

Mediterranean Coastal/Marine Biosphere Reserves: Governance and Management Challenges

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Abstract

Coastal Mediterranean Biosphere Reserves present different types of governance and management systems and are excellent laboratories for experimenting new strategies facing environmental, socio-economic and political challenges. The study carried out on 20 selected Biosphere Reserves evaluated the existing governance and management system as well as opportunities and ways to transform and adapt them to the changing evidences in the Mediterranean Basin. Protected areas, in particular Biosphere Reserves contribute to reduce environmental and anthropogenic negative impacts. They offer excellent opportunities to experience new approaches and to learn from models how to change and accelerate transformation processes driven by local realities and challenges sustained by local population and stakeholders. A strong commitment by national authorities to establish an inclusive good governance, with strong local actor's participation and collaboration, as well as adequate funding and human resource allocation is essential for success. The delegation of authority and accountability to the single Biosphere Reserve could enable them to prepare and to promptly react to emergencies concerning current and future challenges.

Keywords: governance; management; biosphere reserves; protected areas, coastal areas, participation, future challenges

1 Introduction

The Mediterranean Sea region is one of the most populated coastal regions with 21 countries overlooking its banks. Every year millions of tourists visit its beaches and Protected Areas (PAs), among them Biosphere Reserves (BRs), where sustainable tourism approaches are increasingly relevant. In particular, impacts of climate change are exposing the ecosystems to high risks due to the absence of adaptation and mitigation measures. Tools such as the Maritime Spatial Planning and Management Plans are deliberated and applied gradually, and the governance systems are still far from being effective. In addition, the implementation of international obligations at the national level are occurring at different phases in the single states.

In the last decade the protected spaces and particularly BRs, have progressively changed their scope from their primary objectives: conservation, education and scientific research. Today BRs are considered as driving forces for the local socio-economic development, safeguarding the inherent natural and cultural heritage and functioning as a laboratory for experimenting new management approaches and environmental measures [1].

The adoption of inclusive perspectives has allowed the introduction of new approaches for the participation of local bodies, private sector, organizations and civil society. Although mostly not involved directly in the decision taking processes, they are indirectly represented at the different governance levels, mostly by members of local and regional authorities [2].

Recent studies have been aimed at understanding the Governance and Management Systems (GMS), the actions undertaken regarding present and future challenges as well as the various degrees of stakeholders' involvement in the governance processes [3]. The main target of the CNR-ISMAR research realized by the authors, was the evaluation of existing GMS as well as opportunities and ways to transform and adapt them to the changing evidences in the Mediterranean Area.

The Mediterranean Sea is considered one of the world's biodiversity hotspots, where the impact of climate change together with other anthropogenic pressures could be most devastating [4]. Studies analyzed marine and coastal BRs and the severe problems connected to climate change, sea level rise, coastal erosion, biodiversity decline, marine litter, invasive alien species, pressure from tourism, and scarce stakeholder involvement they encounter [5]. Furthermore, the Northern African BRs furthermore are threatened by political instability, social transformations, financial constraints, and sluggish economic development. However environmental risks and over exploitation of marine resources will increasingly threaten the marine and coastal biodiversity and habitats.

2 Survey and Data Collection

The study focused on the current UNESCO Biosphere Reserves located in the Mediterranean coastal area (Figure 1).

The selected sites include the following coastal or marine Biosphere Reserves:

- **Algeria:** Gouraya, El Kala and Taza
- **Egypt:** El Omayed
- **Tunisia:** Zembra and Zembretta
- **Morocco-Spain:** Intercontinental Biosphere Reserve of the Mediterranean
- **Spain:** Terres de l'Ebre, Menorca and Cabo de Gata-Nijar
- **France:** Camargue Delta du Rhone and Fangu Valley
- **Greece:** Gorge of Samaria
- **Italy:** Miramare; Circeo, Po Delta; Cilento and Vallo di Diano; Tuscan Islands; Tepilora, Rio Posada and Montalbo; Somma Vesuvio and Miglio d'Oro; Selve Costiere di Toscana.

The investigation was based on information and available materials (books, documents, articles, reports, internet sources and other grey literature). For each BR selected, the general description of the area (location, size, year of establishment, legal foundations, funding, zoning, governance and management systems, involved bodies etc.) were retained. Despite all the bibliographic data collected, often specific BR information was missing (i.e. present staff number, current budget). Data not publically available so far, were collected through interviews with the directors and/or managers of the BRs. The main questions concentrated on the actual management systems and challenges.



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| 1. Intercontinental Biosphere Reserve of the Mediterranean | 8. Delta del Po | 15. Tepilora, Rio Posada and Montalbo |
| 2. Gouraya | 9. Miramare | 16. Camargue Delta du Rhone |
| 3. Taza | 10. Cilento and Vallo di Diano | 17. Fangu Valley |
| 4. El Kala | 11. Somma Vesuvio and Miglio d'Oro | 18. Terres de l'Ebre |
| 5. Zembra and Zembretta | 12. Circeo | 19. Menorca |
| 6. El Omayed | 13. Tuscan Islands | 20. Cabo de Gata-Nijar |
| 7. Gorge of Samaria | 14. Selve Costiere di Toscana | |

Fig. 1. Coastal/Marine Biosphere Reserves in the coastal Mediterranean area.

