

# **Guidelines for Biodiversity Assessment and Monitoring for Protected Areas**

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<http://www.darwin.gov.uk/index.htm>

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# Foreword by the Vice-Chairman, National Planning Commission of Nepal

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As we move on to the 10<sup>th</sup> Five Year Plan, a significant area of Nepal (18%) is in some form of protected area – national parks, wildlife reserves, hunting reserve and conservation areas. There is an extensive shift in protected area management approach over the period from strict protection approach to community-based conservation approach. With the changes in the management approach, protected areas management has been gradually and successfully linked to local livelihood. This is a remarkable achievement for Nepal and a demonstration of importance accorded to biodiversity conservation in Nepal.

Until recently, however, it has been difficult to monitor biodiversity in protected areas in an objective and scientifically rigorous way. Therefore, there is a growing realization on need for blending biodiversity assessment and monitoring system within a protected areas management system to achieve sound and effective management of protected areas. The present Guidelines to Biodiversity Assessment and Monitoring prepared through the practical experience in Annapurna Conservation Area should help in effective monitoring of biodiversity in protected areas. The Guidelines will be an important document for the managers of protected areas in Nepal and else where.

I would like to congratulate the King Mahendra Trust for Nature Conservation (KMTNC) and its partner organisation the UNEP- World Conservation Monitoring Centre for producing the Guidelines document and extend my appreciation to those who contributed to this document. I would also like to acknowledge the support of the Darwin Initiative of the UK Government.

Shankar P. Sharma, PhD  
Vice-Chairman  
National Planning Commission  
Singh Durbar, Kathmandu

# Foreword by the Officer-in-Charge, UNEP-World Conservation Monitoring Centre

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Biodiversity plays a central role in our lives. We depend upon plants and animal species for food, medicines and raw materials. The genetic resources contained within biodiversity hold the basis of our continued existence. The services provided by biodiversity and ecosystems helps to sustain our livelihoods and protect our health. And there is no doubt that the beauty and variety of our living species greatly improve the quality of our lives.

There has been increasing global recognition of the importance of biodiversity. The 2002 World Summit on Sustainable Development reaffirmed the critical importance of biodiversity in maintaining our wellbeing but also acknowledged that it was being lost at an alarming rate. In response, it established a target of significant reduction by 2010 in the rate of biodiversity loss, regarding this as one of the most important milestones in progress towards a sustainable future. However, overall this recognition has yet to be transformed into concrete action on the scale that will help us achieve the 2010.

The UNEP World Conservation Monitoring Centre (UNEP-WCMC) provides information on the status of the world's living resources, from plants and species to the ecosystems that house them, in order to promote better informed decision-making and support sustainable management of biodiversity. These Guidelines are a significant contribution to our goals, as they help the managers of protected areas obtain and use the biodiversity information necessary for their work. This information will help them know if their actions are being effective, to prioritise their resources, and to promote their successes.

The Guidelines are based on the practical experience of KMTNC and UNEP-WCMC in the development of a biodiversity monitoring system for the management of the Annapurna Conservation Area. They are the result of a productive collaboration and we hope that they will be of wide relevance for protected area managers throughout Nepal and beyond. I would like to acknowledge the commitment of the King Mahendra Trust for Nature Conservation to the success of this project and the support of the Darwin Initiative of the UK Government, which have made these results possible. It is only through such collaboration that we can use the expertise gained in actual practice to help implement the policies expressed at national and international level and to bring about real change that is vital to our future and that of our children.

Mr. Kaveh Zahedi  
Officer-in-Charge  
UNEP-World Conservation Monitoring Centre  
Cambridge, UK

# Foreword by the Member Secretary, King Mahendra Trust for Nature Conservation, Nepal

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The King Mahendra Trust for Nature Conservation (KMTNC) in collaboration with the United Nation's Environment Programme (UNEP)-World Conservation Monitoring Centre (WCMC) has developed 'Guidelines for Biodiversity Assessment and Monitoring for Protected Areas'. With the mission to conserve, manage and promote nature in all its diversity balancing human needs, KMTNC has been actively working in biodiversity conservation in Nepal for more than two decades. The document published in partnership with UNEP-WCMC is an initiative to contribute in effective management of protected areas in Nepal.

