

# The periodic review of biosphere reserves: a mechanism to foster sites of excellence for conservation and sustainable development<sup>☆</sup>

Martin F. Price\*

*Centre for Mountain Studies, Perth College, UHI Millennium Institute, Crieff Road, Perth PH1 2NX, UK*

## Abstract

The past three decades have seen major changes in concepts of conservation, particularly the realisation that people living around 'protected areas' should play participatory roles in their management. Since 1974, the evolving biosphere reserve concept has foreshadowed these broader changes, most recently through the introduction of a periodic review process included in the 1995 Statutory Framework for the World Network of Biosphere Reserves (WNBR). This paper briefly outlines the development of the concept and its implementation, presents the periodic review process, describes its application in the United Kingdom (UK), and concludes with some implications for the future. © 2002 Elsevier Science Ltd. All rights reserved.

*Keywords:* Biosphere reserve; Conservation; Sustainable development; United Kingdom

## 1. Introduction

In 1971, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) established its Man and the Biosphere (MAB) programme. One of its greatest successes, and its current primary focus, has been the development of the concept of biosphere reserves, implemented directly through the World Network of Biosphere Reserves (WNBR) and implicitly through the design and management of many protected areas around the world. Over the intervening three decades, there have been significant changes in concepts of conservation, in particular the growing realisation that areas of importance for the conservation of biological diversity should no longer be 'protected' from those that live around them, but that these people need to play key participatory roles in the management of these areas at the bioregional scale (e.g. Miller, 1996). As it has evolved, the biosphere reserve concept has foreshadowed such changes (Price, 1996). Most recently, the concept has come to include a process of periodic review aimed at ensuring that biosphere reserves fulfil the functions for which they were designated, again foreshadowing other initiatives, such as the periodic review of World Heritage Sites and the Task Force on Management Effectiveness of the World Commission on Protected Areas of IUCN–The World Conservation Union (Hockings et al.,

2000). This paper briefly outlines the development of the biosphere reserve concept, presents the periodic review process, describes its application in the United Kingdom (UK), and concludes with some implications for the future.

## 2. Developments in the biosphere reserve concept and the world network

The first formulation of the biosphere reserve concept was published in 1974 (UNESCO, 1974), with two major objectives: conservation and ecological research. The provision of opportunities for education and training were also important functions. Around core zones of conservation significance, buffer zones were envisaged, with a primary emphasis on the management of ecological resources (e.g. wildlife migration), as well as opportunities for "educational programmes, tourism or other purposes designed to foster appreciation of the biome" (UNESCO, 1974; p. 25) and manipulative research. A biosphere reserve—both core and buffer zones—was expected to have "adequate long-term legal protection" (UNESCO, 1974; p. 16).

Between 1976 and 1981, under this formulation of the concept, 208 biosphere reserves were designated: more than half of the current number in the WNBR. In the early 1980s, the need to strengthen links between conservation and development was stressed in both the World Conservation Strategy (IUCN/UNEP/WWF, 1980) and many papers at the First International Biosphere Reserve Congress in 1983 (McNeely and Navid, 1984). The action plan which resulted

<sup>☆</sup> This article was not part of the UNESCO/Columbia University Conference.

\* Tel.: +44-1738-877-217; fax: +44-1738-877-018.

*E-mail address:* martin.price@perth.uhi.ac.uk (M.F. Price).

from this meeting stated “People should be considered part of a biosphere reserve” (UNESCO, 1984; p. 2). By 1985, there were 239 biosphere reserves. The concept was reformulated in 1986 by the scientific advisory panel on biosphere reserves, which stated that “A primary concern of the biosphere reserve is *conservation*. . . [H]owever. . . the conservation function . . . should be viewed in a more anthropic manner, where *biosphere reserves should be demonstration sites of harmonious, long-lasting relationships between man and the natural environment*” (UNESCO, 1986; p. 69, emphasis in original). The three current functions emerged, as concerns to be combined and harmonised (UNESCO, 1986; p. 72).

- Conservation: “Biosphere reserves should help to strengthen the conservation of biological diversity, genetic resources and ecosystems”.
- Logistic (international research and monitoring): “Together, biosphere reserves should constitute a well-identified international network of areas for research and monitoring directly related to MAB field activities, making the accompanying training and information exchange”.
- Development: “Biosphere reserves should associate environment and land and water resources development in their research, education and demonstration activities”.