3 The “Man and the Biosphere” Programme (MaB)

The "Man and Biosphere" Programme (MaB) - was created in 1971 and endorsed by the 16th UNESCO General Conference as an intergovernmental program aimed at providing scientific foundations for the actions related to a sustainable use of natural resources promoting a balanced relationship between people and their environment. Its aims include the promotion of scientific cooperation, interdisciplinary research for the protection of natural resources, the management of natural and urban ecosystems, and the establishment of a World Network of BRs [6].

After the Rio de Janeiro UN Conference on Sustainable Development in 1992, the objectives of the program have been continuously redefined:

- Identification and assessment of changes in the biosphere determined by anthropic activities and natural events especially in the context of climate change;
- Study and comparison of the dynamic interrelations between natural ecosystems and socio-economic processes;
- Improvement of the exchange and dissemination of knowledge on environmental problems and possible solutions;

- Promotion of environmental education in the field of management and sustainable development.

The MaB Programme includes the Biosphere Reserves, which encompass terrestrial, marine/coastal ecosystems or a combination of them. The BRs prioritize the balance of biodiversity and socio-economic development, promoting the possibility of carrying out multiple territorial functions. These protected areas are suitable for sustainable experimentations and guidance for a sustainable development aimed at improving the benefit of local communities. They promote the involvement of local communities, and are therefore considered best practices for the interaction between social and ecological systems.

The MaB International Co-ordinating Council (MaB-ICC) is the main governing body of the MaB Program, composed by 34 Member States elected by UNESCO's biennial General Conference. The International Advisory Committee for Biosphere Reserves advises the MaB-ICC and the Director-General about the World Network of Biosphere Reserves (WNBR) while the International Support Group (ISG) provides advices to the MaB Secretariat for the implementation of the Madrid Action Plan and other aspects of the MAB program.

The MaB National Committees ensure national participation in the program and support the governing bodies. At present there are 158 National Committees established among the 195 Members States and 9 Associate Members States of UNESCO.

3.1 Evolution of the Biosphere Reserve Strategy

The BR concept was created in 1974 and then significantly revised in 1995 with the adoption of the Statutory Framework and the Seville Strategy, further specifying the modern BRs visions and missions [7]. Before the Seville Strategy, the BRs concept based on the management model and functions of the PAs focused on conservation of natural resources. The management approach was top-down with little involvement of stakeholders or civil society. This kind of BR is called the "1st generation Biosphere Reserve".

Seville Strategy and the Statutory Framework introduced the "2nd generation Biosphere Reserve" combining the three interconnected functions conservation, development and logistical support and appropriate zoning, comprising core areas, adjacent buffer zones; and a transition area where sustainable development is promoted and developed by local actors. The strategy recognized the link between biodiversity conservation and development needs of the local communities [8].

With the Madrid Declaration and the Madrid Action Plan (MAP) adopted in 2008, the BR concept was further developed [9]. The BRs concept introduced participatory processes with a strong cooperation among the different bodies interested in its management. Biosphere Reserves are seen as learning sites for global, national and local sustainability where challenges such as climate change, stresses on ecosystems and landscapes, and urbanization as principle drivers are addressed. Sustainable development takes into consideration the biodiversity conservation and socio-economic growth.

A new vision was established with the “New Roadmap for the MAB Program and its World Network of Biosphere Reserves” [1]: MAB Strategy (2015-2025), Lima Action Plan (2016-2025), Lima Declaration. The 4th World Congress of Biosphere Reserves 2016 in Lima, Peru focused on the implementation of the MAB Strategy according to the 2030 Agenda for Sustainable Development, the Sustainable Development Goals (SDGs) and the Paris Climate Agreement. The related Lima Action Plan includes not only targeted outcomes and actions for implementing the strategic objectives of the MaB Strategy but also specifies the entities responsible for the implementation, the timeline and performance indicators.

3.2 The Biosphere Reserves

The MaB Programme encompasses 701 Biosphere Reserves, including 21 transboundary sites (by end 2019) representing all major ecosystem types and diverse development contexts. MaB and its network support the implementation of the 2030 UN Agenda for Sustainable Development, in particular Sustainable Development Goals number 15 related to life on land, number 13 on climate, number 6 on water, number 14 on sea and oceans, number 11 on cities, number 2 on food, and number 1 on poverty alleviation.

The Biosphere Reserves are characterized by three functions of equal importance and interdependency (Figure 2):



Fig. 2. The three functions of Biosphere Reserves (Photo: Lucrezia Cilenti).

Conservation: the BRs must ensure the conservation of selected ecosystems, variety of landscapes, biological diversity and genetic resources;

Development: to foster sustainable economic and human development, which are socio-culturally and ecologically sustainable and which could be realized locally taking the traditions into consideration;

Education and logistic support: to support demonstration projects, environmental education, training, research and monitoring related to local, national and global issues of conservation and sustainable development.

