# UNESCO Biosphere Reserve management evaluation: where do we stand and what's next?

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**ABSTRACT:** This article provides the first comprehensive review of the discourse evolution of UNESCO Biosphere Reserve evaluation, relative to the general discourse of Protected Area Management Effectiveness (PAME) evaluation. Using literature review and content analysis, it addresses two main research questions: (1) In light of recent literature, is it still relevant and important to evaluate protected areas and biosphere reserves? (2) To what extent has the Periodic Review (PR), which is the only performance evaluation required by the UNESCO Man and the Biosphere programme, effectively addressed the need for "standard indicators to evaluate the economic, social, and ecological progress made by biosphere reserves" (IUCN 1995)? Using synthetic argumentation, we find first that management effectiveness evaluation is still highly relevant and essential for the effective management and global expansion of protected areas and biosphere reserves networks. Second, the PR report has been a soft evaluation tool that led to improved implementation of the biosphere reserve concept, by tackling mainly the *design* and *planning* aspects. However, it lacks results-based indicators that specifically measure *delivery of objectives* linked to the three functions of biosphere reserves (conservation, sustainable development, and logistic support). Third, the PR tool is not designed to systematically integrate into an adaptive management cycle recommended for biosphere reserves. Drawing from lessons and advancements made in PAME evaluation, we conclude with targeted recommendations for the improvement of biosphere reserve management evaluation, in the perspective of enhancing their contribution to the global sustainable development goals.

**Keywords:** Biosphere reserve, periodic review, UNESCO, protected area, Management effectiveness evaluation

## Introduction

The UNESCO World Network of Biosphere Reserves (WNBR) is an international intergovernmental programme initiated in 1971 to reconcile conservation with sustainable development. Initially overlapping with conservation sites designated and legally protected nationally, the Biosphere Reserve (BR) concept gradually improved the implementation of its model by enhancing implementation of its zonation scheme and integrated functions (Ishwaran et al., 2008; Price et al., 2010). Its design currently consists of core, buffer and transition zones, serving three main functions: (1) conservation of natural and cultural values, (2) logistic support for education, training, research and monitoring (3) and sustainable development (UNESCO, 2016a). However, one important component remained largely neglected.

By 1995, when the network had grown to 324 sites in 82 countries, the International Union for the Conservation of Nature (IUCN) - in its *Evaluation of the Implementation of the 1984 Action Plan for Biosphere Reserves*, highlighted that BRs had "no built-in way of evaluating performance and no standardized measure with which to evaluate the economic, social, and ecological progress made. Consequently, it [was] difficult to identify what constitutes 'successful' implementation as a whole" (IUCN, 1995, p. i). More than twenty years following this IUCN observation, we discuss how this evaluation gap has been addressed, and what remains unresolved.

This review sheds light on the following questions:

- How relevant is this problem today, in light of new evidence from the general Protected Areas



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(PA) effectiveness literature, and parallel evolution of the Protected Areas Management Effectiveness (PAME) evaluation discourse? In other words, is it still relevant and important to evaluate PAs and BRs?
- To what extent has the performance evaluation required by the UNESCO Man and the Biosphere (MAB) programme - i.e. the Periodic Review (PR) report, effectively addressed the identified need for a "standardized measure with which to evaluate the economic, social, and ecological progress made" [by biosphere reserves]? (IUCN, 1995)?

Based on literature review of peer-reviewed publications (pertaining to PAME and BR evaluation) and UNESCO official documents, as well as content analysis of the PR forms and PAME methodologies, we use synthetic argumentation to provide evidence that:

- PAME evaluation is still very relevant and essential to decision-making for effective management of existing PAs and BRs, and for the expansion of both networks.
- The PR report has been a generally soft evaluation tool that triggered positive changes for improved implementation of the BR concept mainly in terms of design and planning for the three functions.
- The PR qualitatively evaluates concept implementation but is not designed to measure the effectiveness of BRs in fulfilling their functions, due primarily to the absence of indicators that specifically measure outcomes related to the three functions.
- Though adaptive management is recommended for BR management effectiveness, the PR tool is not designed to systematically integrate into an adaptive management cycle for BRs.

Based on this review, we argue that 20 years after the IUCN evaluation of the MAB programme's action plan, the need for a "standardized measure with which to evaluate economic, social, and ecological progress made" persists. It is essential to tackle this gap for the WNBR to effectively fulfil its new strategic directions, including serving as an effective instrument for the fulfilment of the world's Sustainable Development Goals (UNESCO, 2015). Drawing from the lessons and advancements made in the evaluation of PAs, this review concludes with a number of targeted recommendations for the enhancement of BR Management Effectiveness Evaluation (MEE).