The other major conceptual advance was the redefinition of the outer buffer zone as a “transition area” or “zone of co-operation”, “defined by the extent of co-operation between the landowners and users of the protected area. . . [I]t is not strictly delineated and corresponds more to biogeographic than administrative limits” (UNESCO, 1986; p. 69, 73). Information deriving from experiments, research, and land management practices within the (formerly inner, now only) buffer zone should be applied in the transition area. Thus, the sphere of influence of the biosphere reserve would be expanded, and co-operative activities should be developed between “researchers, managers, and the local population, with a view to ensure appropriate planning and sustainable resource development in the region” (UNESCO, 1986; p. 73).

### 2.1. Recognising a divergence between concept and reality

In 1986, it had been suggested that, if all of the recommendations included in the 1984 action plan were carried out, “biosphere reserves might become the most important component of the world’s protected-area system” (WRI/IIED, 1986; p. 99). However, although the value of the concept was increasingly recognised in the 1980s and 1990s, and the WNBR continued to grow, there was no mechanism to encourage those responsible for biosphere reserves to ensure that they fulfilled their functions; a need already recognised particularly with regard to the logistic function by Harrison (1984).

By 1995, there were 324 sites within the WNBR. Yet, as reported by the Advisory Committee on Biosphere Reserves

in 1993, many had been proposed and approved without full consideration of their potential for achieving the objectives of even the earlier versions of the concept (UNESCO, 1993). In preparation for the International Conference on Biosphere Reserves, held in Seville in March 1995, IUCN prepared an ‘Evaluation of the Implementation of the 1984 Action Plan for Biosphere Reserves’ (IUCN, 1995). This noted that “there was no built-in way of evaluating performance and no standardised measure with which to evaluate the economic, social, and ecological progress made. Consequently, it becomes difficult to identify what constitutes ‘successful’ implementation throughout the Network as a whole” (IUCN, 1995; p. i). Nevertheless, there was a considerable gap between concept and reality; as illustrated by the following:

- “approximately 50% of biosphere reserves consist of a national park with an additional buffer or transition zone” (IUCN, 1995; p. 2);
- “the innovative, interdisciplinary, and multifunctional nature of the biosphere reserve concept presented a challenge to many traditional protected area management agencies” (IUCN, 1995; p. 4);
- “lack of proper administration reduces the ability of the biosphere reserve to function according to the principles outlined in the concept” (IUCN, 1995; p. 6);
- “within the general management structure of many biosphere reserves, there is little opportunity for (local) communities to participate in the decision-making or planning processes, and their opinions are rarely solicited” (IUCN, 1995; p. 9).

### 2.2. The periodic review process

Such findings, and the recognition that the potential of the WNBR could only be realised if its constituent sites conformed as closely as possible to the current version of the concept, were the background to the Seville conference. Two major documents resulted from this meeting (UNESCO, 1995). The first was the Seville strategy, which sets out a vision for biosphere reserves into the 21st century, and provides 92 recommendations, each with implementation indicators. The second was the Statutory Framework of the World Network of Biosphere Reserves (the Statutory Framework), which went through its final stages of drafting at the conference. Later that year, it was adopted by the MAB International Co-ordinating Council (ICC) and the General Conference of UNESCO.

The Statutory Framework provides a mechanism to encourage those responsible for managing biosphere reserves to keep ‘up-to-date’ with the evolving concept. Article 3 states that the key expression of the concept at the beginning of the 21st century is that “biosphere reserves should strive to be sites of excellence to explore and demonstrate approaches to conservation and sustainable development at a regional scale”. The periodic review process enshrined in Article 9 is a means for on-going evaluation of the degree

to which individual sites do strive to attain the goal of being such a 'site of excellence'. The process consists of the following stages:

1. the MAB Secretariat sends out a form to the concerned authority requesting a report on the status of the biosphere reserve according to the criteria in Article 4 of the Statutory Framework (i.e. existence and functioning of the full suite of zones, management policy/plan and designated authority, public participation, and programmes for research, monitoring, education, and training);
2. the concerned authority submits a report to the MAB Secretariat;
3. the Advisory Committee on Biosphere Reserves considers the report and makes a recommendation to the ICC;
4. the ICC either (a) recognises the satisfactory status or management of the biosphere reserve or (b) recommends measures to be taken to ensure conformity with the provisions of Article 4.

