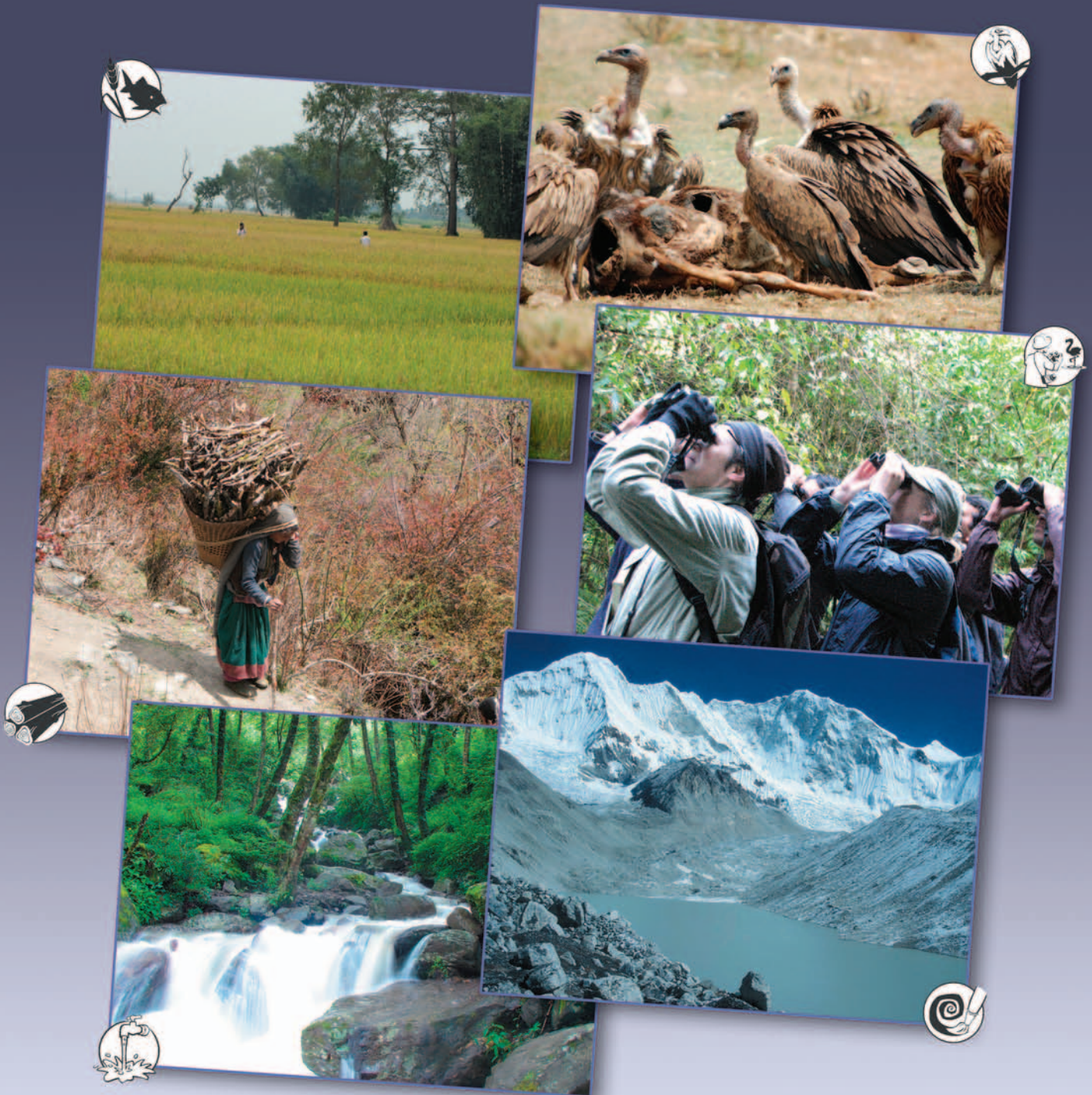


CONSERVING BIODIVERSITY & DELIVERING ECOSYSTEM SERVICES at Important Bird Areas in Nepal



What this report is about and why it is important

This report presents the results of a study which has helped to test a new practical 'toolkit' for assessing ecosystem services at the site-scale. The methods used are accessible to non-experts and deliver scientifically robust results.

It is the first example of applying this approach to a network of sites important for biodiversity conservation in one country—Nepal—and analysing the results in relation to decision-making at both the local and national scales.

It is designed to help decision-makers recognise the value of ecosystem services more fully, leading to a more sustainable future, in which the benefits from ecosystem services are better realised and more equitably distributed. Bird Conservation Nepal has led the study and intend to build on the work it is presenting here, specifically by advocating for the inclusion of ecosystem values in land use policy, planning and management in Nepal, and undertaking actions that more effectively conserve biodiversity and reduce poverty at Important Bird Areas.

