures in terms of point and diffuse pollution.

42. It was not possible to classify the AEGS Sub-division regarding data for Σ16 PAHs in sediment due to insufficient data. There are indications that the offshore zone is in GES while the enclosed areas might be found as non-GES. Regarding Σ5 PAHs in sediments, the AEGS was classified as non-GES. The same limited areas classified as non-GES for TM in sediments are also non-GES for Σ5 PAHs, with the same drivers and pressures as for TM. Additional stations were found non-GES in the northern and central part of the AEGS, mainly in enclosed areas that are more sensitive to land-based sources pollutants.

43. The AEGS Sub-division could not be classified regarding assessment of Σ_7 PCBs in **sediments** due to lack of data. An affected, non-GES area was identified in the coast around Aliaga, Yenisakran and Candarli, as for TM. Possible drivers and pressures are port operations, industry, tourism and agriculture.

44. IMPACTS. No data on biota were available for the AEGS. Drivers and pressures that can impact biota were found in the AEGS.

45. **CI 18 - Level of pollution effects of key contaminants where a cause-and-effect relationship has been established:** Although drivers that could exert pressure and cause impact on CI 18, were identified in the AEGS, no data were available at IMAP-IS to check for impacts in biota. Only two relevant studies in the scientific literature reported data on biomarkers in the AEGS, both for Türkiye. Both showed indications of possible effect of TM and/or pesticides on the molluscs *Mytilus galloprovincialis* and *T. decussatus* collected from Homa Lagoon (Aegean Sea) and in the fish *M. barbatus, B. boops and T. trachurus* collected off the coast of Türkiye.

46. **CI 20 - Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood:** See DPSIR assessment for the LEVS sub-division.

47. **CI 21 - Percentage of intestinal enterococci concentration measurements within established standards:** See DPSIR assessment for the LEVS Sub-division.

Levantine Sea Sub-division

48. **EO5 - CI 13 (DIN – Dissolved inorganic nitrogen and TP – total phosphorus) and CI 14 EO5 - CI 13 (DIN – Dissolved inorganic nitrogen and TP (Chla – Chlorophyll a):** Drivers that could impact CIs 13 and 14 are present in the LEVS: Agriculture, Tourism and maritime activities, Coastal urbanization, Sewage discharge, Seawater Desalination, Ports operation and maritime traffic, gas and oil exploration.

49. The complete GES assessment of the AEL Sub-region for CIs 13 and 14 was impossible given the lack of quality-assured, homogenous data that prevented the application of both EQR and simplified EQR assessment methodologies. Therefore, at this stage of 2023 MED QSR preparation, the assessment of eutrophication was performed by evaluating data only for Chl*a* available from the remote sensing COPERNICUS data by applying the simplified G/M comparison assessment methodology (see below assessment findings). The assessment results show that all evaluated assessment zones can be considered in good status regarding satellite derived Chl*a*.

50. Detailed examination showed that only 1 out of 18 SAUs, in the open waters (OW), was classified in non-good status. The SAU is located in the easternmost part of the southern Levantine Sea. The drivers and pressures in this SAU that could impact CI 14 are related to the area being one of the most densely populated areas in the world. Moreover, untreated or partially treated wastewater are discharged along the shoreline, polluting the coastal zone.

51. **EO 9 – CI 17 (TM in sediments and biota, Σ_{16}PAHs, Σ_5PAHs and Σ_7PCBs in sediments):** Using CHASE+, the northern and eastern (NE) LEVS was classified as in-GES for TM in sediments, when the contribution of the two very limited affected areas (off Haifa and off Beirut, see below see below assessment findings) were not taken into account. No assessment could be performed for the southern LEVS as no data were available. The NE LEVS was in-GES for Σ_{16} PAHs in sediments in Israel, Greece and Lebanon and in-GES for Σ_5 PAHs in sediments in Israel, Greece and Türkiye. The LEVS could not be classified based on assessment of Σ_7 PCBs in sediments due to lack of data and their uneven spatial distribution.

52. Regarding TM in sediments, non-GES stations were identified across the NE LEVS as follows: 1) In Israel, Northern Haifa Bay was non-GES (moderate status) and the main element contributing to this classification was Hg. The area is known to be still contaminated by legacy Hg, a pressure resulting from industry driver by ways of contaminated wastewater discharge. Even though there was a vast improvement following pollution abatement measures, the area is still contaminated; 2) In Lebanon, the main area in non-GES (moderate and poor) was off Beirut, in particular the Dora region, followed by area in the North Lebanon, with Cd and Hg concentrations contributing equally to the moderate classification. In Beirut, the drivers contributing to the pressures and state of the coast are urban development and industry, discharge of wastewater through marine outfalls and by riverine discharge of the Beirut River. In addition, dumpsites are present in the Dora region. Tripoli, in northern Lebanon, is known for its artisanal fishing and boat maintenance activities, the latter a driver for TM introduction.

53. Stations in moderate status regarding TM in sediments were found in Cyprus in Larnaka Bay, off Zygi and in Chrisochou Bay Possible drivers are maritime activities and port operations among others. In Greece, two stations were found in moderate status (Koufonisi (S. Crete), Kastelorizo), with Pb and Cd concentrations contributing to this classification. Possible drivers are maritime activities and traffic, and fishing. In Türkiye, 4 stations were classified as in moderate status: Akkuyu, Taşucu, Anamur, Göksu River mouth. Possible drivers are agriculture, marine activities, riverine discharge.

54. Although the areas with data for Σ_{16} PAH in sediments were overall characterized as in-GES, two geographically limited areas with non-GES status were identified. In Israel, at stations close to the locations of drilled wells for gas exploration. The driver was defined as maritime activities, offshore platforms of gas exploration. In Lebanon, off in Beirut. The same drivers contributing to the status of TM in sediments apply also for Σ_{16} PAH.

55. The LEVS sub-division could not be classified based on assessment of Σ_7 PCBs in sediments due to lack of data and their uneven spatial distribution. The Dora region off Beirut was affected with possible drivers similar to TM in sediments: urban development and industry, discharge of wastewater through marine outfalls and by riverine discharge of the Beirut River.

56. IMPACTS. Although drivers and pressures and non-GES statuses were identified for the CI 17 in the LEVS, essentially no impact was detected in the environmental status classification fish and the NE LEVS was classified as in-GES for TM in *M. barbatus*. The only non-GES station (1 out of 15) in poor status was located off Paphos, Cyprus and this classification was due to the concentration of Hg. No data were available for TM in sediments in this area. It should be emphasized, that concentrations not in-GES do not necessarily imply a biotic effect.

57. **CI 18- Level of pollution effects of key contaminants where a cause and effect relationship has been established:** Although drivers that could exert pressure and cause impact on CI18, were identified in the LEVS, no data were available at IMAP-IS to check for impacts in biota. Only two relevant studies in the scientific literature reported data on biomarkers in the LEVS. Both showed indications of possible effect of TM on various biomarkers in the mussel *Ruditapes* decussatus from Port Said (Egypt) and in the fish *M. barbatus, B. boops and T. trachurus* off the coast of Türkiye.

58. **CI 20 - Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood:** The CI 20 DPSIR analysis was performed at the level of the entire AEL Sub-region due to the lack of data for the separate analysis of LEVS and AEGS Sub-divisions. Drivers that could exert pressure and cause impact on CI 20 were detected in the AEL. The examination of CI 17 results showed no impact on biota in the LEVS and while no data were reported for biota in the AEGS. In addition, data reported to IMAP-IS for CI 17 for biota in the LEVS were examined based on the concentration limits for the regulated contaminants in the EU, concentrations higher than those used for the CI 17 assessment. No impact was detected on CI 20.

59. Out of the 23 studies found in the literature for the AEL, 87% reported concentrations of TM and organic contaminants below the concentration limits for the regulated contaminants in the EU, 4% reported concentrations above the limits but without risk to human health and 9% reported concentrations above the limits for the regulated contaminants with probable risk to human health.

60. **CI 21 - Percentage of intestinal enterococci concentration measurements within established standards:** The CI21 DPSIR analysis was performed at the level of the entire AEL Sub-region due to the lack of data for the separate analysis of LEVS and AEGS Sub-divisions. Drivers that could exert pressure and cause impact on CI 21 are present in the AEL, among them: Urban coastal development, Tourism, sporting and recreational activities; ports and maritime works, maritime activities. However, data were available only for Israel (2021) and Lebanon in 2019-2021 in the LEVS. All stations in Israel were in excellent category. In Lebanon, 4 out of 38 stations were classified in bad category, all in the Beirut area. Possible drivers are urban development and industry, discharge of wastewater through marine outfalls and by riverine discharge.

The Adriatic Sea Sub-region

61. **EO 5 – CI 13 (DIN – Dissolved inorganic nitrogen and TP – total phosphorus) and CI 14 (Chla – Chlorophyll a):** The detailed status assessment results show that all the SAUs achieve GES conditions (high and good status). For all three parameters, the results show that all SAUs and sub-SAUs are in GES. The only exceptions are the results for TP in a part of CAS in the Italian offshore coast (Abruzzo region), and the TP on the SAS coastal and offshore zones (Apulia region), that were classified in moderate status. The Abruzzo and Apulia regions were identified as having aquaculture and coastal and maritime tourism. Both drivers were identified as high impact to CIs 13 and 14. Nutrients might be introduced to the area causing pressure and have the possibility to cause eutrophication and impact habitats and biodiversity. In the case of moderate status for TP, it was a localized effect, not affecting the overall assessment status and all SAUs fall under the GES status (high, good). A natural process of nitrogen limitation in the area and subsequent accumulation of phosphorus may be an additional explanation to the moderate assessment. Although the two drivers, aquaculture and coastal and maritime tourism, are present in other areas of the Adriatic Sea, they did not impact CI 13 nor CI 14, as represented by the available data.

62. **EO 9 – CI 17 (TM in sediments and biota, Σ_{16}PAHs in sediments and Σ_7PCBs in sediments and biota):** Overall, the aggregation of the chemical parameters data per SAU in the Adriatic Sub-region classified 80% of the SAUs as in GES (High or Good status), and 20% of the SAUs as non-GES under moderate status.

63. The detailed status assessment results per contaminant per SAU at the 1st level of assessment (no aggregation or integration) showed that in most cases (80% of SAUs) GES conditions are achieved; 9% of the SAUs are classified in moderate status, 6% in poor status and 5% in bad status.

64. For the sediment matrix, the highest contamination is observed from PCBs, PAHs and Hg resulting in non-GES status for 60%, 57% and 27 % of the sub-SAUs, respectively. For the mussels matrix, the highest contamination is observed from PCBs which results in 39% of sub-SAUs in non-GES status.

65. In the NAS, 19% of sub-SAUs are classified as non-GES. The most affected sub-SAUs in the NAS are HRO-0313-BAZ, HRO-0412-PULP and HRO-0423-RILP in Croatia; Emiglia-Romana', 'Fruili-Venezia-Giulia-1' and 'Veneto-1' in Italy. Also, offshore SAUs IT-NAS-O and MAD-Sl-MRU-12 are affected. The NAS subdivision suffers from Hg contamination (moderate status) in sediments and mussels and PCBs (poor status) contamination in sediments.

66. In the CAS, 12% of the SAUs are classified as non-GES. The most affected sub-SAUs are HRO-0313-KASP, HRO-0313-KZ, HRO-0423-KOR in Croatia. The CAS sub-division suffers from Hg (poor status) and PCBs (moderate status) contamination in mussels.

67. In the SAS, 22 % of the SAUs are classified as non-GES. The most affected SAUs are HRO-0313-ZUC, HRO-0423-MOP and HRO-0313-ZUC in Croatia; and MNE-1-N, MNE-1-C, MNE-1-S, MNE-Kotor, in Montenegro which are found in poor or bad conditions regarding several contaminants. The SAS sub-division is affected by Pb (moderate status) and PCBs (moderate status) contamination in mussels.

68. The main drivers that could put pressure on TM in sediments are industry (waste discharge and dumping of waste), tourism (litter, domestic waste water discharge), ports and maritime works (accidental discharges, dredging), shipping traffic (accidental discharges, solid waste disposal). Shipping traffic is extensive in the Adriatic Sea. Dumping area for dredging in Emilia Romagna was also identified.

69. In the southern Adriatic Sea, Albania's coast and offshore SAUs are non-GES concerning Hg in sediments. In Montenegro, Hg, Pb, Σ_{16}PAHs and Σ_{7}PCBs in sediments were classified as non-GES in the central coastal SAU as well in the Kotor Bay. The project GEF (*Global Environment Facility):* Adriatic Implementation of the Ecosystem Approach in the Adriatic Sea through Marine Spatial Planning, examined in detail the DPSIR elements for Albania and Montenegro marine environment. Those support the results of the NEAT assessment achieved with IMAP monitoring data. In Albania, about 15% of the coastline is urbanized, and tourism is increasing (drivers and pressure). Status. The initial assessment of pollution shows established significant concentrations of mercury and organochlorinated compounds in some of the assessed areas on the northern and central coast (status). In Montenegro, about 32.5% of the coastline is urbanized, while tourism consists mainly beach goers. Nearshore activities, such as shipyards and ports are also of concern (drivers and pressures). Status. The preliminary assessment of pollution shows higher concentration of contaminants in the coastal area, particularly in Boka Kotorska Bay. The levels of some contaminants exceed the established limit, specifically legacy pollutants such as heavy metals and organohalogen compounds in sediments.