In practice, the recommendations of the Advisory Committee have been sent to concerned authorities by the MAB Secretariat for further action before consideration by the ICC. In some cases, this has resulted in actions on the ground which have been reported back to the Advisory Committee.

As well as the end point of the process mentioned under 4(a) above, two others are possible. First, if after a "reasonable period", the ICC finds that a biosphere reserve still does not satisfy the Article 4 criteria, it can notify the Director General of UNESCO that this area will longer be referred to as "biosphere reserve which is part of the network" (WNBR). Second, if a state recognises that a biosphere reserve under its jurisdiction does not have the potential to satisfy these criteria, it can remove it from the WNBR, notifying the MAB Secretariat. This was done in 1998 by Norway with regard to the former Northeast Svalbard Biosphere Reserve, a site of great conservation importance, but with no resident human population and therefore inappropriate for fulfilling the development function. The ultimate aim of the periodic review process is to ensure, within a reasonable period, that all members of the WNBR do fulfil the three complementary and mutually reinforcing functions of biosphere reserves, so that the reality comes to match the concept, and biosphere reserves achieve the recognition as the sites of excellence that they should be. It is realised that this may mean the loss of a number of the oldest biosphere reserves. However, given that new reserves have been designated every year since the periodic review process started, it is unlikely that the total number of members of the WNBR will decline significantly.

The periodic response form has now been sent to those responsible for the 283 biosphere reserves designated up to 1990. The types of actions taken to provide completed reports to the MAB Secretariat have included:

- completion of the form by site managers/co-ordinators;
- completion of the form by national MAB committees;
- preparation of a report by a consultant;

- participatory processes leading to wide consideration of the various issues relevant to all of the reserves in a country currently under consideration;
- proposals to the MAB Secretariat for the extension of reserves to reflect the current concept.

However, despite repeated requests for reports, a considerable number of countries have not responded; an issue considered by the Advisory Committee and recommended to the ICC for consideration at its meeting in March 2002.

### 3. The review process in the UK

The review process in the UK, described below, has not yet led to a report being submitted to the MAB Secretariat. Nevertheless, the thoroughness of the process, and the willingness of the concerned agencies to seriously consider how the concept could be effectively implemented, provides an experience which other countries—especially those with biosphere reserves designated in the early years of the concept—might wish to consider.

There are currently 13 biosphere reserves in the UK: one in Wales (Dyfi), three in England (Braunton Burrows, Moor House-Upper Teesdale, North Norfolk Coast), and nine in Scotland (Beinn Eighe, Caerlaverock, Cairnmore of Fleet, Claish Moss, Loch Druidibeg, Merrick Kells-Silver Flowe, Rum, St. Kilda, Taynish). All were designated in 1976 or 1977, almost entirely on land protected as National Nature Reserves (NNRs), the highest level of national conservation designation in the UK. As these are among the earliest biosphere reserves designated by UNESCO, the MAB Secretariat sent the periodic review form to the UK Government in 1997. In 1998, the Department of Environment, Transport and the Regions (DETR) tendered a competitive contract for a thorough review of the UK Biosphere Reserves. The principal aim of the study was to consider the application of the criteria defined in the Statutory Framework with respect to the UK, with two main objectives defined in the terms of reference:

1. to consider the concepts supporting biosphere reserves and provide advice on their relevance and value in the light of other designations across the UK;
2. to determine if there is any real wildlife gain (i.e. benefits to wildlife) to be achieved by adopting the designation in the UK and, if so, under what circumstances.

The review process began with a workshop in September 1998 which brought together 65 people from a wide range of government agencies, non-governmental organisations (NGOs), and academia to consider the MAB programme in the UK, particularly biosphere reserves. Work then started on a review of the evolution of the biosphere reserve concept, the history of the UK biosphere reserves, and a desk review of the existing sites. At a meeting to review progress on the project held in November 1998, the interagency

Steering Group for the project concluded that the second objective was too narrow, and that the report should therefore take a wider view of the benefits of biosphere reserves as “sites of excellence to explore and demonstrate approaches to conservation and sustainable development on a regional scale”, as defined in the Statutory Framework.

