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Mediterranean Action Plan
Barcelona Convention

SPA / RAC

POST-2020 SAP BIO

EGYPT
CONSERVATION OF MEDITERRANEAN MARINE AND COASTAL BIODIVERSITY BY 2030 AND BEYOND

United Nations Environment Programme
Mediterranean Action Plan
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The original version of this document was prepared for the Specially Protected Areas Regional Activity Centre (SPA/RAC) in the framework of the Post-2020 SAPBIO elaboration by Prof. Moustafa M. Fouda as National consultant for Egypt, supervised by Mr. Mohamed S. Abdelwarith Focal Point for SPAs.

For bibliographic purposes, this document may be cited as
UNEP/MAP-SPA/RAC, 2021. Egypt. Conservation of Mediterranean marine and coastal biodiversity by 2030 and beyond. By M. M. Fouda. Ed. SPA/RAC, Tunis: 119 pp + Annexes.

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This publication has been prepared with the financial support of the MAVA foundation

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EGYPT
CONSERVATION OF MEDITERRANEAN MARINE AND COASTAL BIODIVERSITY BY 2030 AND BEYOND

Ecological Status, Pressures, Impacts, their Drivers and Priority Response Fields

POST-2020 SAPBIO

Strategic Action Programme
for the **Conservation** of **Biodiversity**
and **Sustainable Management**
of **Natural Resources**
in the **Mediterranean Region**

List of Acronyms

ABNJ	Areas Beyond National Jurisdiction
CPUE	Catch Per Unit of Effort
DSC	Differential Scanning Calorimetry
EcAp	Ecosystem Approach
EEZ	Economic Exclusive Zones
EIA	Environmental Impact Assessment
EO	Ecological Objective
GAFRD	General Authority for Fish Resources Development
GBF	Global Biodiversity Framework
GEF	Global Environment Facility
GES	Good Environmental Status
IMAP	Integrated Monitoring and Assessment Programme
IMO	International Maritime Organization
LPUE	Landing Per Unit of Effort
LOA	Length Over All
MCIT	Egyptian Ministry of Communications and Information Technology
MPs	Microplastics
NAPs	National Action Plans
NIOF	National Institute of Oceanography and Fisheries
NIS	Non-Indigenous Species
OACMs	Other Areas-Based Conservation Measures
SEIA	Strategic Environmental Impact assessment
SMART	Specific, Measurable, Accepted, Relevant, Time bound
UNCLOS	United Nations Convention on the Law of the Sea
VMS	Vessel Monitoring System

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List of Maps & Figures

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Executive Summary

Bacelona Convention COP 21 requested to prapre in 2020-2021 the `Post 2020 Strategic Action Programme for the conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region` (Post-2020 SAP BIO), aligned with the SDGs, and harmonised with the Post CBD-2020 Global Biodiversity Framework (GBF) through the optic of the Mediterranean context.The request was based mainly on the recommendations of the evaluation of the implementation of the SAPBIO during the period 2004-2018. SPA/RAC shall (i) carry out a bottom up participatory process at the national level to identify their *needs* and *priorities*, (ii) identify the subregional priorities and orientations based on the diagnosis made at the national level, (iii) develop the draft document of the Post-2020 SAP BIO, and drive the process of its adoption in late 2021.

The present report is the proposed national contribution of Egypt towards SAP BIO elabortion of 2020-2021. National analysis of marine and coastal biodiversity situation was made and involved national institutions and the relevant stakeholders consultation. The purpose is identify clear and realistic *objectives and priority actions* needed to acheive the objectives, aligned with SDGs and Post-2020 GBF, and supported by the Integrated Monitoring and Assessment Programme (IMAP). In addition, it promotes *mainstreaming of biodiversity* in all relevant environmental policies as well as for the sustainable use of marine resources.

This report is prepared in accordance with SPA/RAC request that include sections on: Marine and coastal status; Pressures and impacts; Current response measures; Assessment of marine and coastal status; Pressures and impacts; Assessment of national priority needs and response action; Funding problems and opportunities; and Conclusions and recommendations. In addition, a special section was added on the contribution of Egypt's contribution to the visions, goals and indicators of the draft Post-2020 GBF and the Barcelona Convention (UNEP / MAP) and NBSAP.

Our present state of knowledge of the biodiversity of Egypt is reasonably adequate. Species lists covering most animal and plant groups are available. Numerous publications covering taxonomic, distributional and ecological aspects of the biodiversity of the country are well documented. However, the levels of available information vary considerably among taxonomic groups, geographical areas and types of habitat. Therefore, our information on biodiversity of the Mediterranean marine environment is less than complete. Considerable information on marine habitats and biota is also available, but these data are far from being geographically comprehensive.

Systematic lists of phytoplankton as well as a number of studies of seasonal variations have shown phytoplanktons are represented by at least 661 species. A general character

of the phytoplankton population is the high species diversity and the comparatively small number of individuals of each species; a character which classifies the region among oligotrophic environments.

The composition, distribution and seasonal variations of zooplankton populations have been thoroughly investigated. Copepods represent the most abundant zooplankton element, consisting of more than 200 species. Copepods and Tintinnids were the most dominant zooplankton. However, the abundance of copepod was higher than that previously found in the coastal waters of the same area; this may be due to the fact that the coastal zone suffers from the human activities. Zooplankton also include large proportion of Indo-Pacific and other circumtropical species which have successfully settled and proliferated in this environment due to lessepsian migration. Many studies have shown similar patterns of temporal and spatial differences and introduction of many zooplankton species from various sources.

Macro benthic fauna include many phyla, where Annelida, Mollusca and Echinodermata are most abundant. Arthropoda, Brachiopoda, Ascidians, Nemertini and Sipunculida are much less abundant. Brachiopoda are only restricted to offshore waters. The structure of the macrobenthic community is greatly influenced by depth. In the inshore zone (10 to 50m depth parallel to the coastline), macrobenthic fauna is numerically dominated by molluscs, echinoderms, and polychaetes. In the offshore zones that extend to a depth ranging between 50 and 100m, macrobenthic fauna is dominated by polychaetes, mollusks and echinoderms. The remaining macrobenthic phyla are mostly restricted to deeper, off shore waters. Diversity for microbes is substantially underestimated, and the deep-sea are still poorly known. In addition, the introduction of alien species is a crucial factor that will continue to change the biodiversity of the Mediterranean, due to the warming of the Mediterranean Sea.

Of the 11 cetacean species represented by populations regularly occurring in the Mediterranean Sea, only eight species are regularly occurring in the coastal and pelagic waters. Recent observations confirmed the presence of marine mammals in many parts of the Egyptian waters, indicating marine mammals are either resident or migrating in the Egyptian Mediterranean Sea.

Marine turtles are represented by 3 endangered species: Loggerhead *Caretta caretta*, Green *Chelonia mydas* and Leatherback *Dermochelys coriaca*. While the loggerhead remains relatively abundant, it seems to have almost deserted in the western northern coast. Nesting sites for both species exist along the Sinai coast in Zaranik Protected area. The leatherback and green turtles are becoming increasingly rare except for Bardawil where recent changes led to growth in their numbers, perhaps because of the increase of their favorite food (shrimps and crabs). Additionally, the Bardawil Lake has become an attractive wintering ground for turtles due to the closed fishing season (January – April).

The 25 bird species in SPA/RAC Annex are present, some are common such as pied kingfisher, slender-billed Gull and little term; others are rare such as Mediterranean shag, and still some very rare such as Scopoli`s Shearwater, and Yelkouan Shearwater. However, very little is known about their geographical distribution, ecology, and reproductive biology. The Mediterranean Sea has seen successive waves of introductions. Its biota consists on a mosaic of formally alien species of different biogeography affinities, reflecting its eventual geological history. Non-Indigenous Species (NIS) continues to be a major threat to the coastal, marine ecosystems and species in Egypt. Several attempts have been made to record different taxonomic groups of NIS, however, most of them did not apply or acknowledge the appropriate international criteria used to evaluate them. Available information about NIS in Egypt is still insufficient and exerted efforts are still limited. Three major works on NIS have been completed in Egypt during the last 6 years: preparing a national action plan for marine alien invasive species in the Mediterranean Sea, a survey of 2 years on alien invasive species in the Gulf of Suez and the eastern Mediterranean, and engineering work of diverting the agricultural drainage water and freshwater sources from better lakes into Sinai via a tunnel under the Suez Canal. In addition, several interesting works on the biology and ecology of NIS were published recently. Many publications are available on new records and distribution of NIS in Egypt.

Fishery is one of the socio-economic activities practice in the coastal zone of Egyptian Mediterranean coat. Capture fisheries are important for local coastal communities, providing employment opportunities and a major pillar in food security and economic-social development. The landed fish catch at 2018 was about 57000 tones (declined by about 30 %) caught by about 15000 fishermen used 4100 fishing vessels with different size and engine power. Several fishing gears and methods are used to catch demersal or pelagic fish from different ecosystem types and water depths (up to -1000m) along the Egyptian coast. Many of immigrant Indo-Pacific species are playing important role in raising fish production after the depletion or overfishing of some endemic fish stock which revealed the need for management plan for these resources. Cartilaginous fishes represent about 2.5 % of the fish catch, and their diversity has declined in recent years. Available information on discarded fish is very limited. However, aquaculture (freshwater, brackish and marine) has progressed significantly during the last 3 decades and currently contributes more than 80 % of all fish in Egypt. Extensive and semi intensive marine aquaculture share about 10 % of all cultured fish (about 150 000 tones). Impacts of aquaculture are within the permissible level, with minimum effects on the marine biodiversity.

Available information on important marine habitats representing shallow (muddy, sandy and rocky) and deep areas (Nile Delta Fan) are provided. One of the typical marine ecosystem along the Egyptian Mediterranean Sea is the *Posidonia oceanica* ecosystem, which form large meadows in the infra littoral zone. Along the western part are the sea grass that predominate, along with patches of *Zostra*. Belts of the sea grass *Posidonia oceanica* along with strands of the brown algae *Sargassum spp.* And patches of the green algae *Caulerpa prolifera* occur in the inshore water of that part of the Egyptian coast. The green algae *Caulepra, Codium, Halimeda* and *Udotea* also occur in that area. Other species of *Padina* and *Halimeda* are quite rare.

Red algae, particularly calcareous species of *Lithothamnion* and *Lithophyllum* frequently occur in the offshore waters. Other less abundant red algae species include the genera *Grateloupia, Vidalia, Gigartina, Peyssonnelia, Botryocladia* and *Opuntiella.* Algal growth generally increases during spring and summer. Information of the coralligenous habitats and also deep sea habitats are almost lacking.

The main transboundary issues are: fishing, marine aquaculture, Non-Indigenous Species, maritime transport, cruising, pleasure boating, coastal tourism, energy production, marine

aggregates extraction , offshore oil and gas industry, and sub-marine telecommunication and electric cables. A number of recommendations are proposed to mitigate and eventually avoid the negative impacts of economic activities on the marine environment, local communities and the country as a whole. Those include ensuring the integration of environmental as well as social considerations in economic activities, and the adoption of sustainable practices and measures in many economic sectors.

The main gaps needed for scientifically sound based conservation are; interactive information system on the Egyptian coastal and marine ecosystem; Integrated Monitoring and Assessment Program (IMAP), Effective Protected Areas; Mainstreaming of marine biodiversity into all development sectors; Stakeholder Engagement; Institutional Reform of Nature Conservation Sector; Paradigm Shift in Scientific Research; Revising the Current NBSAP; and Financial, Technical and Human Resources.

Negative impacts include: tourism, over-exploitation beyond sustainable limits, Non-Indigenous Species (NIS), maritime activities, chemical contamination, coastal development and sprawl, eutrophication, changed hydrographic conditions, status of biodiversity, sea-floor integrity, and marine noise. The impacts of these activities resulted in increased air and sea pollution, pressure on the ecosystem, degradation of biodiversity and local habitats. This is mainly attributed to unsustainable physical development along the coast associated with many activities.

Important vulnerable ecosystems are: Posidonia meadows, Coralline algae habitats, Depleted fisheries in all Egyptian Mediterranean Sea, Coastal lagoons connected to the sea (where fish fries are caught for aquaculture purposes), Deep sea ecosystem particularly Nile Delta Fan, seabird, marine mammals and marine turtles habitats, and, hypersaline coastal habitats such as Bardawil Lake, important coastal habitats exposed to erosion, and human Urbanization (salt marshes, sandy, rocky and muddy beaches, and sand dunes).

One of the most important emerging issues is the impact of climate change where the Mediterranean is one of the regions most sensitive to climate. Climate change and sea level rise threaten low lying areas, biodiversity and vulnerable ecosystems causing degradation, and fragmentation. A warming trend of about 1.6°C and a rise in the frequency of extreme events are provided by scientific institutions. So far, none establishment of a model tries to assess Mediterranean Biodiversity. A debate still exists on the possible adaptation measures to restrict the negative impacts by reducing the ecosystem‘s vulnerability, and to exploit the positive aspects or opportunities in the best possible way. Other emerging issues that need to be considered are the recent activities in the EEZ: nature based solution; marine spatial planning; and technological advancement (geoengeering, synthatic biology). Ongoing project "Enhancing Climate Change Adaptation in the North Coast of Egypt" funded by GCF, aims to protect densely populated low-lying lands in the Nile Delta, which have been identified as highly vulnerable To climate change and sea level rise. The project is being implemented by the Ministry of Water Resources and Irrigation with a total budget of US$ 31.4 million over seven years.

The coastal and marine protected areas along the Egyptian Mediterranean Sea (Salloum, Omayed, Brullus, Ashton El Gamil, and Zaranik) have not received enough financial and technical support to improve their performance, except those provided by SPA/RAC and ACCOBAMS on certain issues such as marine mammals action plan and survey, management plan, socioeconomics, and communication strategy of El Salloum MPA, marine turtles survey, capacity building and awareness campaign, action plan for marine vegetations, Egypt's national action plan for the Mediterranean Non- Indigenous Species, and national monitoring program for biodiversity and non-indigenous species in Egypt. However, the existing MPAs are not well representing the different marine ecosystems. In addition, local communities need to be developed for better and good governance of MPAs. Emphasis be focused on the role of women and NGOs. More protected areas need to be declared, developed and well-managed with emphasis on the marine environment, fisheries and ecotourism.

Thus, critical problems still exist, including inability to retain trained staff, under funding, lost opportunities to generate substantial revenues, and adapt to and manage rapid and multi faced systems, complexity and changes. Proposed correction actions include transform from bureaucratic management culture to objective-oriented performance culture; from centralized planning and budgetary to develop financially and technically; from personalized (ad-hoc) decision making to decisions guided by policy and regulations; and from financial dependent to financially self-sustaining.

National Institutions / organizations responsible for coastal and marine ecosystems along the Egyptian Mediterranean Sea include Ministries of Environment, Agriculture and Land Reclamation, Transport, Coastal Governorates, Universities and research centers (National Institute of Oceanography and Fisheries). Defense, Interior, Health, Water Resources and Irrigation, The Bibliotheca Alexandrina, Justice, Arab Academy for Marine Transport, NGO’s, Diving Centers, Fisheries Cooperatives, and many others. The main legislation include the Egyptian Constitution (2014), law 102/1983 for Protectorates, law 4/1994 amended in 2009 for Environmental Protection, 124/ 1983 Fisheries law, Law 48/1983 for Protection of Water Bodies, amended in 2019, and international and regional conventions.

Major threats to marine ecosystems are unsustainable economic activities e.g. unregulated tourism, exploitation of marine resources, overfishing and fishing in illegal areas (e.g. breeding grounds), coastal pollution, oil spills from maritime activities and accidents, pesticides and chemical fertilizers used in agricultural activities, and aquaculture activities. At present, 20% of Egyptians live in coastal areas, which are also visited annually by millions of tourists. In addition, more than 40% of industrial activity occurs in the coastal zone. Enhanced visual counting technique coupled with combustion analysis and differential scanning calorimetry (DSC) was applied to assess microplastics (MPs) contamination in fish digestive tracts from Eastern Harbor, Egypt, to provide a simple and economic method for MPs assessment. This was the first study in Egypt to quantify MPs in fish. Plastic particles were detected in all fish samples, represented by seven thermoplastic polymers. The average number of MPs was at its highest level in *Siganus rivulatus*, *Diplodus sargus*, and *Sardinella aurita* (7527, 3593, and 1450MPs

fish^{-1}, resp.) and the lowest in *Sphyraena viridensis* and *Atherina boyeri* (46 and 28MPs fish^{-1}, respectively). The average weight of MPs as measured by combustion ranged from 302mg kg^{-1} in S. rivulatus to 2mg kg^{-1} in *Terapon puta*. In compliance with IMAP metadata for monitoring and assessment of marine litter indicators, a national programme for "regular monitoring and assessment of marine litter in the Northern beaches of Egypt" was prepared by EEAA.

Global Biodiversity Outlook 5 (CBD, 2020) made it clear that Aichi Biodiversity targets are not yet, fully achieved, though 6 targets have been partially achieved (Targets 9, 11, 16, 17, 19 and 20). This, in turn, will threaten the achievement of Sustainable Development Goals. The COVID 19 Pandemic has further highlighted the importance of the relationship between people and nature.

Biodiversity impacts of climate change include shifts in species distribution and range, and the impacts of mitigation activities and facilitates the spread and establishment of many alien species and creates new opportunities for them to become invasive. There is also concern that existing protected area networks may not be adequate for biodiversity conservation in a time of changing climate. Moreover, the Mediterranean Sea is becoming warmer; its salinity is increasing, and the rise in sea level is accelerating. In addition, the increase of precipitation levels, extreme events and sea acidity are witnessed recently. The Nile Delta is considered one of the most vulnerable sites due to climate change impacts.

One of the major difficulties facing the management and conservation of marine-biodiversity in the Egyptian Mediterranean Sea is the lack of detailed, geographically comprehensive database. In addition, information available on marine species, habitats and ecosystems are not consistent, perhaps due to unclear spatial and temporal patterns. Meanwhile, human activities in the coastal and marine environment have made considerable changes leading to depletion of fish stocks, pollution in all different forms (oil pollution, debris, plastics, noise), fragmentation of habitats, increase of number of invasive species, and the possible impacts of climate change.

Therefore, a detailed, geographically comprehensive database on marine habitats, ecosystems and biota is required to develop a sound management plan for marine biodiversity. This will require field surveys on marine biodiversity to gather information on the geographical distribution, status, and exploitation levels of marine habitats, ecosystems and species. The collected data will be assessed into a GIS database, which will be accessible to biodiversity managers and decision makers. Targets include: 1) establish a marine database on the basis of recent, geographically comprehensive field-collected data; 2) develop and implement an integrated marine biodiversity management plan; and 3) develop economic valuation methodologies for ecosystem services of coastal ecosystems.

Although many institutions hold knowledge on marine biodiversity, decision makers have difficulties to find the type of answers they need. This situation can be challenged by representing a one-entry for questions and collecting all available knowledge in the best possible manner (depending on means and timeframe). The network will integrate available knowledge and process it in a sound and reliable way to provide answers to decision makers in a format that they can readily use. Thus, creating better links between knowledge holders and users will bring significant changes to the way short and long-term impact on marine biodiversity changes are tackled.

The following are the main gaps needed for scientifically sound based conservation. These are; Interactive information system on the Egyptian coastal and marine ecosystem; Integrated Monitoring and Assessment Programme (IMAP), Effective Protected Areas; Mainstreaming of marine biodiversity into all development sectors; Stakeholder Engagement; Institutional Reform of Nature Conservation Sector; Paradigm Shift in Scientific Research; Revising the Current NBSAP; and Financial, Technical and Human Resources.

Priorities include: Effective MPAs management and declaration of more MPAs, integrated monitoring and assessment, NIS, climate change, sustainable fisheries, mainstreaming of biodiversity in all relevant sectors, tourism, ICZM, public awareness, Strategic EIA, and law enforcement and more legislation.

Financial resource mobilization for biodiversity conservation in Egypt is lagging behind due to the huge funding gaps. Reasons for such wide gaps are not only insufficient finance, but also ineffective institutional entity and limited effective partnerships. There are needs for innovative financing mechanisms, focusing on the direction and scale of investment flow with the support for all partners at national, regional, and international level.

Eight opportunities to fulfill this gap are identified based on priorities for Egypt's NBSAP (2015-2030). These are increase domestic funding, increase revenue for protected areas, enhance partnership, harmonize direct and indirect biodiversity expenditures, institutional reform, enhancing efficiency in expenditures, reduce future needs, and incentives reform. It is concluded that establishing partnerships are the most successful tool that has been utilized during the last five years. It is recommended that efforts must be mobilized to increase spending on biodiversity, diversify and increase protected areas revenue, coordinate efforts with other biodiversity related institutions and establish the Nature Conservation Authority.

Egypt's contribution to the visions, goals and indicators of the draft Post-2020 GBF and the Barcelona Convention (UNEP / MAP) is based on:

- Global visions, goals and targets (only coastal and marine).
- SDGs indicators
- UNEP / MAP / IMAP (ecological objectives and indicators)
- Egypt's NBSAP (only indicators related to the coastal and marine environment of the Mediterranean sea

Emphasis is given to the national analysis of the coastal and marine ecosystem (status, pressures, threats, impacts and conservation efforts). It identifies gaps, objectives and priorities.

Proposed national Post-2020 SAP Bio Vision is "By *2030 coastal and marine biodiversity in Egypt is valued, mainstreamed, maintained for the good livelihoods and conserved for the sustainable use of future generations*".

Proposed national Post-2020 SAP Bio Mission is "*Egypt takes effective and innovative actions to reduce the loss of biodiversity to ensure that by 2030 marine ecosystems continue to provide their services to all Egyptian and also ensure pressures on biodiversity are reduced; biological resources are sustainably used and benefits arising out of utilization of genetic resources are shared in a fair and equitable manner; biodiversity issues and values mainstreamed and appropriate policies are effectively implemented in a participatory approach*."

Regarding the objectives and priorities fror Egyptian Post-2020, we propose efforts be made in the next negotiation meetings to include oceans and seas as separate goals, targets and indicators. The global 2030 targets be in line with Regional Sea Programmes (e.g. UNEP / MAP) commitments. These should clearly address the drivers of biodiversity loss and be specific, measurable, actionable, relevant and time-bound.

For Egypt, IMAP is mostly appropriate and valid in terms of GES, ecological objectives and indicators that deal with coastal and marine ecosystems (biodiversity, and NIS) and pollution. Responses indicators include many elements that reflect global, regional and national needs. Out of the 11ecological objectives of GES, the following are the most relevant ones for Egypt: 1, 2, 3, 5, 9, and 11.

A total of 121 marine and coastal indicators from the global goals and targets of the draft Post-2020 GBF, SDG, UNEP / MAP / IMAP and NBSAP were thoroughly investigated. To reduce the total numbers of indicators, a comparison of indicators from all sources were made, and the shared ones were put into one national indicator to suit the national requirements and capacities. A total of 26 national indicators are proposed and can be implemented as baseline data is mostly available at national, regional and global levels.

1.

Introduction

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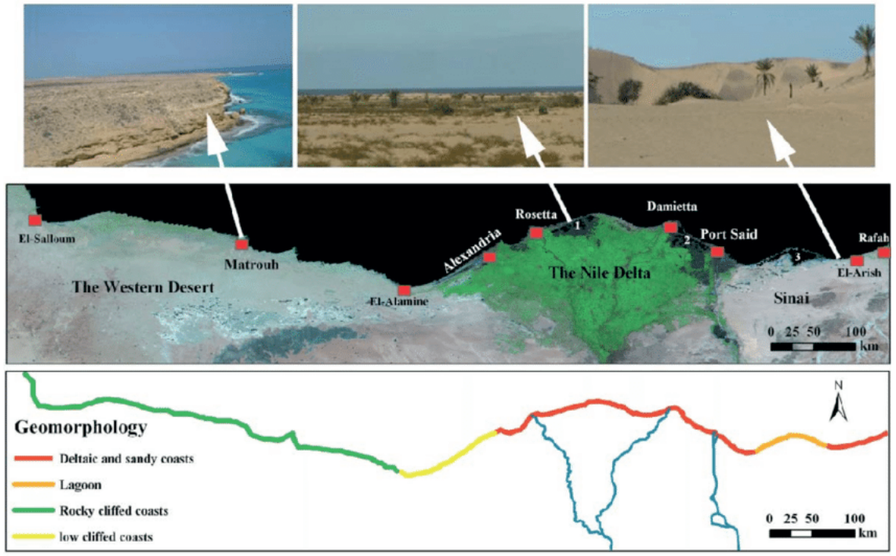
The Mediterranean Sea coast of Egypt extends for about 950 km from Rafah in the east (Sinai–Gaza border), to Salloum in the west (Egyptian–Libyan border) with six coastal lagoons connected to the coast (Maruit, Edku, Burullus, Manzala, Port Fouad and Bardawil). Coastal water can be divided into three subregions that have different ecosystem, eastern to Port Said and central off Nile Delta then western of Alexandria city. Continental shelf is wide in the eastern and central regions with flat and muddy or sandy seabed compared to narrow shelf at western region where the substrate is sandy and rocky. The Mediterranean coastal waters exhibit different types of bottom deposits. The sea bottom at the inshore (extending to 50 m depth) varies from coarse sand in the western locations to coarse gavels and mud in the eastern sections. Most of the shore is interrupted with patches of rocky nature. The offshore region (50-100 m depth) shows homogenous type of sediments; frequently silt with different quantities of mud, which decrease towards the west. There are no sharp boundaries, however, between the different zones. The bottom between Alexandria and El Arish is mostly silty sand resulting from the accumulation of the Nile flood sediments.

Map 1

The Egyptian Mediterranean Sea showing EEZ (Red colour)

The large-scale circulation of the Mediterranean consists of sub-basin scale and mesoscale gyres, interconnected and bounded by currents and jets with strong seasonal and inter-annual variability. This general circulation flow strongly influences the local dynamics of currents in coastal regions. Shelf areas are comparatively small and are separated from the deepest regions by steep continental shelf breaks. This allows the intrusion of the large-scale flow field on the coastal/shelf areas, leading to a direct influence of the large-scale currents on the coastal flow. Transport of material from the coastal areas to the open ocean is enhanced by this mechanism with important consequences for the maintenance of the ecological cycles in the basin.

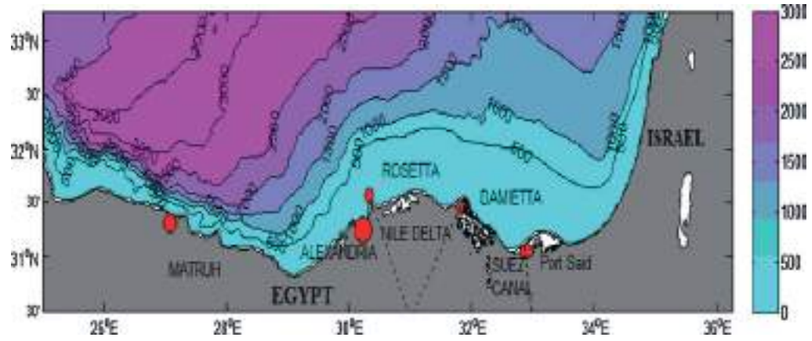


Map 2

The geomorphology of the Mediterranean Sea coast of Egypt. Top: ground photos of the different geomorphologic aspects. Middle: a false colour composite of MODIS image showing the entire coast with the locations of the main towns. Numbers in the satellite image refer to lakes Burullus and Manzala (1 and 2, respectively), and 3 is the Bardawil Lagoon. Bottom: the geomorphological units of the coast.

Coastal sea level variations are mainly due to variations in atmospheric pressure and tides. These variations are generally small in amplitude, being limited to only tens of centimeters. Tidal amplitudes are small, with dominant semi-diurnal components. The narrow continental shelve prevents tidal amplification along the coasts, making these small tidal movements even more difficult to observe at the Egyptian coasts.

Our present state of knowledge of the biodiversity of Egypt is reasonably adequate. Species lists covering most animal and plant groups are available. Numerous publications covering taxonomic, distributional and ecological aspects of the biodiversity of the country are well documented. However, the levels of available information vary considerably among taxonomic groups, geographical areas and types of habitat. Therefore, our information on biodiversity of the Mediterranean marine environment is less than complete. Considerable information on marine habitats and biota is also available, but these data are far from being geographically comprehensive, mostly covering areas around Alexandria, Abu Qir and Arabs Bay. Data covering the rest of the coastline are available such as Salloum Protected areas, and coastal lakes. Furthermore, while species lists are available for most groups, accurate information on the distribution of these species among available habitats along the coast and in deep areas are very limited.



