



**United Nations
Environnement
Programme**

EP



UNEP(DEPI)/MED WG.331/13
30 April 2009

ENGLISH
ORIGINAL: ENGLISH



MEDITERRANEAN ACTION PLAN

Ninth Meeting of Focal Points for SPAs

Floriana, Malta, 3-6 June 2009

**Proposal for updating the Strategic Action Programme
for the Conservation of Biological Diversity
in the Mediterranean Region (SAP/BIO)
on Climate Change Issues**

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LIST OF ACRONYMS

Bd	Biodiversity
CBD	Convention on Biological Diversity
CC	Climate change
CHM	Clearing-House Mechanism
GHG	Green-house Gasses
ICZM	Integrated Coastal Zone Management
MAP	Mediterranean Action Plan
m/c	Marine and coastal
MED POL	Marine pollution assessment and control component of MAP
MPA(s)	Marine Protected Area(s)
NGOs	Non-Governmental Organisation(s)
PAP/RAC	Regional Activity Centre for Priority Actions Programme
RAC/SPA	Regional Activity Centre for Specially Protected Areas
SAP BIO	Strategic Action Programme for the Conservation and Protection of Biological Diversity in the Mediterranean Region
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

1. INTRODUCTION

The Regional Activity Centre for Specially Protected Areas (RAC/SPA) has been designated as the Lead Agency for the “Strategic Action Programme for the Conservation of Biological Diversity (SAP BIO) in the Mediterranean Region”. Among the numerous actions envisaged, between the years 2000 and 2003, several priorities related to the promotion and better management of protected areas are considered, furthermore the role of climatic change on future Mediterranean conservation was borne in mind, and some specific actions dealing with this issue were included in the SAP BIO document. Nevertheless the recent rising of the CC as one of the biggest threat for the Bd has necessitated for an update of the SAP BIO document.

A broad initiative has been launched at the Mediterranean level, in order to prepare for these revisions. The participating countries were invited to prepare national overviews on the impact of CC on Bd. Three sub-regional programmes were organized for these procedures. Eighteen national contributions have been submitted¹.

Taking into account all facts of interest at the national level, sub-regional levels and the synthesis of all regions considered, the conclusions and recommendations reported in this document have been adopted as relevant.

The present document is comprised of two *addenda*: *Addendum 1*, reporting the list of vulnerable and critical sites in coastal and marine areas, provided by the participating countries, based on actual knowledge and predicted impacts of CC on Bd; *Addendum 2*, constituted by a chart summarizing the general actions, relevant targets, objectives, and specific actions identified within the framework of CC on Bd.

2. MAIN FINDINGS

- a. Facts and data provided by national Overviews differ in level and abundance of country specific information due to different national capacities, conditions and practices. Nevertheless, the Overviews are considered as a good base for further actions, their inputs to be further systematized, made user friendly and updateable.
- b. Evidence is provided on key starting points, namely: (i) the very rich Mediterranean biodiversity being highly sensible to impacts of climate change; (ii) the climate change as an already occurring phenomenon; (iii) some impacts observed or occurring being probably irreversible; and (iv) the main concrete actions to limit consequences of CC relying on other anthropogenic causes reducing resilience and therefore increasing impacts on marine and coastal species and habitat. These facts call for urgent, harmonized and comprehensive actions.
- c. National experts agree (in line with the international scientific consensus) on the importance and extent of risks of marine and coastal biodiversity in their countries due to CC, as a result of (and simultaneous complex interactions between):
 - changes in precipitation patterns and the resulting freshwater scarcity, increasing air and sea water temperature, enhancing UV radiation;
 - sea level rise, likely to accelerate coastal erosion, marine intrusion into coastal aquifers and wetlands, and other effects;

¹ An information document titled “synthesis of national overviews on vulnerability and impacts of climate change on marine and coastal biodiversity in the Mediterranean region” has been made.

- acidification (decreasing pH);
 - change of hydrodynamic and hydrological parameters (e.g. local and regional currents, upwelling, thermal stratification, frequency of storms and extreme events, salinity, turbidity, nutrient supply...).
- d. Expected effects of CC-driven stressors will affect marine / coastal biodiversity by producing shifts in the short-, medium- and long-term:
- i. Short-term (ongoing and next decade): spatio-temporal patterns of biodiversity; migratory paths; abundance of species; eco-physiological processes (reproduction; immunological response affecting the individual performance of sensible species at various stages of their life history and possible adaptive selection pressure on species traits;
 - ii. Medium-term (decades): larval dispersal and recruitment; resource availability (food, habitat, etc.); primary and secondary production; complex (non-linear, non-independent) responses at the community / ecosystem level, likely leading to regime shifts and local extirpation of species and habitat losses; simultaneous effects of other human-driven stressors (e.g. over-fishing, pollution, habitat degradation, alien species), and land-sea links (e.g. soil erosion and desertification, agricultural runoff, river regulation, etc.);
 - iii. The long-term effects forecasted by current scenaria might be mitigated by the reduction of GHG emissions and other appropriate measures, while the above short and medium term effects are already expected to occur anyway;
 - iv. These biodiversity changes are likely to have profound direct socio-economical effects, and affect public health. Such effects are so far strongly underestimated in long-term planning of national economies.
- e. National Overviews provided extensive surveys concerning vulnerability and critical sites (hot-spots) in national m/c areas, based on actual knowledge and predicted impacts of CC on biodiversity. Among the large number of critical areas, some of them require a particular and urgent attention due to tremendous socio-economical consequences, such as the Nile Delta and other most critical areas.
- f. Different national conditions, political status, socio-economic status and potential, institutional inequality, attained level of relevant knowledge, etc. call for country and area specific approaches when developing CC/Bd related (sub)regional strategies and programmes.
- g. So far, there is almost no CC/Bd targeted research at regional/national levels. Most implemented or on-going research refers to GHG emissions, less on other general CC phenomena, still less on CC/Bd phenomena and impacts. Presently, research attention is focused predominantly on terrestrial areas and sectoral (forestry and agriculture/fisheries, water resources) issues, much less on m/c areas.
- h. CC/Bd related monitoring programmes are still rare and mostly within short term international projects. In the majority of the countries some actions on biodiversity monitoring, species related mostly, are being implemented on regular or case by case basis. All countries have regular hydro and meteo monitoring, of indirect interest for CC/Bd. In several countries a regular monitoring on GHGs is on-going or in preparation. Presently there is no regular monitoring on CC/Bd in general, nor in m/c areas (with few countries as exceptions). Indicators, parameters and methodologies are not standardized.
- i. All national documents refer to large gaps in knowledge and high uncertainty level.
- j. All riparian countries are active (i) with respect to the UNFCCC, CBD, (ii) as Contracting Parties to the Barcelona Convention, its related Protocols, and the Almeria Declaration. The

