

## **Biodiversity for Sustainability: Views from the MAB Programme and its World Network of Biosphere Reserves**

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The Man and Biosphere (MAB) Programme is a United Nations Educational, Scientific and the Cultural Organization (UNESCO) natural science initiative. The heart of the programme has been the conservation of biodiversity (BD) alongside sustainable and equitable use by humans, since the early 1970s. It is an inter-governmental programme aimed at providing a scientific basis for the improvement of the human-environment relationship. The MAB programme proposes an interdisciplinary research agenda and capacity building approach that target the ecological, social and economic dimensions of BD loss and facilitate the reduction of such loss. It combines the natural and social sciences, economics and education, to improve human livelihoods and safeguard ecosystems. The MAB programme promotes innovative approaches to economic development that are socially and culturally appropriate and environmentally sustainable.

Since the 1970s, the programmes has made commitments to interdisciplinary scientific research in 14 areas (Table 1) that emphasize ecosystems ecology, human and development dimensions, conservation, and genetic resources under the general framework of sustainable development (SD). This agenda has been pursued through ecosystem and thematic research together with networking, partnership and capacity building among the World Network of Biosphere Reserves (WNBR), particularly after the early 1990s.

Table 1: MAB Projects adopted by the ICC in 1971.

1. Ecological effects of increasing human activities on tropical and sub-tropical forest ecosystems;
2. Ecological effects of different land use and management practices on temperate and Mediterranean forest landscapes;
3. Impact of human activities and land use practices on grazing lands, savannah and grasslands (from temperate to arid areas);
4. Impact of human activities on the dynamics of arid and semi-arid ecosystems, with particular attention to the effects of irrigation;
5. Ecological effects of human activities on the values and resources of lake, marshes, rivers, deltas, estuaries and coastal zones;
6. Impact of human activities on mountain and tundra ecosystems;
7. Ecology and rational use of island ecosystems;
8. Conservation of natural areas and of the genetic materials they contain;
9. Ecological assessment of pest management and fertilizer use on terrestrial and aquatic ecosystems;
10. Effects of major engineering works on humans and the human environment;
11. Ecological aspects of urban systems, with particular emphasis on energy utilization;
12. Interactions between environmental transformations and the adaptive, demographic and generic structures of human populations;
13. Perceptions of environmental quality;
14. Environmental pollution and its effects on the biosphere (added in 1974)

A biosphere reserve (BR) is a protected area and a field resource for interdisciplinary MAB work. BRs have triple functions: conservation, development and logistic support. These functions more specifically include conservation of BD as well as cultural diversity (CD), the proposal of innovative approaches to development for a sustainable future, and promotion of research, monitoring, education and training.

BR zoning in core, buffer and transitional area is intended to meet the challenges of BD management in multi-use areas with the objective of SD. To be effective, the management and decision making processes in BRs requires the involvement of all relevant stakeholders and actors in organization/governance arrangements. Recently, a new form of institutional cooperation that connects the different levels of economic and political decision making becomes visible in many countries.

Since the 1990s, BRs have been promoted as a means of implementing the goals of the Convention on Biological Diversity (CBD). These goals include preserving genetic resources, species, ecosystems and landscapes, and identifying and promoting the establishment of activities that are compatible with the goals of conservation and sustainable use through the transfer of appropriate technologies, including traditional knowledge (TK), which promote SD. Therefore, BRs may be areas where traditional lifestyles and indigenous uses of biodiversity are practiced, and/or where there are critical interactions between people and the environment. The establishment of BRs also ensures that benefits derived from the use of natural resources are equitably shared with the stakeholders.

The Madrid Action Plan (MAP) 2008-2013 was developed during the 3rd World Congress of BRs, held in Madrid, Spain in 2008. The MAP consists of 31 targets and 67 actions intended to establish BRs as key internationally-designated areas for SD in the 21st century. The MAP reiterates the critical role of BD for human well-being, strengthens interdisciplinary research and monitoring with a focus on ecosystem services, promotes participatory management and decision making with focus on dialogue building, outlines cultural dimensions of BD and sustainability, and fosters enhanced collaboration, networking, education and capacity building. An important goal of the MAP in ecosystem research is to foster collaborations in research, monitoring and sustainable management of fragile ecosystems across all major biomes: mountains, arid/semi-arid areas, mangroves, drylands, marine/coastal areas, islands, forests, wetlands and urban areas.

In the field of ecosystem services, global research previously focused on regional knowledge sharing and consequent/substantial local benefits. Participatory approaches are necessary to achieve MAP goals. Dialogue therefore plays a central role in reconciling BD conservation and development in BRs. It is imperative that this dialogue strengthens exchanges and partnerships between the research community and other actors, including those in charge of managing habitats and species.

One of the most important aspects of the MAB programme is the human element. This means that cultural dimensions of the programme must be considered. Links between BD and CD are key to BR resilience. Therefore, the integration of cultural values and perceptions of BD, as well as TK practices, are critical. The development of culturally-appropriate and sustainable BD research and management strategies are strongly required.

To meet the goals of more efficient pursuit of the MAB programme, promoting collaboration and building capacity through international, regional, sub-regional and ecosystem networking is necessary. Therefore, we state that: 1) regional and sub-regional networks have a key role to play in the exchange of information and experience among Africa, Latin America and the Caribbean, Europe and North America, Asia and the Pacific, and among the Arab states; 2) ecosystem and theme-specific networks provide valuable insights into SD models and emerging global issues such as climate change mitigation and adaptation possibilities. They include networks and research, capacity building, and educational collaborations regarding global ecosystems including mountains, drylands, coastal zones and islands, marine ecosystems, and urban areas. More specific regional/sub-regional networks include South-South and North-South-South collaboration, which are critical for the transfer and building of capacities and for advancing the BD knowledge base. Examples include South-South Cooperation on Humid Tropics (Brazil, D. R. Congo, and Indonesia), and the Jeju Initiative, which is part of the Asia-Pacific Inter-Linkage of Island and Coastal BRs for Environmental Governance and Socio-Economic Development (2006-2011).

BD and ecosystem services are central to the economic, social and cultural development of local populations through the WNBR which comprises 564 sites in 109 countries. Some opportunities are now presented by the WNBR, and these include a mosaic of ecological systems, a gradation of human interventions, strong regional identity, basic and applied research and participatory management and action for individual BRs. Internationally recognized regional and global networks of learning sites for SD are necessary to develop and test innovative approaches to achieving conservation objectives in the context of SD and to share knowledge and lessons that are learned at all levels.

After reviewing the MAB programme and BRs, we can identify some challenges that must be overcome to ensure more successful outcomes of the programme in the future. These are: increase the visibility of the MAB programme and WNBR and their achievements; improve communication within and beyond the WNBR; increase the number of case studies from the current WNBR demonstrations of the benefits of BD in alleviating poverty; harmonize the reporting from WNBR regarding the economic, social, and cultural values of BD; improve the flow of information from BRs to BD- and development-related processes on national, regional and international levels.

The use of BRs as learning sites for SD and their roles as a living laboratories, alongside improved collaboration and partnerships among private sectors in the context of green investments, will provide a new visionary paradigm against the influence of anthropogenically induced severe and global environmental stress in BD loss and subsequent unsustainable future.