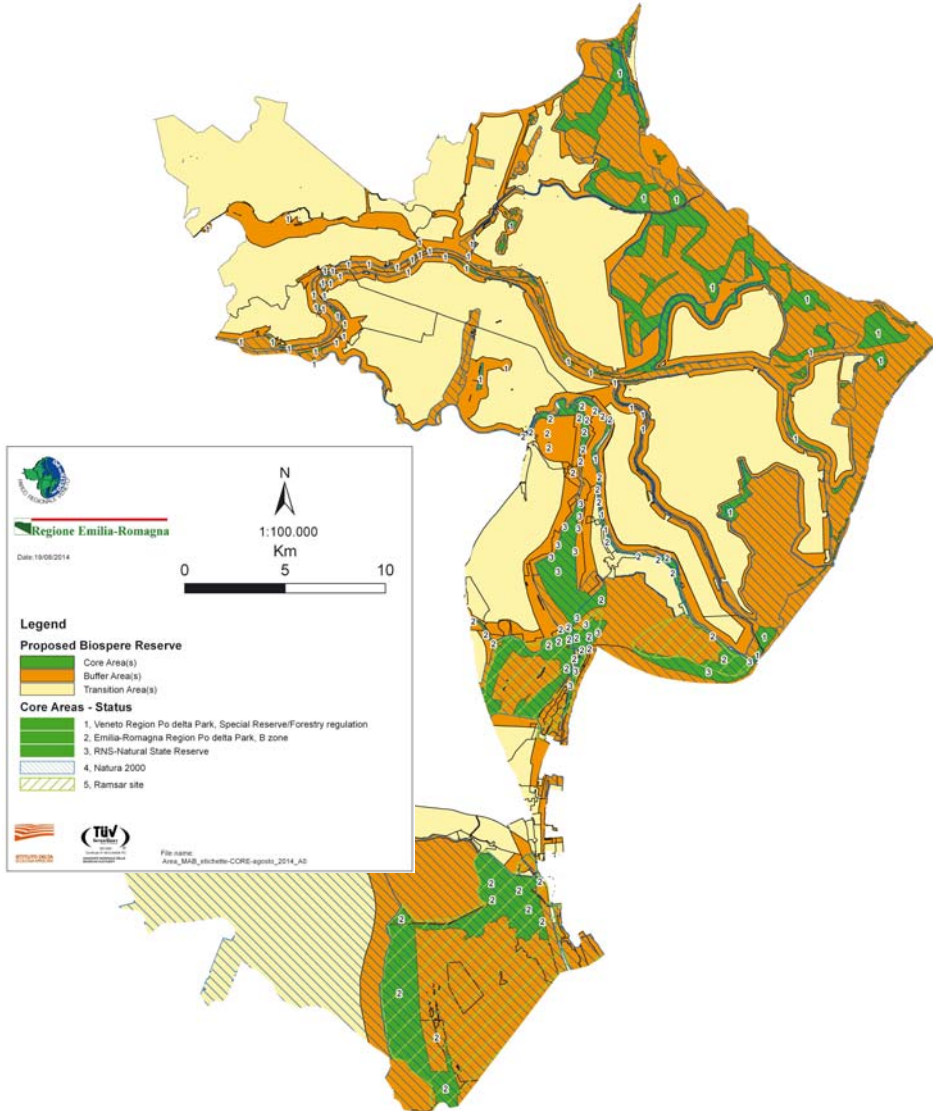


Fig. 3. Zonation system of the Delta Po Biosphere Reserve
(source: Ente parco del Po, www.biosferadeltapo.it)

These functions are in line with the three zones designated within each Biosphere Reserve and are interrelated (Figure 3).

- Core areas are protected sites for conserving nature.
- Buffer zones surround the core areas, can be used only for conservation, and restricted sustainable activities such as environmental education, ecotourism and recreation.
- Transition zones are used for sustainable agriculture, business and tourism. They may contain towns, farms and fisheries, as it is here where most of the inhabitants of the biosphere reserve live.

3.3 The World Network of Biosphere Reserves

The World Network of Biosphere Reserves (WNBR) was created with the objectives to increase the effectiveness of single Biosphere Reserves enhancing common understanding and co-operation at regional and international levels. The WNBR promotes North-South and South-South collaboration and represents a unique tool for international cooperation through the exchange of experiences and know-how, capacity-building and the promotion of best practices [6].

The 701 BRs located in 124 countries are distributed as follows [10]:

- 79 in 29 countries in Africa
- 33 in 12 countries in the Arab States
- 157 in 24 countries in Asia and the Pacific
- 302 in 38 countries in Europe and North America
- 130 in 21 countries in Latin America and the Caribbean

Different regional, sub-regional or thematic networks support the cooperation within the WNBR.

3.4 Benefits created by Biosphere Reserves

The Biosphere Reserves are places where new approaches to manage social and ecological systems, to avoid or reduce conflicts, to protect biodiversity and share solutions with the local population, are tested. They are learning laboratories where conservation and development are balanced and where it is possible to apply sustainability tools, take actions combating climate change, revitalize the local economy and become learning sites to explore and demonstrate strategies combining conservation and sustainable development, exportable to other contexts. Through educational programs organized on the site, the BRs can raise awareness of the local people and authorities on how to improve their quality of life reducing the negative environmental impacts, increase the exchange of information between researchers and citizens, and enhancing the cooperation among stakeholders [1].