commitments related to UNFCCC and the Kyoto Protocol, mainly those on GHG emissions are at a high or relatively high level of national priorities. Other CC and the CC/Bd related issues are at a low level of national priorities, or not identified as priority at all. So far there is no Mediterranean nor national strategies on CC/Bd. CC issues and CC/Bd in particular are not part of national planning systems, the coastal and marine issues are not properly addressed within national/local land-use planning and ICZM. There is a consensus on the need to strengthen or update national legislations with regard to CC issues.

- k. Levels: Some key problems and issues cannot be addressed at levels lower than the sub-regional or regional one. Problems concerning wetlands, lagoons, small islands, estuaries, freshwater habitats; other wider spread habitats such as: Mediterranean forests and maquis – shrubs; sand dunes; low-land areas; are shared by all or by the majority of countries. A number of phenomena concerns few countries only (f. ex. karst, islands, individual species). Problems related to open sea areas (non-indigenous species, impacts on thermophyluos and or “boreal” species, fisheries, Posidonia meadows...) concern all Mediterranean countries. Research and monitoring issues need regional and higher level approaches. Finally, for a number of issues such as capacity building and training, public awareness, methodologies and guidelines, funding strategies and opportunities, a regional approach and/or international co-operation and support are a must.
- l. In most countries regular national sources are limited, in majority of countries very limited; private funds are available only in few countries. For many countries funding through multilateral co-operation is indispensable. The number of international projects is scarce, access to information often difficult. Very limited national and regional funds are allocated for research of CC in the marine realm, since most of on-going CC initiatives are focused on terrestrial and inland aquatic environments.

3. NEEDS WITH A WIDER ASPECT

Among a large number of needs identified at national level, the following require particular attention due to their wider and/or regional aspects:

- i. International co-operation. There is a consensus on needs for and benefits of CC/Bd related international co-operation, also for multi-lateral and/or bi-lateral one. The related implemented or on-going projects considered as needed, successful and beneficial from a number of aspects. Countries with higher economic and institutional potential are looking at international co-operation primarily through needs for strengthened and more efficient actions. For other countries such co-operation is a must, firstly due to the need for scientific and technical assistance and capacity building; secondly, but not less important, as the predominant funding source.
- ii. Integration of CC/Bd in m/c areas into national planning and management practices with ICZM as a broader framework. The need for liasing the CC/Bd problems and actions in c/m areas with the coastal and marine areas management, has been emphasized by almost all Overviews, indicating ICZM as the indispensable broader conceptual framework and planning tool.
- iii. Finally, further MAP/RAC-SPA involvement, guidance and assistance, looking for initiatives at either Mediterranean or sub-regional levels, were unanimously requested.

4. PREREQUISITES TO BE MET

The analysis of findings presented indicates that a number of prerequisites for comprehensive, concerted, efficient and timely actions are still not met or are met partially only, such as: status of CC/Bd in c/m areas in national policy agendas; sound stable funding; information and knowledge available; targeted research; monitoring; institutional and technical capacity and expertise; inventory of hot-spots; ranking priorities; raising public awareness and influencing decision makers. Actions needed to meet these prerequisites are listed below, following their logical order. It is understood that their implementation should not postpone the most urgent short term actions based on the actual knowledge, to be implemented applying the precautionary principle.