With the establishment of protected areas since the last three decades, Nepal has made remarkable achievements in conserving its rich biological diversity and cultural heritage. KMTNC, over the years, with support from His Majesty's Government, has developed a new and innovative concept for protected area management effectively linking conservation with local livelihood. I hope the guidelines will be a tangible tool for biodiversity assessment and monitoring in protected areas.

I praise the input of the team of KMTNC and UNEP-WCMC and wish their endeavour a success. While it is difficult to name few out of a core team, I acknowledge the effort of Dr. Siddhartha Bajra Bajracharya, Mr. Gehendra Gurung, Mr. Ram Chandra Nepal and Mr. Nawaraj Chapagain for successfully designing and implementing the Darwin Initiative funded project.

I also take this opportunity to extend my appreciation to those who contributed to this document and acknowledge the support of the Darwin Initiative of the UK Government.

Mr. Arup Rajouria  
Member Secretary  
King Mahendra Trust for Nature Conservation  
Jawalakhel, Lalitpur  
Nepal

# Introduction

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## 1.1 Background to the guidelines

These guidelines are a product of the project “Building capacity for biodiversity assessment and monitoring in Nepal”. This was a joint project between the UNEP World Conservation Monitoring Centre (UNEP-WCMC) and the King Mahendra Trust for Nature Conservation (KMTNC), and was funded by the Darwin Initiative of the UK government from 2002 to 2005. The principal goal of the Darwin project was to strengthen the capacity of KMTNC to include biodiversity information in management decisions of the Annapurna Conservation Area Project (ACAP). These guidelines have been developed through the Darwin project’s training courses and the field testing of the monitoring protocols by KMTNC staff.

The King Mahendra Trust for the Nature Conservation (KMTNC) was established in 1982 by a Legislative Act of the Parliament of Nepal, which mandated it as an autonomous, non-profit and non-governmental organisation, to work in the field of nature conservation in Nepal. KMTNC’s mission to promote, manage and conserve nature in all its diversity in Nepal is supported by the following guiding principles: (a) always maintaining a balance between human needs and the environment to guarantee long-term sustainability; (b) always seeking maximum community participation in which locals are recognised both as principle actors and beneficiaries; (c) always linking economic, environmental and ethical factors in conservation activities; (d) always managing operations based on sound economic principles and (e) always aiming for quality in all activities.

Geographically, KMTNC activities are spread from the tropical plains to the high Himalayan regions, including Trans-Himalayan regions. The Annapurna Conservation Area (ACA) is one of the major initiatives of KMTNC in the High Himalayan and the Trans-Himalayan regions.

### **Box 1.1. Annapurna Conservation Area and its importance**

Annapurna Conservation Area Project, launched in 1986, is the largest undertaking of KMTNC, and the first and largest Conservation Area in Nepal. ACA is located in the Mountain regions of the west-central Nepal at latitude 28°50’N and longitude 83°57’E (Figure 1.1). ACA covers an area of 7,629 sq. km. and is home to over 120,000 local people of different ethnic, cultural and linguistic groups. ACA is rich in biodiversity and is a treasure house for 1,226 species of plants, 38 species of orchids, 9 species of rhododendrons, 101 species of mammals, 474 species of birds, 39 species of reptiles and 22 species of amphibians. It harbours rare and endangered wildlife species such as the Snow Leopard, Musk Deer, Tibetan Argali, Impeyan Pheasant and Tragopan Pheasant.

ACA is well known internationally and in Nepal for its beautiful mountains and a unique ecology. The area is bounded to the north by the dry alpine deserts of Dolpo and Tibet, to the

*(cont.)*

### **Box 1.1. Annapurna Conservation Area and its importance (cont.)**

west by the Dhaulagiri Himal, to the east by the Marshyangdi Valley and to the south by valleys and foothills surrounding Pokhara. Some of the world's highest snow peaks over 8,000 m and the world's deepest valley of the Kali Gandaki river are in ACA. These extreme diversities have made it Nepal's most popular trekking destination with over 70,000 trekking tourists in the year 2000, which is over 62 per cent of the total trekking tourists visiting Nepal.