The UNESCO's label increases the visibility of the site and if accompanied with an appropriate marketing strategy can become a new source of income. Tourism favored by the label can help to raise environmental awareness and appreciation of an "intact" site and in this way. Hence it is in the interest of BR's managers to ensure the site's protection for increasing the number of tourists and consequently its income. But it is well known that tourism has two faces and the negative impacts (consumption of water, waste, noise, pollution etc.) in some of the studied sites are higher than the positive

ones (e.g. economic growth, revitalization of the site). The results depend on the management of the area that must be based on a long-term strategy, involve in a concrete way the local population into the decision-making process, and the availability of natural resources and funding.

4 GMS in the Investigated Biosphere Reserves

The analysis related to the 20 coastal/marine BRs shows that the major part of them overlap with other PA categories and have adopted the existing GMS of the respective National or Regional Parks. In the last decade, Biosphere Reserves have elaborated biodiversity and sustainable development strategies, but they are rarely implemented at PA level and most sites still lack action plans, adapted management plans and funding to fulfill their supplementary tasks [2].

Table 1: Governance and Management Systems in the 20 selected Mediterranean BRs.

Legal Foundations	15 National Law, 6 National and Regional Laws*
Governance systems	11 Central governing bodies, 10 Regional governing bodies**
Management bodies	9 National Parks, 4 Regional Parks, 1 NGO, 1 Consortium, 1 Transboundary Management body, 1 National body, 1 Agency, 2 PNR + Syndicat Mixte,
Planning tools	10 Park Management Plans, 2 BR Management Plans (1 not yet approved), 5 Action Plans, 1 other plans, 1 any plan, 1 n.a.
Funding:	11 mainly National funds, 6 mainly Region, 1 mainly own funds, 1 Municipalities, 2 mixt

* The Intercontinental Biosphere of the Mediterranean (IBRM), having 2 different legal foundations and governance systems have been counted as 2 separate BRs.

** The IBRM has national legal Frameworks (Morocco, Spain), but Morocco has national and Spain regional governing bodies: Andalusia in the case of IBRM.

Most of the BRs are managed by national or regional park authorities, based on PA management plans. Spain is the only Mediterranean country that through the Law 33/2015 (ex 42/2007) on natural heritage and biodiversity, integrates norms regarding protected areas established in international contexts such as UNESCO BRs [11]. The North-African, Italian, French and Greek BRs have no specific legal status. There, the development functions have only been partially introduced, and the GSM follows the legislation of National or Regional Parks.

The studied Coastal/Marine Mediterranean BRs show a considerable variability in their legal foundations, governance and management systems, planning and management tools and funding sources (Table 1). The participation process is generally ensured by

representatives of the institutions but there is little legal provisions for direct citizen involvement, especially in decision-making processes.

4.1 Management Systems in the Southern Mediterranean BRs

The structures in charge of the BR management in the Northern African countries correspond to the structures in charge of the protected areas. Several public institutions share the management of BRs, most of them are trusteeship bodies rather than management bodies.

The management of protected areas in the Mediterranean is essentially state-owned, centralized and are marked by the preponderance of technical departments. The involvement of multiple administrations in the management system, the limited involvement of the civil society in the decision process, the lack of budgetary autonomy and skilled personnel, the use of police measures instead of incentives, make the management of protected areas particularly difficult. Nonetheless, the recent efforts aimed at improving the involvement of the citizens in project activities introduced by international projects, is showing positive effects. Some countries have recently enacted new legislations on protected areas that strengthen the involvement of relevant stakeholders in their management.

In **Morocco** the main responsible for the management of Protected Areas is the Haut-Commissariat aux Eaux et Forêts et à la Lutte Contre la Désertification (Office of the High Commissioner for Waters, Forests and Fight against Desertification) (HCEFLCD). The Law 1-10-123 from 2010 introduced the concept of management delegation to non-state actors for protected areas, explicitly providing the modalities for the establishment of public-private partnerships. Morocco has a unique BR overlooking the Mediterranean Sea, the Intercontinental Biosphere of the Mediterranean (IBRM) shared with Spain. Thanks to the cooperation with the Regional Government of Andalusia, Morocco is making significant efforts for an efficient management.

The Intercontinental Biosphere Reserve of the Mediterranean (IBRM) - The management structures of this BR consist in a *Transboundary Management Board* responsible for planning and cooperation program of the Reserve with the participation of Government Regional Offices and MaB Committees. The *Transboundary Coordination Committee* is headed by the Director of the IBRM (function occupied by rotation every 2 years of a representative of Spain and Morocco), the 2 coordinators of IBRM country and executive leaders of Regional Governments. The *Cooperation Advisory Board* formed by scientists, NGOs, local associations etc. establish working groups on specific issues. Finally there is the *Administrative and Management Committee* from each country, composed by the Director, National Coordinators of the IBRM, and Directors of the protected areas concerned, local associations of territories not protected by the Reserve.