Map 3

The Egyptian Shelf Zone domain and bathymetry with the main Egyptian geographical sites

The biodiversity of the coastal and marine waters of the Egyptian Mediterranean Sea provide valuable services for its people, as well as crucial nursery habitats for marine animals and sanctuaries for endangered species. These resources have traditionally supported livelihood through fisheries, agriculture and trading. Nowadays, the coastal areas are the focus of rapid urban an industrial growth, oil and gas development, industrial-scale, fisheries and tourism. More than 20% of Egypt total population lives on the coasts where available food and raw material are required for economic development. More than 40% of industrial and developmental activities are concentrated on the coastal zone (ports, cities, infrastructure, petroleum and mining activities and tourism). The biodiversity along the Mediterranean coast of Egypt is largely affected by anthropogenic activities, climate changes accompanied by sea-level rise, and introduction of Non Indigenous Species. That may explain that the most issues and actions evaluated for the implementation of SAPBIO (Relevant legislation promulgated during the period 2004-2018; Status of implementation of National Action Plans (NAPs) under SAPBIO; and Assessment of the relevance for the coming years of the priorities identified in the SAPBIO adopted in 2003) are still needed for future work.

Bacelona Convention COP 21 requested to prepare in 2020-2021 the `Post-2020 Strategic Action Programme for the conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region` (Post-2020 SAPBIO), aligned with the SDGs, and harmonised with the CBD-2020 Global Biodiversity Framework (GBF) through the optic of the Mediterranean context. The request was based mainly on the recommendations of the evaluation of the implementation of the SAPBIO during the period 2004-2018 where most of the issues remain valid, hence should be included in the strategic framework for the implemenation of the future SAPBIO. Therefore, SPA/RAC shall (i) carry out a bottom up participatory process at the national level to identify their needs and priorities, (ii) identify the subregional priorities and orientations based on the diagnosis made at the national level, (iii) develop the draft document of the Post-2020 SAP BIO, and drive the process of its adoption in late 2021.

The present report is the proposed national contribution of Egypt towards Post 2020 - SAP BIO elabortion. National analysis of marine and coastal biodiversity situation was made and involved national institutions and the relevant stakeholders consultation. The purpose is to identify clear and realistic objectives and priority actions needed to achieve the objectives, aligned with SDGs and Post-2020 GBF, and supported by the Integrated Monitoring and Assessment Programme (IMAP). In addition, it promotes mainstreaming of biodiversity in all relevant environmental policies as well as for the sustainable use of marine resources.

2.

Marine and coastal ecosystem status

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2.1. Biological characteristics

2.1.1. Description of water column biological communities

Phytoplankton

The southern Mediterranean is poor in the number of phytoplankton species. This is particularly true along the western stretch of the Egyptian coast of the Mediterranean. The coastal waters fronting the Nile Delta are usually more fertile due to the eutrophication effect of the Nile water and land drainage. The density of phytoplankton in the offshore waters is low.

Phytoplankton of the Mediterranean coastal waters of Egypt has been thoroughly investigated. Several systematic lists of phytoplankton as well as a number of studies of seasonal variations in phytoplankton flora have been published. With at least 661 species recorded, this group exhibits high species diversity. A general character of the phytoplankton population is the high species diversity and the comparatively small number of individuals of each species; a character which classifies the region among oligotrophic environments.

This rich phytoplankton consists mostly of diatoms, dinoflagellates, siticoflagellates and to a much lesser extent chlorophytes and cyanophytes. Diatoms constitute 90 to 95% of the phytoplankton biomass and are represented by 409 species belonging to 84 genera. Dinoflagellates comprise about 3.8% of the total phytoplankton and include 247 species and varieties belonging to 38 genera and 20 families. Diatoms density is highest during winter and to a lesser extent autumn months and is minimal in summer. Dinoflagellates, on the other hand, occur throughout the year but reach their maximum abundance during summer. Thus phytoplankton exhibit temporal and spatial differences

phytoplankton community in Alexandria and Rosetta, during 2008-2009 (El-Din *et al*., 2014) consisted of 207 phytoplankton species, but a few only demonstrated active contribution to total standing crop, such as the green algae *Carteria sp.* and marine *Chlorella vulgaris*, the diatoms *Asterionella glacialis*, *Cylindrotheca closterium*, *Melosira granulata*, *Navicula cryptocephala, Pseudo-Nitzschia palea, Pseudo-Nitzschia sigma, Pseudo-Nitzschia delicatissima, Skeletonema costatum*, and the dinoflagellate *Gonyaulax spp.* The species diversity of phytoplankton community was quite high, being the most diversified (117 species) off Rosetta.

A total of 203 phytoplankton species were quantified through the analysis of the 50 samples collected from Matrouh (Gharib *et al*. 2011). Bacillariophyta made up the highest number (61 genera, 120 species), but there was a remarkably low number of Pyrrophyta (22 genera, 52 species). Freshwater Cyanophyta, Chlorophyta and Euglenophyta were represented by 14, 11 and 4 species respectively. Raphydophyta and Silicoflagellates were represented by one species each. The most diverse genus was *Nitzschia* (9 species). Many species (73) of this community were rare, having a frequency of occurrence of 2.00% in all samples, but they were very important because they controlled the levels of species diversity. Bacillariophyta and Pyrrophyta were more abundant both qualitatively (84.73%) and quantitatively (95.41%) than the other taxonomic groups. They were conspicuous as the

two most diverse groups with 59.11 and 25.62% of the total species number respectively. The following species were frequently found during the study period: *Asterionellopsis glacialis* (Castracane) Round, 1990, *Aulacoseira granulata* (Ehrenberg) Simonsen, 1979, *Cocconeis placentula* Ehrenberg, 1838, *Cylindrotheca closterium* (Ehrenberg) Reiman & Lewin, 1964, *Licmophora flabellata* C. Agardh, 1830, *Licmophora lyngbyei* (K¨utzing) Grunow ex Van Heurck, 1867, *Nitzschia microcephala* Grunow in Cleve & M¨oller, 1878, *Nitzschia sigma* (Kützing) W. Smith, 1853, *Pseudonitzschia delicatissima* (P.T. Cleve, 1897) Heiden, 1928, *Alexandrium minutum* Halim, 1960, *Gonyaulax apiculata* (P´enard, 1891) Entz, 1904, *Protoperidinium minutum* (Kofoid, 1907) Loeblich III, 1970, *Scrippsiella trochoidea* (Stein) Balech ex Loeblich III, 1965 and Chlorella marina Butcher R.W., 1952.

Zooplankton

The composition, distribution and seasonal variations of zooplankton populations along the Egyptian Mediterranean coast have been thoroughly investigated. The subclass copepod represents the most abundant zooplankton element, consisting of 184 species in 70 genera and 35 families, forming about 82% of the total zooplankton. Copepod larvae are also quite abundant, forming about 45% of the total copepoda. Copepod density is particularly high in near shore waters, especially during autumn months, the genera *Paracalanus, Oithona, Euterpina, Clausocalanus, Cerycoeus, Microstella, Oncoea,* and *Calocalanus* are most abundant among all copepods. *Acartia, Candacia, Centropages, Euchaeta, Pleuromamma,* and *Temora* are much less frequent. It should be noted, however, that the standing crop of the copepods off the Egyptian Mediterranean coast has declined progressively since the construction of the Aswan High Dam. The standing crop recorded in 1984 was almost 1/3 of that recorded in 1963.

Planktonic protozoa constitute about 3.9% by number of the total near shore zooplankton and include many species of the groups Tintinnids, Radiolaria, Acantharia and Foraminifera. Family Tintinnidea dominates protozoan families, with the genera *Favella, Tintinnopsis, Codenellopsis, Halicostomella* and *Coxiella* being the most dominants. Foraminifera are relatively rare and are represented by six holoplanktonic species belonging to five genera and three families, with *Giobigerina spp.* being the most numerous. While protozoa are most abundant during spring, foraminifera attain their maximum abundance in the autumn. Appendicularia is represented by the two Urocordata genera *Oikopleura* (eight species) *Firitillaria* (seven species). A total of 25 Siphonophores species, 23 Hydromedusae species and eight species of Scyphomedusae have been recorded from the Egyptian Mediterranean waters. Planktonic larvae include larval stages of Polychaeta, Cerripedia, Echinodermata and Decapoda.

Herbivorous zooplankton include copepods, salps and appendiculariae, while carnivorous plankton is represented by gelatinous organisms, such as medusae, ctenariae, siphonophores, chaetognates, crustaceans and very small pelagic fishes.

The abundance, distribution and diversity of epipelagic copepods were studied along the north-west Egyptian Mediterranean Coast during April, August, 2008, February, 2009 and 2010 (Zakaria *et al*. 2016). Copepoda was the most dominant zooplankton group in the study area, representing 74.14% of the total zooplankton counts. A total of 118 copepod species belonging to 50 genera, 29 families and 4 orders were identified. Among them, 65 calanoids, 46 cyclopoids, 6 harpacticoids and one siphonostomatoid species were recorded. Calanoids represented 54.55% of the total adult copepod counts, while cyclopoids, harpacticoids, poecilostomatoids and siphonostomatoid represented 40.52%, 4.83%, and 0.1% respectively. Among the copepod species recorded, 41 species were recorded in the Egyptian Mediterranean waters for the first time; *Calanus helgolandicus, Cosmocalanus darwinii, Neocalanus plumchrus, Subeucalanus subcrassus, Acrocalanus gibber, Clausocalanus ingens, Aetideus armatus, Aetideus bradyi, Euchaeta media, Centropages abdominalis, Centropages bradyi, Centropages elongatus, Centropages tenuiremis, Temora discaudata, Temora turbinata, Lucicutia longicornis, Pleuromamma borealis, Pleuromamma piseki, Candacia bipinnata, Candacia bradyi, Candacia curta, Candacia truncata, Dioithona rigida*, *Oithona fallax, Oithona robusta, Oithona tenuis, Ratania flava, Oncaea atlantica, Oncaea lacinia, Spinoncaea ivlevi, Copilia longistylis, Sapphirina stellata, Corycaeus crassiusculus, Corycaeus lautus, Ditrichocorycaeus affinis, Ditrichocorycaeus andrewsi, Ditrichocorycaeus asiaticus, Onychocorycaeus catus, Farranula concinna, Farranula curta* and *Farranula gracilis.* Of them 12 species are new records in the Mediterranean Sea, namely *Neocalanus plumchrus, Clausocalanus ingens, Aetideus bradyi, Centropages abdominalis, Centropages tenuiremis, Temora turbinata, Candacia bradyi, Oncaea lacinia, Copilia longistylis, Ditrichocorycaeus affinis, Ditrichocorycaeus asiaticus* and *Farranula concinna*. Fifteen species dominated the copepod population. These were; *Oithona nana*, *Calocalanus pavo*, *Nannocalanus minor*, *Clausocalanus arcuicornis, Paracalanus parvus, Oithona plumifera*, *Oithona similis Subeucalanus crassus*, *Acartia negligens*, *Microsetella norvegica*, *Farranula rostrata, Oncaea mediterranea, Acartia clausi*, *Temora stylifera* and *Clausocalanus pergens.*

On the other hand, the biodiversity of zooplankton community at the continental edge has shown a different pattern (Farrag *et al*., 2019). A total of 304 taxa of zooplankton were recorded comprised 12 phyla. The main dominant phyla were Arthropoda (including Copepoda, Cladocera, Amphipoda, Ostracoda, Decapoda, Malacostraca, Mysidacea, Isopods, larvae of Cirripedia, and Insecta and Crustacean eggs). Ciliophora was represented by Tintinnida; Chordata, which were found in four classes (Appendicularia, Ascidiacea, Thaliacea, and Actinopteri which includes fish eggs and larvae); Cnidaria; Foraminifera; and Radiozoa (Radiolaria). Copepoda was the main abundant group (71.59% of the total zooplankton counts); it was represented by 121 species and immature forms (nubilius larvae and copepodite stages). Tintinnida was the second most abundant group (9.38%, 89 species) with, followed by Cladocera which represented 6.46% of the total zooplankton counts. The most diversified season was the winter (175 species), followed by the autumn (161 species) and the spring (118 species), while the summer was the poorest diversified season (85 species). On the other hand, the highest average abundance (2419.4 ind./m^3) was recorded during the spring season, followed by the autumn (average, 1892.9 ind./m^3), the winter (average, 1892.9 ind./m^3), and the summer season has been ranked as the lowest one in abundance with an average of 1149.9 ind./ m^3.

Zakaria (2015) studied the composition of zooplankton in the eastern Mediterranean and has been shown to include a large proportion of Indo-Pacific and other circumtropical species which have successfully settled and proliferated in this environment due to lessepsian migration. Copepods and tintinnids were the most dominant zooplankton. However, the abundance of copepod was higher than that previously found in the coastal waters of the same area; this may be due to the fact that the coastal zone suffers from the human activities. Many studies have shown similar patterns of temporal and spatial differences and introduction of many zooplankton species from various sources.

2.1.2. Invertebrate bottom fauna macro-algae and angiosperms

Macrobenthic fauna in the Mediterranean coastal waters of Egypt include 8 phyla. Among these, Annelida, Mollusca and Echinodermata are the most abundant. Anthropoda, Brachiopoda, Ascidians, Nemertini and Sipunculida are much less abundant. Brachiopoda are only restricted to offshore waters.

The structure of the macrobenthic community is greatly influenced by depth. In the inshore zone (10 to 50m depth parallel to the coastline), macrobenthic fauna is numerically dominated by mollusca (30.5%), echinoderms (29.9%) and polychaetes (22.5%). In the offshore zones extend to a depth ranging between 50 and 100m, macrobenthic fauna is dominated by polychaetes (41%), mollusca (21.1%) and echinoderms (10%). The remaining macrobenthic phyla are mostly restricted to deeper, off shore waters. The following figure shows a comparison of the relative abundance of the three most common macrobenthic faunal groups in inshore and offshore waters of the western sector of the Egyptian Mediterranean coast near Alexandria.

In addition to depth, bottom type determines the type of benthic community. Silty/ sandy bottom is dominated by the echinoderms *Amphiura* and *Schiaster*; the mollusca *Tysiria, Mucula, Cerula* and *Natica,* the polychaetes *Arenicola, Euclymene* and *Glycera* the crustacians *Gammars* and *Portunus*. In the rocky/coarse gravel bottom, the molluscan *Glycemeris, Venus, Chamelea, Caffista* and *Tellina;* the polychaetes *Hermodice, Eunice, Aphrodite, Lumbricoides:* the echinoderms *Astropecten* and *Echinocardium* as well as the crustaceans *Maja* and *Ethusa* dominate. The intertidal rocky shores are almost poor in number of species and low in diversity indices, occupied by only 95 species with density averaged 1214/ $m^{2.}$ Sampling of ascidian species collected along the Mediterranean coast (Salloum, Matrouh, El- Dabaa, Alixandria, Abu Kir, Rosetta, Damietta, Port Said, and El- Arish) over many years resulted in increasing number of ascidian species into more than 70 species.

Offshore of the western sector of the Egyptian Mediterranean coast, the bottom is predominantly silty with scattered pebbles. This type of bottom supports a variety of sponges particularly off El Gabaha. Associated with this bottom type polychaetes *(Hermodice, Eunice* and *Aphrodite)*, ascidians *(Cytoditus* and *Archidistoma)*, crustaceans (particularly *Synalpheus)*, molluscans (mostly *Astarte* and echinoderms (*Echinus, Cidaris* and *Asropecten*) occur.

Recent studies have shown different pattern in deep water more than 200 meters close to the continental edge off Alexandria. A total of 70 benthic species was recorded, including 63 species of invertebrates. The most abundant phylum was Mollusca (31 species of three classes (Bivalvia, Cephalopoda, and Gastropoda), with the most diverse class being Gastropoda (18 species). The second most diversified class was Malacostracs (Phylum: Arthropoda, subphylum: Crustacea), with 16 species. The least diversified phyla were Porifera (3 species), Cnidaria (4), Chordata (one species), and Annielida (one species) (Farrag et al 2019).). The highest abundance of benthic species occurred in the summer (53 species with 75.7%), while the lowest one was in autumn (27 species, 38.6%). The benthic flora was represented by 6 species belonging to three phyla (Tracheophyta, Chlorophyta, and Rhodophyta). Seagrasses were represented by three species *(Posidonia oceanica, Cymodocea nodosa, and Halophila stipulacea.* Regarding variations based on species occurrence, 13 species were observed during all seasons (*Conomurex persicus, Nerita sanguinolenta, Loligo vulgaris, Octopus vulgaris, Erugosquilla massavensis, Clibanarius erythropus, Liocarcinus depurator, Marsupenaeus japonicus, Trachysalambria curvirostris, Abyssoninoe hibernica, Cymodocea nodosa, Halophila stipulacea, and Codium bursa (Olivi))* and they accounted 18.6% of the total number of species. The occasional occurrence of species during two or three seasons was represented by 23 species (32.9% of the total (70)) recorded along two seasons, while they accounted 12 species (17.1% of the total) along three seasons. The rare species or that recorded during one season were represented by 21 species (30% of the total).

Diversity for microbes is substantially underestimated, and the deep-sea are still poorly known. In addition, the introduction of alien species is a crucial factor that will continue to change the biodiversity of the Mediterranean, due to the warming of the Mediterranean Sea.

A total of 187 accepted seaweed species from El-Arish to Salloum were listed (107 red, 45 green and 35 brown algae), constituting 16% of the Mediterranean seaweeds (Shabaka 2018). 45 accepted species were listed for the eastern Coast (22 red, 18 green and 5 brown algae); 27 species were recorded in El-Arish (12 red, 12 green, 3 brown algae), and 37 species in Port-Said (18 red, 17 green and 2 brown). Alexandria shores showed the highest number of seaweeds with 168 recorded species (97 red, 36 green, and 35 brown algae), while 36 seaweed species were recorded on the western Coast (20 red, 12 green, and 4 brown algae). In addition, 10 alien seaweeds were accepted, including 4 green and 6 red algae. Five seagrass species were reported on the Mediterranean coast of Egypt (Shabaka 2018)*; Posidonia oceanica* (Linnaeus) Delile and *Cymodocea nodosa* (Ucria) Ascherson, *Halophila stipulaceae* (Forsskal) Ascherson, *Ruppia cirrhosa* (Petagna) Grande and *R. maritima* Linnaeus. *C. nodosa* dominates the eastern coast and were recorded along Sinai shores. *H. stipulacea* was also recorded from the west Mediterranean coast of Egypt *P. oceanica* and *C. nodosa* were recorded from Alexandria shores, while *C. nodosa* forms patches in shallow waters. *P. oceanica* and *C. nodosa* have been recorded from El-Dabaa, Marsa-Matrouh and Salloum protected area.

Influence of Harmful Algae on Biodiversity

- Harmful algae are one of the major threats to marine ecosystems (ecosystem degradation and losses in biodiversity). Among the important vulnerable ecosystems are the semi enclosed areas connected to the sea (e.g. lagoons, harbors, empayments) which are considered suitable for triggered harmful algal blooms. Harmful algae have serious effect on biodiversity of marine life and on the ecosystem degradation as well. Some Examples are:
- Algal toxins are responsible for the death of fish and shellfish and have caused episodic mortalities of marine mammals, birds, and other animals depending on the marine food web.
- *Alexandrium minutum* (Halim) besides its toxic effects on organisms of higher trophic levels, this species has been reported to cause allelopathic effects on other phototrophic phytoplankton species (Labib and Halim, 1995), and as *Alexandrium* spp. proliferation progresses, total abundance of diatoms often declines, while dinoflagellate and other flagellate populations increase.

In Alexandria waters, the blooms of the dinoflagellates *Gymnodinium catenatum* H.W.Graham , *Alexandrium ostenfeldii* (Paulsen) Balech & Tangen, *Karenia mikimotoi* Miyake & Kominami ex Oda) Gert Hansen & Moestrup, *Prorocentrum cordatum* (Ostenfeld) J.D.Dodge and the raphidophycean *Chattonella antiqua* (Hada) Ono during Summer 2005-2007 have caused severe reduction in the diversity indexes through the decreasing in number of other accompanied phytoplankton species (Mikhail and Halim, 2009).

2.1.3. Vertebrates other than fish

Of the 11 cetacean species represented by populations regularly occurring in the Mediterranean Sea, only eight can be presumed to be regularly occurring in the coastal and pelagic waters adjacent to the Egyptian Mediterranean coasts (Notarbartolo di Sciara and Birkun 2010). These include one Mysticete species, the fin whale *Balaenoptera physalus*, and seven Odontocetes: the sperm whale *Physeter macrocephalus*, the Cuvier's beaked whale *Ziphius cavirostris*, the Risso's dolphin *Grampus griseus*, the common bottlenose dolphin *Tursiops truncatus*, the rough-toothed dolphin *Steno bredanensis*, the striped dolphin *Stenella coeruleoalba*, and the short-beaked common dolphin *Delphinus delphis*. The three remaining species which regularly occur in parts of the Mediterranean (the killer whale *Orcinus orca*, the long-finned pilot whale *Globicephala melas*, and the harbor porpoise *Phocoena phocoena*) are unlikely to be regularly found in Egyptian Mediterranean waters. The first is being limited to Gibraltar Strait waters, the second to the western basin, and the third to the Northern Aegean Sea.

The monk seal *Monachus monachus*, the only pinniped found in the Mediterranean Sea, once regular throughout most of the region's coasts, until very recently was considered extinct in Egypt, at least since the 20th century (Anon. 2006). It was only in early 2011 that proof of its occurrence in Egypt, in the vicinity of the city of Marsa Matrouh, was evident.

The Egyptian Action Plan for Conservation of Marine mammals in the Mediterranean Sea which was prepared in corporation with SPA/RAC aimed to "Achieving and maintaining the favorable conservation status of marine mammals living in the Egyptian Mediterranean waters". One of its objectives is "Collect and expand knowledge on the status of marine mammal populations in the Egyptian Mediterranean". This objective targeted to: Collect basic information about population ecology (abundance, distribution and structure) of marine mammal species present in the EMW, in addition to Collect basic information on existing anthropogenic pressures in the EMW known to potentially impact on marine mammal populations.

A recent study by Rabia and Attum 2019 on the shoreline encounter and stranding rates of cetaceans in North Sinai, Egypt has confirmed 55 encounters of the common bottlenose dolphin in 20 groups with an average of 2.5 individuals seen per group, one striped dolphin, one common dolphin, and probably Cuvier`s beaked whale from several kilometers from the shore. They also observed 6 stranded common bottlenose dolphins, with a rough average of standing occurrence every 10 days. The authors suggested that there are resident summer populations and that the eastern basin of the Mediterranean may not be as biologically poor in cetacean populations as originally thought. Similar observations of about 10 years confirmed the presence of marine mammals in many parts of the Egyptian waters. Recent marine survey in 2019-2020 reordered 9 species of marine mammals and other iconic species as follows:

Ser.	Items	Rec. frequency	Notes/No. in each recording
1	Common bottlenose dolphin	16	Group
2	Common dolphin	4	Group
3	False killer whale	1	First recorded by Egyptian team (1)
4	Risso's dolphin	3	Group
5	Rough-toothed dolphin	2	Group
6	Striped dolphin	8	Group
7	Cuvier's beaked whale	1	Two
8	Sperm whale	2	Two in each recording
9	Fin Whale	2	Female with 2 calves
10	Loggerhead turtle	4	One
11	Basking shark	3	Individual or two
12	Great white shark	9	Individual or 2 or more
13	Japanese flying squid	1	First record in Mediterranean

Marine turtles in the Egyptian Mediterranean Sea are represented by 3 species:

Loggerhead *Caretta caretta*, Green *Chelonia mydas* and Leatherback *Dermochelys coriaca*. These are endangered, and are rare in the northern coastal waters. While the loggerhead remains relatively abundant, it seems to have almost deserted in the western northern coast. The leatherback and green turtles are becoming increasingly rare. Nesting sites for both species exist along the Sinai coast in Zaranik Protected area.

Recent changes in the biodiversity of the Bardawil Hypersaline Lake have led recently to growth in numbers of loggerhead turtles, perhaps because of the increase of their favorite food (shrimps and crabs). Additionally, the Bardawil Lake has become an attractive wintering ground for turtles due to the closed fishing season (January – April). In October 2012, over 90 sea turtles were found dead, and in various stages of decomposition on the shores of Lake Bardawil. The majority found were loggerhead. However, a few green turtles and only one leatherback were identified. The conclusion reached was that the recent abundance of sea turtles interfered with the catch of fishermen, driving them to eliminate sea turtles from the lake.

The size distribution, age, sex ratio, and the proportion of sexually mature green and loggerhead turtles were recently investigated in the Bardawil lake. A total of 30 green turtles (8 males, 4 females, and 18 juveniles/sub-adults) and 14 loggerheads (one male, 8 females, and 5 sub-adults) were captured. Forty percent of the green and 64 % of loggerhead turtles were believed to be sexually mature. The green turtles had a mean curved carapace length of 65.23 (15 – 100) cm range), and the loggerhead turtles 68.79 cm with a much narrow range of (60 – 80 cm) reflecting the absence of juveniles. Results provide evidence that Lake Bardawil is an important feeding and development area for green turtles, and feeding area for loggerhead turtles and expand our knowledge of such important sites in the Mediterranean basin (Basem and Attum, 2020).

More than 480 bird species are known from Egypt. Most of bird species are non-breeding migrant, which pass through the country or spend only the winter, and are of Palearctic origin. The wintering and transit bird populations, although not present in Egypt, all or most of the time, are important component of the country's biodiversity. Only about 150 species can be considered resident breeding birds, although some of these also migrate further south during winter.

There are a total of 34 Important Bird Areas (IBAs) in Egypt, comprising a wide range of habitats critical for birds, such as wetlands, coastal plains and marine islands. Of these 34 areas, there exist 8 areas along the Egyptian Mediterranean coast and habitats. The number of threatened bird species in Egypt is 43 (9.6%) of all birds. Migratory birds are about 300 species, seabirds are 39 and water birds are 129. There are also 16 globally-threatened species occurring in Egypt.

The 25 bird species SPA/RAC Annex were examined carefully by ornithologists in Egypt. Almost all of them are present, some are common such as Pied Kingfisher and slender-billed Gull, little term; others are rare such as Mediterranean shape, and still some very rare such as Scopoli`s Sshearwater, and Yelkouan Shearwater. However, very little is known about their geographical distribution, ecology, and reproductive biology. All of the fowling species are protected in Egypt in accordance with Law 102/1083 (protectorates), and Law 4/1994, amended in in 2009:

N	Scientfic name	English name	Status
1	*Calonectris diomedea*	Scopoli's Shearwater	migrant, very rare
2	*Puffinus yelkouan*	Yelkouan Shearwater	migrant, very rare
3	*Puffinus mauretanicus*	Balearic Shearwater	migrant, very rare
4	*Hydrobates pelagicus melitensis*	Mediterranean Storm-petrel	migrant, rare
5	*Phalacrocorax aristotelis desmarestii*	Mediterranean Shag	WV, rare
6	*Phalacrocorax pygmeus (Microcarbo pygmaeus)*	Pygmy Cormorant	migrant, rare
7	*Pelecanus onocrotalus*	White Pelican	WV, rare
8	*Pelecanus crispus*	Dalmatian Pelican	WV, very very rare
9	*Phoenicopterus roseus*	Greater Flamingo	WV & FB, uncommon
10	*Pandion haliaetus*	Osprey	WV & FB, uncommon
11	*Charadrius leschenaultii columbines*	Greater Sand Plover	WV & MB
12	*Charadrius alexandrines*	Kentish Plover	RB & WV, common
13	*Numenius tenuirostris*	Slender-billed Curlew	WV, very rare
14	*Sterna albifrons (Sternula albifrons)*	Little Tern	MB & WV, common
N	Scientfic name	English name	Status
15	*Sterna nilotica (Gelochelidon nilotica)*	Gull-billed Tern	RB & WV, common
16	*Sterna caspia (Hydroprogne caspia)*	Caspian Tern	WV, common
17	*Sterna sandvicensis (Thalasseus sandvicensis)*	Sandwich Tern	WV,and RB common
18	*Sterna bengalensis emigrata (Thalas-seus bengalensis)*	Lesser Crested Tern	PV, rare
19	*Larus genei*	Slender-billed Gull	RB & WV ,common
20	*Larus melanocephalus*	Mediterranean Gull	WV, , uncommon
21	*Larus audouinii*	Audouin's Gull	PV,rare
22	*Larus armenicus*	Armenian Gull	WV, uncommon
23	*Halcyon smyrnensis*	White-throated Kingfisher	RB & WV , common
24	*Ceryle rudis*	Pied Kingfisher	RB & WV, very common
25	*Falco eleonorae*	Eleonora's Falcon	PV, rare

- Status of bird at Egyptian Mediterranean coast is based on personal survey from 2009 till 2020
- RB, Resident breeder; WV, winter visitor PV, passage visitor; MB, migrant breeder; FB, former breeder

2.1.4. Non-indigenous, including invasive, species

Invasive species continue to be a major threat to coastal and marine ecosystems and species in Egypt. There are no signs of reduction of this pressure on biodiversity, and there are indications that it is increasing. Several attempts have been made to record different taxonomic groups of alien and invasive species in Egypt. However, most of these did not apply or acknowledge the appropriate international criteria used to evaluate invasive species status. Currently available information about invasive species in Egypt is still insufficient and exerted efforts are still limited in spite of the fact that invasive species represent real threat to Egyptian ecosystems, the economy and human health.