## Biosphere reserves in the general protected area system

### *Protected areas and other international programmes*

Protected areas are considered the key global strategy for the conservation of species populations and habitats (Geldmann et al., 2013; UNEP - WCMC & IUCN, 2016). Their number has been continuously rising, and is currently estimated at 217 155 in 244 countries (excluding UNESCO BRs) covering 14.7 percent of terrestrial regions and 10.1 percent of marine areas within national jurisdictions (UNEP - WCMC & IUCN, 2016). In parallel, other models of site protection under international programmes with a conservation focus or component have been flourishing, all of which aim to contribute to the global sustainability agenda (Schaaf & Clamote Rodrigues, 2016). Designations under these international programmes include: (i) World Heritage Sites estimated at 1052 properties (238 natural or mixed sites) in 165 states (UNESCO World Heritage Center, 2016), (ii) UNESCO BRs organized into a network of 669 in 120 countries (UNESCO, 2016a), (iii) UNESCO Global Geoparks estimated at 120 in 33 countries (UNESCO, 2016b), and (iv) 2261 Ramsar sites in 169 countries (Ramsar Convention Secretariat, 2016). These international designations often overlap with nationally designated PAs, and sometimes with each other, creating Multi-Internationally Designated Areas (Schaaf & Clamote Rodrigues, 2016). Though the multitude of designations on the same surface of land or sea emphasizes the importance of these sites for their natural and cultural values, their management and evaluation become more complex due to the several layers of governance and institutional requirements that are often not proactively aligned (Schaaf & Clamote Rodrigues, 2016). Here, we focus on BRs, of which the design typically comprises core zones that overlap with nationally designated PAs (Dudley, 2013; UNEP - WCMC & IUCN, 2016); therefore, we revisit these two concepts' definitions.


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### *Protected area definition*

The most widely adopted definition of a PA is the one updated in 2008 by the IUCN: "a clearly defined geographical space recognized, dedicated and managed, through legal or other effective means to achieve the long-term conservation of nature with associated ecosystem services and cultural values" (Dudley, 2008, p. 8). This definition revised the IUCN (1994) version by introducing the aspect of ecosystem services, and highlighting objective-based management. Another popular definition of a PA was developed by the Convention on Biological Diversity (CBD), hence recognized by all 196 parties of the Convention: "a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives" (CBD, 2016).

### *Biosphere reserve definition*

Since its inception, the BR concept has gradually evolved from a conservation focus toward a higher degree of integration of the human element and related sustainable development activities (Ishwaran et al., 2008; Price et al., 2010). Early in the MAB programme, a BR was essentially designated through identifying existing sites of high biodiversity value(s) (Ishwaran et al., 2008). This is reflected in UNESCO's early definition of BRs as "protected areas of representative terrestrial and coastal environments which have been internationally recognized for their value in conservation and in providing the scientific knowledge, skill and human values to support sustainable development" (UNESCO, 1984). However the BR concept has gone through many iterations as it adapted to evolving strategic directions of the MAB programme, which are attuned to global sustainability agendas (Millennium Development Goals, Global Sustainable Development Goals) (UNESCO, 2016a). Chronologically, three main phases can be distinguished in the evolution of the programme, which are marked by two milestone events: (1) the Seville conference in 1995, resulting in *The Seville Strategy & The Statutory Framework of the World Network* (UNESCO, 1996), and (2) the Madrid meeting in 2008 resulting in the *Madrid Action Plan* (MAP). These outputs constitute to date the main governing documents of the MAB programme of work. A fourth phase has now been launched with the adoption of the *2015-2025 MAB Strategy*, which highlights more explicitly the instrumental role of BRs in contributing to the achievement of the 2015-2030 Sustainable Development Goals (UNESCO, 2015). In light of the complex evolution of the MAB programme, BRs have now reached a more sophisticated definition:

*Biosphere reserves are areas comprising terrestrial, marine and coastal ecosystems. Each reserve promotes solutions reconciling the conservation of biodiversity with its sustainable use.*

*Biosphere reserves are Science for Sustainability support sites – special places for testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems, including conflict prevention and management of biodiversity.* (UNESCO, 2016a).

Throughout the conceptual developments of the BR, its design remained essentially the same since 1983 when the designation 'transition zone' was introduced to replace 'outer buffer zone' (Price et al., 2010). The BR design consists of a three-zone scheme with a legally protected core zone (also called core area) dedicated to conservation of biodiversity, surrounded by a buffer zone that focuses on the logistic function for research, education and training while accommodating a limited level of resource use and human activity, and an outer transition zone (also called 'area of cooperation') incorporating more human settlements and sustainable socio-economic development activities (e.g. eco-tourism, agriculture) (UNESCO, 2016a). Buffer and transition zones do not need to be legally protected. Few noticeable adaptations to the structure were made with time, including (1) allowing for the designation of several core areas; (2) requiring boundary delineation of the transition zone; and (3) a larger integration of the zones' functions. The latter meaning that conservation, sustainable development, and logistic support, can be implemented in all zones but with varying degrees, depending on the functional focus of each zone (Matar, 2015; UNESCO, 1996). Finally, though the BR is an international designation, the sites have always stayed under the jurisdiction of their States.

### *The UNESCO biosphere reserve in the IUCN protected area categories system*



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The IUCN classifies PAs in different categories based on their management objective(s) (Dudley, 2008). Of the international designations, Biosphere Reserve and World Heritage Site were originally identified as categories in their own right, unlike Ramsar sites (Dudley, 2008). However, the 1994 IUCN guidelines report and its updated version (2008) excluded international designations from the standard categories (Dudley, 2008). The overlapping coverage of BRs and PAs combined with the exclusion of BRs from the formalized PA classification is believed to be the root cause for the conceptual confusion that led to the publishing of a manual in 1996 focusing on clarifying the differences between PAs and BRs (Bridgewater et al., 1996). The main message of the manual was that the two models are not contradictory nor mutually exclusive, rather PA categorization can enhance the implementation of BRs. The authors explain that IUCN categories are based on management objectives, and therefore BRs cannot fit into only one category since their basic premise is inclusive of multi-management purposes within the functional zonation scheme. Hence the different zones may be aligned with different PA categories depending on their management objectives. They argue that the IUCN categorization system provides a good framework to develop BR management plans that recognize the zones as PAs with different management objectives (Bridgewater et al., 1996).