ACA is a new model of protected area in Nepal where local communities are involved in protected area management. KMTNC pioneered the ACA concept, realising that protected areas cannot be isolated from the people living in and around them. The sustainable use of local resources, particularly forest, remains integral both to the livelihoods of the local communities and to the conservation of biodiversity and fragile environments. The local community's role as a partner in the management of a conservation area through a Conservation Area Management Committee has been explicitly reflected in the Conservation Area Management Regulations (CAMR). The regulations authorise Conservation Area Management Committees to issue permits and collect revenues from the local community for allowing fishing, forest resource utilisation, grazing and other resources utilisation. The Conservation Area Management Committee (CAMC) is the main executive body constituted by the KMTNC-ACAP to manage the conservation area. The villagers of every ward nominate nine of the 15 members. Committees exist in all the 55 Village Development Committees of ACA and under these committees are several grassroots institutions, such as the forest management committees, mother's group, tourism management committees, electricity management committee, etc. All these institutions are responsible for executing and linking their specific activities with the conservation of natural resources.

The management of ACA is based on the participatory multi-land use protected area concept. To balance global biodiversity conservation goals and local livelihood concerns, an integrated conservation and development approach has been adopted. A Management Plan prepared in 1997 was based on eight management goals, with objectives, priority programmes and policies. These management goals were: i) to build and strengthen the institutional capacity of ACAP through human resource development; ii) to develop a long term framework for conservation of the natural resources in ACA; iii) to promote nature conservation through sustainable development of tourism; iv) to enhance the status of women by according an equal role to them in decision making processes in conservation and sustainable development; v) reduce stress on critical resources primarily forests through wider use of micro hydro electricity and other alternative programmes; vi) to promote community infrastructure development; vii) to promote cultural heritage conservation; and viii) to carry out essential multi-disciplinary management research to support conservation and development initiatives.

Figure 1.1 The location of the Annapurna Conservation Area in Nepal.