70. IMPACTS. Although drivers and pressures and non-GES statuses were identified for CI 17 in the Adriatic Sea, a few impacts were detected in the environmental status classification of the biota. Moreover, the non-GES status of a contaminant in the biota usually did not correspond to a non-GES status for the contaminant in sediment in the same sub-SAU. In the NAS, sub-SAUs for biota were in non-GES status for Hg and PCBs, with no corresponding non-GES status in the sediment or no data for PCBs in sediments. In 3 instances there was a correspondence between non-GES status for Hg in biota and sediment. In several sub-SAUs, Pb in sediments were non-GES while in-GES in biota. In the CAS there was no correspondence between the status of the sediments and the status of the biota. In the SAS, for 2 sub-SAUs, non-GES status for Pb in sediments corresponds to non-GES status for Pb in biota.

71. **CI 18 - Level of pollution effects of key contaminants where a cause and effect relationship has been established:** Although drivers, that could exert pressure and cause impact on CI 18, were identified in the Adriatic Sea, no data were available at IMAP-IS to check for impacts in biota. One study from the scientific literature reported impact of PAHs on some of the biomarkers measured in the specimens of the fish *Mullus barbatus* collected in an important fishery area in the North Adriatic Sea coming from Rimini to Ancona at a depth of 70 m (Frapiccini et al. 2020).

72. **CI 20 - Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood:** Drivers that could exert pressure and cause impact on CI 20 were detected in the Adriatic Sea Sub-region. The examination of CI 17 results showed no impact on biota. In additions, data reported to IMAP-IS for CI 17 for biota were examined based on the concentration limits for the regulated contaminants in the EU, concentrations higher than those used for the CI 17 assessment. No impact was detected on CI 20.

73. Out of the 25 studies found in the literature, 80% reported concentrations of TM and organic contaminants below the concentration limits for the regulated contaminants in the EU, and 8% reported concentrations above the limits but without risk to human health. Possible impact was detected in 12% of the studies that reported concentrations above the limits for the regulated contaminants with probable risk to human health.

74. **CI 21 - Percentage of intestinal enterococci concentration measurements within established standards:** Drivers that could exert pressure and cause impact on CI21 were detected in the Adriatic Sea, and among them the following: Tourism, sporting and recreational activities; ports and maritime works, maritime activities. However, essentially no impact was detected. Most of the bathing waters in the Adriatic were in the excellent and good GES classifications. A small percentage of bathing waters were classified as poor: 1.7% in Italy and 3.5% in Albania.

The Central Mediterranean Sea Sub-region

75. **EO 5 - CI 13 (DIN – Dissolved inorganic nitrogen and TP – total phosphorus) and CI 14 (Chla – Chlorophyll a):** The complete GES assessment of the CEN Sub-region for CIs 13 and 14 was impossible given the lack of quality-assured, homogenous data that prevented the application of both EQR and simplified EQR assessment methodologies. Therefore, the assessment of eutrophication was performed by applying the simplified G/M comparison assessment for evaluation of Chl *a* available from the remote sensing COPERNICUS data (see below assessment findings).

76. The assessment results show that despite the good status assigned to the assessment zones, the 7 out of 36 sub-SAUs are in the good status i.e., GREA, GREAMB, GREPAT, LBY_E, LBY_W, LBY_W; TUN_B in the Eastern and the Southern parts of the CEN Sub-region.

77. The subSAUs in Greece are located in Bays as are Ambracian Gulf (GREAMB), with pressure mainly from agriculture and Gulf of Patras (GREPAT) with pressures that include harbor operations, industries and agriculture. The more Northern subSAU (GREA) is probably influenced by the local sources of pollution (Igumenitsa port and intense aquaculture).

78. Along the Lybian coast, the influenced marine waters are in the western part of Libyan OW (subSAU LBYW), influenced by waters coming from the Gulf of Gabes where human activities contributed to the impact of eutrophication and by the city of Tripoli; in the eastern part of CW (subSAU LBYE). Several pressures that cause impacts of eutrophication are present in the Gulf of Gabes i.e., the subSAU TUNB located in CW: i) Large hurban center, ii) untreated domestic discharges, iii) industrial discharges, among them phosphogypsum, iv) agrochemical industry, v) agriculture.

79. **EO 9 – CI 17 (TM, Σ16PAHs, and Σ5PAHs in sediments)**: It was not possible to classify the Sub-region based on the CHASE+ application due to very limited available data and they uneven areal distribution in the CEN. The assessment was performed by station. Most of the stations were in-GES with respect to TM in sediments. Stations with non-GES status for Σ_{16}PAHs and Σ_5PAHs in sediments were identified.

80. Non-GES stations regarding Σ_5PAHs in sediments were located at the north-eastern and south-eastern part of Malta, in particular at the Port il- Kbir off Valetta and at the Operational Wied Ghammieq. Drivers and pressures in these areas are industrial plants and marine traffic. Non-GES stations were also located at the in the Gulf of Patras, Gulf or Corinth and in Kerkyraiki.

81. IMPACTS. Drivers and pressures and non-GES statuses were identified for the CI17 in the CEN. However, there were almost no data for contaminants in biota in the CEN. Eight samples of *M. galloprovincialis* were in-GES for TM and 5 samples of *M. barbatus* were classified as non-GES for Hg.

82. **CI 18 - Level of pollution effects of key contaminants where a cause and effect relationship has been established:** Although drivers that could exert pressure and cause impact on CI18, were identified in the CEN, no data were available at IMAP-IS to check for impacts in biota.

83. Examination of the scientific literature on the impact of pollution on biota biomarkers in the CEN found 5 studies for Tunisia and 1 from Italy. Drivers and pressures reported in the studies, encompassed the whole range of them: domestic and industrial discharges, agricultural and riverine runoff, fisheries, harbor and marina utilization, maritime activities, tourism. Studies demonstrated that, in addition to anthropogenic stressors, biomarker responses were influenced also by seasonality, tissue analyzed, spawning status, and on species identity.

84. It should be emphasized that the studies used different biomarkers, with different biota species, measuring in different tissues, and different methodologies. The biomarkers studied were not listed by IMAP, and if listed, not analyzed in the organ or tissue as required by IMAP. Most of the studies measured various biomarkers in the same station, with some showing an effect and others not. All the studies below reported an impact on some of the biomarkers. Therefore, the text below addresses only the areas and species studied, and possible specific drivers, if available, with the knowledge that impact was detected in some of the biomarkers.

85. Tunisia. One mesocosm experiment was performed in Mytilus spp. exposed to sediment contaminated by PAH and TM collected from the Zarzis area, while the effects of hydrocarbons were studied in the mollusc *Ruditapes decussatus* collected from the southern Lagoon of Tunis. The effect of TM on the mollusc *Patella caerulea* was studied in specimens collected from 4 sites in the CEN. The effect of microplastic ingestion was studied in the fish *Serranus scriba* collected from 6 sites along the Tunisian coast (Zitouni et al. 2020) and on the seaworm *Hediste diversicolor* collected from 8 sites along the Tunisian coast .

86. Italy. The effect of plastic ingestion was studies in the fish *Trachurus trachurus* collected for the Sicily straits.

87. **CI 20 - Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood:** Drivers that could exert pressure and cause impact on CI 20 were detected in the CEN. TM data were present for Hg in 5 specimens of *M. barbatus* in IMAP-IS. The concentrations were higher than the thresholds for CI17 but lower than the limits for the regulated Hg in the EU. No studies were found in the literature.

88. **CI 21 - Percentage of intestinal enterococci concentration measurements within established standards.** Drivers that could exert pressure and cause impact on CI 21 are present in the CEN, among them: Urban coastal development, Tourism, sporting and recreational activities; ports and maritime works, maritime activities. No data were available for CI 21 in IMAP-IS.

<u>*The Western Mediterranean Sea Sub-region*</u>

89. **EO5 – CI 13 (DIN – Dissolved inorganic nitrogen and TP – total phosphorus) and CI 14 (Chl*a* – Chlorophyll a):** The complete GES assessment of the WMS Sub-region for CIs 13 and 14 was impossible given the lack of quality-assured, homogenous data that prevented the application of both EQR and simplified EQR assessment methodologies. Therefore, the assessment of Common Indicator 14: Chl *a* was undertaken in the three Sub-divisions of the Western Mediterranean Sub-region as follows: i) in the Central Sub-division of the Mediterranean Sea Sub-region (CWMS): the Waters of France and the Southern part of the Central CWMS; the Alboran (ALB) and the Levantine Balearic (LEV-BAL) Sub-division: the Waters of Spain by applying the Simplified G/M comparison assessment methodology on the satellite-derived Chl *a* data; and ii) the Tyrrhenian Sea Sub-division and part of the CWMS: the Waters of Italy by applying both the Simplified G/M comparison assessment methodology on the satellite-derived Chl *a* data and the simplified EQR assessment methodology on *in situ* measured Chl a data.

90. Despite the good status assigned to the assessment zones, the assessment findings indicate some sub-SAUs in non-good status. The present assessment of the waters of Spain (see below assessment findings) showed there are 8 out of 70 subSAUs which are non-good status (the evaluation was performed on 70 out of 149 SubSAUs), and which are located close to the Mar Menor; in the Segura River mouth; near Valencia; close to the Ebro River mouth; one area close to the French border; and on the Mallorca Island in the Alcudia Gulf. There is a slight difference between the thresholds calculated from the satellite-derived data used for the present assessment and the assessment criteria calculated from *in situ* measurements (see below assessment findings), which resulted in the regional

assessment findings which do not fully match the eutrophication evaluation performed by Spain by applying the assessment criteria calculated from *in situ* measurements. In the waters of Italy, there are 9 out of 54 subSAUs that are in non-good status, and they are located as follows: in front of the Arno River mouth; in front of the Tiber River mouth; close to the Napoli urban agglomeration and SW part of Sardinia Island. In the waters of France, there is 1 subSAU (Golfe de Porto Vecchio) out of the 46 SubSAU in non-good status. For four subSAUs located in the FRD_E Assessment Zone and two in the Corsica Island assessment zone (FRE), the assessment was reconsidered as in good status. In fact, a discrepancy that appeared between the national and sub-regional assessments was addressed further to the justification provided by France which is based on i) the presence of WT I in water body DC04; ii) the presence of WT IIIW in water bodies DC06A; DC07I; DC08B; EC01C; EC04B and DC04; iii) the specific national knowledge of the local hydrological and environmental conditions. Among these 6 water masses, four are located in the FRD-E assessment zone namely DC04 (Golfe de Fos), DC06A (Petite Rade de Marseille), DC07I (Cap de L'estéral – Cap de Brégançon) and DC08B (Ouest Fréjus-Saint Raphaël). Two water masses are located in Corsica Island (FRE) and correspond to EC04B (Golfe D'Ajaccio) and EC01C (Golfe de Saint Florent). Water mass DC04 (Golfe de Fos) is a highly modified water mass characterised by a high spatial heterogeneity in chl *a* distribution. For other water masses (DC06A, DC07I and DC08B; EF04B and EC01C in Corsica), hydrodynamic studies revealed a very low annual renewal of water masses thus explaining slight accumulation of low phytoplankton biomass levels.

91. The below findings derived from literature sources support the assessment findings as presented in assessment findings which indicate a few spatial assessment units in non-good status[8]. Drivers and pressures with impacts on eutrophication are found in the WMS[9.] The Spanish Mediterranean coastal zone may be affected by eutrophication mainly due to anthropogenic pressures, like agriculture (e.g., in Ebro Delta, rice field cultivation covers up to 65% of the area resulting in outputs of inorganic nutrients to nearby bays through drainage channels and the IMAP sub-SAUs ES100MSPFC32 in the vicinity was likely non-GES), but also by aquaculture, tourism, construction of harbors, intense urbanization, and industrialization. In French Mediterranean coast, the Gulf of Lion is one of the most historically known areas as influenced by natural and anthropogenic inputs of nutrients, receiving a large inputs of rural, urbanized, and industrialized discharges through the Rhone River. However, all sub-SAUs in the area were classified as in good status. The northern coasts of the Balearic Archipelago may be affected by the productivity imported from the Gulf of Lion, showing slightly higher concentration in the offshore north-eastern waters. Indeed, IMAP sub-SAU ES110MSPFMAMCp02 on the Mallorca Island in the Alcudia Gulf was classified as likely non-GES.

92. The Italian Western Mediterranean coast may be affected by riverine discharge e,g., the Arno river (subSAUs ITCWTCD and ITOWTCDoff Livorno), and the Tiber River (sub-SAUs ITCWLZ and ITOWLZC, Rome), as well as by the extensive population, tourism, port operations and industries, like the area of Naples (sub-SAUs ITOWCMC, ITOWCMD, ITCWCMC and ITCWCMD).

93. The Mediterranean Sea hosts around 400 coastal lagoons covering a surface of over 640 000 ha, that are important drivers for regional economies by way of fisheries, aquaculture, tourism. recreation and increased urbanization. One example of a well-studied lagoon is the Mar Menor located in the region of Murcia. The drivers and pressures on Mar Menor include tourism and agriculture along its shoreline and drainage area. In the present assessment the IMAP subSAU. ES070MSPF010300030, located close to the Mar Menor and IMAP subSAU ES080MSPFC017 located near the Segura River

[8] The present assessment undertaken at the regional level, by using the satellite-derived Chl *a* data, indicates also weakened status in a few assessment areas along the coast of France, however, national authorities found that some regional assessment findings do not fully match the national assessments based on the use of *in situ* measurements. A presence of non-optimal matching of the regional and national assessments was also expressed by the authorities of Spain.
[9] Agriculture (runoff and riverine discharge), industry (land based sources; industrial wastewater discharge), aquaculture (coastal shellfish and fish farming activities), coastal urbanization and tourism (domestic wastewater discharge), seawater desalination, ports and maritime operations (dredging).

mouth were classified in non-good status. In addition, the area of the Gulf of Oristano in western Sardinia, is connected to the Cabras lagoon and may be influence by it (sub-SAU ITCWSDWB).