A check-list of 42 immigrant Erythrean fish in Egyptian Mediterranean waters is provided by Halim and Rizallah (2011). The list comprises four new records. 17 of the immigrant species are commercially exploited, whereas 15 are known from single records. While the Erythrean fish as invasive species are beneficial to local fisheries, in our view, they do not have an important impact upon the ecosystem. More species have been recorded in recent years from deep waters (Farag *et al*, 2019), as well as considerable knowledge now are available on the biology of certain alien and invasive species that contribute significantly in the Egyptian demersal fishery.

Three major works on NIS have been completed in Egypt during the last 6 years. These are: preparing a national action plan for marine alien invasive species in the Mediterranean Sea, a survey of 2 years on alien invasive species in the Gulf of Suez and the eastern Mediterranean, and engineering work of directing the agricultural drainage water and freshwater sources into better lakes into Sinai via a tunnel under the Suez Canal. The national action plan (NAP) was made in accordance with CBD guidelines and SPA/RAC of UNEP/MAP, and was validated in 2017. It calls for preparing the list of species, priorities,

pathways, and management. This NAP was developed according to the national priorities and opportunities and current challenges. It was formulated to address all issues related to the implementation in the prevention, early detection, containment, eradication (when possible), control and monitoring of NIS in Egypt, and was based on available literature and consultation with all relevant stakeholder. It has specific goals, objectives, and means of achieving each objective. Monitoring program and mitigation measures included underwater visual surveys, monitoring algae, sessile invertebrates, fishes and others. Mitigation measures being implemented included Environmental Impact Assessment, Strategic Environmental Impact assessment (SEIA).

A Prime- 292 Ministerial Decree (2339 / 2014) to establish an inter-ministerial committee of experts to review progress made, resulted in directing the freshwater that used to go to Bitter lakes, into a tunnel under Suez Canal into the Sinai for agricultural purposes. In addition, significant efforts were made where dredging of coastal wetlands and clearing of weed resulted in improving wetlands where more sea water are passing through boghases (entrances), and hence more marine fish now in wetlands.

The first part of implementing the national action plan was the survey along the Suez Canal and the Egyptian Mediterranean Sea (4 times in two years in 2017 and 2018). The aim of these surveys are: establish a database of marine organisms, their environmental origins, their paths and methods of transport, their environmental and socio economic impacts as well as physiochemical characteristics of Suez Canal and Egyptian Mediterranean Sea. Genetic studies on molecular identification of some available species were also made.

A total of 411 species was recorded as non- indigenous species.. Among the different animal groups, 374 species demonstrated Lessepsian behavior (Movement from Red Sea to Mediterranean Sea) with percentage of 91%, while 37 exhibit anti-lessepsian behavior (Movement from Mediterranean Sea to Red Sea) with percentage of 9% of total species recorded. A total of 139 species was reported, including 46 lessipsian species (34 fish species, 8 shrimp species and 4 crabs).

Mediterranean–Indo-Pacific alien invasive phytoplankton species according to Halim (1990) are:

- *Ceratium egyptiacum* Halim =? *Ceratium pulchellum* Schröder
- *Dinophysis giganteum* Kofoid et Michener
- *Dinophysis umbosa* Schiller Wood (1968)
- *Heterodinium dubium* Rampi
- *Heterodinium minutum* Rampi (?) Non-existent
- *Histioneis inclinata* Kofoid et Michener Wood (1968), Balech (1988)
- *Histioneis longicollis* Kofoid Wood (1968), Dodge (1993)
- *Histioneis subcarinata* Rampi Balech (1971
- *Gonyaulax ovalis* Schiller
- *Oxytoxum caudatum* Schiller Wood (1968)
- *Oxytoxum laticeps* Schiller Wood (1968)
- *Oxytoxum variabile* Schiller Establier & Margalef (1964)
- *Prorocentrum maximum* Matzenauer
- *Protoperidinium hirobis* Abe´ Wood (1968)
- *Protoperidinium nipponicum* Abe´ Steidinger *et al*. (1967)
- *Protoperidinium tregouboffii* Halim
- *Pyrodinium schilleri* (Matzenauer) Schiller

According to (Mikhail, 1997; 2003; 2007; 2020; Mikhail *et al*., 2005) the harmful/toxic invasive phytoplankton species and their impacts in Alexandria waters during the last 3 decades comprises are:

- *Alexandrium ostenfeldii* (Paulsen) Balech & Tangen
- (Red Tide bloom forming species, PSP, lower rank)
- *Chattonella antiqua* (Hada) Ono
- (Red Tide bloom forming, Non-toxic to humans, but harmful to fish and invertebrates, formed 3 Fish killing blooms 1998-2000, in the Eastern Harbor)
- *Gymnodinium catenatum H.W.Graham*
- (Red Tide bloom forming species, Toxic PSP, Fish and invertebrate mortality)
- *Karenia mikimotoi* Miyake & Kominami ex Oda) Gert Hansen & Moestrup
- (Red Tide bloom forming species, Non-toxic to humans, but harmful to fish and invertebrates)
- *Heterosigma akashiwo* (Hada) Hada ex Hara and Chihara
- (Toxic, Fish and invertebrate mortality)
- *Heterocapsa triquetra* (Ehrenberg) Stein
- *Gymnodinium impudicum* (Fraga and Bravo) Hansen and Moestrup
- *Osteriopsis ovata* Fukuyo
- *Pseudonitzschia australis* Frenguelli (NIS, Toxic)
- *Heterocapsa circularisquama* Horiguchi (NIS, Toxic)
- *Alexandrium catenella* (Wheddon et Kofoid) Balech (NIS, PSP producer)
- *Dinophysis acuminate* Clap. & lachm (NIS)

The Mediterranean Sea in particular has seen successive waves of introductions. Its biota consists of a mosaic of formally alien species of different biogeography affinities, reflecting its eventual geological history.

It is impossible to prevent movement of marine creatures, but manage them in accordance with international and regional conventions (tools and guidance include relevant guiding principles of CBD, relevant guidelines under the Ballast water convention of IMO, relevant guidelines for control and management of ships Bio fouling, relevant standards by FAO on applying risk analysis in aquaculture, recreational fisheries).

Terminology being used on migratory species over time (e.g. lessepsian migration 50 years ago, invasive species in 1993, non-indigenous species, accidental or causal species, tropical species, circum-tropical and the new concept of adapted species to new environment is being discussed in various scientific communities.

Species migration via Suez Canal occurs from the Red Sea to the Mediterranean and vice versa from the Mediterranean to Gulf of Suez. (At least 60 species). The terminology used by invasion ecologist reflects their pre-conceived options, ranging from neutral to quasi-hostile, sometimes emotionally charged attitudes. The spread of new species to new habitats is and has always been a natural and continuous process over the ages. Man has only accelerated this process.

Invasive species is associated with adverse effects, threatening native biological diversity, the ecological stability of the invaded ecosystems, and the resulting economic and health consequences. Many authors ignore other potential impacts such as over harvesting of resources, destruction of habitats or the introduction of harmful pollutants.

The main dispersal routes include shipping (ballast waters and fouling that represent 70% of alien species), active swimming (fishes), intentional release (aquaculture and aquaria), natural dispersal, through currents and tides, adaptation through Suez Canal, trade, tourism (recreational boats), dumping in the marine environment, ports and marina.

Alien species pattern is not influenced by water volume or current speed, but rather with high salinity that acts as natural barrier.

2.1.5. Species of commercial interest for fishing (fish, mollusk and shellfish)

The first comprehensive check-list of fishes from many parts of the Egyptian Mediterranean Sea included 257 species (El Sayed, 1994). Akel and Karachle (2017) used the reviewed fish papers and grey literature, FishBase, and the Global Biodiversity Information Facility, resulted in the increase in number of fish species from the Egyptian Mediterranean Sea into 364 fish species. Many of these species are of commercial values.

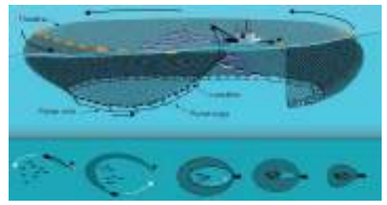
Fishery is one of the socio-economic activities practice in the coastal zone. Egyptian Mediterranean capture fisheries are important for local coastal communities, providing employment opportunities and a major pillar in food security and economic-social development. Due to depletion of the inshore or coastal fisheries resources in the Mediterranean Sea, countries like Egypt make many fishermen suffering and detriment. This depletion also reduces the supply of sea food materials to many fish processing industries in the region. Fishery policy makers have searched for new fishing ground through research works that needs to get fully support in funding. It was clear that the new regime of Economic Exclusive Zones (EEZ) would challenge the capacity of many coastal countries to respond adequately to either the opportunities or the responsibilities that lay ahead. Currently, most living marine resources are exploited on the continental shelves at depths of less than -400m, but in recent years, deep-sea fisheries have been developed all over the world and by time transferred to Egypt. Bottom trawl and long-line fisheries capable of reaching depths down to nearly -1000m have been operating in the Mediterranean Sea in recent years.

Evaluating and assessing of any marine area should include the fish density in that area and catch composing with valued number of species. Catch per unit effort (CPUE) - also called catch rate - is frequently the single most useful index for long-term monitoring of a fishery for better management of the sector.

Fishing fleet and used gear

According to the General Authority for Fish Resources Development (GAFRD)- Ministry of Agriculture-Egypt, during the year 2018, the licensed motorized fleet was 3158 vessels equipped by inboard engines more than 50 up to 1,000 HP, additionally 959 non-motorized boats (most of them using outboard motor) operating at Egyptian Mediterranean Sea. About 15,000 are licensed fishermen for this the Mediterranean Sea. The registered fishing fleet targeting demersal and pelagic species comprises four types of boats that use different fishing gears, as following:

1. Egyptian fishing fleet is subjugated by trawlers (1006 boat) which represent the backbone of the fleet, both in terms of technical characteristics and activity (Moreover, unknown number of vessels registered as longline are using bottom trawl net illegally). Trawlers of different sizes from 12 to 33m Length Over All (LOA) are approved to fishing any area along the coast regardless its identifiable registered port. They operate at various depths (-15 to -900m) and up to 75 km away from the shore, fishing trip usually takes from 1 to 20 days and the number of crew employed ranges from 2 to 12 fishermen per vessel.

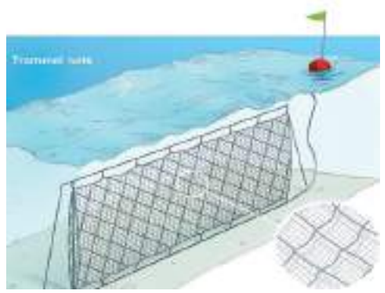


2. Purse seiner (241 boat) with sizes from 14- 33m LOA that looking for pelagic fish shoals along all the coast regardless water depth and distance from the port. Small purse seiners are operating at day time

(about 15m LOA), while larger boats operating at night using illumination to gathering off shore pelagic fishes, fishing trip usually takes 1 or2 days and the number of crew employed ranges from 12 to 25 fishermen per vessel.

3. Hook & line and static nets boats (1911 boat) with sizes from 12 to 20m LOA usually are exploiting shallow fishing ground except some longliners that operate at water depth up to -500m regardless the distant from port, fishing trip usually takes from 1 to 6 days and the number of crew employed ranges from 5 to 14 fishermen per vessel.

4. One thousand artisanal vessels using static fishing gears (gill or trammel nets and hand line-hook) with length <12m LOA, that targeting various fish species according to seasonal abundance within inshore areas. Fishing trip usually takes 1 or 2 days and the number of fishers ranges from 2 to 4 fishermen per vessel.



The number of different commercial fishing fleet is almost stable for last 20 years. Recreational fishing is widespread along the Egyptian Mediterranean coast, but there is no information about fishing effort and catch so the impact of this activity is unknown, only 3141 persons have been licensed for recreational fishing.

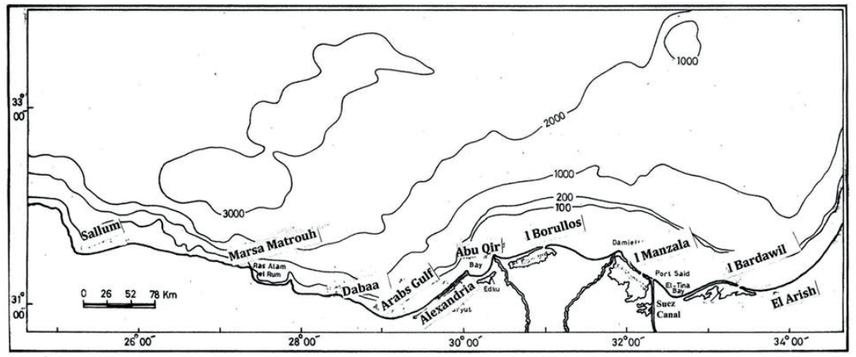
Licenses of Fishermen & Marine fishing Units - 2018 — تراخيص وحدات وصفة الصيد البحرية عام 2018

Site	Fishery Office	Other Licenses: Fisherman Without Boat	Other Licenses: مراقبين	Fisherman Card: (5-years)	Fisherman Card: سنة (1-year)	Recreational Boats	Sailing Boats: 3rd. Class	Sailing Boats: 2nd. Class	Sailing Boats: 1st. Class	Machinery Boats: Kerkoba & Cast net	Machinery Boats: Trammel Net	Machinery Boats: Long Liner	Machinery Boats: Purse Seine	Machinery Boats: Trawling	مكتب المصيد المختص	الموقع
Mediterranean Sea	Matrouh	-	-	3	29	-	-	20	-	-	16	2	-	-	مطروح	البحر المتوسط
	Alexandria	6	700	83	249	-	63	-	-	-	79	246	4	26	الإسكندرية	
	Abu Qir	-	-	341	2411	-	33	-	-	-	153	127	10	25	أبو قير	
	Rashid	165	89	330	2804	-	65	68	2	-	103	65	22	71	رشيد	
	Maadia	241	184	324	524	-	12	-	-	-	114	150	42	81	المعدية	
	Bakim	-	-	-	-	-	17	75	5	-	45	222	50	21	بكيم	
	Mnzeiba	280	7	-	823	-	9	27	1	-	8	13	12	-	مغويبة	
	Bahet El-Berg	434	831	1285	1482	-	61	26	4	-	43	181	26	660	عزبة البرج	
	Gamsa *	63	38	61	6	-	-	-	-	-	-	-	-	-	جمسة *	
	Port Said	45	947	-	711	-	286	197	-	-	21	200	52	128	بور سعيد	
	Arish	448	345	75	1037	-	-	-	-	-	118	5	23	-	العريش	
	Total	1682	3141	2502	10076	-	546	413	12	-	700	1211	241	1006	إجمالي البحر المتوسط	

Source: GAFRD 2019

The wide continental shelf off Nile Delta region is located near historically Egyptian ports with traditionally higher number of fishermen, consequently, fishing operation by different fishing methods is mainly conducted along this fertile fishing ground, extending to the eastern region, but recently (last ten years) due to technology transfer from Mediterranean EU countries, fishing operation expands to west of Alexandria particularly bottom trawl fishery (limited trawling grounds are available but with high fishing efficiently) while long liners exploit larger pelagic species and few demersal species.

The main fishing ports along the Egyptian Mediterranean coast are: Salloum and Marsa Matrouh (Matrouh province), Al Max, Al Anousheh, Mena Sharki and Abu Qir (Alexandria province), Meadea and Rashid (Behera province), Aljazeera ElKhadra and Borge Al Burullus



Map 4.

Main fishing ground and ports along the Egyptian Mediterranean coast. Resources exploitation

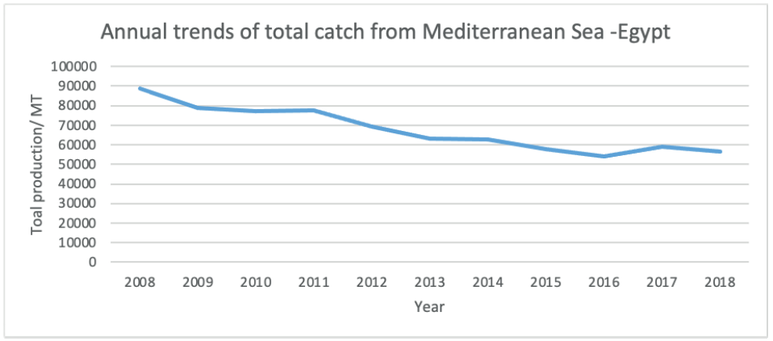
Ressources exploitation

Fishermen are usually targeting more than one fish species at the same time. Thus, it could be affirmed that fishing fleet operating in the Mediterranean region are oriented toward catching a high variety of species, up to one hundred different demersal fish species, crustaceans and some small or large pelagic species. Target species are depending on the distance from the coast to the fishing grounds, water depth, bottom characteristics and the different season of the year. Fisheries production is of high economic value as the catch is generally sold fresh in local markets or directly to private consumers or restaurants. In some fisheries, parts of the high quality catch are exported (FAO EastMed., 2014). Bottom trawling in Egyptian Mediterranean water is multispecies fishery. All over the year, trawlers target mainly shrimps (*Penaeus spp.*, *Metapenaeus spp.*, *Marsupenaeus spp.*, *Parapenaeus spp.* and *Aristaeomorpha spp.*), blue crab (*Portunus pelagicus*) and common cuttlefish (*Sepia officinalis*), and some fish species like red mullet (*Mullus* spp.), lizard fish (*Saurida undosquamis*), family sparidae species like sea breams and porgies (*Diplodus spp.*, *Pagrus spp.*, *Pagellus spp.* and *Sparus spp.*) and European hake (*Merluccius merluccius*). Many other commercial species are considered as by-catch, while discards are mainly composed of small-sized fish and species with no commercial value, including

some invertebrates. So far, information available on discard fish is very limited, and this requires detailed studies as done in other countries in the Mediterranean Sea. Purse seiners are targeting mainly small and medium pelagic species Sardine (*Sardinella aurita*), bogue (*Boops boops*), blue fish (*Pomatomus saltatrix*), barracudas (*Sphyraena* spp.) and recently large pelagic species like Atlantic bluefin tuna (*Thunnus thynnus*) while hooks and nets (gill and trammel) are used to target various pelagic and demersal species according to seasonal abundance such as albacore tuna (*Thunnus alalunga*) Tuna like species (eg. *Euthynnus alletteratus*), Narrow-Bared Spanish mackerel (*Scomberomorus commerson*), groupers (*Epinephelus spp.*), common sole (*Solea spp.*), cuttlefish (*Sepia spp.*), blue crab (*Portunus pelagicus*) and various shrimp species (*Penaeus* and *Metapenaeus spp.*).
The rate of Indo-pacific fish species in the Mediterranean Sea has been increased considerably passing through the Red Sea. Some of these alien species were very successful and have established large populations in the eastern Mediterranean. During last decade immigrant fishes are regularly captured and constitute an important share of commercial catches (e.g. *Nemipterus japonicus*, *Siganus rivulatus* and *Etrumeus teres*).

Annual landing was estimated as 57000 tonnes in 2018 (GAFRD, 2019), the reported amount looks under-estimated, actual catch by Egyptian fishing fleet may be more than that due to miss recording by fisheries observers in fishing ports, where the fish landing is allowed along the day time with shortage in the number of observers, while catch of artisanal and recreational fishing are almost absent.

Figure 1
Annual trends of total catch from Mediterranean Sea -Egypt

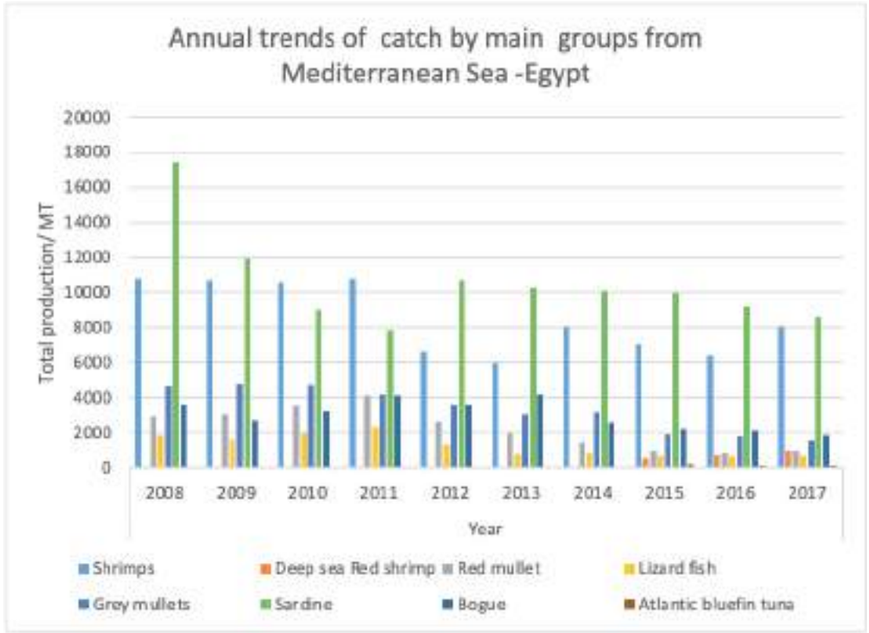


Catch composition

According to GAFRD 2019, small pelagic fishes (sardine and anchovy) are the most landed fish species (25%) followed by crustacean (shrimp and crab) about 20% then mollusks (shell fish) 7% and cephalopods (cuttlefish and octopus) 4%, while cartilaginous fish 2.5% and more than 30 bony fish species are about 40%. During the last ten years, some fish species were added to the recording list while the annual landing is decreased.

Figure 2

Annual trends of catch by main groups from Mediterranean Sea -Egypt



Status of the stocks

The number of stock assessments for several demersal species and some pelagic species conducted in Egypt has increased in the past ten years, with most being undertaken by the National Institute of Oceanography and Fisheries (NIOF) and recently by EastMed project (FAO-UN). Although assessments do not cover the entire Egyptian Mediterranean coast, almost all of them show a state of overexploitation. Most of the assessments recommend a reduction of fishing mortality by 30 to 45% with suggesting some management measures, such as decrease the number of fishing boats, improving trawl selectivity by increasing net mesh sizes, identifying and protecting of nursery and spawning areas, announcing a minimum distance from the coast within which trawlers may not operate, dredging of coastal lagoons inlets, improving their circulation and water quality, and closed areas or seasons.

The high marketability of small fish encourage targeting of immature portion of some stocks. Consequently, demersal fish populations are overfished, shallow areas (within the 5km coastal limit or depths of less than 50 m deep) are trawled illegally and small mesh sizes are used. Shrimp catch by trawlers contributes the highest levels of discard catch ratios, ranging from 3:1 to 15:1 and the amount of by-catch varies in relation to target species. Impact of discards in catch goes far beyond single-species demographic effects because discarded biomass can alter ecosystem structure by favoring scavengers. The consequences of the fishing-driven increase in food supply stemming from discards have seldom been addressed by specific studies.

Geographic distribution of the species

Fishing fleet is usually exploiting the entire marine species living off the Nile Delta region, extending to the eastern region rather than to the western one. Artisanal fishers typically exploit inshore areas off fishing ports along the Egyptian Mediterranean coast, while trawlers are not restricted to geographic boundaries along the coast. No vessel monitoring system (VMS) is in used by the Egyptian fleet, consequently it is impractical to link the official landed fish species to certain fishing ground or definite geographic area (Aly, *et al*., 2019). Few research surveys and experimental fishing could use as an indicator for fishing activities and fishing ground or fish abundance (Mehanna *et al*., 2011).

With increased technology, coastal fisheries have been under significant pressure off Nile delta region of Egypt which is heavily exploited, recently semi-industrial fishing vessels have increasingly turned to exploiting deep-sea species which appeared to be the solution to this economic distressing, where it must extract enough fish to compensate for the costs of these challenging conditions. EU market demands for red deep sea shrimps encouraging the developing of this fishery in Egypt.

Otter bottom trawl catch the deep sea red shrimp from the deep area off Arab bay west of the Nile Delta (-500- 900m water depth) and also off Alexandria governorate. Shrimps of the family Aristeidae comprise one of the most valuable deep-water fishing resources, where at least two species (*Aristaeomorpha foliacea* and *Aristeus antennatus)* sustain highly profitable fisheries for about 80 fishing boat (>20m LOA). The density of the major shrimp species ranges between 95 and 101 kg/km^2, of which 55–74kg/km^2 are deep water shrimp. This suggests a good shrimp potential for 500–700 m depth stratum (Ibrahim *et al*.2011).

The number of tuna boats operating in Egypt is not precisely known, but estimated at 20 to 30 boats with an average length of 17 m and operating with pelagic longlines, they identified the deep water off Lake Burullus (about -500m water depth) are fishing potential, seasonally they targeting albacore (*Thunnus alalunga*), swordfish (*Xiphias gladius*) and dolphinfish (*Coryphaena hippurus*). The catch of albacore by off shore long line ranged between 28 to 100 fish /day and between 258 to 950kg /day (Gabr and El-Haweet (2012).

Moreover, three licensed boats with an average length of 25m are operating with purse seine off Nile Delta region targeting blue fin tuna (*Thunnus thynnus*) around this area. Bluefin tuna quota allocated by ICCAT for Egypt fishing season in 2019 was 266 tones (ICCAT, 2019).

Purse-seine using light had been developed to catch pelagic fishes that were found off shore off Alexandria, the average annual catch per unit effort (CPUE) was 1.7 tones/boat/night (Farrag et.al. 2014).

Off-shore fishery was developed last ten years reached up to 80 Km from the coast and water depth up to -1000m at different fishing ground along the coast near the present survey.

2.2. Main Habitat types

The updated list of habitat types in the Egyptian Mediterranean Sea published in 2019 was sent to experts to be implemented. It seems this updated list needs training to produce an overview on the main habitat types in Egypt. Therefore, it was decided to provide available information on the important habitats in Egypt, representing shallow and deeper areas.

One of the typical marine ecosystem of the eastern basin of the Mediterranean Sea including the Egyptian coast is the *Posidonia oceanica* ecosystem, which form large meadows in the infra littoral zone. Along the western part of the Egyptian Mediterranean coast that sea grass predominates, along with patches of *Zostera*, belts of the sea grass *Posidonia oceanica* along with strands of the brown algae *Sargassum spp.* and patches of the green algae *Caulerpa prolifera* occur in the inshore water of that part of the Egyptian coast. The green algae *Caulepra Codium, Halimeda* and *Udotea* also occur in that area. Other species of *Padina* and *Halimeda* are quite rare.

Red algae, particularly calcareous species of *Lithothamnion* and *Lithophyllum* frequently occur in the offshore waters. Other less abundant red algae species include the genera *Grateloupia, Vidalia, Gigartina, Peyssonnelia, Botryocladia* and *Opuntiella.* Algal growth generally increases during spring and summer.

Information on coralligenous habitats is almost lacking either due to the absence of experts or their locations. This will require capacity development on coralligenous species and habitats, as well as financial resources. This could be one of the priorities for habitat mapping and conditions.

Infralittoral Sandy Mud: This biotope is present along most of the Egyptian Mediterranean coastline. Although, this biotope does not typically support high diversity communities its benthic fauna may provide food for a number of commercially important fish species. This biotope ma yalso provide important feeding and nursery grounds for marine birds and fish. It is listed as endangered natural habitat type.

Circalittoral Sandy Mud: This biotope is widespread across the offshore area and the only epifauna identified was one mantis shrimp. Other sites in the Mediterranean with this biotope are known to support a variety of species, which includes a rich epi- and infauna. Species composition at a particular site may relate, to some extent, to the proportions of the major sediment size fractions. Greater quantities of stones and shells on the surface may give rise to more sessile epibenthic species, some of which are important in the diets of many commercially important fish and invertebrate predators. Circalittoral biotopes may be less susceptible to human impacts related to coastal alteration when they occur at large distances from the shore. However, due to the relatively stable conditions that characterize this biotope, recovery from disturbances may be particularly slow. It is listed as endangered natural habitat type.

Deep Circalittoral Mud: The epi- and infauna of this biotope may be rich and diverse and may serve as food for several demersal fish species. Circalittoral biotopes may be less susceptible to human impacts when they occur at large distances from the shore. However due to the relatively stable conditions that prevail in these biotopes, they may

show slow recovery in the case of serious disturbance. They are commonly subjected to many human activities related to oil and gas exploration and exploitation. It is listed as endangered natural habitat type.