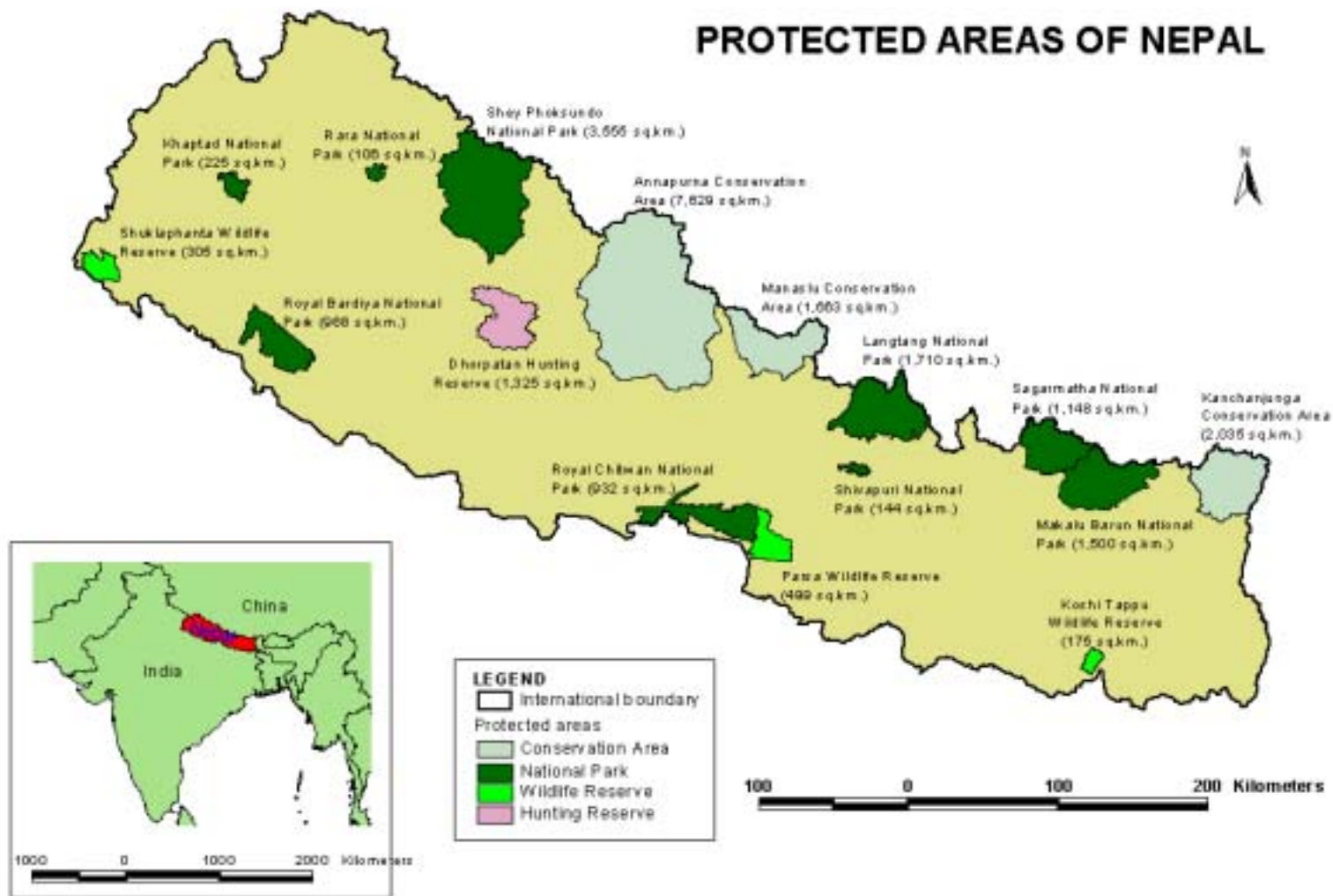
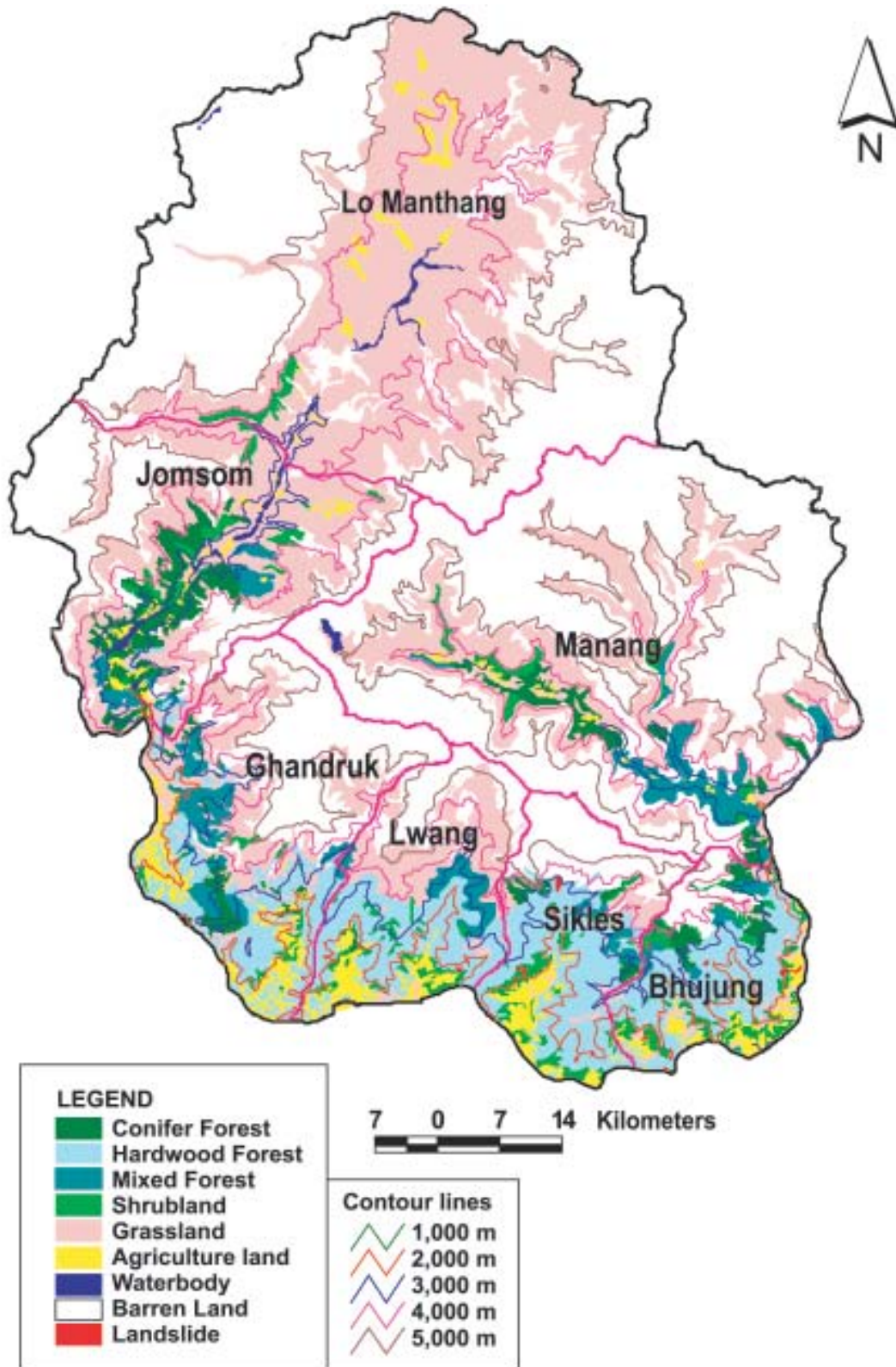