94. The present regional assessment using satellite-derived Chl *a* classified in non-good status one sub SAU EC03B close to Golfe de Porto Vecchio, located along the northern part of Corsica coast. As elaborated in the assessment findings, the assignment of non-good status can be explained in the context of the low number of pixels integrated into the assessment based on the use of the satellite-derived data along with the water properties complexified with sediment resuspension resulted in the uncertain computation of the mean Chl-a values. Additionally, the enclosed feature of the Gulf of Porto Vecchio with very low water renewal contributes to relatively high Chl concentrations observed in the area[10].

95. Mariculture is also well developed in Italian waters, for example off Genoa and in the Gulf of Follonica, the latter south of Livorno that was classified in non-good status in the present assessment (subSAUs ITCWTCD and ITOWTCD).

96. Although the non-good status was not found in the present assessment of the Southern part of the CWMS, it must be recognized that the assessment was impossible at the level of the finest spatial assessment units (subSAUs) due to the absence of finer water bodies delineation and related water typology characterization as for other Sub-divisions in the WMS. Given a less confidential assessment in this part of the WMS, some specific examples of drivers and pressures were mapped from the scientific literature. The Oran harbor (Algeria) which receives the discharge of wastewater, while the Ghazaouet harbor is exposed to chemicals coming mainly from industrial activities. In addition, the high rate of urbanization around the harbor contributes to anthropogenic contamination. Algeria also has seawater desalination plants along its shoreline such as the Bousfer desalination plant in Oran Bay and the Beni Saf desalination plant.

97. **EO 9 - CI 17 (TM in sediments and biota (*M. galloprovincialis)* (ALBS); TM, Σ_{16}PAHs and Σ_{7}PCBs in sediments and biota (TYRS); TM, Σ_{16}PAHs and Σ_{7}PCBs in sediments and biota (CWMS)):** The assessment was conducted using NEAT in the ALBS and the TYRS Sub-divisions. A simplified application of NEAT (1st level, without any further spatial integration) was applied to the CWMS. Data were available only for some SAUs for the northern coast sub-division (Spain, France, Italy). No data were available for the southern CWMS coast (Algeria and Tunisia). The WMS assessment was made for the coastal zone, as 91% of data were coastal.

98. Overall, the Alboran Sea (ALBS) and the Tyrrhenian Sea (TYRS) were classified as in GES, in good status regarding all available parameters and SAUs. In the Central Western Mediterranean (CWMS) Sub-division, 6 out of 7 SAUs were classified in high or good statuses and one SAU was classified as non-GES, in moderate status regarding all available parameters.

99. A detailed examination of these classifications is presented here-below.

100. ALBS. The ALBS Sub-division was in GES (high and good statuses) for TM in sediments and for Cd and Pb in biota, and non-GES (moderate status) for Hg in biota sampled along the Spanish coast. In addition, off Morocco, one SAU was in moderate status for Cd in sediments and one in moderate status for Pb in sediments.

[10] Giret O., Mayot H., Porcheray C., Salou K., Le Bourhis K. (2023). Bilan des schémas régionaux de développement de l'aquaculture marine. Cerema – DIRM Méditerranée. 38 p.

101. TYRS. The TYRS Sub-division was in GES (high and good statuses) for TM, Σ_{16}PAHs and Σ_7PCBs in sediments and biota. For the Italian coast several non-GES parameters were identified for some SAUs, as follows: one SAU was in moderate status regarding Cd and Hg in sediments, one SAU in moderate status for Cd in sediments and in poor status for Hg in sediments, and one SAU in moderate status for Cd and Σ_7PCBs.
102. CWMS. Non-GES SAUs for several parameters were identified in the CWMS sub-division as follows: One SAU with moderate Pb in sediment in Spain; in France, one SAU with poor status of Hg in sediments, moderate status for Cd and Hg in biota and poor status for Σ_{16}PAHs in biota; 2 SAUs with poor and moderate statuses for Σ_{16}PAHs in biota; in Italy, one SAU with moderate status for Cd in sediment and poor status for Σ_{16}PAHs and Σ_7PCBs in sediments.

103. Drivers and pressures are found in the WMS: Large Ports and maritime traffic, Coastal urbanization, Tourism, Riverine discharge, Agriculture and aquaculture, Desalination. Some specific examples for drivers and pressures can be found in the scientific literature.

104. IMPACTS. Drivers and pressures and non-GES statuses were identified for CI17 in the WMS however, essentially no impact was detected in the environmental status classification of biota. In the CWMS, for France, moderate status was found for Hg and Pb in biota, at the same SAU with poor status for Hg in the sediment. In addition, moderate and poor statuses were assigned to Σ_{16}PAHs in biota in three SAUs. No concentration of Σ_{16}PAHs in sediment were reported. In the ALBS, for Spain, Hg in biota was in moderate classification. No concentration was reported for Hg in the sediment. It should be emphasized, that concentrations not in-GES do not necessarily imply a biotic effect.

105. **CI 18 - Level of pollution effects of key contaminants where a cause and effect relationship has been established:** Although drivers that could exert pressure and cause impact on CI18, were identified in the WMS, no data were available at IMAP-IS to check for impacts in biota.

106. Examination of the scientific literature on the impact of pollution on biota biomarkers in the WMS found 4 relevant studies from Algeria, 2 from Italy, 5 from Spain and 4 from Tunisia. Drivers and pressures reported in the studies, encompassed the whole range of them: domestic and industrial discharges, agricultural and riverine runoff, fisheries, harbor and marina utilization, maritime activities, tourism. Studies demonstrated that, in addition to anthropogenic stressors, biomarker responses were influenced also by seasonality, tissue analyzed, spawning status, and on species identity.

107. It should be emphasized that the studies used different biomarkers, with different biota species, measuring in different tissues, and different methodologies. The biomarkers studied were not listed by IMAP, and if listed, not analyzed in the organ or tissue as required by IMAP. Most of the studies measured various biomarkers in the same station, with some showing an effect and others not. All the studies below reported an impact on some of the biomarkers. Therefore, the text below addresses only the areas and species studied, and possible specific drivers, if available, with the knowledge that impact was detected in some of the biomarkers.
108. Algeria: Mussel *Donax trunculus* from Annaba Bay, from 2 impacted sites (Sidi Salem and Echatt) and one reference site (El Battah); fish, *Mullus barbatus* from two impacted sites (Oran, Ghazaouet) and a control site (Kristel), along the Algerian west coast; mussel *Perna perna* transplanted to three sites in the Gulf of Annaba; mussel *Patella rustica* from four sites (3 affected and one reference) off the Bousfer desalination plant (Oran Bay, Algeria).

109. Italy: Fish *Parablennius Sanguinolentus* collected from the port of Bagnara Calabra on the western Calabrian coast of Italy and from a reference site, Jancuia Cove. Stressor – pesticides; mussel, *Mytilus galloprovincialis*, and fish, *Mullus barbatus, Pagellus erythrinus* and *Diplodus vulgaris*, from different stations at the Bay of Pozzuoli, within the Gulf of Naples. Stressors: TM and PAHs.

110. Spain: Three studies conducted near Integrated Multi-Trophic Aquaculture cages in Palma de Majorca as possible driver: two with *Mytilus galloprovincialis,* and one with the fish *Sparus aurata*. In addition, fish, *Seriola dumerili* collected around the Pityusic Islands, (Eivissa and Formentera; Balearic Islands); and European anchovy (*Engraulis encrasicolus*) collected at three areas off Catalonia (Spain): Barcelona, Tarragona and Blanes.

111. Tunisia: Scallop *Flexopecten glaber* were collected from the entrance to the Bizerte Lagoon and a site located near Menzel Abderrahmen, contaminated by inputs from the surrounded industrial manufactories and urban agglomerations; polychaete *Perinereis cultrifera* collected from the port of Rades and the Punic port of Carthage, S2; fish *Serranus scriba* were sampled from 6 sites along the Tunisian coast (2 WMS and 4 CEN). Stressor, microplastic ingestion as a potential vector for the transmission of adsorbed environmental chemicals to marine organisms; seaworm (*Hediste diversicolor)* from eight sites along the Tunisian coasts (2 WMS and 6 CEN), affected by different anthropogenic stresses. Stressor analyzed – microplastic ingestion.

112. **CI 20 - Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood:** Drivers that could exert pressure and cause impact on CI 20 were detected in the Western Mediterranean Sea. The examination of CI 17 results showed no impact on biota. In additions, data reported to IMAP-IS for CI 17 for biota were examined based on the concentration limits for the regulated contaminants in the EU, concentrations higher than those used for the CI17 assessment. No impact was detected on CI-20.

113. Out of the 37 studies found in the literature, 78% reported concentrations of TM and organic contaminants below the concentration limits for the regulated contaminants in the EU and 11% reported concentrations above the limits but without risk to human health. Possible impact was detected in 11% of the studies that reported concentrations above the limits for the regulated contaminants with probable risk to human health.

114. **CI 21 - Percentage of intestinal enterococci concentration measurements within established standards**: Drivers that could exert pressure and cause impact on CI 21 were detected in the Western Mediterranean Sea, and among them the following: Tourism, sporting and recreational activities; ports and maritime works, maritime activities. However, essentially no impact was detected. Most of the bathing waters in Spain, France and Italy were in the excellent and good GES classifications. A small percentage of bathing waters were classified as poor category: 0.1% in Spain, 1% in France, 1.7% in Italy. In Morocco, 20 out of 1**31** stations (1**5**%) were classified as in bad status. Data were not available for Algeria and Tunisia.

Measures and actions required to achieve GES for EO5 and EO9

The knowledge gaps common to IMAP Ecological Objectives 5 and 9

115. There was a vast improvement in the spatial coverage of data reported for IMAP Pollution Common Indicators into IMAP IS since the last 2017 MED QSR. However, data availability is characterized by significant data inhomogeneity, and uneven data distribution along the Mediterranean region, with areas with satisfactory data availability and with areas for which only a few or no data were reported. The following key observations pertain to specific IMAP Pollution Common Indicators:

a) CIs 13&14. The data most lacking are for total phosphorous. Data for all mandatory parameters i.e., the concentration of ammonium, nitrite, nitrate, total nitrogen, orthophosphate, total phosphorus, orthosilicate and chlorophyll a, temperature, salinity, dissolved oxygen and water transparency (Secchi depth), are needed for the Central Mediterranean Sea Sub-region (CEN); the southern part of the Levantine Sea, the sub-division of the Aegean-Levantine Sea Sub-region; and the southern part of the Central part of the Western Mediterranean Sea Sub-region (WMS) which are underrepresented in the IMAP database.

b) CI 17. The data most lacking were for organic contaminants in sediments and biota for all four Mediterranean Sub-regions, followed by trace metals in biota *(M. galloprovincialis and M. barbatus)*. As well as for CIs 13&14, data for all the parameters of CI 17 are needed for the CEN Sub-region; the southern part of the LEVS sub-division; and the southern part of the Central part of the Western Mediterranean Sea (CWMS) sub-division.

c) CI 18. No data were available in IMAP IS for the preparation of the 2023 MED QSR. Therefore, no improvement in the assessment of CI 18 was achieved since the 2017 MED QSR, and the GES assessment was impossible within the preparation of the 2023 MED QSR. Instead, the assessment was performed based on bibliographic studies, as in the 2017 MED QSR, using newer available scientific literature i.e., the studies on biomarkers in the Mediterranean Sea since 2016. It should also be emphasized that data from studies could not be compared to BACs and EACs values as agreed for CI 18 by Decisions IG.22/7 (COP 19) and IG.23/6 (COP 20) as they were not measured in the specific tissue of *M. galloprovincialis*.
Moreover, comparison among the bibliographic studies was mostly impossible. This is due to using different biomarkers, with different biota species, using different tissues, and different methodologies. The confounding factors that hinder environmental status assessment i.e., species, gender, maturation status, season, and temperature were re-confirmed as found in the 2017 MED QSR. In addition, an inherent bias exists in publications toward studies showing an effect. Authors and journals do not usually publish studies showing the lack of effect or response.

d) CI 20. No data were available in IMAP IS to undertake GES CI 20 assessment within the preparation of the 2023 MED QSR. Therefore, the environmental assessment could only be performed by combining the two approaches: i) assessment of the status based on data reported to IMAP IS for CI 17 contaminants in biota, and ii) assessment of the present status based on bibliographic studies, following the same approach applied for preparation of the 2017 MED QSR; however, by using newer available scientific literature. It should also be recognized that due to the lack of data, the rule was not set for assigning the GES/non-GES to the areas assessed further to the use of the EU maximum levels for certain contaminants in foodstuffs, approved as the assessment criteria for CI 20.

e) CI 21. Very limited data were available in IMAP IS to undertake GES CI 21 assessment within the preparation of the 2023 MED QSR. Most of the data were available through EEA and not through IMAP IS.