Circalittoral Mixed Sediments: The presence of benthic invertebrates in this biotope increases habitat complexity through the creation of tubes and burrows. Few marine sedimentary habitats have been thoroughly sampled and it has been argued that the biological diversity of this biotope is often underrepresented since it appears to support a relatively diverse and abundant benthic fauna Particularly, the high densities of infaunal polychaete and bivalve species that exist here have been attributed to the relatively low rate of natural physical disturbance and the heterogeneity of the habitat. It is listed as endangered natural habitat type.

Maerl Beds Maerl: is a slow growing coralline alga which aggregates to form beds. Maerl is longlived and is associated with localized increased biodiversity and is the most sensitive habitat identified within the West Nile Delta area, offshore of Abu Qir Bay. Live maerl beds consist of a top layer of live maerl where photosynthesis occurs and beneath the live maerl the beds normally consist of dead maerl. The calcareous structures that remain once the maerl is dead provide substrate for colonization by invertebrates and shelter. Accordingly, dead maerl beds also provide important habitat on the seabed. The extensive beds (live and dead) are slow growing so are sensitive to physical damage and they are considered to be of ecological importance due to the very high diversity of associated organisms. Maerl beds are found throughout the Mediterranean Sea, and in Egyptian waters maerl beds have been recorded off the Nile Delta on the outer shelf between the Damietta and Rosetta. Moreover, maerl beds were identified at a number of locations offshore of Abu Qir Bay. The survey samples that contained maerl were taken between 60-200 m depth contours. The survey identified areas of live and dead maerl. The marine survey identified areas of dead maerl where it is assumed the top layer of live maerl is also dead. Seabed photography indicated that the maerl is patchy in distribution and it is likely that the patchiness will exist across the entire maerl area.

Infralittoral Rocks: Hard substrate on a predominantly sandy seabed creates complexity in the benthic environment and attracts colonizing organisms by providing niches for species to inhabit. The faunal communities colonizing the rocky surfaces will enhance biodiversity by attracting predators and species that can use the structure as shelter. Stable rocky surfaces within this biotope were densely covered with epilithic sessile fauna such as sponges and hydroids. Two areas of rocky seabed were recorded offshore of Abu Qir Bay. These areas contrasted strongly to the surrounding soft sediments and are thought to be cemented sand features. Large polychaetes (Eunicidae) were also regularly seen.

Seagrass Meadows: Seagrass is an important habitat, providing food and shelter for a wide diversity of flora and fauna, including young turtles, prawns and fish. Some turtle species, including Loggerhead Turtle (*Caretta caretta*) also use seagrass meadows as nurseries. Seagrass is also important as a primary producer providing food for plant grazers and detrivores both in the local area and through sediment transport, offshore. Since seagrass beds have not been systematically mapped in Egyptian waters, there are no definitive data on their distribution. Generally, seagrasses are most commonly found in water depths to 20 or 30 m. On the other hand, large parts of the seabed in El Sallum Bay are covered with seagrass. These include *Posidonia oceanica*, which is reported at 6-26 m depth forming monospecific aggregations, as well as *Cymodocea nodosa*. Both are found on sandy or rocky substrates.

Deep Sea Ecosystems: Deep-sea ecosystems include the waters and sediments found approximately 200 m below the surface. The deep-sea is recognized as a highly complex and heterogeneous ecosystem comprised of several different and contrasting habitats. The deep-sea biosphere also includes the Earth's largest regions partially or completely devoid of free oxygen (i.e., hypoxic and anoxic environments), which include the oxygen minimum zones (expected to expand significantly in tandem with the ongoing global change), the deep hypersaline anoxic basins, and the deep Black Sea (the single largest anoxic region in the world). Until today, researchers have documented life every- where in the deep sea, with active metabolic life from -2 to >100 °C, even in sediments at a depth of 10,000 m and microbial life at 1,000 m below the seafloor.

Recent studies by Farag *et al*, 2019 on the biodiversity in deep water more than 200 meters close to the continental edge off Alexandria, have bottom varies from hard rock to very fine silt. The eastern part includes terrigenous Nile sediment origin, whereas the western side has biocalcarious sediments with shell fragments richness, coastal limestone ridges origin. The identified species were 94 fishes, 64 invertebrates, 6 benthic flora, and 304 zooplanktonic species. The ichthyofauna included 5 Chondrichthyes species (5.3% of the fish species), while Osteichthyes fishes were 89 species (94.7%) belonging to 48 families and 72 genera. The most abundant family was Sparidae (13 species). The highest abundance of fishes occurred in the summer (68 fish species 72.34%), while the lowest abundance occurred in the spring (49 species, 52.13%). Regarding the demersal and benthic biota, the most abundant phylum was Mollusca (31 species) and represented by three classes (Bivalvia, Cephalopoda, and Gastropoda). Gastropoda was the most abundant class (18 species), while the lowest Phyla was Chordata (1 species of Ascidians) and Annelida (1 species). The number of lessepsian fish species were 17 (18.1%) of the total number of species caught by the bottom trawl net. In addition, *Aulopareia unicolor* (F): Gobiidae) was recorded for the first time and considered the second time in Egypt. The benthic flora was represented by 6 species belonging to three phyla (Tracheophyta, Chlorophyta, and Rhodophyta). Sea grasses were represented by three species (*Posidonia oceanica, Cymodocea nodosa, and Halophila stipulacea*). The highest abundance of benthic species occurred in the summer (53 species with 75.7%), while the lowest one was in autumn (27 species, 38.6%). In the continental shelf, zooplanktonic community was represented by 304 taxa, belonging to 12 phyla, 6 phyla (Arthropoda, Tintinnida, Chordata Bfish eggs and larvae^, Cnidaria Foraminifera, and Radiozoa) were dominant. Copepods were the dominant group (71.59%); its annual average abundance was 1271 ind./m3 . Its most diversified season was the winter (175 No/m^3) and its average abundance was 1892.9 ind./m^3 . However, in spring, 118 species were recorded presenting the highest average abundance (2419.4 ind./m^3). The lowest diversified season was summer (85 organisms) with density of 1150 ind./m^3.

Deep sea habitats (example: Nile Delta Fan)

The ecological and biological significance of the Nile Delta Fan (NDF) in the Eastern Mediterranean Sea stems the geological features and natural phenomena (Nile silt sedimentation, physical and biological oceanographic and climatic characteristics).

NDF belong to the Levantine Sea where important geomorphological features are located including highly active mud volcanoes, canyons (Alexandria canyon), fan, escarpment, continental shelf. Deep-sea benthic habitats knowledge is scarce however significant and peculiar habitats related to gas hydrocarbon chemsymbiotic communities are known. It includes of mollusks and polychaete endemic species which represent vulnerable ecosystems. In addition, deep-sea corals communities are predicted in the area. Biodiversity index in the region is quite high (38 out of 50) with a major components of pelagic and benthic communities. Small pelagic fisheries are very important and Blue Fin Tuna (BFT) fishery as well, furthermore the NDF is known as one of the few spawning grounds in the Mediterranean Sea for BFT. Regarding pelagic species, marine turtles aggregate in feeding grounds in the shelf which is equally used as breeding areas for birds.

Salloum area (example of shallow sea grass meadows)

The Gulf of Salloum supports a wide range of ecosystems, from the rich sea grass meadows and rocky reefs of the coastal zone, to the little seamounts. It is thus considered as a great resource for many economic fish species. Seagrass meadows were found forming from scattered small areas to dense vegetation that covered extended areas of the sea floor. The macrobenthic community consisted of 57 species belonging to seven groups, while fish populations contained more than 90 species. Species Richness was closely correlated to depth, organic matter concentrations and sediment characteristics. Some invasive polychaete and introduced fish species were also recorded. Moreover, few species were considered as threatened species. Using GIS analysis to the survey result showed that diversity of seagrass beds, benthic fauna and fish species in the Gulf could be divided into two sections. First section lies to the west of 25º 30'E longitude; contains the highest species composition, while second section (eastward of 25º 30' E) contains the lowest species composition. It was highly recommended, therefore, to declare the first section as a marine protected area (MPA). As the results of this study, the Gulf of Salloum was declared as the first marine Egyptian protected area in the Mediterranean Sea by the Egyptian Prime Minister's decision No. 533 for the year 2010.

Bardawil Lake (Hyersaline habitat)

Lake Bardawil is so far the cleanest hyper saline marine water body in Egypt as well as in the entire Egyptian Mediterranean Sea. It is an important source of local fishery in North of Sinai and the country. The lake covers an estimated area of about 650 km2, with a maximum length of along the east-west axis, of 90 km, and a maximum width, along the north-south axis, of 22 km. It is extremely shallow; its depth ranges from 0.5 m to a rather rare 3 m. A long narrow sandbar of about 100 km long, with a maximum width of 2 km, separates Bardawil Lake from the Mediterranean Sea. Three inlets connect the lake with the sea; two artificial in the westand on eastern natural one at Zaranik.

Bardawil Lake has witnessed a considerable change in the ecological conditions of the lake, resulted in changes in the structure of its fishery from sea bream and mullets to shrimps and crabs that arrived in recent years from the Suez Canal, and became the main dominant commercial catch (about 60 %). Furthermore, marine turtles, mostly green and loggerhead became abundant in the lake due to the presence of their preferred feeding habitats in the lake.

There are 3 species of flowering submerged sea grasses: *Ruppia cirrhoas*, *Cyamodocea nodosa* and *Halodule universis*. They are widely distributed in the lake. The last species seems to arrive from the Suz Canal. Meoibenthic community consists of 20 species belonging to foraminifera (4 species), ostracoda (2 species), nematoda (3 species), nemertinea (one species), copepod (4 species), polychaeta (2 species), oligochaeta (one species), and mollusca (3 species). Nature of sediment and organic matter were the main factors affecting the meifaunal abundance and distribution. Anthrpogenic activities (intensive fish trawling and artificial inlets) seem to affect the distribution of total abundance.

Species composition, distribution of macrobenthic invertebrates in Baradwil Wetland were studied during the last 30 years., where the number of species has increased from 30 species into 52 species belonging to phyla; Coelentrata, Nemertina Annelida, Arthropoda, Mollusca, and Echinodermata. The abundance of benthic invertebrate species was closely correlated with nature of bottom sediments, organic matter, salinity and anthropogenic activities. The standing crop of macrobenthos decreased during the last two decades due to changes in fish community structure. A remarkable increase in the population density of Mollusca was noticed because of the declining of the fish, *Sparus aurata* which was mainly a bottom feeder depending on molluscan animals in its diets. This change in fish community, which consequently changes the whole ecosystem of the lake, encourages us to recommend establishing a monitoring program to follow up changes in the lake ecosystem, especially the benthic fauna that will be of great help in the management of such important water body

2.3. Singular habitats in the country

The Nile delta area cold hydrocarbon seeps

The area supports and harbors an exceptionally high concentration of unique living communities of presumably chemosynthetic organisms such as polychaetes and bivalves.

Physical description of the environment is Cold hydrocarbon seeps A highly concentrated region of cold hydrocarbon seeps in the south eastern Mediterranean Sea in waters off between 300 and 800 off the continental slope North Sinai (Egypt) and the Palestinian Authority Gaza strip.

Measures specific to this area is the recommendation of GFCM/2006/3 for establishment of fisheries restricted areas in order to protect the deep sea sensitive habitats. Deep Sea fisheries restricted area "The Nile delta area cold hydrocarbon seeps".

The Scientific Advisory Committee of GFCM has indicated that this area is characterized by an exceptional concentration of cold hydrocarbon seeps which had favoured the development of a unique living community and recommends that the area should be

given a full protection status by avoiding demersal fishing practices; Fishing with towed dredges and bottom trawl nets shall be prohibited in the areas bounded by lines join in the following coordinates:

31° 30.00′ N, 33° 10.00′ E	32° 00.00′ N, 34° 00.00′ E
31° 30.00′ N, 34° 00.00′ E	32° 00.00′ N, 33° 10.00′ E

Management Body/Authority is the General Fisheries Commission for the Mediterranean (GFCM) of the FAO. The purpose is to ensure the conservation and sustainable use, at the biological, social, economic and environmental level, of living marine resources, as well as the sustainable development of aquaculture in its area of application. In giving effect to the objective of the GFCM Agreement, the Commission shall:

1 _ Adopt recommendations on conservation and management measures aimed at ensuring the long-term sustainability of fishing activities, in order to preserve the marine living resources, the economic and social viability of fisheries and aquaculture; in adopting such recommendations, the Commission shall give particular attention to measures to prevent overfishing and minimize discards. The Commission shall also pay particular attention to the potential impacts on small-scale fisheries and local communities;

2 _ Formulate appropriate measures based on the best scientific advice available, taking into account relevant environmental, economic and social factors;

3 _ Apply the precautionary approach in accordance with the 1995 Agreement and the Code of Conduct for Responsible Fisheries;

4 _ Consider aquaculture, including culture-based fisheries, as a means to promote the diversification of income and diet and, in so doing, ensure that living marine resources are used responsibly, that genetic diversity is conserved and adverse impacts on the environment and local communities are minimized;

5 _ Foster, as appropriate, a subregional approach to fisheries management and aquaculture development in order to better address the specificities of the Mediterranean and the Black Sea;

6 _ Take the appropriate measures to ensure compliance with its recommendations to deter and eradicate illegal, unreported and unregulated fishing activities;

7 _ Promote transparency in its decision-making processes and other activities; and

8 _ Carry out such other relevant activities as may be necessary for the commission to achieve its principles as defined above.

2.4. Transboundary issues

The main transboundary issues identified are: fishing and marine aquaculture, Non - Indigenous Species, maritime transport, cruising and pleasure boating, coastal tourism, energy production, extraction of marine aggregates, offshore oil and gas industry, and sub-marine telecommunication and electric cables.

More than 20% of Egypt's total population lives along the northern coastal zone of the country, with more than 40% of its economic activities concentrated along the coast. Main economic activities in the northern coastal area include industry, agriculture, tourism, maritime, fishing, exploitation of petroleum, and mining activities, and urban development. Information regarding the exact contribution of the sub region to the national economy is unfortunately not available.

The north coast is home to several cities, towns and villages. Main population concentrations are in Alexandria, Port Said, Salloum, Marsa Matruh, El Dabaa, Damietta and many more. The largest Egyptian city on the Mediterranean is Alexandria. It hosts around 4.7 million inhabitants. Other large cities in the region are Damietta, the Beheira Governorate, the Kafr el-Sheikh Governorate, Port Said governorate, and Al Arish. It is expected that the north coast will experience higher levels of population growth rate. This necessitates the adoption of sustainable development policies and programmes that do not negatively impact the Mediterranean coastal zone and impair socio-economic activities that depend on its integrity and wellbeing.

Tourism in the Egyptian Mediterranean is characterized by the dominance of internal tourism as opposed to foreign tourism. Apart from the traditional destination cities such as Alexandria, Port Said, Matrouh and Al-Arish, the north coast extending from Alexandria to Matrouh has emerged as a main attraction for local tourism during the last two decades. About two million Egyptians visit the north coast in the summer season extending from May to September. This has been accompanied by extensive developments of resorts along the Mediterranean coast thus representing an increased pressure on the coastline and the ecosystem.

In recent years Egypt has experienced a boom in fish production, where it has increased from 790,000 tons in 2001 to 1.9 million tons in 2018. This increase in fish production has been mainly attributed to the expansion of aquaculture, which represented 80.7% of the total catch in 2018. This is in comparison to a decline in fish catch from other sources, with a percentage decrease from 55% in 2001 to 19.3% in 2018. Expansion in aquaculture in Egypt in recent years can be linked to the reduction of fish catch from the Mediterranean (88,900 tons in 2008 to 56.730 tons in 2018). Mariculture activities are restricted to specific habitats along the coast at Dieba Trianglar between Rashid and Domietta. It represents about 10% of aquaculture, about 150 000 tones, and is mostly extensive and semi-intensive. Main species are shrimps, sea bream, sea bass, and grey mullets. Impacts of such marine aquaculture on marine biodiversity is not well known except water quality in earthen ponds is richer in phytoplankton than the surrounding areas, due to the high load of nutrients (Shreif Saddek, Personal observation). In addition, a supper intensive aquaculture system has started recently to raise *Anguilla anguilla* in doors, with a possible production of 144 tons yearly.

Main reasons for the decline in fisheries from other sources (excluding aquaculture) have been identified as over fishing, in addition to reduction of re-cultivated agricultural areas that were converted into fish farms due to their higher-income per feddan illegal fishing, overlap between coastal and offshore uses, lack of planning, pollution, and lack of regulations regarding fishing periods to take into account breeding seasons and the use of non-selective fishing gear. This is in addition to other unsustainable fishing practices, including the use of trawls and other mobile bottom gear, the use of dynamite and poison, and the disposal of debris such as food containers and plastics, and vessel debris. It should be pointed out that the size of four of the northern lakes, namely Manzala, Burullus, Edku, and Mariout have drastically declined in size in some cases, as is the case for Lake Edku. Moreover, the northern lakes have been exposed to serious environmental degradation due to the disposal of industrial and agricultural waste, as well as municipal waste, over-fishing, illegal catching of fry fish and reduction of lakes area through years.

Invasive alien species have been responsible for the extinction of native plants and animals, degradation of rare and threatened ecosystems and ecological communities and damage to property, infrastructure, native fisheries, tourism and outdoor recreation. The threats to native biodiversity from marine invasive alien species, either from deliberate or accidental introductions (e.g., in contaminated ballast water or as encrusting organisms on ships), are increasingly serious and very poorly understood. A high percentage of globally and locally threatened species and ecosystems are at risk owing to competition with or predation or infection by invasive alien species.

Maritime transport represents another import sector in Egypt. The strategic location of Egypt attracts a great deal of maritime traffic along the Egyptian Mediterranean coastal zone. Major ports in Egypt are located in Alexandria, New Damietta and Port Said. These ports also have oil and natural gas terminals. Smaller fishing ports are located at a number of designated fish landing facilities in addition to most major ports. Naval port facilities are also found along the Mediterranean coast. Egypt has 6 commercial ports on the Mediterranean out of a total of 15 ports, 3 petroleum ports out of the total 11 and 3 out of the 4 fishing ports. There are no mining or tourist ports on the Mediterranean

Oil shipping through the Suez Canal and along with the Egyptian oil terminals makes the Egyptian Mediterranean coast among the most important oil shipping routes in the Mediterranean basin. The importance of this facility is expected to be further enhanced after the completion and inauguration of the new parallel canal in August 2015. Seaports are considered to be the backbone of the state's foreign trade and its access to the world. Increased maritime transport due to an increase in the volume of trade and tourist activities is likely to further increase pressures on the Egyptian coastal areas, if necessary measures are not introduced. It is therefore essential that the Egyptian Government introduce necessary measures to address the negative impacts resulting from maritime activities. These include the introduction of standards, monitoring and enforcement measures with respect to CO2 emissions, the disposal of waste, oil spills and other harmful chemicals and waste. Moreover, the local capacity in terms of personnel and equipment need to be enhanced to adequately monitor, control, manage the sector and port facilities.

It is evident that from current and expected future urban development in general and that which is associated with tourism along the Egyptian Mediterranean coast, that if proper measures and actions are not introduced, environmental damage to the coastal zone will continue with irreversible damage to some of the natural ecosystem. Policies therefore need to be developed and implemented to promote sustainable and ecotourism that recognizes the importance of the environment and natural resource as being the backbone for the economic viability and further development of the sector and the economy.

As for the offshore oil and gas industry, the most significant contribution the sector has made to the economy was in 2006. During the years when the Egyptian economy was steadily growing from 2006 to the financial crisis in 2009, the sector averaged a contribution of 0.75%. Starting 2012 the sector began contributing negatively to GDP growth, averaging a contribution of -0.3%, reaching -0.9% in the financial year 2014. The Egyptian Mediterranean coast though offers promising ground for gas discoveries, particularly in deep waters. Most activities of the sector are not located in the Mediterranean or the Delta, with only 7% of the rigs in Egypt located in the Mediterranean or the Delta and the majority located in the Western Desert.

With increased stability in the country accompanied by the payment of arrears to foreign petrol companies, explorations have resumed with 53 exploration agreements signed. Fourteen of those explorations are in the Mediterranean Sea: West El Arish off shore, east Port Said, north Rommana, north Ras El Esh, west El Temsah, south Tennin, north El Hammad, and east Alexandria. Linked to the oil industry is the petrochemical industry, with plans to expand activities in this sector. The Government has plans to increase the production of lighter products, petrochemicals and higher-octane gasoline by expanding and upgrading existing facilities and promoting new projects.

Environmental safeguards should be introduced to ensure that exploration activities as well as operations and petrochemical activities do not represent a hazard to the environment. Oil and gas companies operating throughout Egypt should follow strict environmental standards that require the use of appropriate technologies and procedures to ensure the protection of the environment and the ecosystem, in addition to environmental and social impact assessment studies. Contingency plans should be put in place in order to deal with oil spills and accidents related to explorations, drilling and oil and gas transport.

Due to its strategic location, Egypt is a hub for submarine cables. Cables passing through Egypt connect Asia with Europe and North America. There are four main landing locations for cables in Egypt: Zaafarana, Suez, Abu Talaat and Alexandria. The Egyptian Ministry of Communications and Information Technology (MCIT) is working on adding more cables and improving the already existing ones.

No specific data is available on the Mediterranean submarine telecommunications sector. Main environmental problems associated with the sector are the risk associated with the installation of the cables and the possible impacts on benthic communities, and endangered species including marine turtles and marine mammals. There are a number of activities along the Mediterranean coast that have negative environmental impacts on the marine ecosystem. These include landmines, mining and quarrying, and drilling related activities.

A number of recommendations are proposed to mitigate and eventually avoid the negative impacts of economic activities on the marine environment, local communities and the country as a whole. Those include ensuring the integration of environmental as well as social considerations in economic activities, and the adoption of sustainable practices and measures in tourism, fisheries, and marine transport sectors as well as in other activities such as urban development, industry, and agriculture. There is also a need to have in place a good governance system in order to ensure the strict adherence to environmental regulations, and an adequate and effective monitoring system that ensures compliance and adherence to environmental standards and regulations. Policy and decision makers should be made aware of the real cost to society and the economy of unsustainable economic activities and the need to ensure that environmental and social considerations are fully taken into account in the design and implementation of economic activities, and encouraging green and circular economy in these activities. Moreover, local capacities in the assessment and monitoring of marine related socioeconomic activities and their potential impact on the marine ecosystem should be further strengthened.

2.5. Marine and coastal biodiversity gaps needed for scientifically sound based conservation

The following are the main gaps needed for scientifically sound based conservation. These are: Interactive information system on the Egyptian coastal and marine ecosystem; Integrated Monitoring and Assessment Programme (IMAP), Effective Protected Areas; Mainstreaming of marine biodiversity into all development sectors; mainstreaming climate change and variability in all economic sectors as cross cutting issue, Stakeholder Engagement; Institutional Reform and Capacity Development of the Staff of Nature Conservation Sector; Paradigm Shift in Scientific Research; Revising the Current NBSAP; Enhance Cooperation and Coordination among Relevant Governmental Agencies, Financial, Economic Valuation of Coastal and Marine Ecosystem Services, Technical and Human Resources. Special emphasis is to be given to socioeconomic considerations for proper valuation and evaluation of the coastal and marine ecosystems

Marine biodiversity is changing rapidly as a result of natural and human pressures. Such change can lead to environmental, economic and, ultimately, social problems, but also to new opportunities for people and industry. Biodiversity underpins the health of the oceans and their productive ecosystems which, in turn, support sustainable fisheries and provide enormous possibilities for new biotechnological applications. To explore, conserve, and make better use of marine biodiversity, we need a deeper understanding of its origin, its composition and its role in ecosystem functioning. We also need improved approaches and tools to monitor and quantify marine biodiversity and to better inform policy makers and the public on its value in environmental, social (including cultural) and economic terms.

Egypt has made significant progress in marine biodiversity research and knowledge generation owing to strong support, funding, and coordination of research effort. However, there is still a major knowledge deficit and many of the important programmes and initiatives which have driven this progress have now ended. While biodiversity policy has also advanced, Egypt has failed to achieve the biodiversity targets it has set itself. To meet these targets, effective science-based decisions and management will be necessary. This requires good science, strong Egyptian research collaboration, enhanced observing and research capacities, and effective science-policy interfaces.

The social, economic and environment values of biodiversity are very limited, and more research is needed not only at the level of species but also at the ecosystem functions and services. Technological advancements in biosafety and genetic resources should be given a priority. Spatial planning for biodiversity still in the early stage and more works are needed on threats to convince decision makers to make proper interventions. Research is still needed on public awareness not only be aware of the values of biodiversity but also on the steps being taken for biodiversity conservation.

Most of the publications did not respond to specific issues such as new trends in protected areas and other areas of conservation values, links between biodiversity and climate change, habitat degradation and restoration, new technologies such as synthetic biology being used in biodiversity such as Benefit Sharing, Risk Assessment and Risk Management, invasive species, new trends in marine biodiversity (EBSAs, blue economy, nature- based solutions, mainstreaming of biodiversity into development sectors, resource mobilization, traditional knowledge cooperation and synergies with biodiversity related conventions, and technology transfer, modeling and scenarios for future biodiversity.

One of the main obstacles that were found in these publications is convincing scientists to move away from specific scientific research topics to monitoring of ecosystems for management purposes. Efforts are being made during the last 10 years to apply ecosystem approach (EcAp) for intervention by decision makers to produce healthy environment. This requires tremendous human, technical and financial resources.

Scientific Information gaps are still needed on: Physical structure of the coastal and marine environment in accordance with the recent updated classification of habitat types; Oceanography; Interactive Database on biodiversity; Ways in which human interact with the environment, hence biodiversity and ecosystem services.

3.

Pressures and impacts

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3.1. Biological disturbance

Negative impacts on the Northern Mediterranean coast of Egypt include tourism, Overexploitation beyond sustainable limits, maritime activities, chemical contamination, coastal development and sprawl, eutrophication, non-indigenous species, changed hydrographic conditions, status of biodiversity, rational land use, erosion and sedimentation, sea-floor integrity, and marine noise.

Tourism is expanding greatly in recent years with more infrastructures along to coast, extending from Alexandria to Marsa Matrouh. It is the intention of the Government to further develop the north coast to absorb the future population growth in the country and to make it attractive to foreign tourists and investors. However, environmental degradation of the northern coastal areas will be a discouraging factor for foreign tourists to visit main Egyptian Mediterranean cities. The environmental impacts on coastal areas will be further exacerbated by increased levels of urbanization, volume of transport and consequently fuel consumption and CO2 emissions, cruising and pleasure boating, as well as increased levels of ground water consumption and wastewater and solid waste generation and disposal.

There are negative impacts on the ecosystem due to maritime transport and pleasure boating. Some of these causes are more specifically, illegal dumping of waste, marine accidents, ship and vessel maintenance resulting in changes in water quality, introduction of alien and invasive species, and sound pollution.

Egypt is a hub for submarine cables. Main environmental problems are the risk associated with the installation of the cables and the possible impacts on benthic communities, and endangered species including marine turtles and marine mammals. There are other factors that have impacts on the marine ecosystems. These include landmines, mining and quarrying, and drilling related activities.

Eight new Lessepsian fish species have passed through the Suez Canal into the Mediterranean since 2015, representing an 8% increase in species. Climate change plays the main role in this process. This enhanced habitability of the canal has facilitated the establishment in the Mediterranean Sea of over 400 marine Non-Indigenous Species (NIS), including more than 100 species of marine fishes, from the Red Sea (called Lessepsian migration). Suez Canal is an important corridor for world trade; its use shortens shipping distances and reduces CO_2 and sulfur emissions. The considerable body of knowledge available now on the risk of NIS introductions can inform future environmental risk assessments. Changes in shipping routes due to ongoing shifts in trade and climate change may alter usage patterns of the canal. Climate change may also alter the pace of NIS introductions through the canal: the 'tropicalization' of the Mediterranean is expected to provide conditions more suitable for establishment of Lessepsian migrants. Now is the time to incorporate these economic, social and environmental scenarios with scientific knowledge. The United Nations Convention on the Law of the Sea (UNCLOS) and the Convention on Biological Diversity (CBD) incorporate mandates for member states to prevent and manage NIS introductions. These conventions are suitable instruments to develop practices based on science for environmental impact assessments. Furthermore, through the 2017 Ballast Water Management Convention, the International Maritime

Organization (IMO; the UN agency responsible for sustainable shipping) has implemented guidelines and obligations to reduce the spread of NIS via ship ballast water, sediment and hull biofouling. An additional way to manage NIS could be to engage key actors of the shipping industry that are willing to address this issue in the quest for a more sustainable ocean economy.

It is apparent the socio-economic activities do have negative impacts on the Egyptian Mediterranean coast. They are mainly represented in increased air and sea pollution, pressure on the ecosystem, degradation of biodiversity and local habitat. This is mainly attributed to unsustainable physical development along the coast associated with internal tourism, the dumping of agricultural, industrial and municipal waste and urban encroachment on the northern lakes, increased surface and maritime transport, offshore and onshore drilling and oil and gas explorations and operations. Other environmentally negative practices include, overfishing, hunting of wild animals, illegal bird hunting, over collection of plants, and the impact of invasive species.