Despite the close link between BRs and PAs, the governing institutions supporting and administering the two programmes internationally i.e. UNESCO-MAB Secretariat and the IUCN Global PA programme respectively - have no formal arrangement to align and synergize their management and operations at the implementation level (Matar, 2015; Schaaf & Clamote Rodrigues, 2016). Moreover, their evaluations are decoupled processes despite their superimposition.

## Protected Areas Management Effectiveness (PAME) evaluation: discourse evolution

### *PAME evaluation as a requirement*

The worldwide proliferation in number and coverage of PAs and other internationally designated sites did not yet lead to reaching biodiversity conservation goals as global indicators continue to reflect a persisting decline in species numbers and habitats (2010 BIP, 2010; WWF, 2016). The ambitious 2010 conservation targets set by the CBD were not met; in response, the Parties to the Convention adopted a more rigorous plan for 2020 (CBD, 2012). Lack of effectiveness of PAs has been increasingly highlighted as one of the main reasons behind failure to halt biodiversity loss (Anthony, 2014; Cantú-Salazar & Gaston, 2010; Juffe-Bignoli et al., 2014; Leverington et al., 2010a, 2010b). In that perspective, PAME evaluation has become a priority measure toward achieving the 2020 global targets for PAs and biodiversity, as highlighted in the 2014 Protected Planet report: "Assessing whether protected areas are being effectively managed is a crucial element of Aichi Biodiversity Target 11, and a vital prerequisite for achieving protected area objectives" (Juffe-Bignoli et al., 2014, p. 25).

Since biodiversity outcomes are influenced by several characteristics - including the social and economic contexts of PAs, and the relevance of indicators- the relationship of PAME results with conservation outcomes is not straightforward (Anthony & Shestackova, 2015; Carranza et al., 2014; Juffe-Bignoli et al., 2014; UNEP - WCMC & IUCN, 2016). However, recent evidence has consolidated the persistent global importance of PAs as a strategy for conservation, by demonstrating significantly higher species richness and abundance inside than outside PAs (Gray et al., 2016). In their global study, Gray and colleagues (2016) also highlighted the very high cost (including opportunity cost) associated with PA expansion, and subsequently emphasized the critical importance of quantifying the effectiveness of PAs to justify their maintenance and expansion.

At the level of policy, the increase in focus on the management effectiveness aspect of PAs was translated into stricter requirements by the CBD (2010). Indeed, the requirement for CBD parties to conduct and report PAME evaluations for 30 percent of areas covered by PAs nationally was doubled to 60 percent for the 2010-2015 period (CBD, 2010). In summary, the need to evaluate and quantify effectiveness of PAs - and other international sites - in achieving the goals they were designated for, remains a very contemporary and germane topic. Therefore, if not properly conducted, more efforts need to be invested in improving evaluation.

### *PAME evaluation tools*


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PAME has been defined by Hockings and colleagues (2006, p. xiii) as a reflection of (i) design relating to both individual sites and PA systems; (ii) adequacy and appropriateness of management systems and processes; and (iii) delivery of PA objectives including conservation of values. On the other hand, MEE has been defined as "the assessment of how well the PA is being managed - primarily the extent to which it is protecting values and achieving goals and objectives" (Hockings et al., 2006, p. xiii). Building on these background definitions and empirical evidence, international experts have developed a plethora of MEE tools based on the WCPA Framework created by a special taskforce from the IUCN - World Commission on Protected Areas (WCPA) (Hockings, 2003; Hockings et al., 2000). These MEE tools were improved with time, and gradually adopted by many organizations worldwide such as the World Wide Fund for Nature - World Bank (WWF - WB) Alliance, and were adapted to different management objectives of PAs (Hockings et al., 2006; Leverington et al., 2008, 2010a). The discourse on PAME evaluation has evolved with the leadership of the IUCN-WCPA taskforce that continuously updates the Framework and reports on practical experiences (Hockings et al., 2006).

***PAME evaluation implementation and reporting***

In 2010, experts collected and compiled accessible PAME evaluation reports from around the world and recorded more than 50 methodologies developed mainly based on the WCPA Framework (Leverington et al., 2010b). Through a project led by the WCPA and UNEP - WCMC, a Global Database of PAME evaluation reports (GD-PAME) was created to collate collected reports, and continues to be populated online (Coad et al., 2015; Leverington et al., 2010a), therefore increasing transparency of PA reporting and performance. As of 2015, the GD-PAME contained 17 739 reports for 9037 PAs, using more than 90 different evaluation methods (Coad et al., 2015).

Despite these global efforts toward measuring PAME, reports compiled in 2010 showed that only 22 percent of PAs have a "sound management" (Leverington et al., 2010b). Moreover, a 2013 appraisal demonstrated that only 29 percent of PAs had completed and reported the required MEEs; 90 countries (of 196 parties reporting to the Convention) had reached the 30 percent CBD target of 2010, and only 45 had achieved the 60 percent target of 2015 (Juffe-Bignoli et al., 2014). This wide gap between the policy requirement and implementation reflects the persisting need to expand and institutionalize PA MEE worldwide.

Notwithstanding the imperfect nature of PAME evaluation tools and processes, many important lessons have been gained from international experience. What we have learnt from the PAME experience (Leverington et al., 2010a; Pomeroy et al., 2014) is that evaluation should be:

(1) useful to managers and stakeholders and relevant to improving management,

(2) practical in use and cost,

(3) inclusive of scientific input and stakeholder participation,

(4) flexible for use in varying sites and conditions,

(5) systematic and part of an effective management cycle, and

(6) based on holistic indicators balancing human and natural perspectives.