- a. Public awareness and information, influencing decision makers, putting CC/Bd issues at higher level of national priorities. All Overviews indicate a relatively low or low level of public awareness on risks from and impacts of climate change on national/local coastal and marine biodiversity, including proposals for respective socio-economic analyses. Increased awareness of general public, fluent tailored information addressed at scientific, industrial and technical communities should induce political pressure which, combined with a targeted approach to national decision-makers should result with putting CC/Bd issues at an adequate level of national priorities.
- b. Provision of arguments for upgrading policy ranking. Well documented and justified documents should be prepared on: (i) the social, cultural and economic benefits of Bd and ecosystem conservation, (ii) valuation of rendered ecosystem services, (iii) socio-economic analyses, including importance and role of biodiversity as development resource. Also, selected cost-benefit analysis and representative and replicable pilot actions should be implemented as reference and examples of good practices.
- c. Funding of CC/Bd related activities. The need for consistent funding strategies was emphasized, assistance with that regard requested, by several Overviews, also, a regional action by RAC\SPA concerning funding strategies and opportunities.
- d. Data and scientific information. Despite the impressive set of information and data collected, still a number of these (many at national level and in national language) are not registered and made available (grey literature), to: (i) scientists, (ii) local technical, planning and CZM responsible and bodies, (iii) NGOs and the general public. A comprehensive and user friendly information exchange system (CHM), comprising international scientific literature, capable for periodic updating and with a free public access, would prevent or minimize risks of redundancy, overlapping, and implementation of inappropriate or unsustainable actions. Also, practical solutions for exchange of information and harmonization across the region (including assistance to be provided) are needed.
- e. Provision of necessary means and equipment to monitor and study the main impacts of CC on biodiversity and the resulting consequences of CC/Bd.
- f. Filling gaps in knowledge, reducing uncertainties, targeted research. Short- and medium-term expected impacts can be dealt with in a comprehensive and sustainable way only after developing the adequate research lines addressing the gaps in knowledge.
- g. Monitoring. The need for long-term monitoring is obvious as prerequisite. Needs for strengthening of institutional and human capacities for such monitoring, and for related training and capacity building were emphasized by all documents. Support and provision of technical equipment is needed for several countries. The lack of comprehensive and systematic CC/Bd inventory and of ecosystems and species monitoring prevents a reliable assessment of nature and magnitude of CC impacts on biodiversity. The ongoing Bd monitoring initiatives at sub-national, national and transboundary levels might facilitate starting initiatives for broader

monitoring schemes at spatial and temporal levels, focused on CC/Bd. Proposals were formulated for concerted actions at regional level, also for implementation of multi-lateral monitoring programmes.

- h. Improving evidence and systematizing actual knowledge on vulnerability and hot-spots. A very large number of critical sites and areas were identified (see Appendix I), but the present list should not be considered as comprehensive. Further in-depth analyses are needed, including checking, justification, systematizing and ranking.
- i. Comprehensive, harmonized and prioritized planning. Presently in no country exists a systematized planning approach concerning CC and CC/Bd issues. With that regard, the following is needed: (i) adaptation planning of CC impacts in general, CC/Bd in particular, to be integrated into national and local planning systems and practices, (ii) cross-sectoral interlinkages to be established, (iii) in case of m/c areas, interlinkages with ICZM processes and planning, the action to benefit from knowledge, methodology and experience of MAP, notably RAC\SPA and PAP\RAC, (iv) representative and replicable pilot actions.
- j. Awareness and training of specialists on fields related to the CC\Bd. Here, reference should be made at: „ ... *most conservation biologists not aware of the impacts of climate change*“ (UNEP WCMC, 2003). This statement was implicitly confirmed in several national Overviews, by defining this activity as priority. Actions have to be targeted at scientists and professionals in ministries, agencies and bodies for environment protection and nature conservation / management.

5. RECOMMENDATIONS

Taking into account: (i) the main conclusions, needs and prerequisites to be met, presented above; (ii) findings by national Overviews; and (iii) findings of sub-regional meetings and of the regional one, the following actions are recommended.

- a. Actions to provide for the best use of national Overviews and Regional Synthesis. Finalized documents should be distributed in order to (i) incite discussion and proof-checking; (ii) provide for feed-back; (iii) be used at respective levels, as appropriate.
- b. Public awareness, influencing decision makers, setting CC/Bd as high priority in national agendas. A regional awareness raising programme to be implemented: (i) a regional document on expected critical impacts and a set of promotional leaflets to be prepared; also sub-regional and country specific documents; (ii) national awareness raising actions to be implemented, for some countries assisted; (iii) national actions aiming at setting up CC/Bd m/c issues as national priority, to be implemented and assisted; and (iv) pilot actions to be implemented.
- c. Establishment and management of an open-access, regional database (including scientific literature, GIS-based thematic maps, etc.) promoted within the framework of UNEP/MAP, preferably at RAC/SPA, to feed on CC the existing Clearing House Mechanisms. This database should be usable for target groups (scientists, managers, operational responsible and the general public). At national levels, establishment of compatible national databases should to be promoted and assisted, including implementation of selected replicable pilot actions.
- d. Provision of justification for more adequate national funding of CC/Bd activities, by: (i) preparing valuation of costs for actions vs. damage in case of non-action; (ii) valuation of rendered ecosystem services; (iii) assessment of importance and role of biodiversity as

development resource; (iv) preparation of selected representative cost-benefits analysis; and (v) implementation of representative and replicable pilot actions.