Further areas of background work, which contributed to the final report (Price et al., 1999) were (1) a comparison of the functions and criteria of biosphere reserves with those of UK, European, and global designations and (2) a review of the application of the Seville criteria in the UK, with an emphasis on sustainable development and the involvement of local communities. The latter work recognised that many recent speeches by government ministers and documents from the UK Government agencies had stressed the importance of partnerships based on the linkages between sustainable development and conservation. It was concluded that “Reaching agreement on (1) a management policy or plan covering a non-statutory area under a wide range of ownerships and (often overlapping) jurisdictions and (2) the resources and appropriate “authority or mechanism” to implement it would be a challenging and complex process. This has recently been shown with regard to Natura 2000 sites and is also recognised for areas of outstanding natural beauty (AONBs)—and these are statutory designations. Considerable effort would be required to ensure the long-term goodwill and resources required from a large number of stakeholders within the region—recognising that the outer boundaries of the transition area do not have to be specifically delineated. Nevertheless, there are a number of positive experiences in the UK, particularly in coastal areas, and as experiences with biosphere reserves in other countries . . . have shown, such agreements are possible and can be successfully implemented in the long-term, as long as there is broad stakeholder support and funding from a broad base of sources” (Price et al., 1999; p. 22).

### 3.1. Review of sites

In order to assess the applicability of the biosphere reserve concept to the existing UK biosphere reserves, a preliminary desk comparison was made to the criteria specified in the seven sections of Article 4 of the Statutory Framework. It was concluded about all existing sites that:

- they are “of significance for biological diversity conservation” (Section 2);
- they have “a legally constituted core area devoted to long-term protection” (Section 5(a)).

Many sites “encompass a mosaic of ecological systems representative of major biogeographic regions”, though there is rarely much of “a gradation of human interventions” (Section 1). Many have “programmes for research, monitoring, education and training” (Section 7(d)). In some cases, these programmes are implemented de facto; in others, according to strategic research plans. Very few of the existing

biosphere reserves have organisational arrangements for involvement and participation of stakeholders (Section 6). However, none has:

- a clearly identified buffer zone(s), with mechanisms for managing human use and activities (Section 5(b), Section 7(a));
- an outer transition area (Section 5(c)) and is therefore of “an appropriate size to serve the three functions of biosphere reserves” (Section 4), particularly providing “an opportunity to explore and demonstrate approaches to sustainable development on a regional scale” (Section 3);
- a management policy or plan for the area *as a biosphere reserve*, or designated authority or mechanism to implement this policy or plan (Section 7 (b,c), emphasis added).

The corollary of these findings is that if any of the existing the UK biosphere reserves are to continue as members of the WNBR, their boundaries and management will need significant changes. For two sites, however, there appears to be no possibility of restructuring to meet the criteria in Article 4 of the Statutory Framework: St. Kilda and Claish Moss. While both of these sites are of high conservation value—St. Kilda has British, European and global designations up to natural World Heritage Site, and Claish Moss is a Natura 2000 site; the absence of any local community at either site makes it impossible for it to fulfil the development functions of a biosphere reserve. Moreover, the isolation of both sites makes many of the logistic functions, such as education and training, equally difficult. Consequently, it was decided that they did not merit a site visit and could be recommended for withdrawal from the WNBR (‘delisting’) without further consideration. All of the remaining sites were visited in November and December 1998.

The principal aims of the visits were:

- to assess the extent to which the site, and activities on it, matched the Seville criteria;
- to identify existing activities, designations, initiatives, schemes, etc. on, adjacent to, or near the site which could contribute to meeting the Seville criteria;
- to evaluate existing local management structures which could contribute to meeting the Seville criteria for a re-structured biosphere reserve.

During the site visits, lasting 3 days on average, semi-structured interviews were conducted with representatives of statutory agencies concerned with the existing biosphere reserve and the surrounding area, particularly with regard to conservation and land-use planning. In addition, representatives of relevant NGOs and landowners were interviewed when appropriate. Elected officials were generally not interviewed unless they had additional responsibilities (e.g. on local or regional statutory or non-statutory bodies). Information was also obtained through the review of relevant documents and maps.

As noted above, the general conclusion was that conservation objectives are largely met at the 11 sites which were

visited, which is not surprising as not only are all Sites of Special Scientific Interest, all but one (which was de-declared in 1996) are NNRs, but all also fall (wholly or partially) under other UK and European designations. In and around many sites, sustainable resource management practices are being implemented. However, in most cases, such practices are not linked particularly closely, if at all, to the management policy of the sites currently included in the biosphere reserve. This is largely because these sites are effectively core areas, managed for conservation; in some cases, with a surrounding ‘buffer’. Nevertheless, within the regions surrounding many of the sites, there are various schemes, structures or institutions which could contribute to the effective functioning of potential buffer zones and/or transition areas. The clear conclusion is that, to function as biosphere reserves under the criteria defined in the Statutory Framework, the boundaries would need to be redefined and considerably expanded. In addition, mechanisms for local participation and inter-agency co-operation would have to be developed, appropriate management policies/plans drawn up, and resources found.