These lessons from PAME evaluation are also relevant to the BR evaluation as will be developed later in this review. However, we first explore how the BR evaluation is doing to date, and what are some of its main characteristics and challenges.

***Evaluation of biosphere reserves: progress relative to the general discourse***

Relative to PAME evaluation efforts, the UNESCO-MAB experience in evaluation has been slower and less rigorous (Price et al., 2010; UNESCO, 1996). Until recently, there was no process for identifying "unsatisfactory concept implementation or management" of BRs (UNESCO, 1996). The PR report was only introduced 22 years after the first BR was designated i.e. in 1996, during the Seville meeting, and remains the sole evaluation tool officially required from BRs to be submitted after ten years of designation, and every decade thereafter (UNESCO, 1996). Generally, the PR has proven to be a soft tool receiving a low response rate and in


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need of improvement (Lotze-Campen et al., 2008; Matar, 2015; Price et al., 2010).

Initiatives to develop a set of clear indicators for BR evaluation do exist at the national level, e.g. within the German MAB network (Scherfose, 2013). In Germany, a bold initiative was carried out to increase efficiency of large-scale PAs management by harmonizing the criteria systems for all types of PAs. This also allowed for comparison and national appraisal of deficits and successes (Scherfose, 2013). However, such an approach is needed at the international level. To be able to achieve this, there is a need for UNESCO-MAB Secretariat to provide a standard set of indicators that can be used adaptively for the evaluation of BRs (Matar, 2015).

## Biosphere reserves evaluation: The Periodic Review process

### *Periodic review process: definition and aim*

In response to the identified need for the evaluation of BR concept implementation, the PR process was introduced in 1995 as part of Article 9 of the *Statutory Framework* adopted by the MAB International Coordinating Council (ICC) (also referred to as MAB Council) and general Conference of UNESCO:

*…the status of each BR should be subject to a PR every ten years, based on a report prepared by the concerned authority, on the basis of the criteria of Article 4, and forwarded to the secretariat by the State concerned. The report will be considered by the Advisory Committee for BRs for recommendation to International Co-ordinating Council.* (UNESCO, 1996, p. 18).

Price (2002, p. 15) stated that the ultimate aim of the PR process is that "BRs achieve the recognition as the sites of excellence that they should be […] by ensuring within a reasonable period, that all members of the WNBR do fulfil the three complementary and mutually reinforcing functions of BRs". On the other hand, the UNESCO-MAB Secretariat defines the PR process and its objective as:

*…a time to take stock of progress made by the BR, especially as concerns the updating of knowledge, skills and expertise in resource and ecosystem management. It also provides an opportunity to discuss the updating of the zonation system and assess its relevance, question the objectives and means of management policies and examine the issues and problems tied to implementation. It is also a time to discuss weak points. Its objective is to improve the quality of the BRs and their functioning as sites for testing and demonstrating approaches to sustainable development.* (UNESCO, 2016c).

The requirement for PR reporting was re-iterated as Target 9 of the MAP (UNESCO, 2008, p. 15): "all BRs undertake PR and related actions to update zonation, management and other changes to meet Seville and MAP requirements and recommendations", under the responsibility of the MAB National Committees as focal points.

### *Periodic review procedures*

As defined in Article 9 of the *Statutory Framework*, as of 1995, the PR review is requested from all BRs ten years after their designation year. The detailed procedure entails the following steps (Price, 2002; Price et al., 2010; Reed & Egunyu, 2013):

Step 1: The MAB Secretariat sends the request for a PR report to the State (or National UNESCO-MAB Authority) of the BR to be reviewed;

Step 2: The State sends the report to the MAB Secretariat who transmits it to the International Advisory Committee for Biosphere Reserves (IACBR) who reviews it and makes recommendations to the ICC;

Step 3: The ICC reviews the report, assesses it against the criteria of Article 4 (describes the criteria that define a BR) (UNESCO, 1996, p. 16-17) of the *Statutory Framework*. If the PR is judged satisfactory, the positive result is communicated to the UNESCO-MAB Secretariat who then transmits the decision to the National Authority (steps 4-7 no longer apply). If the report is not satisfactory, the ICC sends recommendations for better compliance to the MAB Secretariat;

Step 4: The MAB Secretariat transmits the recommendations for improved compliance to the concerned National Authority;

Step 5: After a 'reasonable period', the National Authority is expected to send back to the MAB


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Secretariat an updated report with evidence of corrective actions based on recommendations;

Step 6: The IACBR reviews the updated PR report and makes a recommendation to the ICC;

Step 7: The ICC makes a final decision, which could be summarized as either 'satisfactory' or 'unsatisfactory'.

If the PR report is unsatisfactory due to its quality or lack of local capacity to complete the PR, the IACBR can recommend assistance from the relevant UNESCO Regional Office to guide the BR management team in preparing the PR; this recommendation is reviewed by the ICC before it is sent to the concerned authority by the Secretariat (G. Ramadan-Jaradi, personnal communication, November 8, 2013). If the final PR evaluation outcome remains unsatisfactory after potential assistance from UNESCO, the ICC can notify the UNESCO Director General that the reviewed BR will be withdrawn from the WNBR. Alternatively, the concerned State can voluntarily announce to the Secretariat the withdrawal of the BR from the WNBR at any stage of the evaluation if it finds it not possible to fulfil the criteria or make the necessary/recommended changes to improve compliance (Price, 2002; Price et al., 2010).