- e. National Inventories of Hot-spots in coastal and marine areas: (i) framework Inventory design to be prepared at regional level, to standardise the process; (ii) training at regional level; (iii) creation of prerequisites at national levels to be incited and supported; (iv) National Hot-spot Inventories to be prepared, offering assistance where needed; and (v) representative pilot actions to be implemented.
- f. Monitoring. The complexity of problems calls for hitherto experiences from on-going separate CC and Bd monitoring activities, also experiences of early stages of MED POL. The monitoring indicators have to be identified and agreed on. The key problems (interrelation with on-going monitoring activities, system design, parameters, indicators, methodologies, institutional framework, capacity building, etc.) are of regional level firstly, to be dealt with at national levels secondly, involving also other relevant Agencies and bodies. The recommendation is: (i) to prepare a comprehensive Inception document; (ii) to organize an initial meeting of Mediterranean experts to set up the basis for further actions; and (iii) to encourage enlargement and adaptation of existing monitoring initiatives by including the CC component.
- g. Research. Problems concerning targeted research on CC/Bd issues are of a multidisciplinary and multilevel nature, complex and in many cases country specific. The key problems are similar to those listed for monitoring, above. A number of priority research topics were listed in Overviews: refinement of modelling tools, response of species vulnerable to CC, non-linear response of ecosystems, and populations-to-ecosystem links. An in-depth further elaboration is needed to define lines of action, priorities, addressees, funding, co-operation and support, as prerequisites for a harmonized and comprehensive research. The recommendations are: (i) to establish a Mediterranean group of experts on CC/Bd research, (ii) to prepare a regional document for an Inception meeting, and (iii) to organize the meeting to set up the bases for a consistent CC and CC/Bd research programme.
- h. Incorporating CC/Bd c/m issues in national planning practices. Here, the following should be taken into account: (i) that all development and land-use planning issues are strongly dependent on country specific legislation and practices; (ii) the need for a step-by-step approach: firstly at planning related to CC in general, secondly targeted at c/m areas, thirdly included in or properly addressed at ICZM; and (iii) the urgency of such initiatives being emphasized by a number of national documents. The recommendations are: (i) to prepare a comprehensive reference document, to present framework criteria, good practices, methodologies and examples; (ii) to organize a regional meeting to set up the basis for further actions; (iii) to implement training at appropriate level; and (iv) to implement pilot actions.
- i. Actions aiming at strengthening ecosystems resilience, such as (i) increasing MPAs connectivity; (ii) adapting legislation on coastal land use to predictions of CC impacts; and (iii) reducing pollution and other anthropogenic pressures, all to be implemented as collateral measures to mitigate CC/Bd impacts.
- j. Reinforcement of legal and institutional frameworks through adapting/updating legislation on CC issues and establishment of national bodies in charge of CC issues, providing for a regional co-ordination. Furthermore, CC/Bd planning should be co-ordinated with other sectors under pressure of CC effects, such as water resources, agriculture, fisheries, tourism, infrastructures, and land use.
- k. Capacity building and training. All Overviews reported the need for capacity building and/or training, at differing levels and on various topics. The developed countries might be considered

as having training implementing capacities, others as potential beneficiaries. The reported requests include training and/or capacity building on: monitoring, planning, co-operation, project formulation, training of specialists. The recommendation is to prepare and implement a regional programme of training and capacity building; such a programme to be liased with respective key actions.

- l.** Co-operation. Taking into account the opportunities identified, eligibility and funding problems, and examples of successful co-operation: (i) a regional document on good practices and problems should be prepared and disseminated; (ii) a training document should be prepared, related to the formulation and implementation of international projects; (iii) training to be implemented at appropriate level(s); and (iv) assistance to be provided, where requested.
- m.** Funding. Recommendations: (i) to disseminate to target groups the supporting documents defined in point 4. above; (ii) to prepare and disseminate an informative document on the needs for stable and permanent funding and good practices and opportunities; and (iii) to include CC/Bd related topics in the programme of the planned SAP/BIO Donors Conference, as appropriate.
- n.** The Overviews expressed a high praise for the efforts and activities of RAC/SPA within the preparation and implementation of the present action. Nevertheless, it was recommended to (i) analyze the capacity of RAC/SPA to implement the enlarged future CC/Bd m/c programme; and (ii) to provide for further strengthening of respective Center's human capacities to be involved.
- o.** Planning, design and implementation of concrete actions:

 - National CC and CC/Bd Strategies and Action Plans (coastal and marine areas included) must be prepared / revised and adopted;
 - practical actions should be planned, designed and implemented: firstly, the urgent actions, based on actual knowledge; secondly, short-term actions, urgent and those aiming at achievement of tangible results within a short time span, pilot actions included; and thirdly medium-term projects, programmes and actions; all based on a long-term Operational Programme
 - permanent national systems of progress monitoring, reporting, and updating of CC/Bd strategies and plans to be established and made operational.

ADDENDUM I-

LIST OF VULNERABLE AND CRITICAL SITES IN COASTAL AND MARINE AREAS SO FAR IDENTIFIED

The list reported below is comprised of the national Overviews on vulnerable impacts of CC on marine and coastal Bd. The list is based on actual knowledge and predicted impacts of CC on Bd.

Albania

- Lagoons: Drini-Mati delta (Patok), N of Erzemi delta, Semani Vjosa area, S Vjosa area, Cheka lagoon – SLR, flooding, low strands destruction, in Mati new wetlands;
- Karavasta and Narta lagoon – SLR, complete change of ecosystem into a saline one;
- Wetlands, former swamps of Durres, Myzeque, Narta, Vrug – SLR, flooding, impacts on agricultural lands habitats;
- Sandy beaches in subsidence areas: Shengjin, Kune-Vain, Tale, Patok, Oshem – SLR, flooding;
- Beaches in elevated areas: Durres, Golem, Myzeque, Divjake, Hirmare, Borch – SLR, partially affected;
- In addition, Patok, Durres, Karavasta-Ndernenas coastline shifting inwards;
- Skutari (Skadar) lake;
- Forests in coastal area – individual areas not specified.