Figure 1.2 Major habitat types in the Annapurna Conservation Area



These guidelines have been developed with the management staff of the Annapurna Conservation Area Project and are designed for their use. Whilst the examples refer to the management of a mountain protected area, it is anticipated that much of the generic advice on establishing assessment and monitoring programmes will be applicable to all types of protected areas.

### **Plate 1.1 A typical landscape of Annapurna Conservation Area**



Photo: Siddhartha B. Bajracharya

## **1.2 Use of the guidelines**

Biodiversity assessment and monitoring in protected areas is normally, and most appropriately, carried out as part of a management planning process. It is therefore suggested that these guidelines are read and used in conjunction with appropriate guidance on management planning within protected areas. However, in some protected areas, management plans may not have been prepared, or may not deal with biodiversity issues in detail (such as in the ACA up to now). Some advice is therefore given in Chapter 2 on key aspects of management planning so that biodiversity assessments can be carried out and monitoring programmes established in the absence of a detailed biodiversity management plan.

An introduction to biodiversity assessments, with emphasis on participatory approaches is given in Chapter 3, however, it is beyond the scope of these guidelines to give detailed practical advice on this subject, and therefore the reader is directed to some recommended references for further information.

Chapter 4 provides guidance on the key practical considerations and decisions involved in establishing a protected area monitoring programme. This primarily focuses on issues concerned with selecting field methods and survey sampling strategies that would be carried out by trained staff or contractors. However, many of the key principles, such as those associated with sampling, may also be applicable to participatory approaches (e.g. selection of sample villages for holding interviews). The chapter includes some brief advice on statistical analysis of monitoring data, but again this subject is too large to deal with in detail here. Tables are therefore provided that give guidance on appropriate statistical tests for various situations, and sources of further information, and statistical software. These should enable readers to complete most forms of statistical analysis required for monitoring purposes.

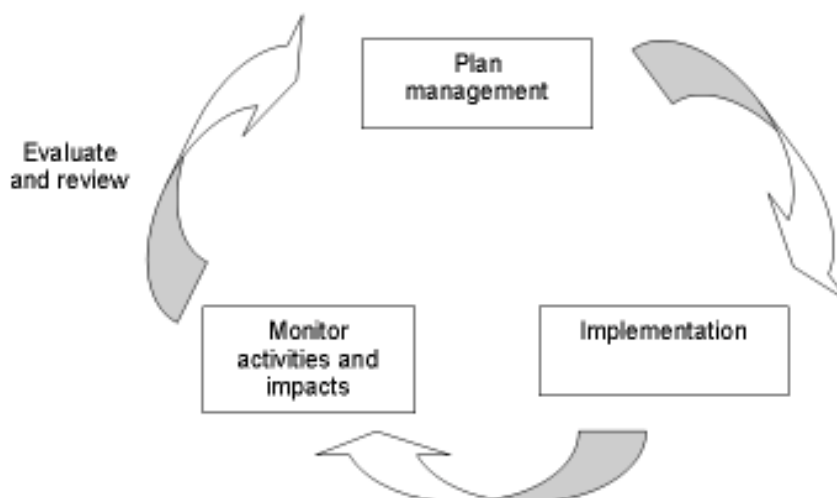
## 2. Definitions and purpose of biodiversity assessment and monitoring for protected area management

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### 2.1 Biodiversity assessment and monitoring as part of protected area management planning

One of the principle reasons for creating National Parks and other types of protected area is to conserve the special biodiversity values within them. Effective conservation of this biodiversity normally requires management actions that are best carried out within some form of management planning framework. This is most efficient if carried out as a continuous process, where plans are prepared, implemented, reviewed and revised according to their impacts as established by monitoring (see Figure 2.1).