Algeria adopted a new legislation on protected areas in February 2011 (Law 11-02). The new Act has established a national Commission on Protected Areas, which brings together representatives of all the sectors concerned, experts and representatives of NGOs which provide advice and opinions on new designations [12]. In Algeria the three main authorities in charge of the management of PAs are:

- Ministère de l'Agriculture, Développement Rural et de la Pêche (Ministry of Agriculture, Rural Development and Fisheries) through the Direction General des Forêts (Forest General Directorate) (DGF)
- Commissariat National du Littoral (National Coastal Council) (CNL) in charge of controlling the coastal areas
- Ministère de la Culture (Ministry of Culture), responsible for cultural parks.

The BRs of *El Kala*, *Gouraya* and *Taza* are included in the national parks of the same name, consequently they have the same administrative organization. These areas are entrusted to a public administrative body including a *Scientific Council* and a *Guidance Council*. The latter is composed of representatives of different ministries, local elected representatives, scientists and an environmental protection association. It is responsible for deliberating on the development and implementation of the park management plan, and the activities carried out in matters related to the missions, organizations and operations of the National Parks [2].

Tunisia, after the political events of 2011, calls for institutional reforms aimed at establishing a clearer distribution of responsibilities between conservation organisms [13]. It also seeks a better coordination to find regular and adequate financial sources to support the National Parks (also through private investments). At present the management of the PAs is carried out by two bodies:

- Ministère de l'Agriculture, des Ressources Hydrauliques et de la Pêche (Ministry of Agriculture, Hydraulic Resources and Fisheries) through the Direction General des Forêts (Forest General Directorate) (DGF) and the Commissariat Régionaux de Développement Agricole (Regional Commission for Agricultural Development) (CRDA)
- L'Agence de Protection et d'Aménagement du Littoral (Coastal Protection and Development Agency) (APAL) subordinated to the Tunisian Ministry of Environment and Sustainable Development, responsible for coastal and marine protected areas.

Zembra and *Zembretta* BR is included in the namesake National Park. The park is managed by the Coastal Protection and Development Agency (APAL). A management plan of the marine part of the BR has been elaborated within the "MedMPA network" project of MedPAN but not yet applied [14]. The Islands are inhabited and the park has no personnel for the daily management.

In **Egypt** the Ministry of Environment through its executive arm, the Egyptian Environmental Affairs Agency (EEAA) is responsible for the management of the PAs. Each protected area has a board which is responsible for managing the site. The members of the board are made up of representatives from the EEAA, Governorate and other officials. The physical management of a protected area is undertaken by the Nature Conservation Authority, by the Area Manager and his staff with broad supervision from the Director General. The management is supported by a grant in aid from the government or a donor, augmented by revenues of the area, generated from entry fees, concessions, licenses fees or the like. The target is to use free market forces to first make the area financially self-supporting and later profitable.

El Omayed - The Omayed BR is situated within the jurisdiction of El Hammam which is affiliated to the Governorate of Matrouh in the El Omayed Protected Area (OPA). There are totally 10 institutions involved in the management of the OPA/BR with different roles and levels of responsibility.

4.2 Management Systems in the Northern Mediterranean BRs

The BR strategies introduced with the new MaB Roadmap [1] regarding conservation and sustainable development as well as GMS for core, transition, and development zones, including the vast marine area, are often not yet approved or implemented. However, the establishment of new GMS of BRs in European countries is well advancing. Managing bodies are composed by representatives of all administrative levels and the authority and accountability is delegated frequently to the Regions. In some countries Regions are governing authorities (Spain, France, Italy), and in almost all countries, the Regions, Provinces and Municipalities are part of the managing bodies. In France the BR bodies are joint committees, called Syndicate Mixte, in Spain regional authorities or consortium, in Italy park authorities or independent institutions as separate legal entities.

The governance and management bodies usually establish instruments regarding involvement of the local people and stakeholders. The participation process is required by national laws and ensured by the local authorities or institutions. Hence, there are rarely legal provisions for direct citizen involvement and the members of managing bodies are representatives of the local authorities or NGOs and not delegates of the local communities. A study of the Italian legal framework shows, that it is very specific and rigid regarding who can legally participate [15]. Generally the local communities are rarely involved in decision-making and taking processes, but have an important role in project activities.

In **Spain** each Autonomous Region is in charge of the establishment and management of protected areas on its own territory. National Parks are established by the central government upon proposal of the relevant Autonomous Region, which will be in charge for the management. At state level, the Ministry of Agriculture, Food and Environment is the main regulatory body. The local Autonomous Regions (Comunidad Autónomas) can develop and enforce their own environmental legislation. In September 2017, the Spanish MaB Committee approved the Ordesa-Viñamala Action Plan 2017-2025 and adopted the Ordesa-Viñamala Declaration to implement the Action Plan in the country's 48 Biosphere Reserves. This document is a guide that serves as a basis for initiatives, actions and projects that will be carried out by the Spanish network in accordance with the Sustainable Development Goals (SDGs) [16]. The three BRs analyzed represent different GMS types:

Terre de l'Ebre – The Regional Government (Generalitat de Catalunya) is the responsible body that has delegated to COPATE (Consorzi de Politiques Ambientals a las Terres de l'Ebre) for the management tasks. The Consortium is composed by different actors of the Government of Catalonia, supra-municipal administrations and other organizations.