### *Periodic review report: content and requirements*

The PR report is used by UNESCO-MAB Secretariat for (1) review by the IACBR and ICC for appraisal of the BR, and (2) updating the BR's information on the official website (also called UNESCO-MABnet) and the WNBR directory. On the other hand, it is unclear whether local BR authorities are using PR reports for any management purposes besides reporting to UNESCO-MAB Secretariat. However, the implementation challenges including non-response and delays, in addition to the absence of published studies on the subject, suggest that local BR authorities complete the PR report for no other purpose than compliance with UNESCO-MAB requirements.

The first PR form (1996) designed by the UNESCO-MAB Secretariat was utilized by most BRs who conducted PR reviews (till 2015). In January 2013, based on the MAP Target 1.4: "Update the […] PR forms for BRs by 2010" (UNESCO, 2008, p. 11), a new version of the PR was published by the UNESCO-MAB Secretariat. The new PR form is readily available online for download by relevant parties in three languages: *English*, *French*, and *Spanish* (UNESCO, 2016c). The form's updates reflect the evolution of the BR concept and overall MAB strategy changes (UNESCO, 2015). Compared to the old form's template (23 pp), the new one is substantially longer (43 pp) and adapted to the conceptual changes made in the BR definition since 1996, especially after the MAP in 2008. The range of subjects is more comprehensive, and questions under each category are much more specific, requesting detailed information. Table No. 1 presents a comparison of the main structure for the body of text of the two versions of the PR form, illustrating the main changes made.

Comparison of structure for the old and new versions of the Periodic Review (PR) Form.

| Structure | Old version titles (1996) | New version titles (2013) |
|---|---|---|
| Chapter 1 | Name | Biosphere reserve |
| Chapter 2 | Country | Significant changes in the biosphere reserve during the past ten years |
| Chapter 3 | Physical characteristics | Ecosystem services |
| Chapter 4 | Zonation | The conservation function |
| Chapter 5 | Human activities | The development function |
| Chapter 6 | Research and monitoring programmes | The logistic function |
| Chapter 7 | Education, training and public awareness programmes | Governance, biosphere reserve management and coordination |
| Chapter 8 | Institutional arrangements | Criteria[1] and progress made |
| Chapter 9 | Conclusion: Criteria[1] and progress made | *N.A.*[2] |

[1] Refers to Criteria of Article 4 of the *Statutory Framework* (UNESCO, 1996)
[2] *NA – Not Applicable*

**Table No. 1**

As Table No. 1 shows, important changes include: (i) reporting on amendments made and actions taken based on the ICC recommendations in the case of second reports (new version, Chapter 2); (ii) emphasizing the BR functions fulfilment as well as governance, management and coordination, by creating a Chapter for each subject (new version Chapters 4-7); and (iii) introducing the "ecosystem services" dimension of BRs (new version, Chapter 3). In addition, although not reflected in Chapter titles (Table No. 1), the 2013 PR Form introduces an emphasis on the role of BRs in "climate change" and social aspects such as "gender mainstreaming", which clearly reflect the future strategic directions of the MAB programme (UNESCO, 2015). Based on document analysis, the questions in the PR forms are mostly descriptive in nature, inquiring about the


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"what", "how" and "who", of each of the above questions, in the perspective of assessing the degree to which the BR concept is being well implemented. Chapter 9 in the old form - equivalent to Chapter 8 in the new one, (Table No. 1) specifically requests from the reporting BR authority to justify how each of the *Statutory Framework*'s Article 4 criteria are being fulfilled. Both forms require an Appendix, the provision of supportive documentation including maps, species lists, legal documents and land use plans etc., as well as updated contact information and media that would be used for the online directory of the WNBR (i.e. on UNESCO-MABnet).

***Periodic review implementation***

*Periodic review response.* According to the MAB Secretariat, the number of PR reports received and examined by the ICC has reached a total of 370 (UNESCO, 2016c). Reports are completed by various parties including site managers, national MAB Committees, and/or consultants. Some countries reported taking additional actions in preparation of the review process and based on its requirements. These included national level participatory processes leading to a review of a wider scope of issues related to all reserves in the country, and and extension of the BR zones in order to better apply the BR conceptual requirements (Price, 2002).

As of 2016, the review of submitted reports has resulted in the withdrawal of 18 BRs from the network, all of which were designated very early in the programme between 1976 and 1986 (UNESCO, 2016c, 2016d). With the exception of two BRs in Australia, all withdrawals are from Europe, and are done voluntarily after the PR process reveals gap(s) that are not possible to fulfil (Price et al., 2010; UNESCO, 2016d). For example, in the UK, the PR review process led to a national evaluation of all sites, after which the government decided to withdraw four BRs that didn't fulfil the criteria (Price et al., 2010). The UK now has the highest number (eight) of withdrawals from the WNBR (UNESCO, 2016d). In this instance, factors influencing the decision included: absence of human settlements within the overall BR area, difficulty to redefine and/or expand certain zones for better compliance with the functional zonation scheme, need for organizational arrangements for involvement and participation of stakeholders, and need for more integrated BR management plans and policies and implementing agency (Price et al., 2010). Some or all of these factors could not be structurally accomplished and/or would not be cost-effective to operate especially given the resources needed and the (sometimes) limited benefit the BR designation would bring to sites that are already well managed for conservation purposes at the national level (Price, 2002; Price et al., 2010; Stoll-Kleemann et al., 2010). On a more positive side, 352 BRs remained within the WNBR after submission of their PR reports. Some of these BRs had to make effective zonation changes or comply with other recommendations from the ICC before approval of their PR reports.