116. The policy measures to address the common knowledge gaps:

a) Increase of data availability and capacity building programmes to address the knowledge and technical gaps of national IMAP Pollution competent laboratories:
b) Further harmonize laboratories' performance in line with the IMAP Monitoring Guidelines in order to increase the representativeness and accuracy of the analytical results for generation of quality-assured monitoring data;
c) Improve availability of appropriate analytical equipment to strengthen technical capacities of national IMAP Pollution competent laboratories;
d) Increase consistency of biota sampling along with the application of Quality Assurance measures;
e) Increase accessibility to quality assurance tools, such as inter-laboratory comparisons (ILCs), proficiency tests (PTs), or certified reference materials (CRMs).
f) Improve DPSIR analysis: DPSIR analysis needs to be improved by supporting the CPs to regularly provide relevant information and share the knowledge which in principle may be ensured by i) reporting information on DPSIR, along with national monitoring data, and compatibly with data reporting for National Action Plans` indicators; ii) ensuring assistance

of the local experts, through the CPs, regarding the identification of specific DPs and their impacts; and iii) complementing DPSIR information reporting with data from the scientific literature and national reports.

g) Monitor the effectiveness of the technical and policy measures for areas class classified as likely non-GES or non-GES.
h) Optimally address the impacts of DPs and tailor the responses within the regional plans and national action plans to the needs of continual improvement of the marine environment status:

The general measures to prevent and abate pollution towards the good environmental status of the Mediterranean:

117. Pollution prevention needs to be encouraged instead of environmental remediation. This could be achieved by reducing and eliminating the use and discharge of known harmful substances, regulating the emergence of new substances with mandatory environmental and social impact assessments, recycling and using biodegradable green compounds, along with planning emergency responses in case of accidental pollution events.

118. Identification of legacy pollutants[11] in the environment is needed, whereby it should be ensured that they are not currently being introduced into the environment. While the mitigation of current pollutants entails measures at the source of pollution, the mitigation of legacy pollutants takes place *in situ*. The latter includes the study of transport and distribution of pollutants in the environment, the use of technologies for pollutants removal from the environment, and bioremediation.

119. Strengthened use of the Best available technology (BAT) is needed to prevent and control pollution, along with the Best environmental Practice (BEP) to support the most appropriate combination of environmental control measures and strategies to prevent and control pollution.

120. Transition to the blue economy needs to support the sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of the ocean ecosystem.

121. Move towards the circular economy and sustainability needs to support the achievement of zero pollution through recycling. It entails markets that give incentives to reusing products, rather than disposing and then extracting new resources. Major changes in production and consumption patterns are needed, with a focus on climate change concerns, biodiversity protection and ecosystem restoration.

122. Regional policy integration is of utmost importance since marine pollution has no borders, and therefore strengthening regional cooperation is necessary, advocating common environmental policies.

The specific measures to prevent and abate pollution towards the good environmental status of the Mediterranean:

123. Aquaculture. There are several strategies and guidelines developed by FAO to assist a sustainable growth for aquaculture sector, including the Ecosystem-based Approach to Fisheries and Aquaculture aiming to assist and set limits for aquaculture production given the environmental limits and social acceptability of sector. In this context it is recommended to apply the following key three principles of the FAO/GFCM strategy:

a) Aquaculture development and management should take account the full range of ecosystem functions and services and should not threaten the sustained delivery of these to society;
b) Aquaculture should improve human well-being and equity for all relevant stakeholders; and

[11] Legacy pollutants are substances that remain in the environment long after they were introduced and after pollution abatement measures were applied or their use was banned.

c) Aquaculture should be developed in the context of other sectors, policies and goals. In this regard, UNEP/MAP-MED POL is preparing a Regional Plan for Aquaculture Management for adoption by COP 23 advocating the below measures.

124. Nutrient reduction, of relevance to addressing several DPs, should follow a more cyclic approach to produce, use and treat nutrients in treatment plants, where recycling and reuse are enhanced instead of environmental discharge. This is true for nitrogen and in particular for phosphorus, which has finite reserves in the environment. Policy and regulatory instruments could include more strict regulation of nutrient removal from wastewater, mandatory nutrient management plans in agriculture, and enhanced regulation of manure.

125. Tourism and Coastal urbanization. Measures should focus on the improvement of waste treatment, sustainable management of coastal areas to reduce disruption of coastal ecosystems, investment in habitat conservation and restoration to provide ecosystem services, along with implementation of the ICZM tools. Sustainable tourism and urbanization require monitoring and decision-making feedback, improvement of communal infrastructure, environmental coastal spatial and marine spatial planning, as well as the optimal environmental impact assessments, carrying capacity, adaptation to impacts of climate changes, etc.

126. Industry. Measures should focus on the improvement of waste treatment and on upgrade of the industry to the use of BAT and BEP. In addition, resources should be used in the context of a circular economy, with the reduction, reuse and recycling of waste, and shifting towards the production and use of greener substances.

127. Agriculture. Responses to the impacts of agriculture are difficult to manage because of the diffusive i.e. non-point sources introduction of nutrients and agrochemicals into the marine environment. Responses should include the management of river runoffs, the reduction of the use of toxic and bio accumulative agrochemicals, the transition to greener fertilizers and biodegradable pesticides and organic farming.

128. Marine traffic and marine and port operations. The responses should focus on improving the technology of ships and ports operations and of ports infrastructure. Use of BAT and BEP to ensure effective onboard and port pollution control facilities, to prevent accidental discharges and spillages. Specifically, for marine traffic, the designation of restricted areas for anchorage and protection of sensitive areas are encouraged. Implementation of the measures related to the designation of the Mediterranean Sea as a Sulphur emission control area (SECA) is expected to generate significant benefits in both pollution reduction and ecosystem protection. However, the introduction of exhaust gas cleaning systems EGCS – scrubbers on ships in the Mediterranean, as alternative abatement technology for air emission of Sulphur region, may generate a new stream of shipping liquid wastes, in which metals and PAH discharges dominate from ships, that is the chemical pollution transferred .

Ecological Objective 10 (EO10) on Marine litter (Marine litter does not adversely affect the coastal and marine environment)
Common Indicator 22: Trends in the amount of litter washed ashore and/or deposited on coastlines
Common Indicator 23: Trends in the amount of litter in the water column including microplastics and on the seafloor

Common Indicator 22: Trends in the amount of litter washed ashore and/or deposited on coastlines

129. According to the available data and information in relation to the Trends in the amount of litter washed ashore and/or deposited on coastlines (IMAP EO10 CI22), only 16% of the monitored beaches achieve GES, 79% do not achieve GES of which 29% fall into the poor status class and 25% in to the bad one. The most commonly found marine litter items in the Mediterranean are Plastic/polystyrene pieces (2.5 cm – 50 cm), followed by cigarette butts and filters, and plastic caps and lids. These 3 items account for approximately 60% of the recorded marine litter.

Common Indicator 23: Trends in the amount of litter in the water column including microplastics and on the seafloor

130. The assessment regarding Floating Marine Litter (IMAP EO10 CI23) revealed that almost all stations (99%) that have been monitored do not achieve GES, and most of them fall into the poor (44 %) and bad (49 %) status classes. The Mediterranean region and its subregions suffer from elevated microplastics concentrations in surface waters, reaching up to 100 times and 1000 times higher than the IMAP TV and the Average floating microplastics concentration on the Mediterranean Sea surface is found equal to 0.36 ± 1.9 items/m2. The most recorded categories of floating microplastics are Sheets (37%), followed by Filaments (30%), Pellets (21%), Fragments (7%), Foam (4%), and Granules (1%).

131. The data provided by the ACCOBAMS Aerial Survey Initiative (ASI) regarding floating mega-litter showed that during the summer 2018 only 20% of the Mediterranean was free of floating mega-litter. The estimated presence probability was highest in the central and western Mediterranean, in the Tyrrhenian, northern Ionian, and Adriatic Seas and in the Gulf of Gabes (> 80%). The lowest presence probabilities occurred in the Levantine basin, in the southern Ionian Sea and in the Gulf of Lion (< 50%).

132. The ASI data showed also an average encounter rate of 0.8 mega-debris per km, ranging between 0 and 111 litter items per km. The total number of floating mega-litter was estimated at 2.9 million items (80% confidence interval was 2.7 to 3.1 million) and average density 1.5±0.1 items per km2. More than two thirds of the recorded items were identified as plastics (68.5%; e.g., plastic bags, bottles, tarpaulins, palettes, inflatable beach toys, etc.), while 1.7% were fishery debris and 1.9% were anthropogenic wood-trash. The remaining quarter (27.9%) was anthropogenic mega-litter of an undetermined nature.

133. For the Seafloor Marine litter component of the IMAP EO10 CI23, the majority (88%) of the seafloor stations monitored do not achieve GES, and most of them fall into the poor and bad status classes (23% and 53% respectively). The average seafloor litter concentration on the Mediterranean coastline is found equal to 570 ± 2,588 items/km2. Up to 10% of the total recorded marine litter is represented by fisheries related items: Synthetic ropes/strapping bands (39%), Fishing nets (polymers) (27%) and Fishing lines (polymers) (25%).

Measures and actions required to maintain/achieve GES EO10

134. Monitoring and assessment should be further linked and connected with the implementation of measures. Specific and well-elaborated findings can provide the basis for the implementation of targeted measures.

135. Although the presence of marine litter in the Mediterranean is variable, tackling few items may yield promising and encouraging results pertinent to the health status of the marine and coastal environment.

136. Cigarette butts and filters are predominant in the Mediterranean beaches and primarily require a behavioral change along with the implementation of strong anti-smoking policies and measures, including a strengthen communication campaign linking the damage in human health with the damage in the marine environment. Cigarette filters do not contain only plastic, but also a cocktail of toxic substances (e.g., arsenic, lead, nicotine and pesticides, etc.) for which their effects in the marine biota and the marine environment still are unknown. The engagement of the cigarette companies in this process is of great importance, including their potential inclusion in a “polluters-pay” principle.

137. The vast presence of plastic bottles being documented by the third main item on the Mediterranean beaches, comprising of plastic caps and lids, the introduction of sound alternatives and incentivizing the use of re-use caps could be among the possible options. Strengthening recycling and Extended Producer Responsibility schemes, targeted and tailored to tackle plastic bottles are also part of the solution, including the minimization of the small-sized bottles (<0.5 litters) which are easier to escape in the marine and coastal environment.

138. Microplastics of various types and shapes are escaping into the marine and coastal environment through wastewater treatment plants (WWTP). The Regional Plan on Sewage Sludge Management gives particular attention to the presence and effective management of microplastics on Pharmaceuticals and Personal Care Products (PPCP) (e.g., lotions, soaps, facial and body scrubs and toothpaste) being present in sewage sludge and proposes methods for reduction at the source as provided hereunder:

a) Regulatory approvals for new products potentially harmful to the environment to be introduced for most/all of personal care materials or detergents. However, the said measure may be difficult to be applied for medication products.
b) Education on the correct use of substances containing drugs, and especially the use of the right dose without excess, including ecolabels to raise awareness of ecological impacts of PPCPs.
c) Encouraging the return of unused or expired pharmaceuticals to specific collection points; and
d) Subjecting wastewater originating from pharmaceutical industries, hospitals or healthcare centres to regulations that limit the concentration of organic pollutants in their effluents.

139. Wastewater treatment plants are essentially taking the microplastics out of the wastewater and concentrating them in the sludge. Therefore, sludge management is of great importance for microplastic removal. Controls should be exercised however on the subsequent use of sludge. Measures that can contribute toward reducing sewage concentrations of microplastics include:

a) Bans on single-use plastics and microplastics in personal care and cosmetic products;
b) Behavior changes and campaigns to reduce the use of such products;
c) Certain textile designs can reduce microfibre generation during washing;
d) Development of household-based systems to prevent microplastics from being released into sewer lines or directly into the environment; and

e) Incineration of sewage sludge to avoid soil and water contamination by microplastics. Care should be exercised however to monitor and regulate pollutants in air emissions with a view to minimise these emissions as much as possible.

140. As rivers in most of the cases is the final repository of litter coming from the various land-based sources the application of measures on land are very relevant for the control and effective management of litter in riverine systems. A Conceptual flow of plastic from production to consumption, waste management and leakage into the environment (i.e., land, rivers and ocean), including possible points of action for policies should be considered. Minimizing leakage on land will subsequently minimize the riverine inputs deriving from wind and rain transportation, as well as from direct dumping and sewerage, and will further reduce the amount of plastics (incl. microplastics) entering the ocean.

141. Storm water is an important contributor of riverine inputs of marine litter especially for the Mediterranean where seasonal, on several occasions extreme, weather events take place such as flash floods. A more systematic approach should be also offered when developing urban storm water management plans. Those plans typically address how urban storm water quantity and quality should be managed to protect ecological, social/cultural, and economic values. Urban storm water management plans are used to assist decision making to ensure that remedial measures (structural and non-structural) in existing developed areas are undertaken in a cost-effective, integrated and coordinated manner, and that decisions in relation to areas of new expansion (including redevelopment) are made with the implications for storm water impacts taken into account in order to achieve the quality goals for water bodies.

142. In addition, it would be valuable to close the knowledge gaps by gathering comparable information across the Mediterranean on the extent of storm water overflows from combined collection systems, which should include inventory of the locations of overflow structures, inventory of functioning of the overflow structures, inventory of sewage storage capacity structures (e.g. starting with agglomerations of more than 100,000 p.e.), with the aim of acquiring better understanding of the occurrence of storm water overflows and their impacts on the quality of receiving water bodies.

143. Promoting Sustainable Urban Drainage Systems (SUDS) is another measure which aims to minimize the impervious cover by promoting infiltration, ponding, and harvesting of storm water runoff. Furthermore, in this decentralized management approach, storm water runoff and pollution are primarily controlled by measures located near the source to strive towards well-integrated measures that perform multiple functions, including flood protection, pollution removal and groundwater recharge, as well as recreation, biodiversity and urban aesthetics.

144. Although most of the marine litter in the Mediterranean region originates from land-based sources, studies confirmed that ship-originated litter are found at sites under major shipping routes and lost fishing gear are also recognized as an important source of marine litter in the region.