3.2. Vulnerable marine ecosystems

These include: *Pocidonia* meadows, coralline algae habitats, depleted fisheries in all Egyptian Mediterranean Sea, coastal lagoons connected to the sea where fish fries are caught for aquaculture purposes, deep sea ecosystem particularly Nile Delta Fan, Sea bird habitats, marine mammals and marine turtles habitats, and, hypersline coastal habitats such as Bardawil Lake, important coastal habitats exposed to erosion, and human urbanization (salt marshs, sandy, rocky and muddy beaches, sand dunes and coastal aquifers).

3.3. Emerging issues such as climatic change effects and open sea including deep-sea ecosystem concerns

The Mediterranean is one of the most sensitive region to climate. A warming trend of about 1.6°C, and a rise in the frequency of extreme events are provided by scientific institutions. So far, none establishment of a model tries to assess Mediterranean Biodiversity. A debate still exists on the possible adaptation measures to restrict the negative impacts by reducing the ecosystem's vulnerability, and to exploit the positive aspects or opportunities in the best possible way.

Most research on the impacts of climate change in the Egyptian Mediterranean is fragmented and is concentrated on the Nile Delta system. Therefore, there is a need to establish a virtual centre that deals with this important issue, and includes all interested scientific institutions and individuals. Data already exist, but need to be verified, modeled, and impacts on biodiversity are properly addressed. There is a vital need to establish a national observatory system for climate change impacts on Egyptian coastal areas and harmonize monitoring and assessments methodologies.

New policies are needed to integrate options for meeting biodiversity, climate and sustainable development objectives at the national level. This will require scientific and technical expertise, and understanding of socio-economic and ethical considerations. For example, climate change policies must, as a priority, identify the protection of biodiversity and healthy ecosystems as highly relevant to climate change mitigation and adaptation.

A significant new research effort is also required to improve understanding the role of biodiversity in the Mediterranean sea and climate systems, the impact of climate change on biodiversity and human populations, and their inter-linkages, feedback mechanisms and cross-scale effects.

Studying of biodiversity in the exclusive economic zone in the Mediterranean, especially in northern Nile Delta and north-western coastal zone, is one of the priorities in the maintenance of marine biodiversity. These studies include:

1 _ Survey of the marine organisms in some areas of environmental sensitivity (North Delta - Salloum - Marsa Matrouh, etc.)

2 _ Mapping of the environmental specifications of those places using techniques of GIS and remote sensing. This activity includes the monitoring of water temperature - the wind - the degree of water transparency - depths of water - soil quality of the beaches, sea level rise, and etc.

3 _ Atlas preparation for the distribution of marine species and conduct studies to predict the presence and distribution of species by use of environmental maps which have been prepared.

4 _ Identify the impact of human activities on marine biodiversity (prospect for oil and gas in the north Delta), as well as overfishing, etc.

5 _ Identification of species at risk, and identification of species at risk most vulnerable ecosystems and hotspots.

6 _ Recording and conservation of genetic origins of these organisms by use of technological means.

7 _ Study the rehabilitation of degraded areas, etc.

Other emerging issues that need to be considered are: nature based solution, marine spatial planning, technological advancement (geoengeering, synthatic biology).

Climate change projects in Egypt:

- A project of "adaptation of climate change in Nile Delta through integrated coastal zone management" was implemented in 2018 by Ministry of water resources and irrigation with cooperation of UNDP to integrate the management of sea level rise (SLR) risks into the development of Egypt's Low Elevation Coastal Zone in the Nile delta by (1) strengthening the regulatory framework and institutional capacity to improve resilience of coastal settlements and development infrastructure, (2) implementing innovative and environmentally friendly measures that facilitate/promote adaptation in the Nile Delta, and (3) establishing a monitoring and assessment framework and knowledge management systems on adaptation.

- A project of "enhancing climate change adaptation in the North coast and Nile Delta in Egypt" is currently implemented by Ministry of water resources and irrigation with cooperation of UNDP and funded by GCF to support adaptation efforts of Egypt in the Nile Delta and to reduce coastal flooding risks in Egypt's North coast due to combination of projected SLR and intense extreme events. The project focuses on constructing 69 km of sand dune dikes as a soft structure along five vulnerable hotspots within the Nile Delta coastal areas and preparing ICZM plan for northern Egyptian coastal zone.

ICZM in Egypt:

- Egypt has prepared national ICZM strategy with cooperation of PAP/RAC that has been approved from EEAA board of directors.

- The strategy addressed main issues affecting the sustainability of Egyptian coastal areas as: irrational land use, water quality deterioration, shoreline flooding and erosion, deterioration of natural habitats, climate change and sea level rise.

4.

Current response measures

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4.1. Marine protected areas and other area-based conservation measures

During the last 10 years, coastal and marine protected areas along the Egyptian Mediterranean Sea (Salloum, Omayed, Brullus, Ashton El Gamil, and Zaranik) have not yet received enough financial and technical support to improve their performance, except for those provided by SPA/RAC and ACCOBAMS on certain issues such Marine mammals action plan and survey, management plan, socioeconomics, and communication strategy of El Salloum MPA, marine turtles survey , capacity building and awareness campaign, action plan for marine vegetations, Egypt's National Action Plan for the Mediterranean Non- Indigenous Species, and National monitoring program for biodiversity and non-indigenous species in Egypt.

However, the existing MPAs are not well representing the different marine ecosystems. Examples include potential habitats for iconic species (such monk seal), and offshore habitats particularly those related to marine mammals and marine turtles, as well deep sea habitats. In addition, local communities need to be developed for better and good governance of MPAs. Emphasis should be focused on the role of women and NGOs. Application of the ecosystem approach needs to be implemented. More protected areas especially along the western coast at Salloum, need to be declared, developed and well-managed with emphasis on the marine environment, fisheries and ecotourism.

There are still many obstacles and needs which are required to achieve effective performance of the protected areas management and achieving the stated targets in NBSAP. Critical problems still exist, including inability to retain trained staff, under funding, lost opportunities to generate substantial revenues, and adapt to and manage rapid and multi faced systems, complexity and changes. Proposed correction actions include transform from bureaucratic management culture to objective-oriented performance culture; from centralized planning and budgetary to develop financially and technically; from personalized (ad-hoc) decision making to decisions guided by policy and regulations; and from financial dependent to financially self-sustaining. The proposed long-term solution is an effective and sustainable PA system operated by an autonomous NCS that has the financial wherewithal and management capacities needed for the effective management. A PA system which is effective in conserving biodiversity, run on a solid economic basis, well-marketed and seen as playing a positive role in the future development of Egypt, will be able to secure substantial political and public support and leverage. Therefore the establishment of NCS as a separate entity will achieve this goal. It is hoped that the Parliament will adopt the draft legislation very soon. This new legislation will enable Protected Areas to be self-financed Agency.

4.2. Legal and institutional frameworks governing the conservation and sustainable use of marine and coastal biodiversity

Responsible Agencies and Organizations; National Institutions / organizations responsible on coastal and marine ecosystems along the Egyptian Mediterranean Sea include Ministries of Environment, Agriculture and Land Reclamation, Transport, Coastal Governorates, Universities and research centers (National Institute of Oceanography and Fisheries). Defense, Interior, Health, Water Resources and Irrigation, Bibliotheca Alexandrina, Justice, Arab Academy for Marine Transport, NGO's Diving Centers, fisheries cooperatives, and many others. Detailed description of the roles of these organizations are presented in previous reports submitted to SPA/RAC (monitoring of marine biodiversity and NIS, action plan of NIS)

The Egyptian Constitution (2014) contains many articles for the conservation of biological diversity and natural resources in Egypt; Article (30) deals with protecting Fisheries Resources; Article (32) Preserving the natural resources of the State and making good use thereof, and taking into account the rights of future generations; Article (44) with the protection of the Nile and Groundwater; Article (45) with the protection of the seas, beaches, lakes, waterways and protected areas, and Article (46) for A healthy environment and the rational use of natural resources to achieve sustainable development.

The most important laws that have articles related to the protection of marine environment are: The protectorate law (103/1983); the protection of the environment (1994, amended in 2009), and law 48/1983 for Protection of Water Bodies, modified in 2019. There are several laws that have been approved and have articles that deal with protected areas and rehabilitation and restoration such as Quarries and Mineral Resources and other laws that were amended and still others being amended such as Law on Fisheries Regulations and more new laws are being considered by the Egyptian Parliament such as Establishment of Protected Areas Agency, Biosafety and ABS Laws. In addition, a new Agency for Waste management and Regulations was established in 2015. Furthermore, the National Strategy for Sustainable Development is being updated and environment is one of the main cross cutting sectors.

Egypt signed many international and regional conventions such as CBD and its two protocols, RAMSAR, CMS, CITES, IMO, FAO, WHO, Barcelona, PERSGA, IUCN, Birdlife International and many others. It is committed to all their obligations such as regular national reporting, attend all COPs, and technical meetings such as SBSTTA, SBI, workshops, and many other activities, including cooperation and synergies with conventions. Egypt has also benefited greatly from capacity building workshops, and was able to obtain numerous technical assistance such as EIAs, green protected areas, funding to implement studies on illegal bird killing, mainstreaming of soaring birds into renewable energy, and establishment of new protected areas. In addition, Egypt has participated in many meetings related to the importance of cooperation and synergy with other conventions, organizations, and initiatives. All of these activities are contributing in supporting implementation of NBSAP, development of policies and reviewing and evaluation of regulations, policies, and legislation, as well as partnerships to support of raising the political profile of biodiversity and awareness of its values. In addition, Egypt has benefited greatly from available guidelines on EIAs, SEAs, and mainstreaming of biodiversity into development sectors.

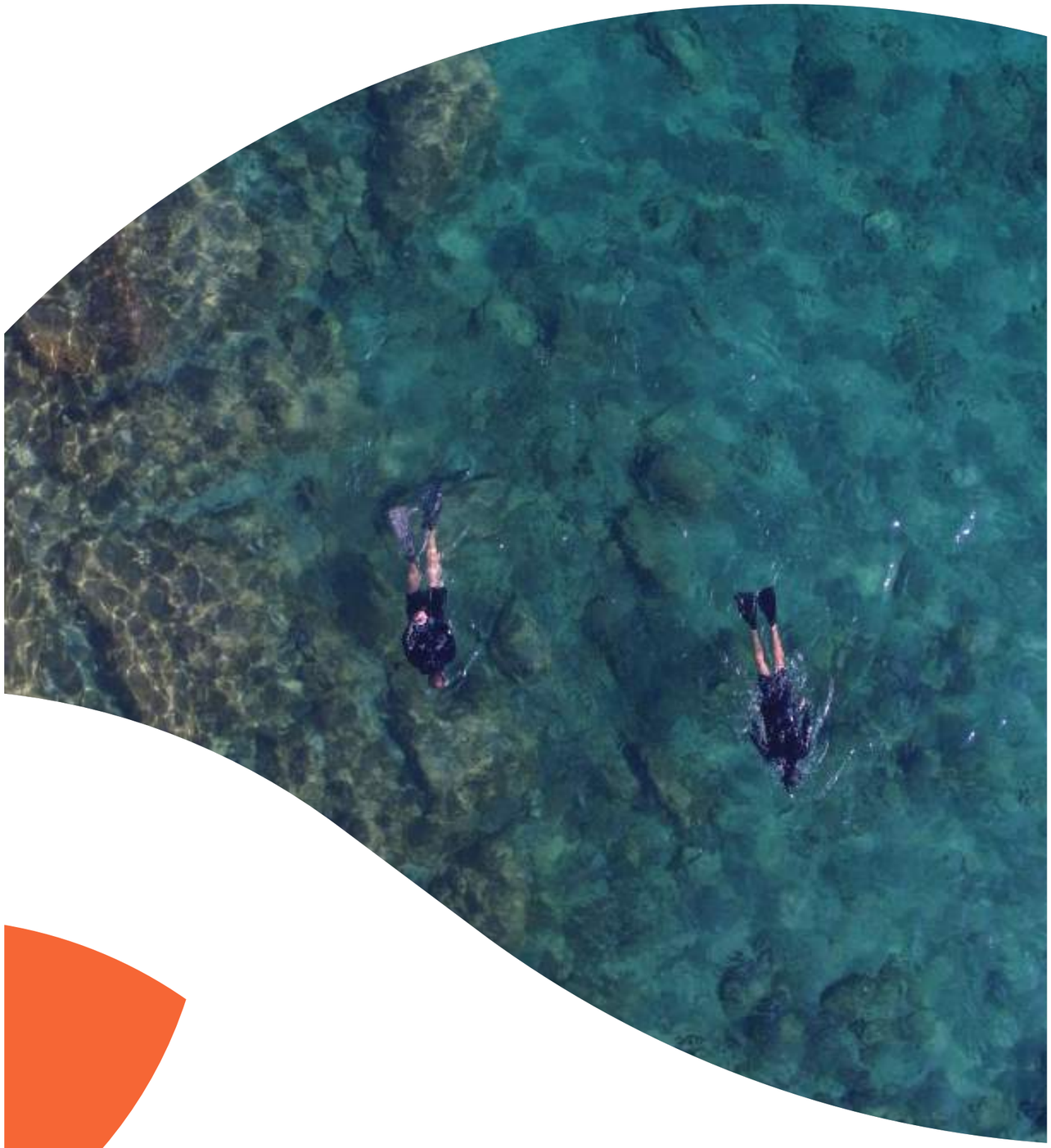
With cooperation of PAP/RAC and UNEP MAP, Egypt has prepared its national ICZM strategy that has been approved from EEAA board of directors. The strategy addressed main issues affecting the sustainability of Egyptian coastal areas as: irrational land use, water quality deterioration, shoreline flooding and erosion, deterioration of natural habitats, climate change and sea level rise.

4.3. Transboundary issues and existing, planned or needed coordination/ harmonisation at subregional or regional level

SPAMIs does exist in several countries in the northern and western countries, however, it does not exist in Egypt due to the current political situation in the region.

5.

Assessment of marine and coastal status and pressures and impacts on the marine and coastal biodiversity



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5.1. Marine and coastal status and pressures relevant to national marine and coastal areas

Major threats to marine ecosystems are unregulated tourism, exploitation of marine resources, overfishing and fishing in illegal areas (e.g. breeding grounds) and coastal pollution, rational land use, erosion, sedimentation, climate change and sea level rise. At present, 20% of Egyptians live in coastal areas, which are also visited annually by millions of tourists. In addition, more than 40% of industrial activity occurs in the coastal zone.

Pollution causes deterioration of critical habitats and species loss. A concrete example is the Delta wetlands. Excessive use and misapplication of pesticides also causes loss of rare species including those that act as pollinators and natural biological control agents.

Over-fishing contribute to biological degradation. Wildlife utilization is, for the most part, unregulated in Egypt and excessive hunting is endangering a number of wild animals as well as several species of resident and migratory birds.

The lack of a sustainable and effective system to address natural heritage management issues is hampering the nation's ability to conserve and manage its unique and critical resources. Poorly regulated marine tourism, coupled with inadequate infrastructures to protect natural resources and insufficient regulations are causing destruction and degradation of natural habitats, landscapes, cultural heritage sites and other resources. In addition, there is a lack of coordination and cooperation between all relevant stakeholders in regards to data collection, storage and analysis of biodiversity data and the absence of comprehensive legal protection for natural heritage resources outside protected areas. This lack of coherence threatens future sustainable returns from natural resources. All of the aforementioned issues are compounded by the fact that few economic incentives are available for biodiversity conservation.

Egypt's wetlands are subject to a variety of human induced threats, which are leading to the degradation of this valuable national resource. One of the major threats is the drainage of water bodies for their conversion into agricultural and settlement developments, ultimately destroying habitat and reducing their areas. Other threats include water withdrawal for irrigation, coastal erosion, invasive species, water pollution, increase of vegetation areas inside the wetlands due to the high nutrients levels that affect the water circulation and pollution dilution, and overfishing.

The severity of pollution varies from lake to lake, but they all share the same cause of pollution - the discharge of untreated or partially treated industrial and household waste water (mainly sewage) and the dumping of agricultural drainage loaded with fertilizer, pesticide and herbicide residues. Excess agricultural runoff and domestic wastewater discharge into these water bodies causes an increase in the levels of nitrogen and phosphorous, a process known as eutrophication, causing harm to other forms of life inhabiting these waters. Such malpractices can be traced back to a rapidly growing population and the increased human activity that comes with it. Applied fishing techniques also have adverse impacts on fish production. They have affected the aquatic environment in many ways. Fishermen use inappropriate techniques to increase their catch. This has caused the killing of the small traits and hence, decreased production. The use of huge

fishing nets causes the death of large numbers of non-target species through habitat destruction and being accidentally engulfed by the fishing nets.

Direct habitat loss is a major threat to coastal and marine ecosystems and is driven by a number of factors: i) the rapid unplanned development of areas such as the north coast and; ii) the unsustainable exploitation (ex. bottom trawlers) of marine resources; iii) deterioration of breeding and nursery sites of fishes at the connection of the sea with coastal lakes and the islands known for breeding of birds; iii) commercial ship trafficking in the Suez Canal and oil leakage from some oil fields; IV) sanitation discharge in the Mediterranean Sea and coastal lakes; v) social pressures on the government to meet the needs of a growing population (unemployment, introduction of new patterns of development, competition for exploiting available resources, lack of public awareness with the importance of inherited culture associated with unorganized development plans and threat of investments due to beach erosion).

Coastal development, intensive tourism and land reclamation put pressure on key wildlife habitats in the Mediterranean. Contributing factors to the decline of wildlife habitat in the Mediterranean include historical overexploitation, degradation of beach nesting habitat due to sand and salt extraction, entanglement in fishing gear, loss of sea grass meadows, pollution and increased ship traffic. In the eastern Mediterranean, seabirds are threatened by habitat loss due to drainage, water diversion, changes in annual water regime, eutrophication, reed cutting, landfills, chemical pollution and hunting. Local and regional problems related to pollution, specifically effluents from domestic and industrial sources, oil transportation, refineries and agricultural runoff are also beginning to have serious impacts on wildlife.

Microplastic pollution has gained significant attention, and there are growing concerns about its potential effects on aquatic environments. The lack of proper solid waste management in Egypt has resulted in the accumulation of plastic litter and its deposition in waterways. However, no attempts have been made to identify or assess marine plastic litter in Egypt. Shabaka, *et al* 2019 provided for the first time, a precise, simple, and cost-effective method to identify microplastics in Eastern Harbor by using differential scanning calorimetry (DSC). This screening revealed the presence of ten polymers in seawater and shoreline sediments. Most of the extracted microplastics are secondary microplastics, as they appear to be remnants of larger plastic fragments.

Enhanced visual counting technique coupled with combustion analysis and differential scanning calorimetry (DSC) was applied to assess microplastics (MPs) contamination in fish digestive tracts from Eastern Harbor, Egypt, to provide a simple and economic method for MPs assessment. This was the first study in Egypt to quantify MPs in fish. Plastic particles were detected in all fish samples, represented by seven thermoplastic polymers. The average number of MPs was at its highest level in *Siganus rivulatus*, *Diplodus sargus*, and *Sardinella aurita* (7527, 3593, and 1450MPs $fish^{-1}$, resp.) and the lowest in *Sphyraena viridensis* and *Atherina boyeri* (46 and 28MPs $fish^{-1}$, respectively). The average weight of MPs as measured by combustion ranged from 302mg kg^{-1} in S. rivulatus to 2mg kg^{-1} in Terapon puta (Shabaka, *et al* 2020).

In compliance with IMAP metadata for monitoring and assessment of marine litter indicators, a national programme for "regular monitoring and assessment of marine litter in the Northern beaches of Egypt" was prepared by EEAA.

5.2. Critical impacts and effects on marine and coastal biodiversity

Recent findings have shown that the Mediterranean region has been identified as a climate change 'hotspot'. Average temperatures in the region have already risen to 1.6°C above pre-industrial levels, while a temperature rise of 2-3°C by 2050, and a rise of 3-5°C by 2100, have been forecasted for the region (IPCC, 2013). This will lead to an increased frequency of extreme weather events, such as droughts, heat waves, storms and floods.

The impact of biodiversity loss is difficult to determine precisely due to the complexity of the processes involved. The loss of biodiversity will impact severely on the livelihoods of the many people who directly or indirectly depend on natural resources. Egypt has not carried out a systematic quantitative assessment of how changes in biodiversity have impacted the provision of ecosystem services, or how the production of ecosystem services has impacted biodiversity. Some examples of the impacts of major threats on biodiversity and associated effects on ecosystem services and human well-being are summarized in the sections below.

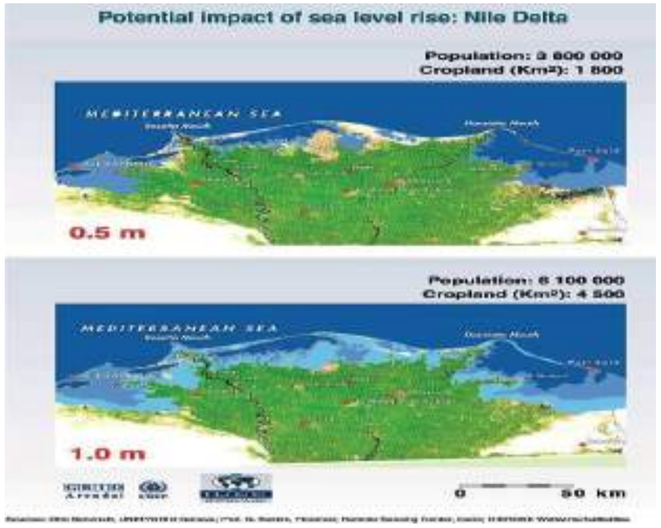
The IPCC assessment reports confirmed that it is extremely likely that human influence has been the dominant course of the observed warming of the atmosphere and the ocean since the mid-20th century. The reports documented both observed impacts of climate change on biodiversity and human well-being, as well as the projected impacts according to a number of scenarios. They also set options for mitigation actions

IPBES assessment in 2019 addressed the direct and indirect drivers of change that have accelerated during the past 50 years to be:1. Land-use change has been the largest negative impact on nature. 2. Climate change is accelerating.3.Many types of pollution, as well as invasive alien species are increasing.4. Human population has doubled, the global economy (4 fold) and global trade (10-fold) are driving the demands for energy and materials.5. Economic incentives have favored expanding economic activity, and often environmental harm, over conservation and restoration.and 6.Nature managed by indigenous and local communities is under increasing pressure.

Global Biodiversity Outlook 5 (CBD, 2020) made it clear that Aichi Biodiversity targets are not yet, fully achieved, though 6 targets have been partially achieved (Targets 9, 11, 16, 17, 19 and 20). This, in turn, will threaten the achievement of Sustainable Development Goals. The COVID 19 Pandemic has further highlighted the importance of the relationship between people and nature.

Biodiversity impacts of climate change include shifts in species distribution and range, and the impacts of mitigation activities. There is also concern that existing protected area networks may not be adequate for biodiversity conservation in a time of changing climate. Moreover, the Mediterranean Sea is becoming warmer; its salinity is increasing, and the rise in sea level is accelerating. The Nile Delta is considered one of the most vulnerable sites in the world due to climate change inputs.

Rising sea level would destroy weak parts of the sand belt, which is essential for the protection of lagoons and the low-lying reclaimed lands. The impacts would be very serious: One third of Egypt's fish catches are made in the lagoons. Sea level rise would change the water quality and affect most fresh water fish. Valuable agricultural land would be inundated. Vital, low-lying installations in Alexandria and Port Said would be threatened. Recreational tourism beach facilities would be endangered and essential groundwater would be salinated. Dykes and protective measurements would probably prevent the worst flooding up to a 50 cm sea level rise. However, it would cause serious groundwater salination and the impact of increasing wave action would be serious.



Map 5.
Potential impact of Sea level rise: Nile Delta

6.

Assessment of national priority needs and response actions

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Detailed information on the implementation measures, their effectiveness, and associated obstacles and scientific and technical needs to achieve national targets of NBSAP are presented in the 6 National Report on biodiversity submitted to the CBD in June 2019. They include the followings:

1 _ Biodiversity related conventions, organizations and initiatives;

2 _ Communication, education, and public awareness;

3 _ Egyptian constitution;

4 _ Funded projects and resource mobilization for biodiversity conservation;

5 _ Law enforcement;

6 _ Mainstreaming of biodiversity into development sectors and sustainable development;

7 _ Partnerships;

8 _ Protected areas network;

9 _ Scientific research and biodiversity monitorings;

10 _ Sustainable development through biodiversity; and

11 _ Spatial planning in protected area.

Each measure taken to contribute to the implementation of Egypt's national biodiversity and action plan is described, and tools or methodology used for the assessment of effective measures are explained. Other relevant information, including case studies to illustrate how the measure taken has resulted in (or is expected to result in) outcomes that contribute to the implementation of NBSAP are also provided. Obstacles that have been encountered and any scientific and technical needs are also described.

One of the major difficulties facing the management and conservation of marine-biodiversity in the Egyptian Mediterranean Sea is the lack of detailed, geographically comprehensive database. In addition, information available on marine species, habitats and ecosystems are not consistent, perhaps due to unclear spatial and temporal patterns. Meanwhile human activities in the coastal and marine environment have made considerable changes leading to depletion of fish stocks, pollution in all different forms (oil pollution, debris, plastics, noise), fragmentation of habitats, increase of number of invasive species, and the possible impacts of climate change.

Therefore, a detailed, geographically comprehensive database on marine habitats, ecosystems and biota is required to develop a sound management plan for marine biodiversity. This will require field surveys on marine biodiversity to gather information on the geographical distribution, status, and exploitation levels of marine habitats, ecosystems and species. The collected data will be assessed into a GIS database, which will be accessible to biodiversity managers and decision makers. Targets include: 1) establish a marine database on the basis of recent, geographically comprehensive field-collected data; 2) develop and implement an integrated marine biodiversity management plan.

Although many institutions hold knowledge on marine biodiversity, decision makers have difficulties to find the type of answers they need. This situation can be challenged by representing a one-entry for questions and collecting all available knowledge in the best possible manner (depending on means and timeframe). The suggested network will integrate available knowledge and process it in a sound and reliable way to provide answers to decision makers in a format that they can readily use. Thus, creating better links between knowledge holders and users will bring significant changes to the way short and long-term impact on marine biodiversity changes are tackled.

Egyptian research has considerably advanced our knowledge of coastal and marine biodiversity in recent years but it is clear that there is still much work to do, as the vast majority of species living in the Egyptian Mediterranean Sea have yet to be discovered or described. Moreover, for most species known, there is a complete lack of knowledge of the full life-cycle, ecological niche and role, population structure and status, pathogens, symbionts, and interactions with other components of the ecosystem. In addition, little is known of the factors that control the generation of diversity itself and its function in regulating many marine processes.

Biodiversity conservation still need more work to be appreciated by the public and different development sectors, and even authorities and policy makers, on issues related to the values of biodiversity and ecosystem services, as well as the meaning of biodiversity in relation to the well being and livelihood of local communities who depend mostly on biodiversity resources.

There are needs for a comprehensive CEPA programme at central level where all funded projects will participate in this programme. Meanwhile, partnerships are to be established with universities and research centers to launch scientific research on all aspects of biodiversity and ecosystem services. Results are to be disseminated to various departments and sectors of EEAA where they will communicate with public, and at the same time, they will use biodiversity barometer to assess progress in understanding the values of biodiversity and ecosystem services.

Funded projects effectiveness is limited to the sites where these projects are being implemented. Biodiversity conservation in other sites and protected areas still suffer from many drivers such as habitat fragmentation, over collection of wild plants and animals, pollution, over-fishing, invasive species, climate changes, and demographic pressures.

Ministry of Environment has increased its budget for protected areas during the last few years. Public and NGOs as well as individuals became more aware of the law and also report quickly to the Ministry of Environment (where exist a special department for citizen services, hotline, website) using social media. The government has also developed policies for biodiversity conservation where a separate entity is being discussed at the Parliament to establish Protected Areas Authority.

Priorities should focus on capacity development to provide enabling environment for law enforcement. This will require comprehensive capacity building not only within the ministry of Environment but also other concerned authorities such as police, coast guards, local authorities, civil society, NGOs, and others. Public are eager for more awareness programs on the values of biodiversity and also meaning biodiversity loss to people. More studies are needed on the evaluation of biodiversity damage and compensation, and the effectiveness of the different laws.

Considerable efforts were made regarding biodiversity mainstreaming in development sectors, particularly with fisheries, mineral resources, human health, and tourism. However, many developmental sectors still think in isolation from biodiversity, not from integrated approach as their understanding and benefits of biodiversity to different development sectors are not yet clear to them. Mainstreaming is a process that takes quite a long time of trust and building capacities among different development sectors. Certain policies and regulations are being implemented such as EIA and SEA, but environmental management needs to be strengthened.