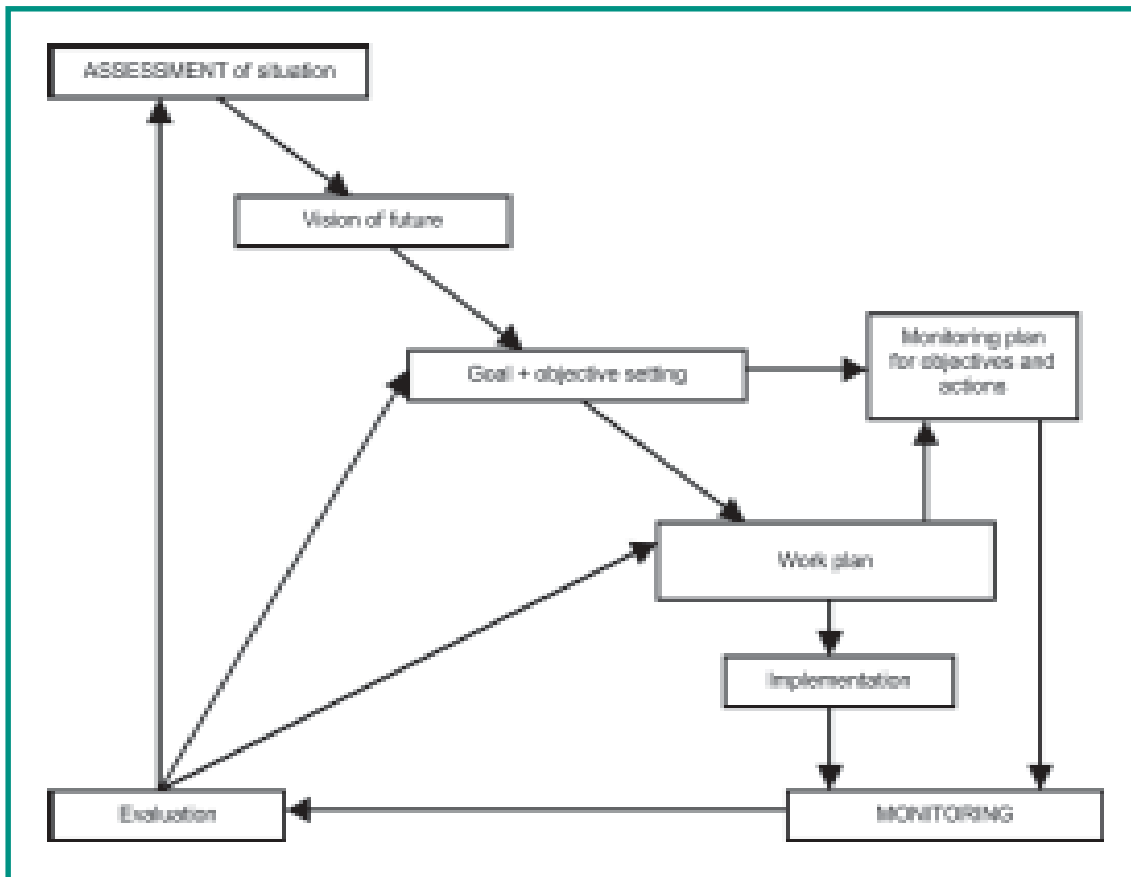
**Figure 2.1. A simplified management planning cycle**



*Source: Adapted from Thomas & Middleton 2003*

To develop an effective management plan requires an initial **assessment** of the status of biodiversity, to set the priorities and objectives for management, and then ongoing **monitoring**, to establish whether or not management actions are achieving their objectives. Biodiversity assessments, therefore, normally form key components of protected area management plans, from which monitoring strategies and programmes are identified and implemented, as depicted in Figure 2.2. The process is essentially a circular one, with periodic evaluations being carried out to assess progress in the implementation of actions and the achievement of objectives. Over the long-term the monitoring data should also be used to re-evaluate the most recent biodiversity assessment to ensure that decisions are based on the best and most up-to-date information.