Algeria

- Sandy coasts of Reghaia-Kadous, of Zeralda-Sedi Fredj, of Mostaganem, El Kala;
- Low-lying beaches of Jijel, Skikda, Ghazaouet;
- Low-lying rocky coasts (vermets) of Kouali (Tipaza) and Mars El Hadjadj (Arzew);
- Sandy beach of Chenoua (Tipaza), the eastern coast of Bejaia;
- Humid coastal zones of El Kala, Skikda and Macta.

Bosnia & Herzegovina

- Neum coastal and marine area;
- Wetland Hutovo blato (Ramsar site and Nature Park);
- Mostarsko blato, Livanjsko polje;
- Neretva, Trebišnjica, Cetina rivers and tributaries (Trebizat river), including riparian areas;
- Lakes and reservoirs: Boračko, Blidinjsko, Buško, Jablaničko, Ramsko, Bilečko.

Croatia

- Critical karst areas of high Bd importance: mountains Velebit, Biokovo (MTR, Ann. Prec.);
- Endemic fish species: rivers Zrmanja, Krka, Cetina, Neretva tributaries (MTR, Ann. Pr.);
- Estuaries and lagoons: Mirna, Krka, Zrmanja, Neretva, Pantan (SLR, MTR, Ann. Pr.);
- Intertidal mudflats: Neretva estuary, N. Dalmatia (SLR, MTR);
- Saltpans, muds, mudflats: NW part of Ravni kotari, Kolensko and Velo/Malo blato (Pag), Ninsko, small wetlands/ponds (MTR, Prec.);
- Marine habitats of particular value: Brijuni, Kornati, Telascica, Lastovo, Mljet;
- Islands' endemism and biodiversity: Krk, Cres, Vis and small off-shore islets (Palagruza, Jabuka, Sv. Andrija, Susac), cliffs on bigger islands (SLR, MTR, Ann. Prec.);
- Coastline adjacent marine areas: endemic marine fauna/flora, Posidonia beds (STR);

- Important nurseries: Velebit Channel, Neretva Delta, Jabuka Pit; marine reserves Limski Bay and Maloston Bay (STR, change of water mass movements);
- Sand/shingle beaches: Rab, Neretva, Mljet Sapunara beach, islands, others (SLR);
- Marine lakes Zmajevsko oko, Mir, two Mljet lakes (SLR, MTR, Ann. Prec.);
- Karst habitats: underground/terrestrial aquatic habitats (Ann. Prec.), submarine karst caves/pits with underground fresh water input (SLR, Ann. Prec.);
- Freshwater lakes: Vransko- Pakostane (reedbed also), Vransko-Cres island (SLR, MTR, Ann. Precip.), marine coraligenous formations (STR), Mljet Veliko lake (SLR, STR, MTR);
- Motovun wet alluvial oak forest, the only one in the Mediterranean;
- Autochthonous sorts of Mediterranean/Adriatic agricultural species and aromatic plants.

Cyprus No data provided.

Egypt

- Lagoons: Maryut, Edku, Borullus, and Manzala and Bardaweel;
- The Northern area of Nile Delta

Greece

Impacts presented and commented in detail but critical areas not geographically identified.

Italy

- Liguria: Coralligenous assemblages / aggregations of *Lithophyllum lichenoides* within the Marine Protected Areas of: Isola di Gallinara, Isola Bergeggi, Portofino, Cinque Terre;
- Tuscany: Areas at risk from SLR: Verisilia Riviera; Coralligenous assemblages / aggregations of *Lithophyllum lichenoides* within the MPAs of: Arcipelago Toscano, Secche della Meloria;
- Latium: Areas at risk from SLR: Fondi and Pontina plains; Coralligenous assemblages / aggregations of *Lithophyllum lichenoides* within the Marine Protected Areas of: Secche di Tor Paterno, Isole Pontine di Ponza, Palmarola and Zannone, Isole di Ventotene e Santo Stefano;
- Campania: Areas at risk from SLR: delta of Volturno (the Gulf of Gaeta), delta of Sele (the Gulf of Salerno); Coralligenous assemblages / aggregations of *Lithophyllum lichenoides* within the Marine Protected Areas of: Regno di Nettuno (Isole di Ischia, Vivara and Procida), Isola di Capri, Punta Campanella, Santa Maria di Castellabate, Costa degli Infreschi;
- Sardinia: Areas at risk from SLR: Pilo lagoon, Tortoli lagoon, Gulf of Orosei (beach and lagoon), Murtas Beach, Porto Pino and Palmas (Sardinia), Gulf of Cagliari, Gulf of Oristano; Coralligenous assemblages / aggregations of *Lithophyllum lichenoides* within the Marine Protected Areas of: Asinara, Capo Testa – Punta Falcone, Arcipelago della Maddalena, Tavolara – Punta Coda Cavallo, Golfo di Orosei – Capo Monte Sannu, Capo Carbonara, Penisola del Sinis – Isola di Mal di Ventre, Capo Caccia – Isola Piana;
- Sicily: Areas at risk from SLR: Stagnone di Marsala, Trapani and Paceco saltmarshes; Noto and the Vendicari lagoon, Pantani Cuba and Longarini; Vermetid platforms within the Marine Protected Areas of: Egadi and Capo Gallo – Isola delle Femmine; Coralligenous assemblages / aggregations of *Lithophyllum lichenoides* within the Marine Protected Areas of: Isole Egadi, Capo Gallo e Isola delle Femmine, Isola di Ustica, Isole Eolie, Isole Ciclopi, Plemmirio, Isole Pelagie, Isola di Pantelleria; Posidonia recife barrier of Capo Feto SCI (Site of Community Interest);
- Apulia: Areas at risk from SLR and/or biodiversity loss: Salento Peninsula (marine caves), Coastal dunes and Alimini coastal lakes, MPA Torre Guaceto, Apulian coastal lakes and wetlands, Lesina and Varano lagoons, Tremiti Archipelago (and local MPA);
- Marche: Areas at risk from SLR and/or biodiversity loss: Conero Promontory;

- Emilia-Romagna: Areas at risk from SLR and/or biodiversity loss: Coastal defences, Padanian Plain and Po delta system;
- Veneto and Friuli Venezia Giulia: Areas at risk from SLR and/or biodiversity loss: Venice and Grado-Marano lagoons, Miramare MPA.