Partnerships with all sectors of the society are not easy to implement without proper planning, capacities and resources to demonstrate objectively benefits and gains of partnerships. They require effective coordination and cooperation with every one, problem solving, and reduce conflicts of interests and duplication in joint work. In addition, partnerships have their own requirements such as determine the responsibility of each partner, priorities, management plans, and means of implementation, monitoring and evaluation, and strengthening of information among different sectors. Partnerships have also other requirements such as benefit for local communities, strategic and spatial planning, adaptive management, institutional support, local needs, research, and public support.

The first study of spatial planning was made in 2019 with the aim to identify hotspots of species richness in Egypt using the distribution map of species. The objectives of the study were: 1) identifying hotspots for main biodiversity kingdoms; 2) identifying the hotspots of biodiversity in Egypt in total;, 3) examining the overlays of land use and land use change; ecosystem distribution and intactness; natural resource management intensity; protected areas in Egypt; 4) reflect the values of biodiversity by mapping ecosystem services; and 5) determining the extent, spatial distribution, severity, impact and trends of key pressures and threats, including invasive species, climate change and pollution, among other pressures, are identified and mapped in some main protected areas of Egypt. Such a study resulted in the production of 75 maps. Huge resources are still needed to continue GIS studies on regular bases.

Egypt have launched a project of "enhancing climate change adaptation in the North coast and Nile Delta in Egypt" through Ministry of water resources and irrigation and all relevant authorities funded by GCF to support adaptation efforts of Egypt in the Nile Delta and to reduce coastal flooding risks in Egypt's North coast due to combination of projected SLR and intense extreme events. The project focuses on constructing 69 km of sand dune dikes as a soft structure along five vulnerable hotspots within the Nile Delta coastal areas and preparing ICZM plan for northern Egyptian coastal zone.

6.1. Needs

Priorities are described in details in the NBSAP (2016 - 2030), and are as follow: effective MPAs management and declaration of more MPAs, integrated monitoring and assessment, NIS, climate change, sustainable fisheries, mainstreaming of biodiversity in all relevant sectors, tourism, ICZM, public awareness, and law enforcement and more legislation.

6.2. Urgent actions proposed

- **Interactive biodiversity information system** should be established to assist in evaluating species. Similarly, research on ecosystem services should be continued, and results be disseminated to improve our understanding of the various values of biodiversity to all sectors of the society (a well-defined implementation program of CEPA is urgently needed).

- **Monitoring and evaluation system** for implementation of NBSAP and IMAP (ecological objectives and indicators) should start very soon at NCS. This will require huge efforts of cooperation among relevant governmental agencies, organizations, women, youth, local communities and others to verify the current implementation of different strategies and action plans such as sustainable development strategy, sustainable production and consumption, green economy, invasive alien species action plan, sustainable fisheries and agriculture, combating desertification, and other important issues related to SDG and biodiversity conservation. A national integrated climate-related observation system is needed with cooperation between all relevant authorizes at national level.

- **Coastal and marine protected areas** are still the most important tools for biodiversity conservation and poverty reduction. They have promoted fisheries, ecotourism and improved the livelihood of local communities. Efforts should be continued to implement all components of Aichi Biodiversity Target, including Other Areas-Based Conservation Measures (OACMs).

- **Stakeholder engagement** should continue regularly to assess NBSAP implementation and provide data to be incorporated in the interactive biodiversity information system. Meanwhile spatial planning efforts for biodiversity should be continued, and modeling as well as scenarios to be provided to establish well defined and implementable policies.

- **Institutional reform of NCS** into a separate entity is imperative to meet the challenges facing coastal and marine biodiversity, taking into consideration of existing opportunities such as innovative financing, partnerships and cooperation at all national, regional and international levels. This will require well defined capacity development in all aspects of coastal and marine biodiversity conservation, as well as new trends in information technology.

- **Mainstreaming of biodiversity into development sectors** should consider new trends, impacts mitigation measures, approaches, tools, gaps, and opportunities exist, taking into consideration implementation of ecosystem approach (EcAp) and nature based solutions. The Egyptian Initiative (A coherent approach for addressing biodiversity loss, climate change, and land and ecosystem degradation) is being implemented as it is knowledge-based, provide nature based solutions, provides actions at all levels, voluntary commitments, and enhance synergies and mainstreaming.

- **There are needs for a paradigm shift from biodiversity scientific research into monitoring species, habitats and ecosystem services**. Results will help policy makers to undertake appropriate measures, especially those related to land and qand marine ecosystem degradation, hence implementing rehabilitation and restoration programs of degraded ecosystem.

- **The current NBSAP needs to be revised** to match with new trends in biodiversity conservation, 2030 agenda for sustainable development and Post- 2020 GBF. This will require well defined targets, SMART indicators, and implementable actions.

Finally, limited **financial, technical and human resources for biodiversity conservation** require an innovative approach and major transformative changes (do not leave anyone behind; use sustainable development; top priorities; economics be oriented for job creation; work for peace and institutional accountability; valuation of ecosystem services using teeb modeling; and seek global partnerships.

7.

Funding problems and opportunities

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7.1. Regular national sources, potential co-financing for international funding

Financial resource mobilization for biodiversity conservation in Egypt is lagging behind due to the huge funding gaps in spending. Reasons for such wide gaps are not only insufficient finance, but also ineffective institutional entity and limited effective partnerships. There are needs for innovative financing mechanisms, focusing on the direction and scale of investment flow with the support for all partners at national, regional, and international level.

In Egypt, there is a wide gap between what is being spent and what is needed. During the 7th Replenishment of the Global Environment Facility (GEF 7) (2018-2022) an additional of $28.5 million is needed each year (21 projects with a total of $60 million, out of which $31.5 from government budget, and the remaining $28.5 million to be financed by other innovative resources).

Eight opportunities to fulfill this gap are identified based on priorities for Egypt's National Biodiversity Strategy and Action Plan (NBSAP) 2015 - 2030. They include increase domestic funding, increase revenue for protected areas, enhance partnership, harmonize direct and indirect biodiversity expenditures, institutional reform, enhancing efficiency in expenditures, reduce future needs, and incentives reform. It is concluded that establishing partnerships are the most successful tool that has been utilized during the last five years It is recommended that efforts must be mobilized to increase spending on biodiversity, diversify and increase protected areas revenue, coordinate efforts with other biodiversity related institutions and establish the Nature Conservation Authority.

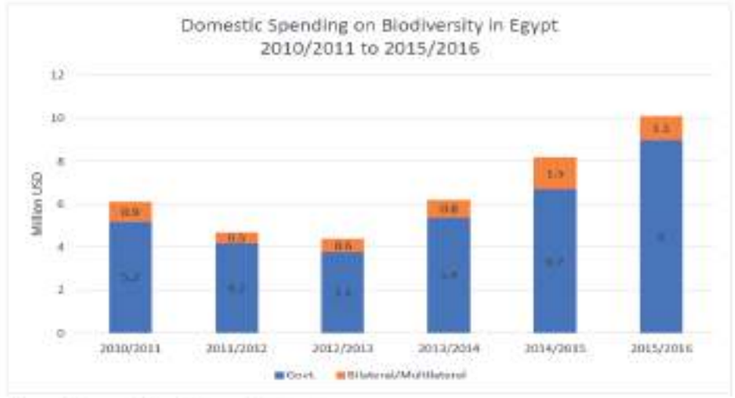

Figure 4 Domestic Spending on Biodiversity

The decline in 2011/2012 & 2012/2013 figures is due to the unstable political conditions in Egypt at that time. Starting from financial year 2013/2014 and with more stability in the political

Future vision for Egypt's financial resources mobilization includes establishing an integrated approach for biodiversity financing that takes into consideration multiple benefits including biodiversity conservation, sustainable use of natural resources, and creating sustainable livelihood for local communities. The approach must include adopting comprehensive financing sources, focusing on private sector sources rather than

only domestic public budget. Future vision also includes support the ongoing efforts to achieve SDGs which will contribute toward promoting sustainable business, and will solve the financing gap problem from its root, as government spending will increase because of the economic growth, revenue will increase because of the rising in standard of living and increase in purchasing power, partnerships will be established more smoothly with private sector because of increase in commercially-environmentally viable business, and future needs will decrease as a result of increase in environment consideration by citizens and business.

Integrating biodiversity conservation into development sectors has started; however, progress is slow to benefit biodiversity. It is planned to continue this work in the future. In addition, assessment of PA"s economics will also continue to show decision makers the long-term cost of inaction, as well as assessment of co-benefits of biodiversity to development sectors. It is also planned to have a business plan for all PAs in Egypt and be aligned with the national development plan of Egypt.

8.

Global, Regional, and National trends

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1- The post 2020: Draft Post 2020 Biodiversity Global framework (GBF)

The Aichi Biodiversity Targets were adopted at CBD as part of the Strategic Plan for Biodiversity 2011-2020. Global Biodiversity Outlook 5 (CBD, 2020) made it clear that targets are not yet, fully achieved, though 6 targets have been partially achieved (Targets 9, 11, 16, 17, 19 and 20). This, in turn, will threaten the achievement of Sustainable Development Goals. The COVID 19 Pandemic has further highlighted the importance of the relationship between people and nature.

CBD COP 14 established the Open-ended Working Group on the Post-2020 GBF to support the process and designated its Co-Chairs. Subsequently, the working Group met twice in Nairobi, Kenya, and Rome, Italy, resulted in the preparation of the Zero Draft of the Post-2020 GBF. Due to the pandemic Covid 19, the third meeting of the working group, SBSTTA 24, and SPI 3 were postponed. The latest update of Zero Draft of the Post-2020 GBF and Appendices was published in 17 August 2020 where this report is considering the elements of the Zero draft. However, more work is still needed to consider many issues such as monitoring framework including indicators that have to be approved by SBSTTA 24 and SPI 3. Therefore, the analysis provided here is expected to change in the near future.

A. 2050 Vision

The vision of the framework is a world of living in harmony with nature where: "By 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people".

B. 2050 Goals

(a) The area, connectivity and integrity of natural ecosystems increased by at least [X%] supporting healthy and resilient populations of all species while reducing the number of species that are threatened by [X%] and maintaining genetic diversity;

(b) Nature's contributions to people have been valued, maintained or enhanced through conservation and sustainable use supporting global development agenda for the benefit of all people

(c) The benefits, from the utilization of genetic resources are shared fairly and equitably;

(d) Means of implementation are available to achieve all goals and targets in the framework.

C. 2030 Mission

To take urgent action across society to put biodiversity on a path to recovery for the benefit of planet and people.

D. 2030 Milestones

The framework has eight milestones to assess, in 2030, progress towards the 2050 goals:

Goal A

A.1 The area, connectivity and integrity of natural systems increased by at least [5%].
A.2 The number of species that are threatened is reduced by [X%] and the abundance of species has increased on average by [X%].

Goal B

B.1 Nature contributes to the sustainable diets and food security, access to safe drinking water and resilience to natural disasters for at least [X%] million people.
B.2 Nature is valued through green investments, ecosystem service valuation in national accounts, and public and private sector financial disclosures.

Goal C

C.1 Access and benefit-sharing mechanisms are established in all countries.
C.2 Benefits shared increased by [X%].

Goal D

D.1 By 2022, means to implement the framework for the period 2020 to 2030 are identified and committed.
D.2 By 2030, means to implement the framework for the period 2030 to 2040 are identified or committed.

E. 2030 Action Targets

The framework has 20 action-oriented targets for 2030 which, if achieved, will contribute to 2030 Milestones and the outcome-oriented goals for 2050. Actions to reach these targets should be implemented consistently and in harmony with the Convention on Biological Diversity and its Protocols and other relevant international obligations, taking into account national socioeconomic conditions.

(a) Reducing threats to biodiversity

- **Target 1:** By 2030, [50%] of land and sea areas globally are under spatial planning addressing land/sea use change, retaining most of the existing intact and wilderness areas, and allow to restore [X%] of degraded freshwater, marine and terrestrial natural ecosystems and connectivity among them.
- **Target 2:** By 2030, protect and conserve through well connected and effective system of protected areas and other effective area-based conservation measures at least 30 per cent of the planet with the focus on areas particularly important for biodiversity.
- **Target 3:** By 2030, ensure active management actions to enable wild species of fauna and flora recovery and conservation, and reduce human-wildlife conflict by [X%].
- **Target 4:** By 2030, ensure that the harvesting, trade and use of wild species of fauna and flora is legal, at sustainable levels and safe.
- **Target 5:** By 2030, manage, and where possible control, pathways for the introduction of invasive alien species, achieving [50%] reduction in the rate of new introductions, and control or eradicate invasive alien species to eliminate or reduce their impacts, including in at least [50%] of priority sites.

- **Target** 6: By 2030, reduce pollution from all sources, including reducing excess nutrients [by x%], biocides [by x%], plastic waste [by x%] to levels that are not harmful to biodiversity and ecosystem functions and human health.
- **Target 7:** By 2030, increase contributions to climate change mitigation adaption and disaster risk reduction from nature-based solutions and ecosystems based approaches, ensuring resilience and minimizing any negative impacts on biodiversity.

(b) Meeting people's needs through sustainable use and benefit-sharing

- **Target 8:** By 2030, ensure benefits, including nutrition, food security, livelihoods, health and well-being, for people, especially for the most vulnerable through sustainable management of wild species of fauna and flora.
- **Target 9:** By 2030, support the productivity, sustainability and resilience of biodiversity in agricultural and other managed ecosystems through conservation and sustainable use of such ecosystems, reducing productivity gaps by at least [50%].
- **Target 10:** By 2030, ensure that, nature based solutions and ecosystem approach contribute to regulation of air quality, hazards and extreme events and quality and quantity of water for at least [XXX million] people.
- **Target 11:** By 2030, increase benefits from biodiversity and green/blue spaces for human health and well-being, including the proportion of people with access to such spaces by at least [100%], especially for urban dwellers.
- **Target 12:** By 2030, increase by [X] benefits shared for the conservation and sustainable use of biodiversity through ensuring access to and the fair and equitable sharing of benefits arising from utilization of genetic resources and associated traditional knowledge.

(c) Tools and solutions for implementation and mainstreaming

- **Target 13:** By 2030, integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies and accounts at all levels, ensuring that biodiversity values are mainstreamed across all sectors and integrated into assessments of environmental impacts.
- **Target 14:** By 2030, achieve reduction of at least [50%] in negative impacts on biodiversity by ensuring production practices and supply chains are sustainable.
- **Target 15:** By 2030, eliminate unsustainable consumption patterns, ensuring people everywhere understand and appreciate the value of biodiversity, and thus make responsible choices commensurate with 2050 biodiversity vision, taking into account individual and national cultural and socioeconomic conditions.
- **Target16:** By 2030, establish and implement measures to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health reducing these impacts by [X].
- **Target 17:** By 2030, redirect, repurpose, reform or eliminate incentives harmful for

biodiversity, including [X] reduction in the most harmful subsidies, ensuring that incentives, including public and private economic and regulatory incentives, are either positive or neutral for biodiversity.

- **Target 18:** By 2030, increase by [X%] financial resources from all international and domestic sources, through new, additional and effective financial resources commensurate with the ambition of the goals and targets of the framework and implement the strategy for capacity-building and technology transfer and scientific cooperation to meet the needs for implementing the post-2020 global biodiversity framework.
- **Target 19:** By 2030, ensure that quality information, including traditional knowledge, is available to decision makers and public for the effective management of biodiversity through promoting awareness, education and research.
- **Target 20:** By 2030, ensure equitable participation in decision-making related to biodiversity and ensure rights over relevant resources of indigenous peoples and local communities, women and girls as well as youth, in accordance with national circumstances.

F. **Implementation support mechanisms**

(a) Mobilizing sufficient resources
(b) Capacity development
(c) Knowledge generation, management and sharing
(d) Technical and scientific cooperation, technology transfer and innovation
(e) Enabling conditions
(f) Responsibility and transparency
(g) Outreach, awareness and uptake

Issues F, G, H, and I are to be considered in the future meetings of SBSTTA 24 and SPI 3. CBD COP 15 will adopt a Post 2020 Global Biodiversity Framework as a stepping stone towards the 2050 of "living in harmony with nature.

1- **UNEP/MAP/ SPA/RAC**

During the last 10 years, UNEP / MAP has evolved taking into account the achievements and shortcomings of MAP's first years of existence as well the results of emerging issues related to the coastal and marine environment in the Mediterranean sea. The main objectives of MAP II were to:

- Assess and control of marine pollution;
- Ensure sustainable management of natural marine and coastal resources;
- Integrate the environment in social and economic development;
- Protect the marine environment and coastal zones through prevention and reduction of pollution, and as far as possible elimination of pollution whether land or sea-based;
- Protect the natural and cultural heritage;
- Strengthen solidarity among Mediterranean coastal states; and
- Contribute to the improvement of the quality of life.

The ecosystem approach is the overarching principle of the UNEP / MAP for integration of all policies. A specific Roadmap was agreed in 2008 to apply the ecosystem approach in order to define and achieve a Mediterranean Good Environmental Status (GES). The ecosystem approach in the Mediterranean went through the following 7 steps:

1- Definition of an Ecological vision *"A healthy Mediterranean with marine and coastal ecosystems that is productive and biologically diverse for the benefit of present and future generations".*

2- Setting **common strategic goals**.

-To protect, allow recovery and, where practicable, restore the structure and function of marine and coastal ecosystems thus also protecting biodiversity, in order to achieve and maintain good ecological status and allow for their sustainable use.

- *To reduce pollution in the marine and coastal environment so as to minimize impacts on and risks to human and/or ecosystem health and/or uses of the sea and the coasts.*
- *To prevent, reduce and manage the vulnerability of the sea and the coasts to risks induced by human activities and natural events)*

3- Identification of important ecosystem properties and **assessment of ecological status and pressures.**

4- Development of a set of **ecological objectives** corresponding to the vision and strategic goals.

5- **Derivation of operational objectives and indicators and target levels**.

6- Revision of **existing monitoring programmes for ongoing assessment and regular updating of targets.**

7- Development and **review of relevant Action Plans and Programmes**.

In 2016, the contracting parties (21) of Barcelona Convention adopted a novel and ambitious Integrated Monitoring and Assessment Programme and related Assessment Criteria (IMAP). It is considered that IMAP is a key achievement for the Mediterranean region, which will enable, for the first time, a quantitative, integrated analysis of the state of the marine and coastal environment, covering pollution and marine litter, biodiversity, non-indigenous species, coast and hydrographic issues. IMAP is based on common regional indicators, targets and Good Environmental Status (GES) description.

The following are IMAP ecological objectives (11) (EO) and common indicators (27):

- ***Ecological objective 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 (**Biodiversity**).*
  - ***Common Indicator 1:*** *Habitat distributional range, to also consider habitat extent as a relevant attribute*

- ***Common Indicator 2:*** *Condition of the habitat's typical species and communities*
- ***Common Indicator 3:*** *Species distributional range (EO1 related to marine mammals, seabirds, marine reptiles)*
- ***Common Indicator 4:*** *Population abundance of selected species (EO1, related to marine mammals, seabirds, marine reptiles)*
- ***Common indicator 5:*** *Population demographic characteristics (EO1, e.g. body size or age class structure, sex ratio, fecundity rates, survival/mortality rates related to marine mammals, seabirds, marine reptiles)*

- ***Ecological objective 2:*** *Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem (**Non-indigenous species**).*
  - ***Common Indicator 6:*** *Trends in abundance, temporal occurrence, and spatial distribution of non-indigenous species, particularly invasive, non-indigenous species, notably in risk areas (EO2, in relation to the main vectors and pathways of spreading of such species)*

- ***Ecological objective 3:*** *Populations of selected commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock (**Harvest of commercially exploited fish and shellfish**).*
  - ***Common Indicator 7:*** *Spawning stock Biomass;*
  - ***Common Indicator 8:*** *Total landings;*
  - ***Common Indicator 9:*** *Fishing Mortality;*
  - ***Common Indicator 10:*** *Fishing effort (EO3);*
  - ***Common Indicator 11:*** *Catch per unit of effort (CPUE) or Landing per unit of effort (LPUE) as a proxy*
  - ***Common Indicator 12:*** *Bycatch of vulnerable and non-target species (EO1 and EO3)*

- ***Ecological objective 4:*** *Alterations to components of marine food webs caused by resource extraction or human-induced environmental changes do not have long-term adverse effects on food web dynamics and related viability (**Marine food webs**).*

- ***Ecological objective 5:*** *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 (**Eutrophication**).*
  - ***Common Indicator 13:*** *Concentration of key nutrients in water column*
  - ***Common Indicator 14:*** *Chlorophyll-a concentration in water column*

- ***Ecological objective 6:*** *Sea-floor integrity is maintained, especially in priority benthic habitats (**Sea-floor integrity**).*

- ***Ecological objective 7:*** *Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems (**Hydrography**).*
  - ***Common Indicator 15:*** *Location and extent of the habitats impacted directly by hydrographic alterations (EO7) to also feed the assessment of EO1 on habitat extent*

- ***Ecological objective 8:*** *The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved (**Coastal ecosystems and landscapes**)*
  - ***Common Indicator 16:*** *Length of coastline subject to physical disturbance due to the influence of man-made structures;*
  - *Candidate Indicator 25: Land use change*

- ***Ecological objective 9:*** *Contaminants cause no significant impact on coastal and marine ecosystems and human health (**Pollution**)*
  - ***Common Indicator 17:*** *Concentration of key harmful contaminants measured in the relevant matrix (EO9, related to 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 10:*** *Marine and coastal litter do not adversely affect coastal and marine environment (**Marine litter**).*
  - ***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*
  - ***Candidate Indicator 24:*** *Trends in the amount of litter ingested by or entangling marine organisms focusing on selected mammals, marine birds, and marine turtles*

- ***Ecological objective 11:*** *Noise from human activities cause no significant impact on marine and coastal ecosystems (**Energy including underwater noise**).*
  - ***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 animal*
  - ***Candidate Indicator 27:*** *Levels of continuous low frequency sounds with the use of models as appropriate*

EU funded very recently a new project (IMAP-MPA) to contribute towards the achievement of GES in the Mediterranean Sea and along its coast. The project proposes to consolidate,

integrate and strengthen the ecosystem approach (EcAp) for Marine Protected Area (MPA) management and their sustainable development. The first steering committee of the IMAP-MPA was held in Tunis, 10 March 2020, just prior the spread of the pandemic Corona Covid 19 in the region and elsewhere.

UNEP/MAP/ SPA/RAC established a task force to prepare the Post-2020 SAP BIO elaboration 2020-2021 to produce the Mediterranean regional strategy that aim to:
Identify clear and realistic objectives as well as priority actions needed to achieve the objectives, aligned with SDGs and Post 2020 GBF, and supported by and Integrated Monitoring and Assessment Programme (IMAP). It also promote the mainstreaming of biodiversity into all relevant environmental policies as well as the one for the sustainable use of marine resources (e.g. fisheries).

The Post-2020 SAP BIO strategy is based on:

1. National analysis of marine and coastal biodiversity situation, involving national institutions, and including stakeholders national consultation meetings;
2. Sub-regional analysis and consultations to add transboundary harmonization and complementarity at four sub-regional levels supported by the concerned countries plan

UNEP /MAP Post-2020 Taskforce have submitted to CBD comments on the indicators for monitoring elements of the draft goals and draft targets of the Post-2020. It indicated clearly that UNEP / MAP structures are relevant to the Post-2020 GBF implementation in the marine and coastal environment of the Mediterranean. Most of the common indicators of the ecological objectives are included in the comments of the UNEP / MAP (biodiversity, NIS, fisheries, eutrophication, hydrography, underwater noise and marine litter, whereas two indicators are being developed (sea floor integrity, food webs) are being developed.

2- **Egypt`s NBSAP**

The first NBSAP of Egypt (1997 - 2017) was updated in 2016 and adopted at national level, covering the period from 2015 to 2030.This NBSAP resulted from application of participatory approach of all relevant stockholders including (governmental agencies, scientific research institutions, NGOs and local communities, etc.) , discussed, revised and adopted at a national workshop. Then it was sent to the Ministry of Environment to communicate with the Ministry of Planning, Monitoring, and Administrative Reform to be one of the main cross-cutting pillars of the National Strategy of Sustainable Development 2030.

The Egyptian NBSAP (2015 - 2030) included guiding principles (equity, solidarity and responsibility, ecological soundness, know-how and eco-technology, spiritual values, and sustainable use of natural resources).The following six main Goals for biodiversity conservation are: 1) conserve and manage terrestrial and aquatic biodiversity to ensure sustainable use and equitable benefits to people; 2) Sustainable use of natural resources; 3) Access to genetic resources and benefit sharing (Nagoya Protocol); 4) Improve our understanding of biological diversity and ecosystem functioning in a changing environment; 5) Prepare for climate change and combat desertification; and 6) Build partnerships and integrate biodiversity into all national development frameworks. NBSAP has a well-defined vision and mission, national action plan, and national targets (20). For each target, there are baseline information, challenges, priority actions, and indicators. Based on the experience gained during implementation during the last 4 years NBSAP need to be revised to match up with new trends in biodiversity conservation, and 2030 Agenda for Sustainable Development, and to ensure actions are actionable.

The road map for the preparation of the Egyptian Biodiversity Strategy and Action Plan (NBSAP) went through several steps, beginning with the formation of the national biodiversity committee; revision of the first strategy (1997-2017); consultative process for priorities and threats to biodiversity in Egypt; creating the framework for the current strategy (2015-2030); formation of the 6 working groups to deal with the approved 6 goals; drafting the strategy; revision by the global NBSAP; and stakeholders and biodiversity specialist consultations for preparing the final version of the strategy.

Information on the 20 national targets of the Egyptian NBSAP, and the respond to specific questions requested by the CBD Secretariat such as relationships of the national targets with Aichi Biodiversity targets (directly or indirectly related), sustainable development goals (SDGs), level of application of the national target (national, regional, international), and other information. A total of 118 priorities are identified in NBSAP. National targets are linked with Aichi Biodiversity Targets and SDG, using the 6NR Data Tracking tool (an excel spread sheet, linking all targets, and implementation level, and also assessment of implementation measures (11) used in this 6NR).

Targets related to the coastal and marine ecosystems in Egypt are included to facilitate comparison with the draft Post 2020 Global Biodiversity Framework, SDGs, and IMAP ecological objectives and targets. These

- **National Target 1:** *By 2030, PAs network secured and expanded to cover 17% of total terrestrial and inland water and at least 5% of coastal and marine representative areas, especially priority sites of particular importance for biodiversity and key ecological processes, and Effective management of PAs.*
- **National Target 2:** *By 2020, develop and implement unified Egyptian methodology for the identification and monitoring of priority of all components of biodiversity according to the international standards to ensure the maintenance or rehabilitation of 50% of our most threatened species focusing on mammals and reptiles to a favorable conservation status.*
- **National Target 3:** *By 2030, National conservation and rehabilitation programs of threatened and endemic species at risk are developed and implemented with*

measures to evaluate its implementation.

- **National Target 4:** *By 2030, all IAS and pathways are identified and prioritized with measures in place to update and verify these pathways, with national programs for 30% of identified pathways to control and manage IAS.*
- **National Target 6:** *By 2018, apply CBD tools to monitor and control the impact of tourism on biodiversity, in particular in protected areas and vulnerable ecosystems.*
- **National Target 7:** *By 2020, measures, including waste management plans and law enforcement, are in place to prevent and reduce the impact of pollution and waste on ecosystems, especially on wetlands and coastal and marine areas.*
- **National Target 8:** *By 2025, negative effects of different sectoral policies (land- use planning, transport, energy, uncontrolled urbanization, etc.) on priority elements of biodiversity are minimized, and measures to correct these effects are applied through developing and implementing land use plans.*
- **National Target 9:** *By 2021 rate of wetland loss reduced by 25% and water efficiency in irrigation improved by 50%.*
- **National Target 10:** *By 2027, promote the implementation of good fishing practices in both Mediterranean Sea and Red Sea, favorable to fish protection and their habitats.*
- **National Target 14:** *By 2025, investigate and monitor all the effects of climate change on biodiversity and ecosystem services.*
- **National Target 15:** *By 2020, the knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared, transferred, and applied.*
- **National Target 16:** *By 2020, enhancing environmental awareness of Egyptians of the importance of biodiversity and ecosystem services through integrating environmental themes into university and school curricula, promoting green media, and supporting youth clubs and eco-industry.*
- **National Target 17:** *By 2018, biodiversity values are promoted and integrated into national planning process and mechanisms to support their incorporation into national accounting and reporting systems to be developed.*
- **National Target 18:** *By 2018, ensure that the national strategy is supported by effective legislation and institutional frameworks to improve its enforcement.*
- **National Target 20:** *By 2020, adequate financial resources for the effective implementation of the Strategic Plan for Biodiversity 2011-2020 has been mobilized of from all sources and increased substantially from the current levels.*

9.