### 3.2. *Further actions*

The draft final report of the review was completed by the end of 1998. It was very slightly modified following review by the interagency Steering Group, but not published until August 1999 because of the process of devolution within the UK, which included spring elections in Scotland and Wales. One implication of devolution has been that responsibilities for the one reserve in Wales moved to the Countryside Council for Wales (CCW); and, for the nine reserves in Scotland, to Scottish Natural Heritage (SNH). In summer 2000, the DETR conducted a consultation process with these and other interested government agencies and NGOs to consider how to take forward the recommendations in the review.

At the end of 2001, the final outcomes remain unclear for a variety of reasons, including institutional change, the outbreak of foot-and-mouth disease, and the realisation that effective implementation of the biosphere reserve concept will require appropriate resources and the establishment of participatory and co-operative frameworks and management policies/plans. In Wales, CCW has expressed support for the extension of the Dyfi Biosphere Reserve, noting the need to define the optimal boundaries of the three zones and identify the resources necessary for efficient functioning. A public meeting, organised by CCW and the Dyfi Eco Valley Partnership, which brings together over 20 representatives from the public, private and NGO sectors to foster sustainable development in the wider region, was held in November 2000 to consider the potential significant expansion of the biosphere reserve and its benefits for regional sustainable development. Strong support was expressed by a local member of the Welsh Assembly.

In the area around the Branton Burrows Biosphere Reserve in England, there is growing support from the communities in the area to maintain its biosphere reserve status, and to increase its extent. Given that the other two English biosphere reserves (Moor House-Upper Teesdale, North Norfolk Coast) largely overlap AONBs, the passage of the Countryside and Rights of Way Act in July 2000 may facilitate further progress towards effective implementation, as this law increases the funding available for AONBs.

In Scotland, the Scottish Executive led a consultation, mainly with national organisations. Very few responses were received. SNH then undertook an internal review of the existing nine Scottish biosphere reserves, and recommended to its Board that Caerlaverock, Claish Moss, Rum, and St. Kilda should be delisted as biosphere reserves. At its meeting in December 2000, the Board of SNH recommended to the Scottish Executive that it should delist these sites as biosphere reserves. The remaining five sites—Beinn Eighe, Cairnmore of Fleet, Loch Druidibeg, Merrick Kells-Silver Flowe, and Tainish—should be retained as biosphere reserves, to allow further examination of options to improve their functioning as biosphere reserves, particularly in the context of the ongoing review of National Nature Reserves.

## 4. Conclusion

The value of the biosphere reserve concept is increasingly well-recognised around the world as a valuable and workable model for linking the conservation of biodiversity with sustainable development at the regional scale. In 1996, at the Montreal World Conservation Congress, UNESCO organised a workshop entitled “Biosphere Reserves—Myth or Reality” (IUCN, 1998). In his foreword to the proceedings, Adrian Phillips, then chair of IUCN’s World Commission on Protected Areas, states that the workshop showed that “biosphere reserves are an idea whose time has come”. However, as exemplified by the UK experience, the evolution of the biosphere reserve concept and, until recently, the lack of indicators and mechanisms to review effectiveness, has led to a number of sites which are biosphere reserves only in name, and not in reality. The periodic review is a critical process to identify and encourage change in such sites. This has already taken place in some countries, for instance through the expansion of the Babia Gora biosphere reserve (Poland) and the Omayed biosphere reserve (Egypt). An essential complement to this process should be an easily-accessible information system that allows those responsible for, and interested in, biosphere reserves, to assess the current status of implementation at sites around the world and to identify and benefit from relevant actions and experiences. The indicators linked to the recommendations of the Seville Strategy are a first step in this regard, but they need to be more ‘user-friendly’ and more closely linked to the periodic review process, as suggested by Price (1999)

and tested in a pilot study for sites within the EuroMAB region by Grady and Jakubowska (2000).