Israel

Impacts presented and commented in detail, critical areas not geographically identified.

Lebanon

- The Accar bay;
- Coastal area of Tyr;
- Small islands.

Malta

- low-lying NE coast of Maltese islands, sand dunes and sandy beaches,
- coastal located areas with rare and endemic species;
- freshwater rock pools,
- coastal located Special Areas of Conservation and SPAs.

Montenegro

- Coastal lagoons, lowlands, Tivat Salinas, Buljarica marsh/bay, Velika plaza-Stoj-Knete-Ada Bojana, Bojana river estuary: SLR, change of precipitation pattern, saltwater intrusion, changes of ecosystem functioning;
- Bay of Kotor: SLR, change of mass movements, impacts on ecosystem functioning.
- MPAs: Platomuni, Katici island, Stari Ulcinj island – STR, change of mass movements, impacts on ecosystem functioning;
- Bay of Kotor, port of Bar, Ulcinj – Milena Port, Bojana river estuary: thermophilous species;
- Bojana river estuary, Knete and Port Milena, Buljarica marsh, Jaz river, Morinj bay: conversion in permanent marine, salted waters;
- Sub-Mediterranean Starocrnogorska karstic area, Kuci-Zijovo, mountains Rumija, Lovcen, Orjen: MTR, precipitation pattern change, hydrology, impacts on ecosystem functioning;
- Skadar lake (National Park and Ramsar site), Gornje Blato, Boljesestre: WTR, MTR, impacts on hydrology, on ecosystem functioning, birds ...

Morocco

- Estuary of Oued Moulouya;
- Marshes and swamps between Fnideq et Martil;
- Lagoons: Nador and Smir;
- Bays of Tanger and Al Hoceima;
- Cape Trois Fourches;
- Forest areas of Tanger, Tétouan, Chefchouan and Nador;
- Coastal stretches of bays of Tétouan-Smir, Al Hoceima, Bou Areg, and Saidia.

Slovenia

- Secovje salina NP, other salinas, coastal wetlands, Skocjan inlet – impacts: SLR, flooding, salt water intrusion, habitat degradation/loss, endangered: breeding colonies, nesting sites;
- Trieste bay – STR, change in mass movements, impact on relict / „boreal“ species;
- National c/m areas – STR: coral bleaching, NIS, N-wards shifting of thermophilous species;
- Coastal flysch cliffs, SLR: increased erosion.

Spain

- Ebro Delta, Llobregat Delta, with 50 cm SLR, and presently reduced sediment transport – 50% of areas to disappear; coastal lagoons 5 km long at Cabo de Gata,
- Coastal low land areas; about 20 km along the Manga del Mar Menor, Mazaron, Carboneras - Almeria, inlands retreat likely; Albufera de Valencia, Santa Pola - Alicante,
- Beach erosion and retreat along the entire Spanish Mediterranean coast (Mazarrón, Murcia; Carboneras, Almería; Puçol and Massalfasar, Castellón; Albufera de Valencia, Valencia; Santa Pola, Alicante);
- *Posidonia oceanica* meadows along the Spanish Mediterranean (losses already occurring due to anthropogenic impacts);
- All wetlands and marine ecosystems dominated by sessile organisms (red coral, gorgonians, sponges, ...).

Syria

The most critical areas, as listed:

- Ras Al-Bassit, Oum Al-Tiur, Wadi Kandil, Joun Jablah et Al-Hamidiah, Ibn Hani, Al-Azhari;
- Estuaries: Al-Kabir Al-Shimali, Al-Housen, Al-Kabir Al-Janobi;
- Beaches: Jablah, Baniyas, Tartous, Al-Nawras, Al-Bassit, Blue Coast, Al-Rimal Al-Zahabih;
- Coastal valley: Al-Ghamka;
- 15 sites in coastal area of archaeological importance, Ras Shamra, Amrit and Arwad;
- Islands: Arwad, Al-Hbas, Al-Namil and Abo Ali;
- Sea water intrusion into aquifers in coastal plains of Al-Hamidiah near Baniyas, at Al-Bassa and N of Lattakia (zone Dimsarko, and area located N of Wadi Kandil);
- 18 freshwater springs, primarily in the Baniyas area.

Tunisia

The most critical areas, as listed:

- Lagoons: Bizerte, Garaet Ichkeul, and Ghar el Melh;
- Salt ponds: Kalaat, Andalo;
- Humid areas: The Gulf of Gabes;
- Archipelagos and islands: Kuriat, Kneiss, Kerkennah and Jerba;
- Sandy beaches: all sandy beaches along the coastal strip.