145. Through the updated Regional Plan on Marine Litter Management in the Mediterranean, the Contracting Parties of the Barcelona Convention have set measures and a timetable to be implemented in relation to sea-based sources of marine litter, especially related to the establishment of best practices to create incentives for fishing vessels to retrieve derelict fishing gear, collect other items of marine litter, and deliver it to port reception facilities. It also presents incentives to the delivering of waste in port reception facilities such as the non-special fee system.

146. In the past years, considerable attention has been brought to the scale of abandoned, lost and discarded fishing gear (ALDFG), the impacts on the marine environment through ghost fishing, and possible measures for reducing its occurrence like the FAO Voluntary Guidelines on the Marking of Fishing Gear. Given that aquaculture now supplies over half the seafood produced worldwide, it is

considered of great importance that this issue is also examined at farm level, especially given the continued expansion of global aquaculture development.

147. Measures targeting specifically on aquaculture farming should focus on overall recommendations and to propose measures scoping to reduce marine litter from aquaculture, block the relevant pathways to the marine environment and reduce the contribution to marine plastic pollution by aquaculture. Moreover, a second level of measures should be introduced touching upon the specific requirements and standards to be applied on a mandatory basis for aquaculture practices.

148. Measures that can contribute to reduced generation of marine litter from aquaculture include the following:

a) Replace to the extent possible plastic infrastructure components with other of physical nature.
b) Use higher density plastics (e.g., Polyethylene terephthalate (PET) or Ultra-high molecular weight polyethylene (UHMWPE)) which are more resistant to fragmentation, UV-irradiation.
c) Reduce single-use plastic with the introduction of relevant alternatives and invest in developing recovery, cleaning and re-distribution schemes.
d) Minimize the use of plastic types with low levels of recyclability.
e) Reduce to the extent possible the use of equipment consisting of different types of plastic (i.e., different lifespan and different approach for collection and recycling).
f) Ensure to the extent possible that all packaging is reusable or recyclable.
g) Reduce to the extent possible packaging and over-packaging to minimize packaging waste.
h) Develop awareness raising trainings for aquaculture staff similar to those offered from the shipping sector (e.g., HELMEPA).
i) Reduce to the extent possible the use of single-use plastics and establish relevant policies;
j) Minimize the use of plastic types with low levels of recyclability;
k) Reduce to the extent possible the use of equipment consisting of different types of plastic (i.e., different lifespan and different approach for collection and recycling).

149. Moreover, aquaculture should ideally apply a circular approach planning considering the whole life cycle of the used equipment. High procurement standards should be introduced, especially when dealing with purchasing of equipment, packaging, polystyrene boxes and other types of consumables and equipment.

150. The IMO’s Marine Environment Protection Committee (MEPC) recently adopted its strategy to address marine plastic litter from ships with substantial actions to reduce marine plastic litter from, fishing vessels; shipping, and improve the effectiveness of port reception and facilities and treatment in reducing marine plastic litter. The strategy also aims to achieve further outcomes, including enhanced public awareness, education and seafarer training; improved understanding of the contribution of ships to marine plastic litter; improve the understanding of the regulatory framework associated with marine plastic litter from ships; strengthened international cooperation; targeted technical cooperation and capacity-building.

151. Under the Mediterranean Strategy for the Prevention of, Preparedness, and Response to Marine Pollution from Ships (2022-2031) in its common strategy also addresses the prevention and reduction of litter, in particular plastics entering the marine environment from ships thought the fully implementation of the IMO Action Plan and the UNEP/MAP updated Regional Plan on Marine Litter Management in the Mediterranean.

152. When facing plastic pollution at large, the following measures or aspects can be also considered:

a) Introducing a number of prevention elements/measures at regional, sub-regional and national levels, having a focus to minimize the production, use and consumption of plastics (especially of single-use plastics), as well as to minimize their leakage into the marine and coastal environment (so, before the introduction of effect/impact);
b) Revising of the current legal framework of the Mediterranean Countries at the National level (e.g., updated/new National Action Plans and/or Programmes of Measures) and development of data base on the production and consumption of plastic products at the national level;
c) Development of compulsory, legally binging EPR systems for priority products (e.g., food and beverage packaging);
d) Progressive minimum recycled content in priority products;
e) Reduction targets in production and consumption of virgin plastic feedstock;
f) Promote behavioral change for achieving sustainable consumption patterns and increase rates of separation, collection, and recycling;
g) Develop mandatory requirements with the industry with a focus on specific, priority single-use plastic items (e.g., information on the composition of plastics on the market and even standards to ease the recycling of certain single-use plastic products);
h) Strengthen the acceptance criteria of the plastics for admission to the organized landfill, facilitating the recycling, reducing plastic disposal at organized landfills, and solicitating and promoting the separation, and recycling at sub-national level (i.e., municipalities, cities, or agglomerations);
i) Minimize the introduction of incentivized interventions, and rather focus on structural changes at governance/national administration, industry, and society levels.

153. The legally binding Regional Plan on Marine Litter Management in the Mediterranean was introduced in 2013 (Decision IG.21/7, COP18); entered into force in 2014; and updated in COP 22 (Antalya, Turkey, 7-10 December 2022; Decision IG.25/9) to further reflect global and regional agenda relevant to marine litter management.

154. The Updated Regional Plan on Marine Litter Management includes stronger links to global agenda, i.e. the United Nations Environmental Assembly (UNEA) Resolutions on marine plastic litter, microplastics and single-use plastic products pollution; UNEP marine litter partnerships and initiatives like the Global Partnership on Marine Litter (GPML) and the Clean Seas Campaign; the IMO Action Plan to Address Marine Plastic Litter from Ships; the Basel Convention - Plastic Waste Partnership (PWP); as well as the EU Policies on Marine Litter and Plastic.

Ecological Objective 1 (EO 1) (Biological diversity is maintained or enhanced. The quality and occurrence of coastal and marine habitats and the distribution and abundance of coastal and marine species are in line with prevailing physiographic, hydrographic, geographic and climatic conditions):

Common Indicator 1: Habitat distributional range
Common Indicator 2: Condition of the habitat's typical species and communities

155. The seabed and its benthic habitats are a key component of the Mediterranean's marine ecosystem. It holds a high diversity of marine communities and species and provides a range of essential ecosystem services including provision of seafood, natural coastal protection and carbon sequestration. For the assessment in relation to the IMAP EO1 CI1 and CI2 (Habitat distribution and condition), given that distribution maps are available for three key habitats (Coralligenous, Maerl/rhodoliths and Posidonia oceanica meadows) in a limited number of countries, it is only possible to present a preliminary approach to seabed habitat assessments for the 2023 Med QSR. This is done at a broad scale and with a focus on assessing the extent of pressures, as a proxy for impacts on habitats. However, according to the available data and information, the seabed is under severe pressure in the coastal zone where extensive stretches of coast have lost their natural marine habitat through the building of coastal infrastructure and sea defences. Offshore, down to depths of 1000m, the most wide-spread and extensive damage to seabed habitats comes from bottom fishing using trawls and dredges. Below this depth, these fishing practices are banned, thereby providing protection to sensitive deep-sea habitats throughout the Mediterranean. However, as the habitats are generally distributed throughout the Mediterranean (north to south, east to west), it is considered unlikely that distributional range will vary at the Mediterranean Sea scale.

Measures and actions required to maintain/achieve GES for EO1 Common Indicators 1 and 2

156. Although the knowledge base and assessment methodologies are under rapid development, systematic assessment of seabed habitats for the Mediterranean Sea is still at an early stage of development. Therefore, given the limited data availability regarding the distribution of habitats, the main measures and actions proposed here are about improvements in the availability of data:

a) Habitat maps – these provide the fundamental basis for habitat assessments and need to be further improved in quality and accuracy. The EUSeaMap full coverage map of broad habitat types relies on the quality of the underlying input data, especially on seabed substrates, and needs to be improved across much of the region. Countries should be encouraged to contribute mapping data to help improve the region-wide seabed mapping;
b) Activities and pressures – the mapping of pressures, using activities as a basis, provides a good means to assess the wider seabed of the region. These data are generally more easily (and cheaply) collected than direct observational data of the seabed, offering a more cost-effective means to undertake assessments. Further, such data are important for management of pressures (i.e., reducing pressures in areas to help achieved GES) and for marine spatial planning; further data collection is needed, particularly in the south and east, to provide an even coverage across the Mediterranean. The current region-wide datasets of activities and pressures (from the EEA/ETC-ICM) are at a 10km-by-10km grid resolution – for use in relation to seabed assessments, the data need to be prepared at a finer resolution;
c) Monitoring data on the state of the seabed – the traditional collection of direct observations of the seabed (e.g., through video and sampling) remains an important aspect of data collection programmes, providing a means to validate pressure data to assess seabed habitat condition. Monitoring programmes are costly and need to be focused on the needs of assessment and measures to ensure good value. To facilitate pan-regional assessments, the monitoring data need to be compatible between countries, following specified data standards; further data

collection is needed, particularly in the south and east, to provide an even coverage across the Mediterranean;

d) Pressure-state interactions – there is continued need for study of pressure-state interactions, both at research level and through state assessments, to improve confidence in use of pressure data (such as a proxy for broad-scale state assessments);
e) Climate change – the effects of climate change on the seabed and its communities need to be better understood; of particular importance is assessment of the carbon storage capacity of marine habitats and the contribution this makes to mitigation of climate change effects; the importance of shallow vegetated habitats, such as Posidonia oceanica meadows, for blue carbon is often highlighted, but the carbon sequestration capacity of the much more extensive soft sediment habitats of the shelf zone and its disruption by physical disturbance pressures is ultimately a more important knowledge gap;
f) Assessment methods – further work is needed to develop specific indicators (or test existing indicators available in other regions) for use with the monitoring data, and to bring the assessment methods to a fully operational level. Based on these methods, Contracting Parties need to agree threshold values to provide a clear means to assess the extent to which GES has been achieved;
g) Assessment results – the availability of seabed assessment results, including visualisation of the extent of GES in each part of the region, provides an important output that demonstrates the work of the IMAP and Contracting Parties, stimulates improvements and helps direct actions towards achieving GES.

CI3: Species distributional range (related to marine mammals, seabirds, marine reptiles)
CI4: Population abundance of selected species(related to marine mammals, seabirds, marine reptiles)
CI5: Population demographic characteristics (body size or age class structure, sex ratio, fecundity rates, survival/mortality rates related to marine mammals, seabirds, marine reptiles)

157. For the **Monk Seal**, one of the flag species of the Mediterranean, the current assessment of the status in relation to (CI3, CI4 and CI5), provides insight into both the strengths and limitations of the species across the Mediterranean basin. Most recent data shared by experts, through the survey conducted to produce this assessment, indicate that the species continues to breed in its known breeding zones and there is a moderate expansion of the specie's range. The present assessment concluded that for CI3-distribution, GES has not been achieved for all Group B countries (where no monk seal breeding is reported, but repeated sightings were reported), while it has been achieved for most of the Group A countries (countries, where monk seal breeding has been reported after year 2010). However, the lack of a baseline estimates for monk seal population abundance (CI4), makes difficult to validate the (likely) expansion of the species reported in recent years.

158. Concerning the Monk Seal Population demographic characteristics (CI5), various types of data need to be gathered to enable accurate description of Mediterranean monk seal population demographics. Key demographic data and survivorship are logistically difficult to determine, requiring access to the seals in remote locations and long-term uninterrupted monitoring to build individual historical series.

159. The Mediterranean Sea harbours 25 **cetaceans'** species, which are subjects to various human pressures, which reflects on their conservation status. At the present moment, it is not possible to assess whether cetaceans' populations achieved Good Environmental Status (GES) under the EcAp/IMAP framework, since baseline/reference values for the GES assessment were only recently defined, thanks to the data gathered by the ACCOBAMS Survey Initiative in summers 2018 and 2019. However, the 2018 - 2021 IUCN Red-List Assessment shows that the most of cetacean populations in the Mediterranean Sea are significantly threatened, apart from the wide-spread species, such as common bottlenose dolphin (*Tursiops truncatus*) and striped dolphin (*Stenella coeruleoalba*), the status of which has improved since mid-2000.

160. **Seabirds** sensu lato form a crucial component of the region's marine biodiversity and ecosystem with many of the relevant taxa being endemic or near endemic in the Mediterranean. Mostly situated on top of marine food webs, these highly mobile organisms come to land to breed, thus contributing to nutrient exchange between marine and coastal areas, by linking sea and land. The integrated Good Environmental Status (GES) of EO1 of three Common Indicators related to seabirds (CI3, CI4 and CI5) reveals that for many populations of various species GES is reached, when taking a modern baseline approach. However, the data quality currently prevents a truly quantitative integrated GES assessment across the entire region. Furthermore, specifically some of the endemic taxa which are of conservation concern, currently appear to fail to reach GES targets, at least in some of the CIs. These species are facing multiple pressures at land and at sea, seabirds from different functional ecological groups in the region act as indicators and serve as sentinels for the health of the Mediterranean Ecosystem.

161. Combining the findings of this assessment regarding **marine turtles** with literature on research and conservation actions taking place in the Mediterranean, marine turtle can be considered as meeting GES in relation to CI3, CI4 and CI5. Indeed, distribution of turtles across the Mediterranean (CI3) is increasing in loggerhead nesting outside their traditional range. Similarly, green turtle distribution at sea is deemed to be expanding. Nesting levels, a basic proxy for population abundance (CI4), are stable or increasing at all major nesting sites where recent data have been reported and nesting is occurring where there was previously none. At the breeding areas, available data suggest that hatchling sex ratios (CI5) are in favourable condition. This is the one demographic characteristic that is likely to be impacted by climate change, but it is also one that can be adequately monitored and if required mitigated against. However, there are fundamental gaps in monitoring and data reporting for turtles in marine habitats. Monitoring methods and data reporting require standardisation across all CPs. Further research is required for better understanding of turtle populations and improving their conservation status.