*Periodic review implementation benefits.* Compared to the pre-Seville period, the introduction of the PR process by the MAB Secretariat proved beneficial to the compliance and alignment of the BR implementation with the BR concept. At the site level, improvements were made through improved zonation and integration of functions, and increased dialogue between stakeholders and UNESCO-MAB institutions (UNESCO, 2014a). Overall, the PR process has been successful in the collection of updated information concerning the WNBR and consolidating the BR concept. The PR increased the value and credibility of the MAB programme throughout the network by enforcing adherence to the requirements, and implementing withdrawals when necessary. However, the PR monitoring system has encountered many challenges, some of which were addressed by the MAB Secretariat, while others prevail (Price et al., 2010).

*Implementation challenges faced by the UNESCO-MAB Secretariat.* A summary of PR submission dates for BRs globally shows that many reports are submitted with several years of delay (UNESCO, 2014b). For example, a recent study on the ArabMAB Network showed that 43 percent of outstanding PR reports were not submitted due to delays or non-response (Matar, 2015). In parallel, the acceptance of these reports by UNESCO-MAB Secretariat despite the delays reflects a large flexibility regarding the ten-year submission due date. In 2009, the ICC reported that 220 PRs had already been submitted to the MAB Secretariat, but one fifth of the Member States (21 countries) had not yet submitted any PR reports despite the fact that some of their BRs were designated before 1996 (UNESCO, 2009, p. 1).


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Again in 2010, submissions were 130 reports short of 359 for BRs designated before 2000, indicating a continuous gap in response levels to the PR requirement (Price et al., 2010). The problem of non-response also applied to BRs that received recommendations by the MAB Secretariat for corrective measures, based on a first submission (Price et al., 2010).

To address the issue of delay and non-response, the MAB Secretariat introduced the Exit Strategy in 2013 (UNESCO, 2014a). Briefly, the strategy consists of sending 'warning letters' to non-respondents with compliance deadlines. If the concerned State doesn't send any feedback, the MAB Bureau (elected representatives of the ICC) reserves the right to recommend to the ICC the withdrawal of the BRs from the WNBR. By 2014 the Exit Strategy 'threatened' around 266 BRs in 76 countries (UNESCO, 2014c), reflecting the high level of non-compliance with PR reporting and/or recommendations so far. The first stage of implementation of the Exit Strategy increased response levels with many new PRs received in direct response to 'warning letters' (UNESCO, 2014a). In addition, UNESCO-MAB has set a final deadline for complying with Article 4 criteria either through PRs or responses to recommendations i.e. follow-up reports (UNESCO, 2014a).

*Implementation challenges at the national and local levels.* Various parties, including national MAB committees, consultants and BR managers, with different financial means and level of expertise, complete PR reports. The main identified challenges for effective PR reporting and compliance relate to technical and financial capacity. First, the cost of the PR evaluation procedure and expert fees can be prohibitively high in some countries. Price and colleagues (2010) conducted a first assessment of costs to prepare one PR report, showing a wide range that starts at 2 200 USD in Canada where the evaluation is conducted by volunteer experts but can reach up to 43 000 USD in France (Price et al., 2010, p. 552). However, a broader research on this subject is needed for a more accurate world estimate since this evaluation was limited to eight countries and hence does not represent the WNBR geographical diversity (Price et al., 2010). Second, the lack of human or financial resources for operating required changes at the site level - for fulfilment of criteria and recommendations - was also reported as a limiting factor to compliance. In some cases, these costs weighted against 'perceived benefits' led to the authorities' decision to withdraw from the WNBR. Examples include the Australian Southwest BR and five other sites in the UK, where the BR designation was not perceived to be adding much value to those sites with a conservation focus (Price et al., 2010). In response to these challenges, the UNESCO-MAB Secretariat has expressed a commitment to offer technical support through UNESCO's regional offices.

***Periodic review limitations, and progress made on existing recommendations for improvement***

*Limitations of the periodic review tool and process.* Until 2010, the effectiveness of the PR process as a tool for 'quality-control' was criticized due to weak enforcement of withdrawing non-compliant BRs from the WNBR (Price et al., 2010). However, the recent (2013) introduction and implementation of the Exit Strategy suggests that UNESCO-MAB Secretariat is addressing this issue through stricter enforcement of reporting (UNESCO, 2014d).

On the other hand, the PR review process presents some inherent limitations similar to PAME evaluation tools. Indeed, the PR process is a self-assessment subject to non- transparency and bias from several sources throughout the process, especially from the interviewee, and evaluator (i.e. how the evaluator understands the PR influences the result) (Anthony, 2014; Burnard, 1991; Cook & Hockings, 2011; Matar, 2015; Papp, 2011; Stoll-Kleemann, 2010; WWF, 2007). The MAB Secretariat attempts to mitigate this limitation by requesting supportive documents to the PR claims as part of the PR Report (UNESCO, 2013). Moreover, the IACBR encourages the PR evaluation to be a cooperative process involving stakeholders representing the array of involved parties in the management of the BR (Price et al., 2010). If implemented, collaborative reporting processes would reduce the interviewee and evaluator bias (Cook & Hockings, 2011), however many countries still lack the resources and infrastructure necessary to ensure stakeholder involvement (Price et al., 2010). In addition, on-the-ground validation mechanisms by the UNESCO-MAB Secretariat are still missing for crosschecking qualitative information provided in the PR.