Turkey

- SPAs: Belek, Kas-Kekova, Patara, Fethiye-Gocek, Koycegiz-Dalyan, Gokova Bay, Datca-Bozburun, Foca.
- Rivers: Gediz and Menderes.
- Wetlands: Gediz delta, Kucuk Menderes delta, Buyuk Menderes delta, Baffa lake, Koycegiz lake, Goksu delta, Tuzla lake, Yumurtalik lagoon, Akyatak lagoon
- Vermetid reefs: Datca, Gazipasa, Cevlik.

ADDENDUM II-

TABLE OF PRIORITY ACTIONS ON CLIMATE CHANGE AND MEDITERRANEAN MARINE AND COASTAL BIODIVERSITY CONSERVATION

Starting from the needs, the prerequisites and the recommendations reported in the present document some priority actions have been identified and are concisely described in the table below.

Four general categories have been determined, for each of these specific targets were identified. For each target relevant concrete objectives are indicated. For each objective specific actions and the following characteristics are defined.

Scale level: It refers to the spatial scale on which each target is applicable, distinguishing between:

- regional (R): concerning the whole Mediterranean region;
- national (N): concerning each participating country;

One objective can be achieved at several scale levels.

Actors : This refers to the kind of institution and organism capable of undertaking the proposed actions to reach defined targets.

TF (Time frame): Temporal deadline, distinguishing:

- ST (short term): within 4 years since the approbation
- MT (medium term): within 10 years since the approbation
- LT (long term): after 10 years since the approbation

Imp. (Implementability): Ease (in practical terms) of implementing each specific action:

- A (high-level, immediate applicability)
- B (medium-level)
- C (low-level, logistic/economic/institutional conditions are not met).

All the actions below summarised must be considered as in integration/updating to the chapter III of the SAP BIO document². In several case links and synergies between the new actions specially dealing with CC and the SAP BIO actions are possible and necessary.

² Chapter 3. Identification and categorization of targets, objectives and specific actions.

CATEGORY		TARGET				
PUBLIC AND INSTITUTIONAL AWARENESS		<p>General objective Put CC and Bd issues at higher level of national and international priorities.</p> <p>Specific targets</p> <ul style="list-style-type: none"> - Increase public awareness on the relevance of CC and Bd issues. - Incorporate CC and marine/coastal Bd in national planning practices. 				
Activity (Priority actions)	Objective	Scale level	Specific action/s	Actor/s	TF	Imp
Implement a regional raising programme on CC and Bd.	a) Increase public/institutional awareness on the effect of CC on marine and coastal Bd.	R	- Spread and distribute the document of synthesis of national overviews on vulnerability and impacts of CC on marine and coastal Bd in the Mediterranean region.	Regional organizations	ST	A
			- Prepare a general awareness document.	Regional organizations	ST	A
			- Prepare promotional leaflets.	Regional organizations	ST	A
			-Development of national specific actions and initiatives (conferences, expositions, manifestations, ...).	National authorities	ST	B
	b) Put CC/Bd issues as high priority in national agendas	N/R	- Spread and distribute the national overviews on vulnerability and impacts of CC on marine and coastal Bd.	Regional organizations (as coordinator/s) national authorities and bodies	ST	A
			- Organize a regional meeting on the incorporation of CC/Bd issues into national planning practices.		ST	A
			- Organize regional, sub-regional and national training.		ST	A

CATEGORY		TARGET				
RESEARCH AND MONITORING		<p>General objective Fill, as much as possible, gaps in knowledge on the effect of CC on marine and coastal Bd.</p> <p>Specific targets</p> <ul style="list-style-type: none"> - Improve the exchange of information and harmonization among Mediterranean countries within the framework of CC/Bd issues. - Improve knowledge on hot spots (sites and areas more vulnerable). - Improve monitoring. - Develop research lines addressing the gaps in knowledge. 				
Activity (Priority actions)	Objective	Scale level	Specific action/s	Actor/s	TF	Imp
Develop an international systematized and user friendly information exchange system (CHM) on CC and Bd	Improve the accessibility to scientific and grey literature	R	Create and manage an open-access, regional database (including scientific literature, GIS-based thematic maps, etc.), usable at several levels, to feed relevant existing Clearing House Mechanisms on CC.	Regional organizations	ST	B
	Improve the scientific survey, research and monitoring design/implementation and reduce redundancy and overlapping					
Inventory the hot-spots (more endangered sites and areas by CC) in coastal and marine zones	Improve evidence, systematize and prioritize range critical areas and sites more endangered by CC	N/R	- Prepare a list of species and habitats endangered by CC	Regional organizations	ST	A
			- Prepare guidelines at regional level to standardise the process.	Regional organizations	ST	A
			- Implement training at regional level.	Regional organizations	ST	A
			- Implement pilot actions in 2 countries	Regional /National authorities	ST/MT	B
			- Prepare national inventories.	Reg./ National authorities	ST	B
Implement a multilateral programme of monitoring on CC and Bd	Assess nature and impacts of CC on marine and coastal Bd	R/N	- Prepare a comprehensive inception document focused on: interrelation with on-going monitoring activities, system design, parameters, indicators, methodologies.	Regional organizations	ST	A
			- Organize an initial meeting of experts at Mediterranean	Regional organizations and	ST	A