Measures and actions required to maintain/achieve GES for EO1 Common Indicators 3, 4 and 5

162. For Monk Seal:

a) Since GES has not been achieved in relation to CI3-distribution, for all Group B countries, while it has been achieved by Group A countries except for Cyprus. Therefore, actions dedicated to facilitating the widespread distribution of the species in all Group B countries and Cyprus should be a priority. Such actions should include not only the set-up of a good monitoring network but also the protection of key habitats for the species and the reduction of any potential threats (e.g., intentional killings, tourism disturbance).
b) When looking at Mediterranean monk seal population abundance (CI4), the lack of a baseline estimates makes difficult to validate the (likely) expansion of the species reported in recent years. Based on the reported information by regional experts, it seems that most (rough) population estimates come mainly from the minimum photo-identified individuals. However, an approach using pup-multipliers method may be taken as a new way forward for reliable abundance estimates. A common strategy for producing population estimates should be agreed on to be able to compare information among researchers.
c) Considering that Monk Seal photo-identification is a widespread practice across the region, the creation and implementation of a data-sharing platform would offer great potential to establish reliably information on movements and home range establishment. Such initiative is currently in the portfolio of actions to be supported by the Monk Seal Alliance.
d) Data reported by regional experts manifests the difficulty to study the population demographic characteristics (CI5). Since key demographic data and survivorship are logistically difficult to determine, new actions should focus on providing opportunities for long-term uninterrupted monitoring to allow building individual historical series, key to assess basic demographic trends. New technologies, combined with the long-term regular use

of more traditional methods (e.g., individual tags and photo-identification) may shed light on these aspects.

e) Recommended topics for research:
   i. Distribution
   ii. Abundance
   iii. Pup production
   iv. Movements
   v. Foraging areas
f) Recommended Conservation Measures:
   i. Protect critical pupping habitat
   ii. Regulate human activities
   iii. Improvement of surveillance
   iv. Habitat restoration
g) Management and Law Enforcement measures:
   i. Regulation of Fishing activities
   ii. Public education and awareness
   iii. Management of tourism
   iv. Reduce anthropogenic mortality

163. For Cetaceans:

a) Understanding and addressing pressures/state of cetaceans' linkages
   i. Continue the work on definition of pressures/cetaceans' interaction hotspots; particularly extension of anthropogenic noise/cetaceans' hotspots analysis to maritime traffic and identification of marine litter/cetaceans' hotspots.
   ii. Intensify efforts to improve knowledge on interrelations between climate change and cetaceans, including identification of sensitive cetaceans' species and monitoring of their state related to climate change.
   iii. Continue efforts in data collection and processing regarding the ship strikes, in cooperation with international organisations on marine traffic, notably IMO and ACCOBAMS.
   iv. Develop techniques and models to assess cumulative/synergistic effects of pressures and impacts on cetaceans, including underwater anthropogenic noise, chemicals, marine litter, climate change and emerging pathogens, taking into consideration the existing recommendations (such as from the 2021 IWC Intersessional Workshop "Pollution 2025" etc).
   v. Intensify efforts to implement the existing pressures' mitigation tools, such as guidelines and best practices already developed in the scope of UNEP/MAP, ACCOBAMS and IWC.

b) GES assessment Methodological issues
   i. Reformulate GES definitions and linked GES assessment elements under CI5, as proposed in the 21WG.514/Inf.11, notably to shift human induced mortality assessment to CI12 and focus on actual population demographic characteristics (sex ration, calf productivity etc)
   ii. Define GES assessment criteria, particularly baseline/reference and threshold values, for CI5, as soon as sufficient data is collected/available. Possibly select representative pilot areas where adequate data could be collected on regular bases.
   iii. Invest efforts in further quantification of thresholds for CI3
   iv. Encourage sub-regional level of cooperation between countries in reviewing and adjusting GES assessment criteria.
c) Data collection and availability for CI3 and CI4
   i. Replicate and conduct regularly regional synoptic surveys and complement with other monitoring efforts.

ii. Promote and support research of cetaceans in the southern Mediterranean.

d) Data collection and availability for CI5

iii. At the national level (or where possible at sub-regional level), establish or ensure functioning of the stranding networks, with the particular support of regional agreements/organisations (SPA/RAC, ACCOBAMS) in the segment of capacity building and application of new technologies.

iv. Regularly submit national strandings data to MEDACES, including information on causes of mortality,

v. Upgrade MEDACES and ensure MEDACES data availability and easy accessibility (in standard spatial GIS format) via MEDACES website

vi. Intensify research efforts on population genetics, taking into account the ongoing work by other relevant organisations.

164. For Sea birds

a) Collection of quantitative monitoring data at national level should be promoted to allow assessments that reflect the impact of pressures on local populations. Indeed, for the current assessment cycle, the data that was made available was patchy, heterogenous, and limited for a robust GES assessment of all indicator species for the three CIs across subregions. It is believed that the IMAP Infosystem will facilitate data reporting and improve efficiency and comparability for monitoring and GES assessments of future cycles.

b) The lack of representative, comparable subsamples distributed equally across the subregions remains being one of the major challenges for an integrated assessment of the status of marine avifauna in the region, to achieve a robust GES assessment, monitoring data between two cycles should be made fully comparable. This requires monitoring a certain number of same or representative populations as prolonged time series at the finest spatial scale practical.

c) In order to improve the representativeness of monitoring samples, coordinated monitoring within subdivisions or subregions would further improve overall GES assessments. Mid-winter count data made available by IWC for this assessment cycle as well as transboundary counts of Mediterranean Shag roosts in the Adriatic are good examples highlighting useful outcomes of coordinated and synchronised monitoring efforts.

d) Enabling coordinated efforts and achieving standardised monitoring at the local level also requires regular transfer of know-how and calibration of monitoring methods within subdivisions, subregions or across the region. Finally, harmonisation between different assessment programmes such as MSFD can be further improved for a more efficient assessment of GES in the Mediterranean.

e) Quantifying GES for seabird populations in the Mediterranean remains challenging. Seabirds are highly mobile organisms and therefore a robust analysis of their state requires transboundary monitoring. Ensuring communication and information exchange between different assessment programmes and sea conventions within the region and for migratory species which leave the Mediterranean also other seas can help overcome this challenge.

f) The majority of seabird species in the Mediterranean form metapopulations with discrete local breeding colonies. Without better understanding the demographic connectivity between these colonies, deciding on a meaningful spatial scale at which GES should be assessed remains to some extent arbitrary. Therefore, closing such knowledge gaps will be pivotal for the finetuning of monitoring programmes and for successful GES assessments in the future.

g) Currently, a strong bias remains in the amount of monitoring data available for the different aspects in the life cycle of the majority of Mediterranean seabirds. This bias means that there is insufficient knowledge regarding the non-breeding season and the periods the birds spend out at sea, often far away from the breeding grounds. To reduce this bias, it is recommended that future assessment cycles increase the effort of monitoring the birds away from the colonies, by means of increased colour ringing and ring-reading, tracking programmes and counts at bottlenecks.

165. For marine reptiles

a) The competent authority in each CP needs to understand the data reporting requirements and which entity is undertaking specific monitoring actions. Through doing this it can identify gaps in data acquisition resulting from lack of fieldwork in necessary sites, gaps in reporting at sites where monitoring is carried out and identify entities that could be tasked with additional field monitoring at currently unmonitored sites. In terms of progressing towards adequate reporting, the simplest first step to take is to ensure data from all existing monitoring programmes are collected and reported in a standardised manner. The next most simple change is that in locations where monitoring programs exist, but collection of certain data is lacking, the programs should be adapted to acquire this sought-after information and analyse and report it as required.
b) It is recommended that each CP has in place some oversight or coordination mechanism to ensure all required monitoring activities are carried out. The coordinator could be a governmental body, scientific institution, or non-governmental organisation, with the important remit that they know what work is being carried out and have the competency to collect and synthesise the information adequately for each six-yearly Mediterranean Quality Status Report.
c) This IMAP reporting framework, a requirement of all riparian Mediterranean states does not exist in isolation but coincides with other international reporting requirements such as those for the EU Habitats Directive and its Marine Strategy Framework Directive (MSFD). There is much overlap and synergy between these programs, which means data collected if collected in adequately rigorous manner can be used multiple times and not only for the IMAP. Of note is the recently published article highlighting progress towards a common approach for assessing marine turtle population status at European level within the MSFD, which should be considered when designing and coordinating marine turtle monitoring strategies. The resulting economy of scale lessens the burden on competent authorities as suitable coordinated actions obviate the need to repeat work and simplifies the analysis process.
d) Research priorities for marine turtles in the Mediterranean
    i. Set up long-term in-water monitoring programmes in key foraging areas for assessing sea turtle abundance and trends
    ii. Assess distribution and level of nesting activity in Libya
    iii. Quantify bycatch (especially in small-scale fisheries), rates and intentional killings in associated mortality key foraging areas and migratory pathways
    iv. Understand how climate change might impact sex ratios, geographical range, and phenology
    v. Estimate/improve estimates of demographic parameters
    vi. Improve population abundance estimates
    vii. Assess the movement patterns of adults from key rookeries
    viii. Identify development habitats of post-hatchling and small turtles, and dispersal and settlement patterns.
    ix. Assess the movement patterns of juveniles
    x. Develop and test new bycatch reduction methods
e) `Conservation priorities for marine turtles in the Mediterranean
    i. Year-round protection of key feeding and wintering grounds
    ii. Continue current conservation methods at nesting areas (in situ protection, relocations, light management, etc.)
    iii. Educate fishermen on on-board sea turtle handling best practices
    iv. Seasonal protection of main migratory corridors
    v. Implement TED in bottom trawlers
    vi. Trans-boundary large MPA in the Adriatic
    vii. Implement LED lights in set nets

Ecological Objective 2 (EO 2) (Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem):

Common Indicator 6: Trends in abundance, temporal occurrence, and spatial distribution of non-indigenous species, particularly invasive, non-indigenous species, notably in risk areas

166. The results of this assessment regarding EO2 (Non-indigenous species, CI6) indicate that for the past 15-20 years new NIS introduction rates have been relatively stable in the West Mediterranean and the Adriatic, slightly but not statistically significantly increasing in the East Mediterranean but increasing in the Central Mediterranean. However, even if the rate is staying constant the total (cumulative) number of NIS in the basin is increasing steadily, with corridors and shipping the main pathways responsible.

167. At the same time, there has been a notable increase in research effort and reporting, spurred by both policy requirements but also scientific interest coupled with citizen science initiatives, particularly in the southern Mediterranean. Consequently, clear interpretation of these trends is hampered by the lack of long-term standardised monitoring data, as it is not possible to disentangle the confounding effects of differential recording efforts spatially and temporally from real changes in pathway pressure or vector management.

168. Nevertheless, a number of invasive, high-impact NIS have displayed an increased geographic expansion in the last decade or so, which can be deduced even behind the “noise” of increased detection and reporting. NIS species of warm affinities with long-range pelagic dispersal appear to have been favoured by climate change and increased seawater temperatures to penetrate the cooler regions of the Mediterranean, secondary anthropogenic dispersal however still plays an important role in the spread of the more sedentary species.

169. NIS species of warm affinities with long-range pelagic dispersal appear to have been favoured by climate change and increased seawater temperatures to penetrate the cooler regions of the Mediterranean, secondary anthropogenic dispersal however still plays an important role in the spread of the more sedentary species.

Measures and actions required to maintain/achieve GES for EO2 Common Indicator 6

170. With regards to suitable data availability, the majority of the CPs have developed, and many are already implementing IMAP-compliant monitoring programmes. Furthermore, the IMAP Data and Information System is operational and has already started receiving NIS data, such that standardised time series are anticipated to be available for the next assessment cycle. This should make possible the formal quantification of abundance and spatial distribution changes and increase our confidence in the assessment of trends in temporal occurrence. If CPs have not already initiated the process, IMAP can assist in co-ordinating the development of priority NIS lists for monitoring of abundance through risk analysis and risk assessment. Early detection and early warning systems can be informed by regularly updating the spatial distribution information entered into MAMIAS and the IMAP Info System.

171. Threshold values for trends in temporal occurrence have not been set yet but methodologies and approaches are under discussion through regional co-operation. Quantifying/modelling pathway pressure can assist in specifying quantitative targets (percentage reduction) by introduction pathway. Importantly, all these methodological steps need to be adapted for GES assessment at the national level. The effect of reporting lags on new NIS data and trends analysis in this assessment was circumvented by not using the data of the last 3 years (2018-2020), however it would be beneficial to adopt a commonly agreed methodology to deal with this issue in order to avoid loss of information.

172. Next important steps for GES assessment of NIS include the elaboration of the remaining aspects of CI6 that relate to impacts, by further developing assessment criteria and quantitative targets for the most vulnerable/important species and habitats at risk. This is work that ideally should be co-ordinated with the implementation of EO1 Common Indicators CI1 and CI2 and EO6 on sea floor integrity.

173. Besides methodological considerations with regards to IMAP and the assessment of GES, working towards achieving GES requires actions to mitigate and reduce invasion pressure, especially coordinated actions by all the states. Towards that effect, the draft updated Action Plan concerning NIS has already taken consideration the Mediterranean NIS baselines and the results of the MedQSR2023, such that in its proposed actions there is emphasis on preventative measures, including encouraging and facilitating CPs to strengthen their legislative and institutional framework in order to systematically risk assess and manage pathways, as well as elaborate early warning systems, rapid response plans and mechanisms to control intentional introductions. The other axis of focus of the Action Plan relates to the impacts of NIS, where targeted impact studies for priority species are proposed in order to identify density-response relationships and acceptable abundance levels. The implementation of the NIS Action Plan will progress in parallel with the Ballast Water Management (BWM) Strategy for the Mediterranean (2022-2027) which focuses on the management of ship-mediated introductions from ballast water, by facilitating the implementation of the Ballast Water Management Convention, and biofouling, by developing national strategies and action plans to manage this vector.