Menorca – The Conseil Insular de Menorca (island government) is the responsible governing body of the BR, while the Agencia Menorca Reserva de Biosfera, is the

management body which works under the Conseil Insular and is associated with the Department of Economy, Environment and Game.

Cabo de Gata-Nijar – The BR is included in the Cabo de Gata-Nijjar Natural Park managed by the Consejería de Medio Ambiente y Ordenación del Territorio de la Junta de Andalucía. The BR surface area coincides with that of the Natural Park, the status which was granted earlier.

In **France** the Ministry of Ecological and Inclusive Transition (MTES) is the main driver of the establishment of protected areas. The State has set up specific organizations of management of the various types of protected areas under its jurisdiction. The Regional Parks (NRP) are proposed by the regional authorities themselves. There is a 10 year trial period until they become permanent. Their funding is shared among municipal, prefectural, regional, state and other sources. They have ensured budgets on a 3-5 year basis grounding on management plans agreed upon and adopted by the stakeholders. Each one has a charter of principles for their management, based on hierarchically ordered values to be preserved. There is a central coordination and support mechanism, and a backing up by the state services to each NRP administration scheme [17]. The BRs are partially or completely overlapping with protected areas recognized by national law. The responsibility for BRs is entrusted to a public institution or an association. The majority of BRs are managed by public institutions (national parks, regional parks, mixed associations). The two BRs analyzed have the following GMS:

Camargue - Its governance is ensured by the Camargue Regional Natural Park (PNRC) and the Syndicate Mixte (Joint Committee) for the management and protection of the Camargue in the Gard Department (SMCG). The Syndicate Mixte is an association of municipalities and other local authorities that pool financial resources and work together in common projects. Operational decisions are made by the Management Committee, the Technical Committee (made up of partners and stakeholders of the site) and the Scientific Council (involving local researchers).

Fango Valley - The BR is managed by the Parc Naturel Régional de Corse and the Comité d'Aide a la gestion (composed by three municipalities, Office National des Forêts (ONF) and the Association APEEM).

In **Italy** the framework law on protected areas (Law 394/1991) outlines the fundamental principles for the institution and management of protected areas regarding their mission, classification and governance. It also sets out the legislation for national and regional protected natural areas. National Parks and marine areas are under the auspices of the Ministry for Environment, Land and Sea Protection (MATTM). Regional Parks are run by various regional administrations. However, once a park has been created, it is managed by an independent institution as a separate legal entity. The Regions and the autonomous provinces adopt their own legal frameworks for protected areas. These regulations are adopted within the national framework on protected areas. BRs have no specific legal status, some of them are partially or completely overlapping protected areas recognized by national or regional law.

Miramare BR - The Marine Reserve of Miramare was established with a decree of the Ministry of the Environment that has entrusted its management to the Italian

Association WWF ONLUS. In 2006, as part of a reorganization of the management of the protected areas of the WWF Italia, some services of the MPA Miramare were transferred to the company WWF Oasi srl with the authorization of the Ministry for Environment, Land and Sea Protection. The Miramare BR is managed by different actors, which have enforced different management tools: the WWF Italy for both the core area and the marine buffer zone, the Superintendence for the historical and artistic heritage of the Friuli Venezia Giulia Region, in collaboration with the WWF Italy, for the terrestrial buffer zone; the Ministry of Agriculture and Forestry, for the marine transition area; the Friuli Venezia Giulia Region, for the terrestrial transition area.

Po Delta – From the administrative point of view, the BR area is shared between two Italian regions (Veneto and Emilia Romagna) and their respective Regional Natural Parks. The Po Delta Regional Park of Veneto Region (Ente Parco Regionale Veneto del Delta del Po) is acting as coordinator and secretariat of the Reserve and supports the Institutional Coordination Board, the main decision taking body for all the issues regarding its management. This body is composed by institutional authorities which have a fundamental role in BR issues.

Tepilora, Rio Posada and Montalbo – This BR is included into the Regional Park of Tepilora established with Regional Law n. 21 in 2014. The management body is composed by a Permanent Consultative Assembly, the Coordinator (Regional Park and CEAS), the Management Committee, the Scientific Committee and the Participatory Tables for thematic issues.

Selve Costiere di Toscana – The BR is included in the Regional Park of Migliarino, San Rossore, Massacciucoli located in Tuscany Region and is administered by the park authority according to the Regional Law n. 61/11979.

The BRs *Cilento and Vallo di Diano, Tuscan Islands, Somma Vesuvio Miglio d’Oro and Circeo* are part of respective parks, National Park of Cilento, Archipelago Toscano National Park, Vallo di Diano and Alburni, National Vesuvius Park, Circeo National Park and for this reason they have the same GMS. The National Park Authority is the management body supervised by the MATTM. The managing bodies are those established by the framework Law 394/91 (President, Board of Directors, Executive Committee, Board of Auditors and the Community of the Park).

In **Greece** - After a long process of consultation and debate between the competent authorities, the environmental NGOs, the Ministry of Environment and Energy (the main governing body for protected areas in Greece) and citizens, the Greek Parliament voted on 8 February 2018 the Law 4519 “Management Bodies of protected areas and other provisions”. This law regulates all issues concerning the organization and operation of the Protected Areas Management Bodies. Following the provisions of Law 4519/2018, the Management Bodies now receive finance from the regular budget of the Ministry of Environment and Energy. This is a new source of income, until 2017 Management Bodies received financing only from co-financed European programs and the Green Fund of Ministry of Environment & Energy [18].