**Figure 2.2. Biodiversity assessment and monitoring within a management planning cycle**



Four key principles for effective management planning have been identified by Hockings *et al.* (2001):

1. The plan should have conceptual rigour as a decision making framework. This framework should provide:
  - a clear sense of a desired future for the area;
  - a set of strategies and actions for achieving this future;
  - clear guidance that can assist managers dealing with opportunities and eventualities that arise during the life of the plan;
  - a basis for monitoring of plan implementation and progress towards the desired future and adjustment of planning strategies and actions as required.
2. The plan should place the management of the area into a relevant environmental, social and economic planning context. Where possible, planning decisions should be integrated into this broader planning framework.
3. The content of the plan should be formulated within an adequate and relevant information base and should place management issues within a broader context and in relation to the desired future for the area: the needs and interests of any local and indigenous communities and other stakeholders should have been considered within the plan.
4. The plan should provide a programme and prioritised set of actions for achieving the desired future for the area.

Protected areas cannot remain in isolation from the communities and the economic activities in and around protected area. As noted in point 3, plans should address the needs of local communities and other stakeholders. The V<sup>th</sup> IUCN World Park Congress held in Durban, South Africa has also emphasised on the rights of local communities in relation to natural resources and biodiversity conservation. Participatory management approaches,<sup>1</sup> such as where "*two or more social actors negotiate, define and guarantee amongst themselves a fair sharing of the management functions, entitlements and responsibilities for a given territory, area or set of natural resources*" (Borrini-Feyerabend *et al.* 2000) should therefore be used wherever appropriate. At the very least management planning should involve adequate consultations with all stakeholders.

Management plans for protected areas are typically prepared following a logically ordered sequence as summarised below (based on the IUCN Guidelines prepared by Thomas and Middleton 2003).

1. Pre-planning phase (appointment of planning team, scoping of task, agreement on the process to be followed).
2. Data gathering and review.
3. Evaluation of data and resource information.
4. Identification of constraints, opportunities and threats.
5. Development of overall long-term vision for the protected area and specific objectives.
6. Development of options for achieving the vision and objectives (including zoning if appropriate).
7. Preparation of a draft management plan.
8. Public consultation on the draft management plan.
9. Assessment of submissions, revisions of draft management plan, production of final management plan and reports on consultation process.
10. Approval / endorsement of management plan.
11. Implementation of actions identified within the management plan.
12. Monitoring and evaluation of implementation and impacts of the management plan.
13. Review and update of the management plan.

In practice some of these steps may be carried out iteratively (i.e. by going back and forth). For example, collation of data on the protected area (Step 2) may be influenced by an evaluation of what features are of particular value (Step 3). The proposed sequence also suggests that consultations are carried out at Stage 8. However, we recommend that consultations start at Stage 1 and should involve community participation at Stages 2, 3, 4, 5 and 6 to ensure that the plan is adequately researched and that it deals with the interests of all stakeholders.

It is important to note that the proposed sequence is circular, such that Stage 13 is a review and up-date of the management plan. This facilitates adaptive management. The key rationale for adaptive management of biodiversity is the recognition that our knowledge of ecological

<sup>1</sup> Also known as co-management, collaborative, joint, mixed, multi-party or round-table management.

relationships is incomplete and, therefore, the management of natural resources is always experimental. It therefore aims to improve our management effectiveness by studying the impacts of implemented activities and learning from these. Adaptive management therefore explicitly states objectives (and hypotheses on how they are to be achieved), monitoring requirements and evaluation methods, and then adjusts and improves actions according to the results obtained and lessons learnt. See BC Forest Service at <http://www.for.gov.bc.ca/hfp/amhome/introgd/toc.htm> and the website of Foundations of Success <http://www.fosonline.org/Resources.cfm> for further guidance on adaptive management.

There are a large number of suggested contents, structures and formats for protected area management plans (e.g. Ramsar Bureau 2002), but there is actually considerable similarity amongst them. According to Thomas and Middleton (2003) the most commonly found contents of a management plan include:

- Executive summary.
- Introduction (e.g. purpose and scope of plan, reason for designation of protected area and authority for plan).
- Description of the protected area.
- Evaluation of the protected area.
- Analysis of issues and problems.
- Vision and objectives.
- Zoning plan (if appropriate).
- Management actions (list of agreed actions, identifying schedule of work, responsibilities, priorities, costs and other required resources).
- Monitoring and review.