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Finally, the ten-year PR reporting timeline has been criticized as "too long to effectively monitor changes occurring in BRs or actions taken to respond to recommendations" (Price et al., 2010, p. 555).

*Previous recommendations for improvement and progress made.* Research and documentation on effectiveness of the PR process and implementation locally and regionally is still very limited. The UK and Canadian practices are the only national experiences published in the peer-reviewed literature to date. These, in addition to a review of international implementation - incorporating internal knowledge from UNESCO-MAB Secretariat (Price et al., 2010), provided the basis for the development of recommendations for improving the PR process. Main recommendations included:

- UNESCO-MAB Secretariat to update the PR Form (design a new form) and correspond with National MAB Committees to undertake periodic reviews;
- Establish information-sharing platforms and mechanisms to be used for sharing information about the purpose and benefits of PRs, PR reports and best practices (Price, 2002);
- Reduce the reporting timescale from ten to five years, for more effective tracking of progress over time (Price et al., 2010);
- Emphasize shifting the BR evaluation discourse from a "stick and carrot" procedure where the PR is perceived as an imposed procedure to overcome by BR stakeholders, to a collective learning process engaging multiple stakeholders and used for adaptive management (Bouamrane, 2007).

The objectives of these recommendations are to enhance the understanding of the PR process and its benefits, emphasize its 'learning' aspect, and ultimately improve management effectiveness of BRs.

Progress made based on these recommendations is variable. The PR was updated in 2013 but it is still too soon to assess the impact of this change on effectiveness of the process. As for information sharing, the UNESCO-MAB Secretariat has shared a limited number of "model PR reports" on its official website, to provide an example for BRs to follow (UNESCO, 2016c). However, a larger scale open platform for sharing PR resources and best practices is still lacking, and the reports remain internally shared only. Therefore limited opportunity exists to exchange knowledge and technical capacity within the WNBR, or even at the level of regional networks, for the improved effectiveness of the PR process. Moreover, downscaling the timeframe for PR evaluation to five years was abandoned after being seriously discussed in the IACBR, partly because the number of reviewers is limited, while the number of submitted reports is expected to double (G. Ramadan-Jaradi, personnal communication, November 8, 2013). Moreover, according to Price and colleagues (2010), a five-year period was considered too short to make the type of changes that ICC would recommend after one PR process, such as zonation changes. Finally, the use of evaluation as part of a systematic and adaptive management cycle is a widely established and recommended approach for the effective management of PAs and BRs (Gormley et al., 2015; Kingsford et al., 2011; Schultz et al., 2011). However, the design of the PR Form (increased in length in 2013), prohibitive cost of the process, and lack of local capacity and resources, decrease the possibility of adopting this recommendation. In addition, adaptive management intrinsically includes evaluation as a continuous iterative process, which needs to be done systematically and frequently (Folke et al., 2005; Holling, 1978; Williams, 2011). In that perspective, a ten-year period between evaluations is too lengthy and in contradiction with the nature of adaptive management.

**Transferring lessons from the Protected Areas Management Effectiveness (PAME) evaluation to the Periodic Review (PR) evaluation**

Based on relevant literature and on the methodologies used for PAME and BR evaluation, we summarize here relevant characteristics of PAME evaluation tools in comparison to UNESCO's PR tool (Table No. 2). The list of characteristics is by no means comprehensive, especially in characterizing the PAME evaluation tools since they are very diverse. A case-by-case evaluation would be needed otherwise to compare each PAME evaluation tool to the PR Form. However this comparison provides a general picture that facilitates the identification of limitations inherent to the PR tool, and the evaluation of its appropriateness for adaptive management approaches to BRs fostered by the UNESCO-MAB Secretariat


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and experts (Bouamrane, 2007; Reed & Egunyu, 2013).

Comparison of the PAME and PR evaluation tools characteristics.

| PAME evaluation tools | UNESCO's Periodic Review tool |
|---|---|
| Based on the same (WCPA) Framework, but flexible and customizable to the case of each PA. | Standard Form, not customizable to the case of each BR. |
| Includes quantitative and qualitative evaluation. | Only qualitative and largely descriptive. |
| Can be used for a frequent and iterative evaluation process embedded in the PA management cycle i.e. for adaptive management. | Required only once every ten years, and is not practical nor designed to be systematically used for iterative evaluation i.e. adaptive management. |
| Utilized for global reporting and compliance with the CBD requirements. | Remains a largely "top-down" and internal requirement by UNESCO-MAB Secretariat. |
| Generally useful to PA managers, and practical to integrate in internal management procedures for adaptive management. | Generally perceived as a "cumbersome" and administrative procedure by BR managers. |
| Evaluates outputs and outcomes. | Evaluates *whether plans exist to evaluate outputs and outcomes*, but does not evaluate outputs and outcomes. |
| Addresses the question *how far are you from optimizing the management of your PA?* i.e. 'present to future oriented'. | Addresses the question *what actions have you taken so far to implement the BR concept?* i.e. 'past to present oriented'. |
| Presents the limitations of subjectivity and evaluator bias due to self-evaluation. | Presents the limitations of subjectivity and evaluator bias due to self-evaluation. |
| Requires triangulation with supportive hard evidence to validate self-evaluation. | Requires triangulation with supportive hard evidence to validate self-evaluation. |

**Table No. 2**

Perhaps the most important difference between the suite of PAME evaluation tools and the PR tool is that the latter is not designed to assess effectiveness ofall aspects of management, but rather focuses on assessing whether the BR conceptual characteristics - including the three zones (core area, buffer zone, transition zone), and related functions (conservation, sustainable development and logistic support) have adequate implementation plans and programmes of work, and that the basic governance arrangements required by the programme are fulfilled (e.g. an appropriate management plan). Though this is a very important part of the evaluation, it is insufficient for providing a comprehensive evaluation of the performance of BRs in reaching their functions.