Ecological Objective 3 (EO3, Populations of commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock)
Common Indicator 7. Spawning stock Biomass
Common Indicator 8. Total landings
Common Indicator 9. Fishing Mortality

Common Indicators 7, 8 and 9

174. The assessment in relation to the EO3 **CI-7** (Spawning stock biomass) indicates that while the biomass of some species under management plans is already increasing as a result of decreased fishing pressure, others have yet to show any improvement. Across the region, 44 percent of the stocks were found to have low relative biomass levels, with 19 percent intermediate and 37 percent high. For Total landings (**CI8**), capture fisheries production in the region has been stalled since the mid-1990s, with a decrease in 2020 likely exacerbated by the COVID 19 pandemic. Landings for the Mediterranean and the Black Sea (2018–2020 average) amount to 1 189 200 tonnes (excluding tuna-like species), very similar to the landings reported in The State of Mediterranean and Black Sea Fisheries 2020 (2016–2018 average). However, landings in 2020 show a 16 percent decline in comparison with 2019, likely related to some extent to the impacts of the COVID-19 pandemic on fleet dynamics, demand and trade. The total production for the Mediterranean Sea alone was 743 100 tonnes (62 percent of the total capture fish production in the region).

175. For Fishing mortality (**CI9**), the overexploitation of stocks has decreased over the past decade, with an accelerated reduction of fishing pressure in the last two years, particularly for key species under management plans. However, most commercial species are still overexploited, and fishing pressure is still double what is considered sustainable. Most stocks for which validated assessments are available continue to be fished outside biologically sustainable limits, and average fishing pressure is still twice the level considered sustainable (average F/FMSY = 2.25). Nevertheless, there has been a 10 percent decrease in the percentage of stocks in overexploitation since 2012 and a continuous gradual decrease in fishing pressure since 2012 (a 21 percent decrease since 2012, double what was reported in 2020). Furthermore, for some priority species under management plans, fishing pressure

has declined by considerably more over the past decade, including European hake (-39 percent) and common sole (-75 percent). However, fishing pressure continues to increase on certain other stocks, notably commercially important blue and red shrimp in the central and eastern Mediterranean.

Measures and actions required to maintain/achieve GES for EO3 Common Indicators 7, 8 and 9

176. Although the percentage of stocks with validated assessments has continued to increase since the last edition of The State of Mediterranean and Black Sea Fisheries (FAO, 2020a), particularly in the western Mediterranean, as has the geographical coverage of assessments, efforts are still required to extend assessment coverage to all GSAs, while the decrease observed in the percentage of landings assessed highlights the need to ensure the regular assessment of key stocks with high landings.

177. The positive signs for fishing pressure provided by this overall analysis are most likely related to the adoption of a significant number of national and regional management measures in the recent past, underpinned by an increase in the quality and coverage of scientific advice, particularly on priority species and key fisheries. Measures consist of adopting multiannual management plans that include effort control measures and/or the introduction of quota-based management for some species, as well as the establishment of fisheries restricted areas (FRAs) and spatio-temporal limits to protect essential habitats and life stages. Nevertheless, the slow recovery in biomass of certain key stocks and the need to honour the objectives of the GFCM 2030 Strategy for sustainable fisheries and aquaculture in the Mediterranean and the Black Sea point to the importance of continuing to implement an effective and generalized management framework, including through strengthening existing management plans and defining new ones, as well as ensuring the effective implementation of those in place. Since 2018, research programmes have been incorporated, through specific recommendations, into the GFCM workplans for the Mediterranean. Research programmes share the common aim of improving the scientific basis for the provision of advice on existing and potential management measures through dedicated actions towards increasing the quality and quantity of information on resources and addressing previously identified knowledge gaps and shortcomings in relevant scientific or technical advice. More recently, research programmes have been complemented by pilot studies and projects. Pilot studies and projects rest on similar principles, i.e. conducting scientific data collection and analysis on specific themes, fisheries or species, but have a more limited geographical and temporal scope. In all cases, the core principle is to take full advantage of ongoing research at the country level by providing experts with a regional platform for coordination, knowledge exchange and capacity building enriched by new activities developed based on common methodologies. The data collected through these initiatives are generally aimed at providing the scientific basis for determining the most appropriate management measures for selected fisheries.

178. The correct estimation of fishing mortality requires a precise understanding of riparian states' fishing capacity. Due to the specificities of the Mediterranean fleet, composed of a large majority of small-scale polyvalent vessels, information on fishing capacity is sometimes incomplete or inaccurate. Furthermore, the estimation of robust reference points for fishing mortality requires the use of long time series and the incorporation of environmental and ecosystem variables, as well as the design of robust methods that can integrate information from different sources.

179. The update and adoption of new specific binding recommendations related to the mandatory requirements for data collection and submission, underpinned by the GFCM Data Collection Reference Framework (DCRF) has greatly improved the quality of the data in support of advice, in line with the need expressed by riparian states. The GFCM 2030 strategy for sustainable fisheries and aquaculture in the Mediterranean and the Black Sea is also contributing in this endeavour through specific actions such as, for example, the execution of harmonized scientific surveys-at-sea.

180. The correct estimation of total landings requires a precise knowledge of the fishing activities carried out by the active fishing fleet operating in the Mediterranean. The specificities of the Mediterranean fleet, composed by a large majority of small-scale polyvalent vessels, as well as the

existing variety of landing sites, and the different capacity of Mediterranean riparian states to accurately monitor the landings in such sites, make difficult an accurate estimation of landings in the region.

181. The GFCM has proposed a number of solutions to improve the quality of the estimation of total catch. On one hand, the GFCM DCRF provides the technical elements to improve and harmonize the collection of information on fisheries throughout the Mediterranean and on the other the GFCM 2030 strategy provides an effective instrument to guide an increase in the collection of sound information (e.g. bycatch monitoring programme and a survey of small-scale fisheries), as well as the implementation of dedicated actions to assess and curb IUU fishing, which are expected to largely improve the quality of the estimates for this indicator.

182. Care needs to be taken in interpreting trends in the indicator for total landings because variations in total catch/landing may be a result of various factors, including the state of the stock, changes over time in the selectivity of fishing gear, changes in the species targeted by fishing activities, as well as inconsistencies in the reporting.

Ecological Objective 7 (EO7): Alteration of hydrographical conditions
Common Indicator 15: Location and extent of the habitats impacted directly by hydrographicalterations

Common Indicator 15
183. All countries had difficulties with the monitoring of the CI15 (Location and extent of the habitats impacted directly by hydrographic alterations) of EO7 according to the Guidance factsheet and could not provide monitoring data therefore, the Good Environmental Status has not been assessed. Further simplification of the Guiding Factsheet is therefore needed so to allow countries to report on the physical loss of habitats, i.e., the structures' footprint. GES should be defined in close coordination with the EO1 and EO6.

184. A baseline assessment has been made using data from the national reports prepared in the frame of EcAp MED III and IMAP MPA projects, including some other countries that used the same report format, and from the data provided by scientific partners, Mercator Ocean in particular. Climate change seems to have far bigger impacts on the habitats and marine ecosystems in general than the impacts of hydrographic alterations caused by new structures.

Measures and actions required to maintain/achieve GES for Common Indicator 15

185. Establishment of the national IMAP, monitoring programme that will systematically collect statistically significant data of the hydrographic parameters is required – first, to allow modelling of hydrographic alterations of the planned structures at the very local scale in the EIA/SEA and second, to provide subsequent monitoring data once the structures have been built. A close cooperation has to be established with the authorities that are responsible for planning of such structures including those responsible for EIA. In parallel, mapping of habitats in a surrounding area that could possibly be impacted by such hydrographic alterations should be prepared (link to EO1 and EO6).

186. Creation of a digital spatial database of all data from EIA/SEA including spatial coverage and location of the intervention, existing and planned structures and marine habitats. The Copernicus Marine services, the EMODnet service and the spatial planning information system of individual countries (via WMS or WFS layers) should be used, thus providing necessary data for the CI 15 assessments and monitoring.

187. As the rational possibility, a revision of the existing indicator Factsheet should be considered that will simplify the method to allow countries to report on the physical loss of habitats, i.e., the structure's footprint only.
188. Considerations should also be given to the possibility of proposing a set of climate change related indicators in the frame of IMAP. This could include monitoring of hydrographic parameters (e.g., salinity, temperature, waves and currents) that are changing rapidly due to climate change. The use of hydrographic parameters reported within EO 5 on eutrophication should be taken into account with the use of remote sensing and other available sources for climate change in order to determine the hydrographic alterations in the Mediterranean region. In-situ data are equally important and should be used to monitor changes in variables due to climate effects that is required also by the EU Marine Strategy Framework Directive (MSFD). Such alterations may have much stronger impacts on marine habitats and ecosystems than those monitored by the CI 15 itself.

Ecological Objective 8 (EO8): Alteration of hydrographical conditions)
Common indicator 16 (CI 16): Length of coastline subject to physical disturbance due to the influence of human-made structures;
Candidate common indicator 25 (CCI 25): Land cover change.

Common Indicator 16 and Candidate Common Indicator 25

189. Monitoring data in relation to CI16 (Length of coastline subject to physical disturbance due to the influence of human-made structures) of EO8 was provided for 57% of the total Mediterranean coastline (31 283 km), out of which 26 658 km (85.2%) of coast is natural and 4 625 km (14.8%) is artificial. This provides a good overview of the baseline situation. However, changes in the percentage or total length of coastline subject to physical disturbance due to the influence of human-made structures could not be assessed because only the first set of monitoring data was provided, except three countries that provided two sets of data. The provided data indicate that the majority of human-made structures belong to ports and marinas.

190. Within the framework of this assessment a pilot study was conducted for the Candidate Common Indicator 25 (Land cover change) of EO8. It covered the Adriatic sub-region (coastal zone of 10 km width) and showed that In 2018 the built-up areas occupy 8.77% (2 500 km2) of the Adriatic coastal zone. The largest land cover change from 2012 is the increase of the built-up area by 27 km2 representing a land take trend of 1% in six years. In the 2012-2018 period the land cover changed from forest and semi-natural land (24 km2), water bodies (3 km2) and agricultural land (2 km2) to built-up (27 km2) and wetlands (2 km2).

Measures and actions required to maintain/achieve GES for EO8 Common Indicator 16

191. First, technical issues that have to be considered in future monitoring and assessments of CI 16 are as follows:

a) Monitoring of the coastline (second and following assessments) should use the same level of details and spatial resolution as the initial assessment (baseline data). Otherwise, monitoring results could be compromised by the fact that coastline length increases by using larger scales, more so on more indented coasts.
b) The calculation of the length of the coastline varies also due to deformations caused by the choice of the cartographic projection (i.e., calculated in plane by using one of the cartographic projection or by using the ellipsoid). It is recommended to use the ellipsoid lengths calculated on WGS84 as required by the Guidance Factsheet and related Data Dictionaries and Data standards.
c) Methods of mapping coastline vary between the national reports which results in semantic differences of assessed CI 16, in particular with regard to mapping of the length of artificial

structures. This should be taken into account while interpreting aggregate data for the Mediterranean. Classification of artificial structures should be unambiguous, regardless of the monitoring period, country or the method used (visual inspection of aerial images or field survey). A manual that will elaborate on various situations should be prepared so that interpretation is unambiguous, i.e., harmonised.

192. Second, measures and actions to achieve GES include the following:

a) The country-specific GES should be defined based on the first set of monitoring data in order to allow assessment of changes for the next QSR. Country specificities could significantly affect the assessment, i.e., interpretation of calculated CI 16. Therefore, issues such as the following need to be taken into account. For example, a country with a significant length of coastline on uninhabited islands, islets and rocks and with a small proportion of artificial coast can be interpreted as a very good condition, while in fact there is a lot of construction on the mainland part of the coast. Another issue is the total length of the coastline per country. If a country has a short coastline than it is expected that the proportion of the artificial coastline will be larger to provide facilities for all human coastal and maritime activities. When defining GES thresholds, these should be considered; i.e., different thresholds could be defined for different parts of coastline. For the definition of country specific GES, the list of assessment criteria and the Guiding document prepared by PAP/RAC can be utilised (PAP/RAC, 2021), including the results of testing the Guiding document in Morocco (PAP/RAC, 2022).

193. Also, measures and actions to achieve GES should be specified and may, in general, include the following three types:

a) Particular management actions needed in order to move towards GES.
b) Measures aimed at obtaining new knowledge for assessing and achieving GES (e.g., scientific research, application of innovative solutions at pilot locations).
c) Measures with the aim of disseminating knowledge to all stakeholders and involving them in defining measures and actions for achieving GES.

194. Particular management actions regarding coastline artificialisation could include:

a) Analysis of existing artificial coastlines and their categorization into those that are necessary, those that can be reduced and those that can be returned to nature (e.g., abandoned jetties, etc.).
b) When planning new artificial structures on the coastline, first analyse whether human needs can be achieved through better management of existing artificial structures and their functional transformations.
c) Along existing artificial coastlines: improve monitoring of environmental impacts and implement measures to reduce negative impacts (such as pollution, habitat fragmentation, noise, light pollution, water cycle).
d) For new artificial coastlines, examine the use of nature-based solutions and ensure financial or other benefits for their implementation.
e) Encouraging the use of coastline in a way that consumes spatial/natural resources as little as possible: e.g., restricting land-take for the second homes.
f) Protect, restore, conserve and enhance threatened and degraded coastal habitats.