Samaria Gorge - The Forest Directorate of Chania – Department of Forest Protection and Management, and Public Prosecutor and the Management Body of Samaria National Park-Western Crete have the responsibility for the management of the Samaria

National Park which includes the BR. The administrative body of the park is governed by the Board of Directors composed by 7 members and is currently in the process of appointment [18].

5 Prospects of Mediterranean Biosphere Reserves

5.1 Southern and Northern Mediterranean BRs perspectives

The Northern African BRs face the following problems: insufficient public funds designated to PAs, and not specifically to BRs. Management plans are developed for PAs and do not reflect the provisions of the MaB framework. In most cases they are not implemented. Frequent problems also concern conflicts of competences between the responsible management bodies; underqualified staff, scarce involvement of citizens in the decision processes [19].

Nevertheless, the countries have considerable opportunities for a consistent improvement of the performance of the BRs. Algeria shows a strong commitment to develop the BRs through several programs and has established a good coordination among partners involved in the BR management. The IBRM management in Morocco/Spain has a great opportunity to be considered a best practice for transnational BRs. In Egypt the potential of the BRs is very high due to the tourist interest even if the unstable political situation reduced the number of visitors in the last decade.

All countries are supported by international donors (e.g. GEF, World Bank) and Foundations (e.g. MAVA, WWF) with projects focused on conservation and development of the PAs. National strategies and responses to address climate change effects have been prepared in the North African countries. A Climate Change Adaptation Program has been recently started in Morocco with the support of the GIZ, which aims to increase capacities and develop adaptation approaches to afford the risks caused by climate change [9].

In Northern Mediterranean BRs, similarly to Southern ones, most of the Management Plans are grounded mainly on conservation and elaborated primarily for National Parks and not for the BRs, thus ignoring the principles of the MaB strategy. Therefore, the conservation function of the PA is usually well established. Awareness raising, capacity building, education and formation, communication and site promotion is mainly carried out by the Park Management. The Tuscan Island BR can be considered a good example of citizen's involvement through its website and the use of different Social Media. The online tools are permanently updated and the activities of the Biosphere Reserve promoted [20]. The targets to foster sustainable economic and human development and the logistic function to support research, monitoring, environmental education and training are only partially task of the PA Management. The main reasons are the lack of delegation of duties and financial resources, skilled personnel or missing professional competences. In this way the mission of the BRs is often downgraded to the use of an international brand and its prestige and fame as promotional tools.

International programs, especially EU projects offer excellent instruments to implement those operations traditionally not foreseen in the PA management plans (e.g. stakeholder involvement, mitigation and adaptation measures, disaster prevention and reduction, destination and heritage management, economic use of local resources).

Numerous European Projects involve PAs/BRs (e.g. LIFE EBRO-ADMICLIM, ADAPTAMED, LIFE-CLINOMICS, CLIMAPARKS, CHANGE WE CARE, ECOSS etc.) for exploring and testing new ideas needed to face present and future challenges. Such projects offer good opportunities to promote and create visibility for the BR's image and brand through media, education, training, and other dissemination activities. The BRs can be instrumentalized as laboratories to test innovative concepts and processes as well as multilevel governance and management approaches. Hence, long term incentives and follow-up projects could foster a continuous upgrading of BRs as future integrated frameworks for sustainable territorial development.

5.2 Adaptation of BRs Governance and Management to Changing Evidences

The study of the Mediterranean BRs shows a considerable diversity of governance and management strategies and participatory mechanisms. The institutional diversity of the GMS of protected areas, especially Marine and Coastal Protected Areas has already been observed by other investigations [21]. There is no one solution for all the PAs. The adaption of GMS to changing evidences and enhanced efficacy demand might be the key for the success of the conservation and development strategies in the coming decades (Table 2).

The BR Framework offers excellent opportunities to experience new concepts and to learn from models showing how to change, accelerate transformation processes driven by local realities and challenges, and sustained by local population and stakeholders. BRs have the potential to contribute to reduce climate change and biodiversity loss as well as to boost sustainability of socio-economic development through mitigation and adaptation measures included in their management plans. Technological solutions are essential drivers in the transition towards a green economy. Environmentally sound technologies include a variety of cleaner production process and pollution prevention technologies as well as end-of-pipe and monitoring technologies [22].

A study in five Spanish Biosphere Reserves successfully realizing innovative sustainability actions, emphasized the importance of knowledge co-creation among all the actors under the leadership of the BR manager. The study concluded that governance models must adhere to multilevel stakeholder participation and facilitate interactions among the different levels. Science is considered a key driver in knowledge acquisition and structuring, whereas BR managers are fundamental for transition on a local scale when sufficient institutional support, adequate skills, and positive attitudes are existing [23].

The WNBR has furthermore the chance to foster awareness raising and exchange of ideas and experiences worldwide. The Initiative "BiosphereSmart" is a global observatory "based on the idea to maximize the use of new information technologies to build a covenant for a sustainable future and a transition to green societies based on knowledge. It focuses on: sharing knowledge on climate change, green economies, and sustainable development [24].