Drawing from the lessons learned concerning methodologies for evaluation in the PAME discourse, many criteria identified for effective evaluation are still partially or fully unfulfilled with the PR process and tool. According to the six criteria of effective evaluation (Leverington et al., 2010a; Pomeroy et al., 2014), we find that:

(1) its level of usefulness to local managers and stakeholders is still questionable, and more research on local BRs at a larger geographical scale (beyond Europe and North America) and/or regional networks is needed to further address this question;

(2) its practicality in use and cost varies but so far PR reporting is resource-intensive and can therefore be perceived as a burdensome requirement to be fulfilled by BR staff only for the benefit of retaining the international UNESCO-MAB designation;

(3) though it has been reported that the PR process is increasingly involving stakeholder-participation, many BRs lack the infrastructure for participatory processes and the resources to develop such infrastructure; in addition broader scale studies on PR processes locally are needed to assess feasibility and adoption of stakeholder participation in developing as well as developed countries;

(4) flexibility for use in different sites and conditions is not a characteristic 'by-design' of the PR form, neither is its use for a comprehensive evaluation of BR management performance (functional outputs and outcomes);

(5) the tool is not designed to effectively integrate into a frequent and iterative systematic evaluation process that meaningfully contributes to an adaptive management cycle; and

(6) holistic indicators balancing human and natural perspectives are largely missing as the PR formonly inquires whether 'indicators exist' without providing the relevant social ecological and economic indicators themselves.

**What's next for UNESCO biosphere reserves evaluation?**

So far there is no one international account and database of BRs' performance in achieving their conservation, sustainable development, and logistic functions that would be 'equivalent' to global reviews of performance for other models of conservation sites, such as the Global Study (Leverington et al., 2010a, 2010b) and GD-PAME for PAs. Though efforts have been made to update the PR tool and increase compliance, there are still serious pitfalls in the evaluation system of BRs management and effectiveness. Notably, there is a "lack of indicators and mechanisms to review effectiveness in BRs" (Lotze-Campen et al., 2008, p. 113) that has


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continued since 1995. Therefore, the UNESCO-MAB is one international programme that requires more focused attention to improve the rigor of its management effectiveness evaluation, and the transparency of its performance with the aim of enhancing the effectiveness of global concerted efforts toward reaching the international sustainability goals (i.e. Sustainable Development Goals).

The increasing complexity of reporting for sites with multiple overlapping designations, combined with often-limited resources available for this purpose, creates the responsibility and need to identify knowledge-sharing opportunities and synergies between programmes at the level of management and reporting (Schaaf & Clamote Rodrigues, 2016). Given the close conceptual and physical connections between PAs and BRs, and the continuing relevance of quantifying performance for PAs and BRs (Gray et al., 2016), we suggest that there is an opportunity to develop an evaluation tool (with set indicators) for management effectiveness evaluation of UNESCO BRs based on the accumulated knowledge and experience of PAME evaluation tools and their implementation.

This review identifies several gaps that need to be addressed for a more effective contribution of the UNESCO BRs to the global conservation and sustainability goals. Management effectiveness includes aspects of design, adequacy and appropriateness of management systems and processes, and delivery of objectives (Hockings et al., 2006). We argue that while the PR helps ensure the first two aspects of BR effectiveness are met, the third aspect "delivery of BR objectives" is still lacking proper evaluation. Hence, evaluation needs to more rigorously measure outputs and outcomes. For BRs, this is not limited to the conservation value but should appropriately evaluate sustainable development and logistic support outcomes as well. Therefore there is a need to develop performance-based standard indicators adapted to the BR conceptually and contextually, which will allow quantification of effectiveness. In order to develop criteria and indicators for evaluation of the sustainable development and logistic functions, there should be clear standard guidelines on the management and expectation outcomes of all three zones. Using a totally different approach, similar recommendations have been made to UNESCO based on a review of BR effectiveness in the Asia-Pacific region (Meijaard et al., 2010); a fact that consolidates our conclusions.

Moreover, PR evaluation is effective at reviewing compliance with the zoning scheme as well as making sure that plans to implement the three functions exist and are operational. However, it should not function as a stand-alone MEE tool, as it fails to adequately assess performance. BR MEE is a different type of evaluation that must be results- based, systematic and integrated into the BR management cycle. The PAME evaluation lessons provide us with transferrable criteria of effective evaluation, which can be leveraged for the creation of an innovative standardized tool for the MEE of BRs. The new tool would complement the PR by serving a different purpose. While the PR evaluates "effectiveness of concept implementation", the BR MEE tool would evaluate "effectiveness of management of the BR", and would be more practically integrated into the BR management cycle allowing for evaluation on a shorter timescale. Based on this review we argue that the new BR MEE tool needs to incorporate characteristics of improved PAME evaluation tools in order to compensate for the persisting gaps of the PR reporting system.

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