EGYPT'S CONTRIBUTION TO THE VISIONS, GOALS AND INDICATORS OF THE DRAFT POST-2020 GBF, THE BARCELONA CONVENTION (UNEP/MAP) ABD NBSAP

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It is based on:

- Global indicators for goals and targets (only coastal and marine).
- SDGs indicators
- UNEP / MAP / IMAP (ecological objectives and indicators)
- Egypt's NBSAP (only indicators related to the coastal and marine environment of the Mediterranean sea

Emphasis is given to the national analysis of the coastal and marine ecosystem (status, pressures, threats, impacts and conservation efforts). It identifies gaps, objectives and priorities.

To simply the process and make comparisons among relevant indicators, it was decided to focus on:

1. Coastal and marine ecosystem

- Habitats extent
- Habitats conditions
- Iconic species of mammals, birds and reptiles
- Common species
- Threatened species
- Sustainable fisheries
- Wetlands
- Non Indigenous

2. Pollution

- Marine acidity
- Eutrification
- Oil pollution
- Hazardous waste
- Marine litter
- Plastics and microplastics
- Underwater noise

3. Responses

- Resource mobilization and capacity development
- Marine Protected Areas and other effective-based conservation measures (OECMs)
- Integrated coastal management (ICZM)
- Adoption of other UNEP / MAP protocols
- Mainstreaming of marine biodiversity in all relevant sectors
- Pollution control
- Marine genetic resources
- Ecosystem restoration
- Climate change
- Public Awareness
- Law enforcement
- Research and Development
- Hydrography
- Spatial Planning

The visions, goals, targets and indicators of the draft GBF, GES, and NBSAP were compared, and, it was decided that the updated NBSAP (2016-2030) still valid, and be focused on the coastal and marine biodiversity in the Egyptian Mediterranean Sea to be as follow:

Proposed national post 2020 SAPBIO Vision is "By *2030 coastal and marine biodiversity in Egypt is valued, mainstreamed, maintained for the good livelihoods and conserved for the sustainable use of future generations*".

Proposed national post 2020 SAPBIO Mission is "*Egypt takes effective and innovative actions to reduce the loss of biodiversity to ensure that by 2030 ecosystems continue to provide their services to all Egyptian and also ensure pressures on biodiversity are reduced; biological resources are sustainably used and benefits arising out of utilization of genetic resources are shared in a fair and equitable manner; biodiversity issues and values mainstreamed and appropriate policies are effectively implemented in a participatory approach*."

Proposed national post 2020 SAPBIO Strategic Goals

- **Strategic Goal 1:** Conserve and manage coastal and marine biodiversity to ensure sustainable use and equitable benefits to the people
- **Strategic Goal 2:** Sustainable use of natural resources (fisheries)
- **Strategic Goal 3:** Access to genetic resources and Benefit sharing (Nagoya protocol, local knowledge and traditions)
- **Strategic Goal 4:** Improve our understanding of biological diversity and ecosystem functioning in a changing environment
- **Strategic Goal 5:** Prepare for climate change mitigation and adaptation
- **Strategic Goal 6:** Build partnerships and integrate biodiversity into all national development frameworks

Regarding the objectives and priorities for Egyptian Post-2020, we propose efforts be made in the next negation meetings to include oceans and seas as separate goals, targets and indicators. The global 2030 targets be in line with Regional Sea Programmes (e.g. UNEP / MAP) commitments. These should clearly address the drivers of biodiversity loss and be specific, measurable, actionable, relevant and time-bound.

After a thorough analysis, it was found that for Egypt, IMAP is mostly appropriate and valid in terms of GES, and ecological objectives and indicators that deal with coastal and marine ecosystems (biodiversity, and NIS) and pollution. Responses indicators include many elements that reflect global, regional and national needs. Out of the 11ecological objectives of GES, the following are the most relevant ones for Egypt: 1, 2, 3, 5, 9, and 11:

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 (**Biodiversity**).*

2- *Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem (**Non-indigenous species**).*

3- *Populations of selected commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock (**Harvest of commercially exploited fish and shellfish**).*

4- *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 (**Eutrophication**).*

5- *Marine and coastal litter and contaminants cause no significant impact on coastal and marine ecosystems and human health (**Pollution & Marine litter**)*

6- *Noise from human activities cause no significant impact on marine and coastal ecosystems (**Underwater noise**).*

A total of 121 marine and coastal indicators from the global goals and targets of the draft Post-2020 GBF, SDG, UNEP / MAP / IMAP and NBSAP were thoroughly investigated. 61 indicators belonged to coastal and marine ecosystem. Of them, 26 from the goals and targets of the draft GBF; 5 SDG indicators; 15 IMAP indicators; and 5 national indicators. Out of the 15 indicators for marine pollution, there were only one global indicator; 2 SGD, and 12 IMAP indicators. The response category has the largest number of indicators (48), with 17 global; 11 SDG; and 20 national indicators.

To reduce the total numbers of indicators, a comparison of indicators from all sources were made, and the shared ones were put into one national indicator to suit the national requirements and capacities available. For example, sustainable fisheries from all sources were put into one national indicator with appropriate components and elements (baseline data). Experts' opinion were considered during the whole process. Results have shown a total of 26 national indicators that can be considered and be implemented as baseline data is mostly available at national, regional and global levels that shown in the next table.

On examining the proposed national indicators, it can be seen that they are a mix of several existing indicators, some from GBF and SDGs, and still others from IMAP and the NBSAP. Genetic resource indicators are not included in IMAP, however, they will be important when the new UN convention on marine biodiversity conservation beyond national jurisdiction will be adopted. Similarly new emerging issues such as spatial planning, nature-based solution, and financiang mechainism are considered as national indicators.

No.	Indicators items	Indicators elements	Responsible institutions
1	**Habitat extent and condition**	• Inventory of selected habitats including marine Protected Area; Connectedness and Representativeness by applying relevant; • IUCN Red List for Ecosystems and Species Habitat indices; • Habitat mapping using deferent techniques; • Identify condition of habitats typical species and communities, taking into considerations of: Location and extent of the habitats impacted directly by hydrographic alterations; The length of the coastline subject to physical disturbance due to the influence of man-made structures; The Proportion of national exclusive economic zones managed using ecosystem-based approaches; • Integrate habitat mapping indicators with other species and communities indicators.	NCS – EEAA NIOF
2	**Sustainable fisheries**	• Annual reports on fish resources; • Bycatch and illegal catch of vulnerable and non-target species; • Biological studies of important commercial species include: Landings, reproductions, fishing effort, Catch per unit of effort (CPUE) or Landing per unit of effort (LPUE) as a proxy; • Degree of application of a legal/regulatory/ policy/institutional framework; • Fisheries management plans adopted and implemented.	GAFRD
3	**Threatened/ Iconic species**	• Species distributional range (related to marine mammals, seabirds, marine reptiles); • Population abundance of selected species (related to marine mammals, seabirds, marine reptiles); • Population demographic characteristics (body size or age class structure, sex ratio, fecundity rates, survival/mortality rates) related to marine mammals, seabirds, marine reptiles • List of key biodiversity declared and managed; • Implemented recovery programs for critically endangered species; • Red List for Threatened species.	NCS – EEAA
4	**Common Species**	• Baseline information on the status of common species in selected habitats (vegetation, invertebrates, etc.); • Growth in Species Occurrence Records Accessible Through GBIF.	NIOF NCS, Univ. and research centers
5	**NIS**	• List of Non – Indigenous species (NIS) and priorities; • Trends in abundance, temporal occurrence, and spatial distribution of non-indigenous species, particularly invasive, non-indigenous species, notably in risk areas (in relation to the main vectors and pathways of spreading of such species); • Trends in policy responses, legislation and management plans to control and prevent spread of invasive alien species.	NCS, EEAA, and other relevant agencies
6	**Wetlands, including Saltmarshes and sea grass**	• Extent of water-related ecosystems over time; • Ramsar sites improved and effectively managed; • Trends in water quality in aquatic ecosystems (Ramsar Sites); • Salt marsh extent; • Sea grass extent.	NCS – EEAA
7	**Marine Acidity**	• Average marine acidity (pH) measured at agreed suite of representative sampling stations.	EEAA NIOF
8	**Eutrification**	• Concentration of key nutrients in water column; • Chlorophyll-a concentration in water column; • Percentage of intestinal enterococci concentration measurements within established standards; • Index of coastal eutrophication.	EEAA NIOF
9	**Hazardous waste**	• Level of pollution effects of key contaminants where a cause and effect relationship has been established; • Concentration of key harmful contaminants measured in the relevant matrix (related to biota, sediment, and seawater); • Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood.	EEAA NIOF
10	**Oil pollution**	• 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.	EEAA NIOF
11	**Marine litters and Microplastics**	• Trends in the amount of litter and microplastics ingested by or entangling marine organisms focusing on selected mammals, marine birds, and marine turtles; • Trends in the amount of litter in the water column including floating or microplastics and on the seafloor; • Trends in the amount of litter washed ashore and/or deposited on coastlines.	EEAA NIOF
12	**Underwater noise**	• Levels of continuous low frequency sounds with the use of models as appropriate; • 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.	NCS – EEAA
13	**Land Based sources**	• Annual report on all land based sources; • Increase public awareness; • Government efforts to reduced land based sources.	EEAA NIOF
14	**Hydrography**	• Location and extent of the habitats impacted directly by hydrographic alterations.	EEAA

No.	Indicators items	Indicators elements	Responsible institutions
15	**Resource Mobilization**	• Official development assistance and public expenditure on conservation and sustainable use of biodiversity and ecosystems; • Amount of funding provided through the Global Environment Facility and allocated to biodiversity focal area, and green climate funds; • Encourage innovative financing mechanism for coastal and marine biodiversity; • Proportion of total research budget allocated to research in the field of marine technology; • Annual allocated budget for effective management of MPAs • Revenue generated and finance mobilized from biodiversity relevant economic instruments (blue economy); • Trained staff on mechanisms resource mobilization related to biodiversity; • Regulations issued for positive incentives.	MoE
16	**Climate change and risk disaster reduction**	• Bioclimatic Ecosystem Resilience Index (BERI); • Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies; • Implementation of the national strategy for climate change that integrate mitigation, adaptation, impact reduction and early warning system; • Encourage climate change and risk disaster reduction into primary, secondary, and university curricula.	EEAA
17	**CEPA Communication, Education and public awareness**	• Biodiversity engagement index; • Biodiversity Barometer; • Biodiversity Engagement Indicator; • Encourage communications among relevant biodiversity; • People are aware of the values of coastal and marine biodiversity; • People are aware and involve of the steps that can take to conserve and sustainably use the coastal and marine biodiversity;	EEAA
18	**MPAs & OECMs**	• Marine Protected area coverage; • Ecological representation; • Important areas for biodiversity; • Marine ecosystem services & Benefits; • Connectivity; • Integration; • Effectively managed; • Equitably managed; • Strengthening resilience; • Other effective area-based conservation measures; • Declared international sites.	NCS – EEAA GAFRD

No.	Indicators items	Indicators elements	Responsible institutions
19	**Marine genetic resources**	• Establish checkpoint communication published in the ABS Clearing House and other related instruments; • Provided information relevant to the utilization of genetic resources to designated checkpoints; • Permits or their equivalent granted for access to genetic resources.	NCS – EEAA
20	**Pollution control**	• Cumulative human impacts on marine ecosystems • Proportion of wastewater safely treated; • Degree of integrated water resources management implementation; • Published reports on assessment of pollution; • Number of issued decrees to enforce pollution control; • Volumes of waste recycled annually; • Presence / absence of key indicator pollution species.	EEAA
21	**ICZM**	• Pilot ICZM Plans implemented.	EEAA
22	**Mainstreaming**	• Renewable energy share in the total final energy consumption; • Progress towards national targets established in accordance with Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011–2020; • Number of hotels and companies applied criteria for eco-tourism; • Number of SIA developed, approved and implemented.	EEAA
23	**Spatial Planning**	• Planning process – also from the stakeholders and various sectors are harmonized; • A policy and legal framework to ensure implementation of the MSP and inter-sectoral integration; • Actions and resources to develop the plans and responsibilities; • Decisions taken on spatial planning; • Immediate, intermediate and long-term outcomes of spatial planning.	Planning Ministry
24	**Research & development**	• Assessments, reports and maps on all issues related to coastal and marine ecosystems and endangered species; • Innovating solutions (measures) to maintain healthy coastal and marine ecosystems.	NIOF NCS, Univ. and research centers
25	**Law enforcement**	• Proportion of traded wildlife that was poached or illicitly trafficked; • Issue a law for wildlife protection; • Law enforcement in MPAs.	EEAA

No.	Indicators items	Indicators elements	Responsible institutions
26	**Restoration**	• Establish policy and regulatory framework for restoration action plan approved by CBD; • Availability of human and technical capacities related to coastal and marine ecosystems; • Enhance land used planning process in restoration; • Improve human perception towered the value of the marine and coastal ecosystem; • Improve research on carbon sequestration/ storage in marine and coastal ecosystems; • Implement sustainable production and consumption action plan; • Perce. of the deteriorated habitats restored.	EEAA

Finally, the proposed Egyptian SAB BIO Post-2020 will require intensive implementation in terms of planning, coordination and coordination, partnerships at all national, regional and international levels, capacity development, technical and human resources. Thus, implementation will be a real challenge for future Post 2020 Global Biodiversity Framework.

10.

Conclusions and recommendations

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Egypt has the legal framework, strategies and action plans to protect marine environment and restore habitats and species. But protection has been incomplete, restoration has been small-scale, and the implementation and enforcement of legislation has been insufficient. To put biodiversity on the path to recovery by 2030, there is a need to step up the protection and restoration of the marine environment. This should be done by improving and widening our network of coastal and marine protected areas and by developing an ambitious restoration plan. Key commitments by 2030 include: 1- Legally protect a minimum of 10 % of the Egyptian Mediterranean Sea, and integrate ecological corridors; 2- Effectively manage all marine protected areas, defining clear conservation objectives and measures, and monitoring them appropriately.

To reserve biodiversity loss, there is a need to be more ambitious with coastal and marine restoration. A new restoration plan will help improve the health of existing and new marine protected areas, and bring diverse and resilience nature back to all marine ecosystems. This means reducing pressures on habitats and species, and ensuring all use of ecosystem is sustainable. It also means tackling pollution and invasive alien species. The plan will create jobs, reconcile economic activities with nature and help ensure long-term productivity and value of the nature capital.

Restoring the good environmental status (GES) of coastal and marine ecosystems.
Restored and properly protected marine ecosystems bring sustainable health, social and economic benefits to coastal communities. The need for stronger action is the entire marine and coastal ecosystem. Biodiversity loss is severely exacerbated by global warming.

Achieving GES of marine ecosystem, including through strictly protected areas, must involve the restoration of carbon-rich ecosystems as well as important fish spawning and nursery areas.

Fishery is one of the socio-economic activities practice in the coastal zone of Egyptian Mediterranean coat. Capture fisheries are important for local coastal communities, providing employment opportunities and a major pillar in food security and economic-social development. Many of immigrant indo-pacific species are playing important role in raising fish production after the depilation or overfished of some endemic fish stock which revealed needed of management plan for these resource.

Therefore, marine resources must be harvested sustainably and threw must be zero tolerance for illegal practices through implementation of fisheries policy.

The application of the ecosystem-based management approach will reduce the adverse impacts of fishing, extraction and other human activities, especially on sensitive species and seabed habitats. To support this, **national maritime spatial plans** should aim at covering all maritime sectors and activities, as well as area-based conservation management measures.

Healthy fish stocks are key to the long-term prosperity of fisherman and the health of the marine environment and biodiversity. This makes it all the more important to maritime or reducing fishing mortality at or under Maximum Sustainable Yield levels. This will help to achieve a healthy population age and size distribution for fish stocks.

The by-catch of species threatened with extinctions must also be eliminated or reduced to a level that allows full recovery. If they cannot be eliminated, this should be minimized so as not to threaten their conservation status. To support this, data collection on by-catch for all sensitive species must be stepped up.

In addition, **fisheries management measures** must be established in all marine protected areas according to clearly defined conservation objectives, and on the basis of the best available scientific advice. The lack of a coordinated and integrated approach between environmental policies and fisheries policies to protect marine biodiversity further exacerbates the problem. The conflict witnessed in Lake Bardawil is an indication that the lake should be designated a marine protected area, with an integrated management approach to accommodate fishing activities, in order to ensure sea turtles' survival in the long term. Further research and field surveys should be conducted to fully document the of the wetland as a feeding, wintering and development habitat for sea turtles in the Mediterranean, their interaction with the lake's fisheries, as well as monitor mortality rates and causes.

Pollution is a key driver of biodiversity loss and has harmful impact on our health and environment. While Egypt has a solid legal framework in place to reduce pollution, greater efforts are still required, by addressing all aspects of pollution, particularly excessive nutrients, hazardous and solid waste, and oil pollution. It is suggested to develop a **set of indicators for the progressive reduction of pollution**, and establish baselines to help monitor progress. Pressures from marine litter, plastics and microplastics and underwater noise should be addressed under a **Marine Strategy Framework**.

Non-Indigenous Species (NIS), although many are considered beneficial species in Egypt, can significantly undermine efforts to protect and restore marine environment. Besides inflicting major damage to nature and economy, many NIS also facilitate the outbreak and spread of infectious diseases, posing a threat to humans and wildlife. Without effective control measures approved by CBD and SPA/RAC the rate of invasion and the risks it brings to our nature and health will continue to rise.

In Egypt, there is currently no comprehensive **governance framework** to steer the implementation of biodiversity commitments agreed at national, regional or international level to address the gap, it is suggested to establish a council to help map obligations and commitments and set out a road map to guide their implementation. Such a council will put in place a monitoring and review mechanism, which should include **a clear set of agreed indicators**. Such governance structure will ensure co-responsibility and co-ownership by all relevant sectors in meeting Egypt biodiversity commitments. It will also support administrative capacity building, transparency, and stakeholder dialogue.

Business for biodiversity. All parts of the economy and society will have to play their role. Industry and business have an impact on nature, but they also produce the important innovation, partnerships and expertise that can help address biodiversity loss. That will require **sustainable corporate governance** in the form of platforms for business for biodiversity. Particular attention be paid to measures to incentivize and eliminate barriers for the take up of nature-based solutions, as these can lead to significant business and employment opportunities in various sectors and are the key to innovation for economic or societal needs that rely on marine environment resources.

Biodiversity consideration need to be better integrated into public and business decision-making at all levels. That will require developing methods, criteria and standards to describe the essential components of biodiversity, its services, values, and sustainable use. These will include **measuring the environmental footprint and organizations on the environment**, and also natural capital accounting.

The fight against biodiversity loss must be underpinned by sound science. Investing in research, innovations and knowledge exchange will be key to gathering the best data and developing the best nature-based solutions. It is suggested to improve the existing knowledge center located at the National Institute for Oceanography and fisheries in Alexandria. To help integrate biodiversity and ecosystems into school, higher education and professional training, the new knowledge center will also encourage cooperation in **education for environmental sustainability**. University of Alexandria can take an active role in improving the knowledge center for marine biodiversity as it has excellent capacities in training, education and research on the field of marine biodiversity.

The draft Post 2020 Biodiversity Framework should consider the followings:

1. Ambitious global 2030 targets in line with Regional Sea Programmes (e.g. UNEP / MAP) commitments. These should clearly address the drivers of biodiversity loss and be specific, measurable, actionable, relevant and time-bound.
2. A much stronger implementation, monitoring and review process. This will require revising the Egyptian NBSAP, with regular review cycle.
3. An enabling framework to bring the ambition to life, across areas such as finance, capacity, research, innovation and technology.
4. Fair and equitable sharing of benefits for the use of genetic resources linked to biodiversity (both ABS and the draft of the international agreement on marine biological diversity of areas beyond national jurisdiction (ABNJ)
5. Support be given to global efforts to apply the One Health approach, which recognizes the intrinsic connection between human health, animal health and healthy resilient nature.

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Annexes

Annex I.

Compilation of Global Biodiversity Framework Post 2020, SDGs, IMAP Ecological Objectives (EOs) and Indicators, and National Indicators

Table 1.

Global Biodiversity Framework Post 2020			SDGs			IMAP Ecological Objectives (EOs) and Indicators			National Indicators		
Proposed Global Indicators	Relevant Goals and Targets		Indicators	Relevant Targets		IMAP Indicators	Ecological Objective		Indicators	Relevant Targets	
(a) Official development assistance on conservation and sustainable use of biodiversity (SDG indicator 15.a.1)	D, 18	resource mobilization	6.3.1 Proportion of wastewater safely treated	6.3	response - pollution control	Common Indicator 1: Habitat distributional range (EO1) to also consider habitat extent as a relevant attribute	EO 1 Biodiversity	Coastal / marine ecosystem-habitats extent	PAs coverage	NATIONAL TARGET 1	Responses - Marine Protected areas
15.a.1 (b) revenue generated and finance mobilized from biodiversityrelevant economic instruments (SDG indicator 15.a.1)	D	resource mobilization	6.4.1 Change in water-use efficiency over time	6.4	response - pollution control	Common Indicator 2: Condition of the habitat's typical species and communities (EO1)	EO 1 Biodiversity	Coastal/ marine ecosystem - Habitat conditions	Number of declared international sites	NATIONAL TARGET 2	Responses - Marine Protected areas
Amount and composition of biodiversity-related finance reported to the OECD Creditor reporting system	18	resource mobilization	6.5.1 Degree of integrated water resources management implementation	6.5	response - pollution control	Common Indicator 3: Species distributional range (EO1 related to marine mammals, seabirds, marine reptiles)	EO 1 Biodiversity	Coastal/ marine ecosystem - Iconic species of mammals, birds, reptiles	Annual allocated budget for PAs secure	NATIONAL TARGET 1	Responses - Resource mobilization

Global Biodiversity Framework Post 2020			SDGs			IMAP Ecological Objectives (EOs) and Indicators		National Indicators		
Amount of funding provided through the Global Environment Facility and allocated to biodiversity focal area (decision X/3)	18	resource mobilization	6.6.1 Change in the extent of water-related ecosystems over time	6.6	Coastal / marine ecosystem-habitats extent	EO 1 Biodiversity	Coastal/ marine ecosystem - Iconic species of mammals, birds, reptiles	Annual generated income from PAs	NATIONAL TARGET 1	Responses - Resource mobilization
Average marine acidity (pH) measured at agreed suite of representative sampling stations (SDG indicator 14.3.1)	A	pollution	7.2.1 Renewable energy share in the total final energy consumption	7.2	Response - mainstreaming of biodiversity	EO 1 Biodiversity	Coastal/ marine ecosystem - Iconic species of mammals, birds, reptiles	No. (%) of inputs within the biodiversity information system	NATIONAL TARGET 2	Coastal/ marine ecosystem - Habitat conditions
Bioclimatic Ecosystem Resilience Index (BERI)	1	response - climaætechange adaptaion and risk disaster	13.1.3 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies	13.1	response - risk disaster reduction	EO 2 Non-indigenous species	Coastal/ marine ecosystem - Non Indigenous Species	Number (%) of known threatened species communities assessed and documented	NATIONAL TARGET 2	Coastal/ marine ecosystem - Threatened species
Biodiversity Barometer	15, 19	response - public awareness	13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula	13.3	response - risk disaster reduction	Common Indicator 7: Spawning stock Biomass (EO3);	EO 3 Harvest of commercially exploited fish and shellfish	Coastal/ marine ecosystem - Sustainable fisheries	No. (%) of implemented recovery programs for critically endangered species	NATIONAL TARGET 2	Coastal/ marine ecosystem - Threatened species
Biodiversity Engagement Indicator	15	response - public awareness	14.1.1 Index of coastal eutrophication and floating plastic debris density	14.1	Pollution - eutrification	Common Indicator 8: Total landings (EO3);	EO 3 Harvest of commercially exploited fish and shellfish	Coastal/ marine ecosystem - Sustainable fisheries	No. and percentage of published AIS records.	NATIONAL TARGET 4	Coastal/ marine ecosystem - Non Indigenous Species
Biodiversity Habitat Index	A, B, 1	coastal / marine ecosystems - habitats	14.2.1 Proportion of national exclusive economic zones managed using ecosystem-based approaches	14.2	coastal/ marine ecosystem - habitats extent	Common Indicator 9: Fishing Mortality (EO3);	EO 3 Harvest of commercially exploited fish and shellfish	Coastal/ marine ecosystem - Sustainable fisheries	No. and percentage of national implemented programs formanagement of AIS annually.	NATIONAL TARGET 4	Coastal/ marine ecosystem - Non Indigenous Species
Biodiversity Intactness Index	A	coastal / marine ecosystems - habitat conditions	14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations	14.3	Pollution - marine acidity	Common Indicator 10: Fishing effort (EO3);	EO 3 Harvest of commercially exploited fish and shellfish	Coastal/ marine ecosystem - Sustainable fisheries	Number and (%) of hotels and companies applied criteria for eco-tourism.	NATIONAL TARGET 6	Responses - Mainstreaming of biodiversity
Comprehensiveness of conservation of socioeconomically as well as culturally valuable species	A		14.4.1 Proportion of fish stocks within biologically sustainable levels	14.4	coastal / marine ecosystem - sustainabl feshieries	Common Indicator 11: Catch per unit of effort (CPUE) or Landing per unit of effort (LPUE) as a proxy (EO3)	EO 3 Harvest of commercially exploited fish and shellfish	Coastal/ marine ecosystem - Sustainable fisheries	Number and (%) of published reports on assessment of pollution.	NATIONAL TARGET 7	Responses - Pollution control

Global Biodiversity Framework Post 2020			SDGs			IMAP Ecological Objectives (EOs) and Indicators			National Indicators		
Coverage of other effective area-based conservation measures	A, 2	response – OECMs	14.5.1 Coverage of protected areas in relation to marine areas	14.5	response - MPAs	Common Indicator 12: Bycatch of vulnerable and non-target species (EO1 and EO3)	EO 3 Harvest of commercially exploited fish and shellfish	Coastal/ marine ecosystem - Sustainable fisheries	Number and (%) of issued decrees to enforce pollution control.	NATIONAL TARGET 7	Responses - Pollution control
Coverage of protected areas in relation to marine areas (SDG indicator 14.5.1)	2	response - MPAs	14.6.1 Progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing	14.6			EO 4 Marine food webs		Number and (%) of rehabilitated or restored pilot projects in polluted ecosystems.	NATIONAL TARGET 7	Responses - Pollution control
Cumulative human impacts on marine ecosystems	A, 1	coastal / marine ecosystem - human empact	14.7.1 Sustainable fisheries as a proportion of GDP in small island developing States, least developed countries and all countries	14.7		Common Indicator 13: Concentration of key nutrients in water column (EO5);	EO 5 Eutrophication	Pollution - Eutrophication	Number of waste disposal sites upgraded	NATIONAL TARGET 7	Responses - Pollution control
Degree of application of a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small-scale fisheries (SDG indicator 14.B.1)	8	coastal / marine ecosystem – fisheries	14.a.1 Proportion of total research budget allocated to research in the field of marine technology	14.a	Response - Resource mobilization	Common Indicator 14: Chlorophyll-a concentration in water column (EO5)	EO 5 Eutrophication	Pollution - Eutrophication	Volumes of waste recycled annually	NATIONAL TARGET 7	Responses - Pollution control
Degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing (SDG indicator 14.6.1)	4, 8	coastal / marine ecosystem - fisheries	15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type	15.1	coastal/ marine ecosystem - habitats extent		EO 6 Sea-floor integrity		Trends in water quality in aquatic ecosystems (dams, rivers and Ramsar Sites)	NATIONAL TARGET 7	Coastal/ marine ecosystem - Habitat conditions

Global Biodiversity Framework Post 2020			SDGs			IMAP Ecological Objectives (EOs) and Indicators			National Indicators		
Degree of integrated water resources management (SDG indicator 6.5.1)			15.5.1 Red List Index	15.5	coastal/ marine ecosystem - Threatened species	Common Indicator 15: Location and extent of the habitats impacted directly by hydrographic alterations (EO7) to also feed the assessment of EO1 on habitat extent	EO7 Hydrography	Coastal / marine ecosystem-habitats extent	Presence / absence of key indicator pollution species.	NATIONAL TARGET 7	Responses - Pollution control
Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP (SDG indicators 8.4.2 and 12.2.2)	14. 15		15.7.1 Proportion of traded wildlife that was poached or illicitly trafficked	15.7	response - law enforcment	Common Indicator 16: Length of coastline subject to physical disturbance due to the influence of man-made structures (EO8);	EO 8 Coastal ecosystems and landscapes	Coastal / marine ecosystem-habitats extent	Number (%) of land-zones and land use management plans implemented.	NATIONAL TARGET 8	
Ecological Footprint	14, 15		15.9.1 Progress towards national targets established in accordance with Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011–2020	15.9	Response - mainstreaming of biodiversity	Candidate Indicator 25: Land use change (EO8)	EO 8 Coastal ecosystems and landscapes	Coastal / marine ecosystem-Habitat conditions	Number (%) of SIA developed and approved and implemented	NATIONAL TARGET 8	Responses - Mainstreaming of biodiversity
Ecoregion Intactness Index	1		15.a.1 Official development assistance and public expenditure on conservation and sustainable use of biodiversity and ecosystems	15.a	Response - Resource mobilization	Common Indicator 17: Concentration of key harmful contaminants measured in the relevant matrix (EO9, related to biota, sediment, seawater)	EO 9 Pollution	Pollution - Hazardous waste	Number (%) of restoration and desertification control project carried out.	NATIONAL TARGET 8	