			<p>level to set up the basis for further actions.</p> <p>- Encourage the enlargement and adaptation of existing monitoring initiatives to the CC component, and search for synergies with EU ongoing related programmes.</p>	<p>National authorities</p> <p>Regional organizations and National authorities</p>	ST	A
Develop adequate research lines addressing gaps on knowledge about the effect of CC on marine and coastal Mediterranean Bd	Fill in gaps on the responses of the marine and coastal environment to CC with particular attention to: the refinement of modelling tools; the response of species vulnerable to CC; non-linear response of ecosystems and populations-to-ecosystem links	R/N	- Establish a Mediterranean group of experts on CC/Bd research.	Regional organizations	ST	A
			- Prepare and organize a regional meeting to set up the bases for a targeted programme.	Regional organizations and National authorities	ST	A
			- Carry out pilot research in 2 countries.	Regional organizations and National authorities	ST/MT	C
			- using the first monitoring results review the research lines and update pilot actions	Regional organizations and National authorities	MT/LT	C

CATEGORY		TARGET				
CAPACITY BUILDING, COORDINATION AND FUNDING		<p>General objective Have technical capacity and funding to understand, assess and limit the negative consequences of CC on marine and coastal Bd.</p> <p>Specific targets</p> <ul style="list-style-type: none"> - Improve capacity building of Mediterranean countries. - Increase funding devoted to CC and Bd. 				
Activity (Priority actions)	Objective	Scale level	Specific action/s	Actor/s	TF	Imp
Set of national bodies/committees in charge of CC issues	Reinforce institutional framework and coordinate Bd issues with other sectors under pressure by CC effects	N/R	Development at national level of specific Bodies or Committees in charge of managing CC effects	National authorities	MT	B
Develop a regional programme of training/capacity building on issues dealing with CC and Bd	Improve capacity building of several Mediterranean countries on monitoring, planning, co-operation, project formulation and training of specialists	R/N	- Prepare a regional reference document on good practices and problems.	Regional organizations and national authorities	ST	A
			- Prepare a training document in formulation of international projects.		ST	A
			- Using training implementing capacities of several developed countries and of regional bodies, provide assistance requested by others beneficiaries countries		ST	B
Develop funding strategies	Have the funding to implement the activities/actions on CC and Bd	R	- Prepare a supporting document on socio-economic risks assessment and observed consequences of CC, as well as economic valuation of non-adaptation to CC impacts on marine and coastal Bd in terms of ecosystem services and goods.	Regional organizations	ST	A
			- Prepare an informative document on the needs for stable and permanent funding as well as on respective practices and opportunities.		ST	A

			- Implement a funding strategies also on the basis of the first results obtained within the framework of other actions (monitoring, capacity building, research, social-economical analysis, ...)		MT/LT	C
Establish a permanent coordinating system of national and international activities, initiatives and actions	Coordinate the national and international progress of strategies and plans on CC and Bd	R	- Analyze the present capacity of RAC/SPA. - Provide for an appropriate strengthening of RAC/SPA human capacity and funding.	Regional organizations	ST ST	A A

CATEGORY		TARGET				
GENERAL CONCRETE ACTIONS BASED ON ACTUAL KNOWLEDGE		<p>General objective Have National Strategies Improve the scientific understanding about the effect of CC on marine/coastal Bd and try to mitigate the negative impact of the CC on Mediterranean Bd.</p> <p>Specific targets - Strengthen ecosystems resilience. - Improve knowledge on sensitive species/habitat to CC.</p>				
Activity (Priority actions)	Objective	Scale level	Specific action/s	Actor/s	TF	Imp
Prepare National CC and CC/Bd Strategies and Action Plans	Have National Strategies and Action Plans related to CC and Bd	R/N	- Elaborate guidelines and reference documents	Regional organizations	ST	A
			- Promote and implement national processes for the wording of national documents	Regional organizations and National authorities	ST	A
Increase MPAs connectivity	Mitigate the impact of CC on Bd	N/R	Promote a network of Mediterranean MPAs at regional level as a tool to halt and/or minimize the harmful effects of CC, prioritizing the protection of underrepresented habitats and largely unprotected subregions at regional level, as well as applying the results issued from scientific research on connectivity and ecosystem functioning (as translated into recommendations) to establish criteria for site-selection, zoning, planning and management of MPAs	Regional organizations and National authorities	MT	B
Reinforce legislation on coastal land use by adapting it to CC predictions	Mitigate the impact of CC on Bd	N	Pilot case - Assist one or two countries in the first revision of legislation on coastal land use	Regional organizations and National competent authorities	MT	B
Interlink ICZM and CC impacts on Bd	Mitigate the impact of CC on Bd	R/N	- Elaboration of reference documents and training	Regional organization	ST	A
			- Interlink and adapt planning and ICZM project (future or on-	Regional organizations and	ST	A

			going) to CC predictions, with particular attention to Bd - Update the ICZM projects on the basis of new results on CC and Bd	National authorities	MT	C
Monitor plant and animal communities potentially responding to CC	Improve knowledge	R/N	- Define a draft provisional list of species and habitat potentially sensitive to CC - Monitor and update the distribution and abundance maps of species sensitive to variations in temperature	Regional organizations and national research institutions National research institutions	ST ST	A B
Establish a network of sampling sites, preferably within the system of Mediterranean MPAs, to measure Bd variables to relate to CC	Improve knowledge	R/N	- Define set of indicators to be used and elaborate standardised protocol to collect data. - Made one / several pilot studies to refine and validate the standardised protocol - Implement the standardised protocol in selected protected area.	Regional organizations and national research institutions Regional organizations and national research institutions National Research Institutions	ST ST MT/LT	A A B