If the WNBR is to be a network that truly consists of “sites of excellence to explore and demonstrate approaches to conservation and sustainable development at a regional scale”, it is necessary to accept that a number of the early sites, designated when (a) biodiversity conservation and ecological research were the major objectives and (b) it was expected that the entire area of each biosphere reserve should be legally protected, may not have the potential to function as such ‘sites of excellence’ for various reasons. In the UK, this is the basis for the understanding that SNH has now come to, recognising that it may be appropriate to delist some sites, in the interest of focusing on other existing sites that have the potential to fulfil all the functions of biosphere reserves. This pragmatic approach of review and serious consideration of delisting should strengthen the value of the WNBR as a whole, and of the individual sites within it, for both biodiversity conservation and sustainable development. It is to be hoped that the periodic review process will prove a stimulus for more countries to follow this example and also provide the necessary resources for biosphere reserves which are maintained within the WNBR, so that it is a strong network that truly consists of sites of excellence, continuing to set global standards.

## References

- Grady, S., Jakubowska, J., 2000. Report on the survey for biosphere reserve co-ordinators. In: Price, M.F. (Ed.), EuroMAB 2000: Proceedings of the First Joint Meeting of EuroMAB National Committees and Biosphere Reserve Co-ordinators. DETR, Swindon, pp. 173–204.
- Harrison, J., 1984. An international data bank on biosphere reserves and the need for standardization. In: McNeely, J.A., Navid, D. (Eds.), Conservation, Science and Society. UNESCO, Paris, pp. 371–376.
- Hockings, M., Stolton, S., Dudley, N., 2000. Evaluating Effectiveness: A Framework for Assessing the Management of Protected Areas. Best Practice Protected Area Guidelines Series No. 6, IUCN, Gland and Cambridge.
- IUCN, 1995. Evaluation of the Implementation of the 1984 Action Plan for Biosphere Reserves. UNESCO, Paris.
- IUCN, 1998. Biosphere Reserves—Myth or Reality? IUCN, Gland and Cambridge.
- IUCN/UNEP/WWF, 1980. World Conservation Strategy. IUCN, Gland.
- McNeely, J.A., Navid, D. (Eds.), 1984. Conservation, Science and Society. UNESCO, Paris.
- Miller, K.R., 1996. Balancing the scales: guidelines for increasing biodiversity’s chances through bioregional management. World Resources Institute, Washington DC.
- Price, M.F., 1996. People in biosphere reserves: an evolving concept. *S. Nat. Res.* 9, 645–654.
- Price, M.F., 1999. Strategies for biosphere reserves. In: Eisto, I., Hokkanen, T.J., Öhman, M., Repola, A. (Eds.), Local Involvement and Economic Dimensions in Biosphere Reserve Activities. Publications of the Academy of Finland 7/99. Oy Edita Ab, Helsinki, pp. 106–114.
- Price, M.F., MacDonald, F., Nuttall, I., 1999. Review of the UK Biosphere Reserves. Environmental Change Unit, University of Oxford, Oxford.
- UNESCO, 1974. Final report, Task Force on Criteria and Guidelines for the Choice and Establishment of Biosphere Reserves. MAB Report Series No. 22. UNESCO, Paris.
- UNESCO, 1984. Action Plan For Biosphere Reserves. *Nat. Res.* 20 (4), 1–12.
- UNESCO, 1986. Report of the Scientific Advisory Committee on Biosphere Reserves. In: Final Report, Ninth Session, International Co-ordinating Council of the Programme on Man and the Biosphere. MAB Report Series No. 60. UNESCO, Paris, pp. 66–79.
- UNESCO, 1993. Final Report, Twelfth Session, International Coordinating Council of the Programme on Man and the Biosphere. MAB Report Series No. 63. UNESCO, Paris.
- UNESCO, 1995. The Seville Strategy and the Statutory Framework of the World Network of Biosphere Reserves. UNESCO, Paris.
- World Resources Institute/International Institute for Environment and Development (WRI/IIED), 1986. World Resources 1986. Basic Books, New York.

**Martin F. Price** is Director of the Centre for Mountain Studies at Perth College, an academic partner of the UHI Millennium Institute. He has a PhD in geography from the University of Colorado. One major focus of his research is the development and implementation of mechanisms to foster linkages between conservation and sustainable development. He is a World Heritage Technical Advisor to IUCN—The World Conservation Union, and a member of UNESCO’s, Advisory Committee on Biosphere Reserves and of IUCN’s, World Commission on Protected Areas.