In Nepal a national framework for management plans has been agreed, which is summarised in Box 2.2.

**Box 2.2. A national framework for management plans**

|                                   |  |
|-----------------------------------|--|
| 1. Executive summary              |  |
| 2. Introduction and background    | Introduction, statement of significance, description of protected area, legislation and policies, present practices          |
| 3. Rationale of a management plan | Goals and objectives, vision and mission statement, guiding policies, management approaches and logical framework of outputs |
| 4. Park management                | Management zones, management issues, strategies and actions  |
| 5. Buffer zone management         | Management zones, management issues, strategies and actions  |
| 6. Budget and action programmes   | Budget summary, park and buffer management activities and budget schedule for 5 years  |

## 2.2 What is a biodiversity assessment?

Biodiversity assessment is the first stage in the process of defining the biodiversity management objectives for an area. Its purpose is to gather and assess the information required to make decisions and recommendations for the future.

In the context of management planning for a protected area a biodiversity assessment involves measuring or surveying what exists in the area and what is known about it, judging its value and identifying the most important features (e.g. grasslands for livestock grazing, timber for fuel and building materials, medicinal plants, water storage functions and habitats and species of particular conservation concern). Assessments therefore need to involve a social component that identifies biodiversity features of high socio-economic value, as well as features of high aesthetic, cultural or intrinsic value. Assessments also typically include identification of the principal factors affecting the important biodiversity features within the protected area (e.g. the dependency of top level predators, such as a Snow Leopard *Uncia uncia*, on its prey species, or the impacts of fuel wood collection on forest regeneration).

## 2.3 What is monitoring?

Monitoring is often thought of as a programme of repeated surveys or measurements, usually by means of a standardised procedure. However, this is merely surveillance if there is no predetermined objective or value that guides what the findings ought to be. For example, daily measurements of rainfall are a type of surveillance. It is more appropriate for protected area management needs to define monitoring more rigorously as: *"the collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective"* (Elzinga et al. 2001).

Thus, in the context of protected area management needs, monitoring is carried out to determine if biodiversity conservation, livelihood enhancement and other objectives are being met, such as the maintenance of the existing area of a particular habitat or a specified number of a particular species, or development of a community woodlot to reduce impact on natural forests. It is better to think of monitoring in this more precise way, because it helps to ensure that protected area monitoring programmes and their methods are focused on protected area objectives, and so support their achievement. Thus, a protected area monitoring programme has a specific purpose, tied to objectives that have already been defined.

Monitoring should not attempt to describe the general ecology of a site or measure things that may merely be of interest. Unfortunately, monitoring schemes often resort to measuring a wide variety of variables, which may or may not be related to the protected area objectives and management questions that need to be addressed. As a result, time and money may be spent collecting unnecessary data. Even worse, it may be found that key management questions cannot be answered with the information obtained.

Nor should monitoring programmes be confused with research studies that are designed to establish why something is happening (i.e. to test a hypothesis). Many of the field methods and scientific principles of biodiversity assessment and monitoring can be used in research, but their purpose is different. In particular, research may often need to be more detailed, sensitive and scientifically rigorous than required for many monitoring purposes. For example, it may be adequate to monitor vulture numbers by occasional counts of soaring birds. This may establish if population trends are meeting conservation objectives, but will

not reveal the factors determining population size. To establish what influences population size would require much more time consuming, difficult and costly studies. These would probably not be necessary if, according to monitoring data, populations appear 'healthy' and conservation objectives are being met. However, such detailed research could be triggered if monitoring data reveal a decline below a preset warning level (which should be above the conservation objective population level).

In practice, monitoring data may sometimes be of use for research work. For example, if it is necessary to measure livestock and vulture numbers within the same area, then it may be possible to examine if vulture numbers are affected by livestock numbers (by correlation analysis). However, such fortuitous use of monitoring data should not influence monitoring designs. Instead monitoring and research requirements should be designed separately and then if there is overlap between requirements (e.g. both need the same data on livestock numbers) then they may be combined.

### **Plate 3.1 A female Cheer Pheasant**



Photo: Raju Acharya