Table 2. Challenges of Biosphere Reserves related to governance, management and operations.

CHALLENGES	
ISSUES	SOLUTIONS
GOVERNANCE	
Good Governance	<ul style="list-style-type: none"> • Link conservation goals to sustainable development • Promote interactive and inclusive governing mechanisms • Define capacities to direct impact and control • Foresee and prevent conflicts and disasters
Site Management Organization	<ul style="list-style-type: none"> • Develop a management structure appropriate to the size and scale of the BR • Define responsibilities for the management of environmental, economic, social and cultural issues
Deliberative processes	<ul style="list-style-type: none"> • Delegate the responsibilities for decisions and actions to the adequate level • Define the decision and participation processes
Funding	<ul style="list-style-type: none"> • Define regular funding in performance agreements • Participate to EU/international and national projects • Explore opportunities of co-funding e.g. donors, sponsors, ecosystem services
MANAGEMENT	
Partnership	<ul style="list-style-type: none"> • Establish relationships with relevant bodies through networking and platform creation • Define cooperation mechanisms • Establish public-private partnerships
Public and Stakeholder involvement	<ul style="list-style-type: none"> • Increase the role of local people in management decisions and day-to-day management of BRs • Develop a feeling of ownership, pride and 'stewardship' among residents
Evidence base	<ul style="list-style-type: none"> • Establish site knowledge and data base • Assure appropriate priority setting and decisions taking through result based, bottom-up and outside-in mechanisms
Assessment/Monitoring	<ul style="list-style-type: none"> • Strengthen research and impact assessment efforts • Establish effective monitoring with adequate indicators • use citizen sciences and change mechanisms jointly with academic partners
Human Resources	<ul style="list-style-type: none"> • Engage professionals with adequate competences • Encourage proper training, equipping, remuneration of managers, staff and rangers in line with required standards
Communication	<ul style="list-style-type: none"> • Integrate ICT and social media in communication strategies, encouraging rangers and guides to share stories, discoveries, challenges and threats with visitors • Establish online community platforms

OPERATIONS	
Target planning	<ul style="list-style-type: none"> • Establish foresight and adaptation mechanism • Identify opportunities offered by EU/national programs to cooperate and fund targeted projects
Action Plans	<ul style="list-style-type: none"> • Action Plans must include detailed recommendations for the implementation (including roles of actors, timing, responsibilities, costs, source of funding) to improve efficiency of BR functions and processes
Innovative tools and technologies	<ul style="list-style-type: none"> • Adopt new ICT products, services, and innovative marketing tools • Promote the use of new sustainable technologies

BiosphereSmart provides a web-based platform linked to UNESCO-MaB for Biosphere Reserves and similar territories, with the aim of:

- Sharing experience and lessons in using BRs in green economic development;
- Sharing ideas and best practices on issues related to sustainable development and climate change;
- Promoting sustainable urban futures issues within BRs and their surroundings;
- Providing an educational tool with mapping and advanced communication services;
- Empowering sustainable communities to improve their access to information and decision-making capacity;
- Improving information and response capacity for managers and scientific community in BRs;
- Strengthen partnerships within the World Network of BRs (WNBR).

6 Conclusions

Several studies related to PA management effectiveness have been carried out recently, pointing to the increasing importance of GMS. Most of the studies were based on interviews with managers or government representatives who expressed their point of view based on their own perceptions, “addressed” to present good results. Perhaps it would be better to assign assessment tasks to external and independent experts.

As emerged by the survey [8], Protected Areas can really contribute to reduce environmental and anthropogenic negative impacts. The results confirm conclusions of studies emphasizing that governance authorities have to dedicate a strong commitment to establish an inclusive good governance, with strong participation and collaboration, as well as a management with adequate funding and human resource allocation [25]. To improve the efficiency of the operations, it is necessary to foster capacity building for BR managers and staff, increase financial support and tools, enhance cooperation among the different governing and managing bodies, and strengthen public awareness and communication.

The Protected Areas, and consequently the BRs which are part or equivalent to their territory, are generally established and governed by the States (central governments). Only recently, restricted bottom-up approaches are established in some PA. This does not mean that a governance community model is more efficient than a top-down

governance. But the involvement of local people with their know-how and sense of ownership can increase the acceptance of the measures and reduce conflicts. Biosphere Reserves could become ideal places to launch innovative projects towards sustainability and adaptation to changing environment, due to their tasks to co-create knowledge involving all the actors. The leadership of the BR managers is fundamental for processes based on local evidences. It is imperative to foresee incentives and funding for follow-up actions in a long term to launch the transformation towards sustainable territorial development.

Seven principles are key to achieve good governance and management, and responsible leadership: legitimacy, transparency, accountability, inclusiveness, fairness, connectivity and resilience [26]. Only few of them have been found in the BRs analyzed. There is much work to do for reaching an adequate Governance and Management System, and there is not much time for preserving and developing in a sustainable way these areas for the next generations. The authorities should be committed to delegate authority and accountability to the single Biosphere Reserve, enabling them to be prepared and to promptly react in emergencies regarding present and future challenges.

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