Global Biodiversity Framework Post 2020			SDGs	IMAP Ecological Objectives (EOs) and Indicators			National Indicators		
Global saltmarsh extent	A	coastal / marine ecosys-tems - salt marsh		Common Indicator 18: Level of pollution ef-fects of key contami-nants where a cause and effect relationship has been established (EO9)	EO 9 Pollution	Pollution - Ha-zardous waste	Number (%) of maps developed for sus-tainable land use planning.	NATIO-NAL TAR-GET 8	
Global seagrass extent	A. 1	coastal / marine ecosys-tems - sea grass		Common Indicator 19: Occurrence, origin (where possible), extent of acute pollution events (e.g. slicks from oil, oil pro-ducts and hazardous substances), and their impact on biota affected by this pollution (EO9);	EO 9 Pollution	Pollu-tion - Oil pollution	Number (%) of Ramsar sites are improved and effectively managed	NATIO-NAL TAR-GET 9	Coastal/ marine eco-system - Wet-lands
Growth in num-ber of records and species in the Living Planet Index database	19	coastal / marine eco-system - Iconic species		Common Indicator 20: Actual levels of contami-nants that have been detected and number of conta-minants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9);	EO 9 Pollution	Pollution - Ha-zardous waste	Number and % of assess-ments, reports and maps on coastline habitats and en-dangered species.	NATIO-NAL TARGET 10	Res-ponses - Re-search & Develop-ment
Growth in Spe-cies Occurrence Records Acces-sible Through GBIF	19	coastal / marine eco-system - Iconic species		Common Indicator 21: Percentage of intestinal enterococci concen-tration measure-ments within established standards (EO9)	EO 9 Pollution	Pollution - land based sources	Number and % of reports about fishery re-sources.	NATIO-NAL TARGET 10	Coastal/ marine eco-system - Sus-tainable fisheries
Human Appro-priation of Net Primary Produc-tion (HANPP)	14			Common Indicator 22: Trends in the amount of litter washed ashore and/ or deposited on coast-lines (EO10);	EO 10 Marine litter	Pollution -Marine litter	Number and % of pilot ICZM Plans imple-mented.	NATIO-NAL TARGET 10	Res-ponses - ICZM

Global Biodiversity Framework Post 2020			SDGs	IMAP Ecological Objectives (EOs) and Indicators			National Indicators		
Living Planet Index and derivatives	A. 8	coastal / marine eco-system - Iconic species		Common Indicator 23: Trends in the amount of litter in the water column including microplas-tics and on the seafloor (EO10);	EO 10 Marine litter	Pollution -Marine litter	Number and % of fishery mana-gement plans officially approved.	NATIO-NAL TARGET 10	Coastal/ marine eco-system - Sus-tainable fisheries
Number of assessments on the IUCN Red List of threatened species	19	coastal / marine ecosys-tem - Threate-ned species		Candidate Indicator 24: Trends in the amount of litter in-gested by or entangling marine organisms focusing on selected mammals, marine birds, and marine turtles (EO10)	EO 10 Marine litter	Pollution -Marine litter	Number and % of pilot area of forest man-groves replanted.	NATIO-NAL TARGET 10	
Number of checkpoint communiqués published in the ABS Clearin-gHouse	C	response - marine genetic resource		Candidate Indicator 26: Proportion of days and geographical distribution where loud, low, and mid-fre-quency impulsive sounds exceed levels that are likely to entail signifi-cant impact on marine animal	EO 11 Energy including underwa-ter noise	Pollution -un-derwater noise	Number and % of reports about fishery re-sources.	NATIO-NAL TARGET 10	Coastal/ marine eco-system - Sus-tainable fisheries
Number of users that have provi-ded information relevant to the utilization of ge-netic resources to designated checkpoints	C	response - marine genetic resource		Candidate Indicator 27: Levels of continuous low frequen-cy sounds with the use of models as appropriate	EO 11 Energy including underwa-ter noise	Pollution -un-derwater noise	Number and % of pilot ICZM Plans imple-mented.	NATIO-NAL TARGET 10	Res-ponses - ICZM
Ocean Health Index	A, 1	coastal / marine ecosys-tem					Number and % of fishery mana-gement plans officially approved.	NATIO-NAL TARGET 10	Coastal/ marine eco-system - Sus-tainable fisheries
Percentage of Parties that implement their biosafety measures	16						Hunting quotas and list of sites officially approved	NATIO-NAL TARGET 12	Coastal/ marine eco-system - Sus-tainable fisheries

Global Biodiversity Framework Post 2020			SDGs	IMAP Ecological Objectives (EOs) and Indicators	National Indicators		
Percentage of Parties to the Cartagena Protocol on Biosafety implementing the relevant provisions of the Protocol.	16				Gaps in maps and information pertaining to endangered ecosystems, habitats, vegetation and rare species identified.	NATIONAL TARGET 12	Coastal/ marine ecosystem - Threatened species
					Number of green energy initiatives annually.	NATIONAL TARGET 14	Responses - Mainstreaming of biodiversity
Percentage of Parties with legal and technical measures for restoration and compensation.	16				No. of list of key biodiversity declared and managed.	NATIONAL TARGET 15	Coastal/ marine ecosystem - Threatened species
Percentage of threatened species that are improving in status.	3	coastal / marine ecosystems - threatened species			No. of ecosystem services valued annually.	NATIONAL TARGET 17	Coastal/ marine ecosystem - Habitat conditions
Proportion of fish stocks under sustainable management certification schemes	8	coastal / marine ecosystems – fisheries			No. of trained staff on the mechanism and method of valuing the ecosystem services.	NATIONAL TARGET 17	Responses - Resource mobilization
Proportion of fish stocks within biologically sustainable levels (SDG indicator 14.4.1)	4. 8	coastal / marine ecosystems – fisheries			No. of regulations issued for sustainable economic incentives.	NATIONAL TARGET 18	Responses - Resource mobilization
Proportion of known species assessed through the IUCN Red List.	19	coastal / marine ecosystems - threatened species			Issue the law for wildlife protection.	NATIONAL TARGET 18	Responses - Resource mobilization
Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies (SDG indicator 13.1.3)	7	response - climate change adaptation and disaster risk reduction			Upgrade the national system for biodiversity indicators to be more effective	NATIONAL TARGET 19	Responses - Law enforcement

Global Biodiversity Framework Post 2020			SDGs	IMAP Ecological Objectives (EOs) and Indicators	National Indicators
Proportion of terrestrial, freshwater and marine ecological regions which are conserved by PAs or OECMs.	2				
Proportion of total research budget allocated to research in the field of marine technology (SDG indicator 14.A.1)	19	response - resource mobilization			
Proportion of transboundary basin area with an operational arrangement for water cooperation (SDG indicator 6.5.2)	1				
Protected Area Connectedness Index (PARC-Connectedness).	2	coastal / marine ecosystems - habitats extent			
Protected area coverage	A, 2	response - MPAs			
Protected Area Coverage of key biodiversity areas	A, 2	response - MPAs			
Protected Area Representativeness Index (PARC-Representativeness)	A, 2	coastal / marine ecosystems - habitats extent			
Protected Areas Management Effectiveness	1. 2	response - MPAs			
Red List Index and derivatives	A, B, 1, 3, 5, 8, 9	coastal / marine ecosystems - threatened species			
Red List Index for Ecosystems	A, 1	coastal / marine ecosystems - habitats extent			
Species Habitat Index	A, B	coastal / marine ecosystems - habitats extent			

Global Biodiversity Framework Post 2020			SDGs	IMAP Ecological Objectives (EOs) and Indicators	National Indicators
Species Protection Index	A, 2	coastal / marine ecosystems - habitats conditions			
Species Status Information Index	19	coastal / marine ecosystems - iconic species			
Sustainable fisheries as a percentage of GDP in small island developing States, least developed countries and all countries (SDG indicator 14.7.1)	18				
Total amount of approved funding for developing countries to promote the development, transfer, dissemination and diffusion of environmentally sound technologies (SDG indicator 17.7.1)	18				
Total number of internationally recognized certificates of compliance published in the ABS Clearing-House	12				
Total number of permits or their equivalent granted for access to genetic resources	12	response - genetic resources			
Trends in invasive alien species vertebrate eradications.	5				
Trends in policy responses, legislation and management plans to control and prevent spread of invasive alien species	5	coastal / marine ecosystem – NIS			

Global Biodiversity Framework Post 2020			SDGs	IMAP Ecological Objectives (EOs) and Indicators	National Indicators
Trends in Protected area downgrading, downsizing and degazettement (PADDD)	2				
Trends in the numbers of invasive alien species introduction events.	5	coastal / marine ecosystem – NIS			
WAZA bio-literacy survey (Biodiversity literacy in global zoo and aquarium visitors)	15, 19				
Wetland Extent Trends Index	A. 1	coastal / marine ecosystem – wetlands			

Annex II.

Compilations of the most relevant indicators by main categories

Serial	Indicator	Sub-category	Relevant Goal & target	Source
Coastal/marine ecosystem				
1	Biodiversity Habitat Index	Habitat conditions	A, B, 1	Post 2020
2	Biodiversity Intactness Index	Habitat conditions	A	Post 2020
3	Cumulative human impacts on marine ecosystems	Pollution control	A, 1	Post 2020
4	Degree of application of a legal/ regulatory/ policy/institutional framework which recognizes and protects access rights for small-scale fisheries (SDG indicator 14.B.1)	Sustainable Fisheries	8	Post 2020
5	Degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing (SDG indicator 14.6.1)	Sustainable Fisheries	4, 8	Post 2020
6	Global salt marsh extent	Salt marsh	A	Post 2020
7	Global sea grass extent	sea grass	A. 1	Post 2020

Serial	Indicator	Sub-category	Relevant Goal & target	Source
8	Growth in number of records and species in the Living Planet Index database	Iconic specie	19	Post 2020
9	Growth in Species Occurrence Records Accessible Through GBIF	Iconic specie	19	Post 2020
10	Living Planet Index and derivatives	Iconic specie	A. 8	Post 2020
11	Number of assessments on the IUCN Red List of threatened species	Threatened species	19	Post 2020
12	Ocean Health Index	Habitat conditions	A, 1	Post 2020
13	Percentage of threatened species that are improving in status	Threatened species	3	Post 2020
14	Proportion of fish stocks under sustainable management certification schemes	Sustainable Fisheries	8	Post 2020
15	Proportion of fish stocks within biologically sustainable levels (SDG indicator 14.4.1)	Sustainable Fisheries	4. 8	Post 2020
16	Proportion of known species assessed through the IUCN Red List	Threatened species	19	Post 2020
17	Protected Area Connectedness Index (PARC-Connectedness)	Habitats extent	2	Post 2020
18	Protected Area Representativeness Index (PARC-Representativeness)	Habitats extent	A, 2	Post 2020
19	Red List Index and derivatives	Threatened species	A, B, 1, 3, 5, 8, 9	Post 2020
20	Red List Index for Ecosystems	Habitats extent	A, 1	Post 2020
21	Species Habitat Index	Habitats extent	A, B	Post 2020
22	Species Protection Index	Habitat conditions	A, 2	Post 2020
23	Species Status Information Index	Iconic specie	19	Post 2020
24	Trends in policy responses, legislation and management plans to control and prevent spread of invasive alien species	NIS	5	Post 2020
25	Trends in the numbers of invasive alien species introduction events	NIS	5	Post 2020
26	Wetland Extent Trends Index	wetlands	A. 1	Post 2020
27	6.6.1 Change in the extent of water-related ecosystems over time	Habitats extent	6.6	SDGs
28	14.2.1 Proportion of national exclusive economic zones managed using ecosystem-based approaches	Habitats extent	14.2	SDGs
29	14.4.1 Proportion of fish stocks within biologically sustainable levels	Sustainable Fisheries	14.4	SDGs
30	15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type	Habitats extent	15.1	SDGs
31	15.5.1 Red List Index	Threatened species	15.5	SDGs
32	Common Indicator 1: Habitat distributional range (EO1) to also consider habitat extent as a relevant attribute	Habitats extent	EO 1 Biodiversity	IMAP Indicators
33	Common Indicator 2: Condition of the habitat's typical species and communities (EO1)	Habitat conditions	EO 1 Biodiversity	IMAP Indicators
34	Common Indicator 3: Species distributional range (EO1 related to marine mammals, seabirds, marine reptiles)	Iconic species	EO 1 Biodiversity	IMAP Indicators
35	Common Indicator 4: Population abundance of selected species (EO1, related to marine mammals, seabirds, marine reptiles)	Iconic species	EO 1 Biodiversity	IMAP Indicators
36	Common indicator 5: Population demographic characteristics (EO1, e.g. body size or age class structure, sex ratio, fecundity rates, survival/mortality rates related to marine mammals, seabirds, marine reptiles)	Iconic species	EO 1 Biodiversity	IMAP Indicators
37	Common Indicator 6: Trends in abundance, temporal occurrence, and spatial distribution of non-indigenous species, particularly invasive, non-indigenous species, notably in risk areas (EO2, in relation to the main vectors and pathways of spreading of such species)	NIS	EO 2 Non-indigenous species	IMAP Indicators
38	Common Indicator 7: Spawning stock Biomass (EO3);	Sustainable fisheries	EO 3 Harvest of commercially exploited fish and shellfish	IMAP Indicators
39	Common Indicator 8: Total landings (EO3);	Sustainable fisheries	EO 3 Harvest of commercially exploited fish and shellfish	IMAP Indicators
40	Common Indicator 9: Fishing Mortality (EO3);	Sustainable fisheries	EO 3 Harvest of commercially exploited fish and shellfish	IMAP Indicators

Serial	Indicator	Sub-category	Relevant Goal & target	Source
41	Common Indicator 10: Fishing effort (EO3);	Sustainable fisheries	EO 3 Harvest of commercially exploited fish and shellfish	IMAP Indicators
42	Common Indicator 11: Catch per unit of effort (CPUE) or Landing per unit of effort (LPUE) as a proxy (EO3)	Sustainable fisheries	EO 3 Harvest of commercially exploited fish and shellfish	IMAP Indicators
43	Common Indicator 12: Bycatch of vulnerable and non-target species (EO1 and EO3)	Sustainable fisheries	EO 3 Harvest of commercially exploited fish and shellfish	IMAP Indicators
44	Common Indicator 15: Location and extent of the habitats impacted directly by hydrographic alterations (EO7) to also feed the assessment of EO1 on habitat extent	Habitats extent	EO7 Hydrography	IMAP Indicators
45	Common Indicator 16: Length of coastline subject to physical disturbance due to the influence of man-made structures (EO8);	Habitats extent	EO 8 Coastal ecosystems and landscapes	IMAP Indicators
46	Candidate Indicator 25: Land use change (EO8)	Habitat conditions	EO 8 Coastal ecosystems and landscapes	IMAP Indicators
47	No. (%) of inputs within the biodiversity information system	Habitat conditions	National target 2	National Indicators
48	Number (%) of known threatened species communities assessed and documented	Threatened species	National target 2	National Indicators
49	No. (%) of implemented recovery programs for critically endangered species	Threatened species	National target 2	National Indicators
50	No. and percentage of published AIS records	NIS	National target 4	National Indicators
51	No. and percentage of national implemented programs for management of AIS annually	NIS	National target 4	National Indicators
52	Trends in water quality in aquatic ecosystems (dams, rivers and Ramsar Sites)	Wetlands	National target 7	National Indicators
53	Number (%) of Ramsar sites are improved and effectively managed	Wetlands	National target 9	National Indicators
54	Number and % of reports about fishery resources	Sustainable Fisheries	National target 10	National Indicators
55	Number and % of fishery management plans officially approved	Sustainable Fisheries	National target 10	National Indicators
56	Number and % of reports about fishery resources	Sustainable Fisheries	National target 10	National Indicators
57	Number and % of fishery management plans officially approved	Sustainable Fisheries	National target 10	National Indicators
58	Hunting quotas and list of sites officially approved	Sustainable Fisheries	National target 12	National Indicators
59	Gaps in maps and information pertaining to endangered ecosystems, habitats, vegetation and rare species identified	Threatened species	National target 12	National Indicators
60	No. of list of key biodiversity declared and managed	Threatened species	National target 15	National Indicators
61	No. of ecosystem services valued annually	Habitat conditions	National target 17	National Indicators
Pollution				
62	Average marine acidity (pH) measured at agreed suite of representative sampling stations (SDG indicator 14.3.1)	Marine Acidity	A	Post 2020
63	14.1.1 Index of coastal eutrophication and floating plastic debris density	Eutrification	14.1	SDGs
64	14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations	Marine acidity	14.3	SDGs
65	Common Indicator 13: Concentration of key nutrients in water column (EO5);	Eutrophication	EO 5 Eutrophication	IMAP Indicators
66	Common Indicator 14: Chlorophyll-a concentration in water column (EO5)	Eutrophication	EO 5 Eutrophication	IMAP Indicators
67	Common Indicator 17: Concentration of key harmful contaminants measured in the relevant matrix (EO9, related to biota, sediment, seawater)	Hazardous waste	EO 9 Pollution	IMAP Indicators
68	Common Indicator 18: Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)	Hazardous waste	EO 9 Pollution	IMAP Indicators
69	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 (EO9)	Oil pollution	EO 9 Pollution	IMAP Indicators
70	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 (EO9)	Hazardous waste	EO 9 Pollution	IMAP Indicators
71	Common Indicator 21: Percentage of intestinal enterococci concentration measurements within established standards (EO9)	Land based sources	EO 9 Pollution	IMAP Indicators

Serial	Indicator	Sub-category	Relevant Goal & target	Source
72	Common Indicator 22: Trends in the amount of litter washed ashore and/or deposited on coastlines (EO10)	Marine litter	EO 10 Marine litter	IMAP Indicators
73	Common Indicator 23: Trends in the amount of litter in the water column including microplastics and on the seafloor (EO10)	Marine litter	EO 10 Marine litter	IMAP Indicators
74	Candidate Indicator 24: Trends in the amount of litter ingested by or entangling marine organisms focusing on selected mammals, marine birds, and marine turtles (EO10)	Marine litter	EO 10 Marine litter	IMAP Indicators
75	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 animal	underwater noise	EO 11 Energy including underwater noise	IMAP Indicators
76	Candidate Indicator 27: Levels of continuous low frequency sounds with the use of models as appropriate	underwater noise	EO 11 Energy including underwater noise	IMAP Indicators
Response				
77	Official development assistance on conservation and sustainable use of biodiversity (SDG indicator 15.a.1)	resource mobilization	D, 18	Post 2020
78	15.a.1 (b) revenue generated and finance mobilized from biodiversity relevant economic instruments (SDG indicator 15.a.1)	resource mobilization	D	Post 2020
79	Amount and composition of biodiversity-related finance reported to the OECD Creditor reporting system	resource mobilization	18	Post 2020
80	Amount of funding provided through the Global Environment Facility and allocated to biodiversity focal area (decision X/3)	resource mobilization	18	Post 2020
81	Bioclimatic Ecosystem Resilience Index (BERI)	Climate change adaptation and risk disaster reduction	1	Post 2020
82	Biodiversity Barometer	public awareness	15, 19	Post 2020
83	Biodiversity Engagement Indicator	public awareness	15	Post 2020
84	Coverage of other effective area-based conservation measures	OECMs	A, 2	Post 2020
85	Coverage of protected areas in relation to marine areas (SDG indicator 14.5.1)	MPAs	2	Post 2020
86	Number of checkpoint communiqués published in the ABS Clearing House	marine genetic resources	C	Post 2020
87	Number of users that have provided information relevant to the utilization of genetic resources to designated checkpoints	marine genetic resources	C	Post 2020
88	Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies (SDG indicator 13.1.3)	climate change adaptation and disaster risk reduction	7	Post 2020
89	Proportion of total research budget allocated to research in the field of marine technology (SDG indicator 14.A.1)	resource mobilization	19	Post 2020
90	Protected area coverage	MPAs	A, 2	Post 2020
91	Protected Area Coverage of key biodiversity areas	MPAs	A, 2	Post 2020
92	Protected Areas Management Effectiveness	MPAs	1. 2	Post 2020
93	Total number of permits or their equivalent granted for access to genetic resources	marine genetic resources	12	Post 2020
94	6.3.1 Proportion of wastewater safely treated	pollution control	6.3	SDGs
95	6.4.1 Change in water-use efficiency over time	pollution control	6.4	SDGs
96	6.5.1 Degree of integrated water resources management implementation	pollution control	6.5	SDGs
97	7.2.1 Renewable energy share in the total final energy consumption	mainstreaming of biodiversity	7.2	SDGs
98	13.1.3 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies	risk disaster reduction	13.1	SDGs
99	13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula	risk disaster reduction	13.3	SDGs
100	14.a.1 Proportion of total research budget allocated to research in the field of marine technology	Resource mobilization	14.a	SDGs
101	15.7.1 Proportion of traded wildlife that was poached or illicitly trafficked	Law enforcement	15.7	SDGs
102	15.9.1 Progress towards national targets established in accordance with Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011–2020	mainstreaming of biodiversity	15.9	SDGs

Serial	Indicator	Sub-category	Relevant Goal & target	Source
103	15.a.1 Official development assistance and public expenditure on conservation and sustainable use of biodiversity and ecosystems	Resource mobilization	15.a	SDGs
104	Number of declared international sites	MPAs	National target 1	National Indicators
105	Annual allocated budget for PAs secure	Resource mobilization	National target 1	National Indicators
106	Annual generated income from Pas	Resource mobilization	National target 1	National Indicators
107	Number and (%) of hotels and companies applied criteria for eco-tourism	Mainstreaming of biodiversity	National target 6	National Indicators
108	Number and (%) of published reports on assessment of pollution	Pollution control	National target 7	National Indicators
109	Number and (%) of issued decrees to enforce pollution control	Pollution control	National target 7	National Indicators
110	Number and (%) of rehabilitated or restored pilot projects in polluted ecosystems	Restoration	National target 7	National Indicators
111	Number of waste disposal sites upgraded	Pollution control	National target 7	National Indicators
112	Volumes of waste recycled annually	Pollution control	National target 7	National Indicators
11.3	Presence / absence of key indicator pollution species	Pollution control	National target 7	National Indicators
114	Number (%) of SIA developed and approved and implemented	Mainstreaming of biodiversity	National target 8	National Indicators
115	Number and % of assessments, reports and maps on coastline habitats and endangered species	Research & Development	National target 10	National Indicators
116	Number and % of pilot ICZM Plans implemented	ICZM	National target 10	National Indicators
117	Number of green energy initiatives annually	Mainstreaming of biodiversity	National target 14	National Indicators
118	No. of trained staff on the mechanism and method of valuing the ecosystem services	Resource mobilization	National target 17	National Indicators
119	No. of regulations issued for sustainable economic incentives	Resource mobilization	National target 18	National Indicators
120	Issue the law for wildlife protection	Law enforcement	National target 18	National Indicators
121	Upgrade the national system for biodiversity indicators to be more effective	Resource mobilization	National target 19	National Indicators

Annex III.

Webinar Report

A consultative workshop on national contribution of Post-2020 SAP BIO was virtually held on Monday 9th November. It was attended by 27 representatives from SPA/RAC Secretariat and its experts, the drafting team of the report, Nature Conservation Sector and Integrated Coastal Zone Management of the Egyptian Environmental Affairs Agency, National Institute of Oceanography and Fisheries, Universities and Research Centers, Arab Academy for Maritime and Technology, and others.

The following main issues were discussed and agreed to be elaborated in the final report:

Studies on marine mammals are needed in terms of their geographical distribution, biology, and impacts of pollution and climate change on marine mammals.

- Relationship between fisheries and marine biodiversity be elaborated.
- Information on fish catch/ discard fish be included in the final report.
- Impacts of aquaculture on the Egyptian Mediterranean environment need clarification.
- More MPAs should be declared (e.g. Ras Al-Hekma).
- Priorities be given to retain staff, and increase governmental budget.
- Potential habitats for threatened species should be protected (monk seal).
- Information on cartilaginous and by catch be elaborated.
- Coraligenous habitats are considered as priority issues.
- A report on the standing marine mammals is sent to ACCOBAMS Secretariat for exchange of information with other Mediterranean countries.
- Conservation and Development should be elaborated.
- The current projects and action plan for land-based sources affecting the Mediterranean Sea be stated, with focus on industrial waste, oil and gas projects in offshore areas, and their impacts on marine biodiversity. Indicators for marine pollution should be established soon.
- Marine biodiversity in off shore areas be given a priority.
- Make use of the new document of GFCM be used for marine biodiversity mainstreaming in all relevant sectors.
- The need for more cooperation and coordination at all levels (national, regional and

international).

- The real challenge is the implementation of national SAP BIO Post-2020.
- MPAs in the offshore areas should be declared soon.
- Further studies on NIS are needed for proper implementation of the National Action Plan.
- Capacity development on all relevant issues should be given priorities.
- Current National Action Plan on marine litter to be included in the final report.
- The role of socio-economic considerations in marine biodiversity conservation should be explored.
- Search for social experts should continue and be involved in the management of MPAs.
- Research on genetic resources, using recent DNA techniques be given a priority.
- New trends in bird migration patterns in Egypt be studied, with a focus on pathogenic diseases and new bird habitats.
- Consideration be given to the current project on climate change adaptation in sensitive habitats (e.g. Nile Delta).
- A reference to the current Integrated Coastal Zone Management Plan to be included in the final report.

Annex IV.

Combating Plastic Pollution in Egyptian Marine Environment

Egyptian Efforts

1 _ In 2013, Egypt with other contracting parties to the Barcelona Convention (COP 18) adopted the Regional Plan on Marine Litter Management in the Mediterranean that represents among others a set of legally binding measures to prevent and reduce marine litter generation and improve its management.

2 _ In 2016, Egypt declared its national Sustainable Development strategy (Egypt vision 2030). Marine litter prevention as well as solid waste management were included with special attention (Goals 11, 12, 13, and 14).

3 _ In 2016 the national marine litter management plan was put into effect to fulfill our obligations and measures relevant to the Regional Plan for Marine Litter Management in the Mediterranean.

4 _ A National Initiative on Reduction of Plastic Bags Consumption in Egypt has been launched by the Ministry of Environment on the World Environment Day on 5 June 2017. This unique public-private sector collaboration aimed to reduce the annual consummation of 12 billion non-degradable plastic bags in Egypt.

5 _ In 2017, Egyptian National Solid Waste Management Programme NSWMP launched its investment component to support the implementation of environmentally sound and climate-friendly municipal solid waste management systems and the related infrastructure according to national laws and regulations.

6 _ With appreciated support from "Sustainable Water Integrated Management Programme & Horizon 2020" (SWIM-H2020 SM), Egypt has finished the first national assessment report of marine litter in the Egyptian Mediterranean coastline and came up with targeted management options. The programme was funded by the European Commission

7 _ In 2018, we ended our first national Marine litter monitoring program along the Egyptian Mediterranean Coast. Rustles revealed that plastic represents 70-85 % of the total monitored marine litter.

8 _ Currently, a national programme for "regular monitoring and assessment of marine litter in the Northern beaches of Egypt" was prepared by EEAA, in compliance with IMAP metadata for marine litter monitoring.

9 _ In order to promote individual and corporate behavior change, 55 awareness campaigns and 2 National workshops have been implemented between 2016 and 2019. NGOs and youth communities played an important role in such campaigns.

10 _ Recently, a new initiative is being prepared in Alexandria to reduce the consumption of single use plastic bags. This pilot initiative will be implemented in collaboration with NGOs, retailers, and youth communities. The idea based on achieving a win-win situation between the environment and hyper markets. During this initiative, big retailers and hyper markets will distribute multiuse bags with their printed advertisement, while the customers will gain some benefits and discount on bringing this multiuse bag each shopping and refrain from using the single use plastic bags.

POST-2020

SAP BIO

Strategic Action Programme
for the **Conservation** of **Biodiversity**
and **Sustainable Management**
of **Natural Resources**
in the **Mediterranean Region**

UN environment programme

Mediterranean Action Plan
Barcelona Convention

SPA / RAC
The Mediterranean Biodiversity Centre

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MAVA FONDATION POUR LA NATURE

This publication has been prepared
with the financial support of the MAVA foundation