195. Results of above measures and actions could be measured by km of reversed coastline (from artificial to natural), km of recovered coastal habitats, % of nature-based solutions used in e.g., coastal protection, number of innovative projects tested (e.g., beach nourishments without impacts on coastal habitats), number of people involved in GES awareness, number of people actively working on the measures, and alike.

Measures and actions required to maintain/achieve GES for EO8 Candidate Common Indicator 25

196. Varying geographic, socio-economic, cultural and environmental contexts of coastal zones require the application of specific measures and actions in order to achieve GES. First, in order to define GES in a more objective way a technical manual should be prepared that will allow better understanding of concepts of integrity and diversity of coastal ecosystems and landscapes and their importance for ecosystem approach. This will also allow better assessment of land cover changes in the next QSR period, in particular for the areas with significant changes.

197. Second, more objective GES should be prepared either at the sub-regional level or at country level that will allow more objective assessments for the future QSR.

198. The main targets under EO8 could include the following:

a) Avoid further construction within the setback zone and the flooding prone low-lying coastal zone;
b) Give priority to low-lying coastal zone when preparing adaptation plans to climate change;
c) Maintain diverse and harmonised coastal land cover structure, and reverse dominance of urban land cover;
d) Keep and increase landscape diversity.
e) These general recommendations should be further elaborated and adapted to particular regions. In general, measures and action could be of the following types:
f) Particular management actions needed in order to move towards GES;
g) Measures aimed at obtaining new knowledge about assessing and achieving GES (e.g., scientific research, application of innovative solutions at pilot locations);
h) Measures with the aim of disseminating knowledge to all stakeholders and involving them in the actions for achieving GES.

199. Particular management actions regarding land cover change could include:

a) Analysis of existing built-up areas and their categorization into those that are necessary, those that can be reduced and those that can be returned to nature (e.g., abandoned industrial zones, etc.).
b) When planning new built-up areas, first analyse whether human needs can be achieved through better management of existing built-up areas and their functional transformations.
c) In existing built-up areas: improve monitoring of environmental impacts and implement measures to reduce negative impacts (such pollution, habitat fragmentation, noise, light pollution, water cycle).
d) For new construction areas, examine the use of nature-based solutions and ensure financial or other benefits for their implementation.
e) Encouraging the use of space in a way that consumes spatial/natural resources as little as possible: e.g., restricting land-take for second homes.
f) Protect, restore, conserve and enhance threatened coastal ecosystems and habitats (e.g., dunes, wetlands and coastal forests and woods, in particular).

Common measures to enhance knowledge gaps:

I. Strengthen the science-policy interface (SPI):

In order to improve the delivery of IMAP the following measures should guide addressing the gaps identified during the preparation of the 2023 MED QSR:

a) Strengthen the use of unprecedented achievements in science and technology in order to ensure that the growing development demands and a healthy ocean co-exist in harmony by identifying the most relevant innovative knowledge and technologies that are of utmost importance for reliable and cost-effective monitoring and assessment of the state of Mediterranean Sea with a focus on:

i. Promotion of inter-disciplinary research aimed at understanding and prediction in the Mediterranean Sea;
ii Mapping of all components of the Mediterranean marine environment, along with the anthropologic pressures across time scales;
iii. Application of observing and remote techniques to strengthen the IMAP-based monitoring practices and improve forecasts of the state of the marine environment;
iv. Application of holistic view within the “source-to-sea” framework to structure the assessment of the land-based pressures in conjunction with their impacts on the oceans.

b) Enhance partnerships and support the transfer of ocean knowledge for science-based management, with a focus on strengthening:

i. The national capacities related to monitoring and data analysis;
ii. The use of the scientific networks to support the objectives of partnerships for the science-policy interface (SPI);
iii. The synergies for marine science in the Mediterranean.

II. Improve IMAP InfoSystem database management:

IMAP-IS should be significantly improved. It should be restructured from the repository of data reported by the CPs into an advanced information system which supports integrated assessments and ensure the validation of uploaded data, first technically and then scientifically. It needs to provide a quarriable database, with export formats (vertical and horizontal) for scientific evaluation and presentation, therefore allowing IMAP users and data evaluators to sort, retrieve and export data based on any available parameter of the metadata and data. The formats of the extracted data should be compatible, to the extent possible with other standard analysis methodologies and presentation/mapping tools.

Most importantly, the QA/QC mechanism of the IMAP IS needs to be significantly strengthened including operational and scientific quality control of data. The implementation of QC/QA controls and data flagging is necessary. The online tools supporting assessments should also be integrated into IMAP IS.

DDs and DSs should be updated, as appropriate, further to the experince built during the present IMAP cycle of data reporting and the preparation of the 2023 MED QSR Pollution and Marine Litter assessments.

It is also necessary to invest significant resources to ensure IMAP IS interoperability with national databases This has to be followed by significant improvement of data quality control and quality assurance at the national level.

III. Improve the GES assessment:

For further improvement of the integrated GES assessment of IMAP Pollution and Marine Litter Cluster, it is necessary to continue streamlining the assessment methodologies applied for the environmental status assessment for the Pollution and Marine Litter Cluster within the 2023 MED QSR.

5. Main Actions and Measures Supported the work of UNEP/MAP for the Protection of the Mediterranean Sea and Coast since 2017 Med QSR

200. Since the adoption of MedQSR of 2017, a series of actions and measures were undertaken that supported the efforts made within the framework of UNEP/MAP-Barcelona Convention. The main measures adopted by the Contracting Parties to the Barcelona Convention since 2017 are:

- The **UNEP/MAP Medium-Term Strategy 2022-2027** (MTS) adopted in 2021 as a key strategic framework for the development and implementation of the Programmes of Work of UNEP/MAP. It aims at achieving transformational change and substantial progress in the implementation of the Barcelona Convention and its Protocols, also providing a regional contribution to relevant Global processes[12].
- **Designation of the Mediterranean Sea Emission Control Area for Sulphur Oxides and Particulate Matter**: The Contracting Parties to the Barcelona Convention successively adopted two consensual decisions at their 21st meeting (Naples, Italy, 2-5 December 2019) and 22nd meeting (Antalya, Türkiye, 7-10 December 2021) concerning the designation of the Mediterranean Sea Emission Control Area for Sulphur Oxides and Particulate Matter (Med SOX ECA), pursuant to Annex VI to the International Convention for the Prevention of Pollution from Ships (MARPOL).
- **The Regional Plan on Urban Wastewater Treatment.** It applies to the collection, treatment, reuse and discharge of urban wastewaters and the pre-treatment and discharge of industrial wastewater entering collecting systems from certain industrial sectors. Its objective is to protect the coastal and marine environment and human health from the adverse effects of the wastewater direct and or indirect discharges, in particular regarding adverse effects on the oxygen content of the coastal and marine environment and eutrophication phenomena as well as promote resource water and energy efficiency.
- **Regional Plan on Sewage Sludge Management**. It applies to the treatment, disposal and use of sewage sludge from Urban Wastewater Treatment Plants. Its objective is to ensure effective reuse of beneficial substances and exploitation of energy potential of sewage sludge, while preventing harmful effects on human health and the environment.
- **The Updated Regional Plan on Marine Litter Management in the Mediterranean.** The updated version of the Regional Plan further expands the provision of the version adopted in 2013, to include a number of additional elements, i.e., new definitions, expanded scope of measures in 4 principal areas (economic instruments, circular economy of plastics, land-based and sea-based sources of marine litter), and amendments targets for plastic waste and microplastics.
- The under development **Regional Plans on (a) Agriculture, (b) Aquaculture, and (c) Storm Water, Management in the Mediterranean,** which are expected to be approved by COP23 in December 2023.
- **The Common Regional Framework for Integrated Coastal Zone Management**. It provided the Methodological Guidance for Reaching Good Environmental Status (GES) through ICZM. Its objective is to support the implementation of the EcAp in a coordinated and integrated manner so to take all EOs and their GES into account through the implementation of the ICZM Protocol and other Protocols and related key documents.
- Following the emerging need to introduce MSP in the entire Mediterranean Region and to provide a planning tool to assist achieving GES of marine environment, the COP 20 (17-20 December 2017, Tirana, Albania) adopted the **Conceptual Framework for Marine Spatial Planning** as a guiding document to facilitate the introduction of this management tool into the Barcelona Convention framework, with the aim to further support achieving Good

[12] In particular the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs), the UN Decade on Ecosystem Restoration, the UN Decade of Ocean Science for Sustainable Development and the UNEP's Medium-Term Strategy 2022-2025, approved at UNEA-5 in February 2021.

Environmental Status (GES) of the Mediterranean Sea and Coasts; investigate in more details connections between land and sea areas; and propose coherent and sustainable land and sea-use planning frameworks relating with key economic sectors and activities that may affect the coastal and marine resources.

- In order to provide best assistance to the CPs for the implementation of Marine Spatial Planning a **MSP Workspace** has been prepared and training provided for the region's planners and other MSP practitioners who can access information and tools, and share knowledge, news and insight on MSP. https://msp.iczmplatform.org/
- The **Post-2020 SAPBIO**[13] and the **Post-2020 Regional MCPAs and EOCMs Strategy**[14], both adopted in 2021 as action-oriented policies for the preservation of the marine and Coastal Biodiversity that contribute to achieve the respective targets of the Sustainable Development Goals and the CBD Post-2020 Global Biodiversity Framework, through the optic of the Mediterranean context.
- The **Mediterranean Strategy for the Prevention of, Preparedness, and Response to Marine Pollution from Ships** (2022-2031). Adopted in 2021 to enhance the implementation of the Protocol concerning Cooperation in Preventing Pollution from Ships and, in Cases of Emergency, Combating Pollution of the Mediterranean Sea. It sets seven Common Strategic Objectives addressing key ships related environmental issues (pollution, climate change, air emission, marine litter (plastic and), Nin-Indigenous Species, designation of special areas, emerging issues related to pollution from ships in the Mediterranean). Its implementation is supported by an Action Plan made of 190 specific actions expected to be implemented in the next ten years.
- The **Strategic Action Programme to address pollution from land-based activities** (SAP-MED) adopted in 1997 as a long-term policy (2000-2025) focused on combatting pollution from land-based sources and activities and their impact on marine and coastal environment. Its objective is to improve the quality of the marine environment of the Mediterranean through facilitating the implementation by the Contracting Parties of the LBS Protocol and promoting shared-management of the land-based pollution. The SAP-MED was designed to assist Parties in taking actions individually or jointly within their respective policies, priorities and resources, which will lead to the prevention, reduction, control and/or elimination of the degradation of the marine environment, as well as to its recovery from the impacts of land-based activities.
- The **Ballast Water Management Strategy for the Mediterranean Sea** (2022-2027) adopted in 2021 updates a first strategy in 2012. The overall objectives of this Strategy are to: (i) establish a framework for a regional harmonised approach in the Mediterranean on ships' ballast water control and management which is consistent with the requirements and standards of the Ballast Water Management Convention; (ii) initiate some preliminary activities related to the management of ships' biofouling in the Mediterranean region; and (iii) contribute to the achievement of GES with respect to NIS as defined in IMAP.
- The **Regional Action Plan on Sustainable Consumption and Production in the Mediterranean** adopted in 2016 as a substantive contribution by the Mediterranean Region to the implementation of the 2030 Agenda for Sustainable Development. It defines common objectives and identifies actions guiding the implementation of the sustainable consumption and production at the national level, addressing, as appropriate, key human activities which have a particular impact on the marine and coastal environment and related transversal and cross-cutting issues.

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[13] The Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region (Post-2020 SAPBIO). It was adopted in 2021

[14] The Post-2020 Regional Strategy for marine and coastal protected areas and other effective area-based conservation measures in the Mediterranean

201. The UNEP/MAP efforts for the preservation of the Mediterranean Sea and Coast are a contribution from the region to achieve global objectives in relation to the marine environment. In addition to providing a regional contribution to achieve the relevant Sustainable Develop Goals, the action of UNEP/MAP is harmonised with the following global processes since 2017:

- UN Decade on Ecosystem restoration (2021-2030).
- UN Decade of Ocean Science for Sustainable Development (2021-2030).
- UNEP Regional Seas Strategic Directions 2022-2025.
- The Ecosystem Approach: Towards a practical application across Regional Seas Conventions and Action Plans.
- UNEP Marine and Coastal Strategy 2020-2030.
- Post-2020 global biodiversity framework (CBD).
- United Nations Environment Assembly: UNEA-3 (December 2017), UNEA-4 (March 2019), UNEA-5 (February 2021).
- The relevant Decisions of UNFCCC COP 27 (Sharm el-Sheikh from 6 to 20 November 2022).
- The Intergovernmental Negotiating Committee (INC) mandated to develop legally binding global treaty to control plastic pollution.

202. In addition to the measures undertaken within the framework of the UNEP/MAP, the conservation of the Mediterranean Sea and Coast benefited from measures adopted as part of European Union policies of relevance for the Mediterranean marine and coastal environment. These included in particular:

- The EU Sustainable blue economy, new approach.
- The EU Biodiversity strategy for 2030.
- The EU Nature restoration Law proposal.
- The EU Circular economy action plan.
- The EU MSP Directive and implementation.
- The EU Green Deal for the Climate neutrality.
- The EU Marine Strategy Framework Directive.
- The EU Plastics Strategy.
- The EU Single-use Plastic Directive.
- The EU Green Deal Policy Framework.
- The EU Waste Framework Directive.
- The EU Revised Port Reception Facilities Directive.