Research and Compilation Team: Jenny Birch, Hum Gurung, Alison Stattersfield, Ishana Thapa and David Thomas

Edited by: Martin Jenkins

Recommended citation: BCN and DNPWC (2012) *Conserving biodiversity and delivering ecosystem services at Important Bird Areas in Nepal*. Kathmandu and Cambridge, UK: Bird Conservation Nepal, Department of National Parks and Wildlife Conservation, and BirdLife International

Published by: Bird Conservation Nepal, PO Box 12465, Lazimpat, Kathmandu, Nepal, Department of National Parks and Wildlife Conservation, PO Box 860, Kathmandu, Nepal and BirdLife International, Wellbrook Court, Girton Road, Cambridge CB3 0NA, UK

Designed by: NatureBureau, www.naturebureau.co.uk

Printed by: Print Communication, Kathmandu

ISBN: 978-0-946888-83-2

© BCN and DNPWC, 2012

Cover photo credits: Andy Graham, David Thomas, TheDreamSky/flickr.com, Mathias Zehring, JyotendraJyu Thakuri, ©Jan Sasse for TEEB

Contents

2	Overview
4	Key recommendations
6	Ecosystem services and human well-being
8	Ecosystem services and decision-making
10	Ecosystem services and biodiversity
12	Nepal's natural habitats and the ecosystem services they provide
14	Important Bird Areas as centres of biodiversity and providers of ecosystem services
16	The status of Nepal's Important Bird Areas and the ecosystem services they provide
18	Pressures on ecosystem services
20	Changes to ecosystem services
22	National and local planning
24	Policy sectors
24	Protected areas
24	Forests
25	Grasslands
25	Wetlands
26	High mountains
26	Water management
27	Tourism and recreation
27	Climate change
28	Case studies
28	Shivapuri Nagarjun National Park
29	Koshi Tappu Wildlife Reserve
30	Rara National Park
31	Phulchoki Mountain Forests
32	Appendix 1: Map of IBAs and selected data
34	Appendix 2: Scientific methods
36	Appendix 3: International environmental conventions

Acknowledgements

This project would not have been possible without guidance from the Department of National Parks and Wildlife Conservation (DNPWC). Special thanks go to Mr Krishna Prasad Acharya, Director General and Dr Maheshwar Dhakal, Ecologist. We are also grateful to Mr Sagar Rimal, Under Secretary and Mr Prakash Lamsal, Joint Secretary at the Ministry of Forests and Soil Conservation. We would like to thank Mr Top Khatri and Ms Shalu Adhikari from the Conservation and Sustainable Use of Wetlands in Nepal project, Mr Biju Kumar Shrestha, National Planning Commission, Mr Prakash Nath Pyakurel, Department of Forest and Mr Kamal Jung Kunwar, DNPWC for their highly valuable comments on the draft report, and we acknowledge the policy guidance given by Mr Yuba Raj Bhusal, Member Secretary, National Planning Commission and Dr Krishna Chandra Paudel, Secretary, Ministry of Forests and Soil Conservation. We are grateful to all the participants from various organisations who contributed their time and knowledge to the expert consultation workshop in Kathmandu and to the Important Bird Area monitoring workshop in Chitwan.

We thank Mr Gopal Prakash Bhattarai, Chief Warden, Shivapuri Nagarjun National Park, Mr Ashok Ram, Warden, Koshi Tappu Wildlife Reserve and Mr Durga Poudel, Warden, Rara National Park for their advice and assistance during the field work. Similar support was provided by Mr Bal Mukunda Ghimire, President, Federation of Community Forestry Users, Lalitpur district. Also to all the community members at these sites who took part in various stakeholder workshops. We are also grateful to all who have worked with us to collect the data, both in the field and via desk research, especially Mr Bhogendra Rayamajhi, Mr Chandra Chaudhary, Mr Manoj Sah, Ms Rama Silwal and Mr Bhola Dhaka, and to those from the local communities who helped us with the household surveys and carbon transects, especially Tul Bahadur Malla, Surya Bahadur Karki and Darja Bahadur Sinjuwala, who undertook over 250 surveys in the vicinity of Rara National Park.

We warmly thank BCN staff Meneka Basnyat, Jyotendra Jyu Thakuri and Ravi Shankar Pandit who have been closely engaged and contributed to many activities of the project. Their dedication and commitment made it possible to undertake the field work efficiently and effectively. We also thank BirdLife Secretariat colleagues for their advice and contributions during the project and in the development of the draft report including: Stu Butchart, Mike Evans, Lincoln Fishpool, Carolina Hazin, Mel Heath, Donal McCarthy and Rob Munroe. The results of this work were presented at a training workshop in Singapore in May 2012, and we thank our BirdLife Asian Secretariat colleagues, Cristi Nozawa and Mike Crosby, for helping to facilitate this, the BirdLife Cambodia and Vietnam country programmes who tested the methods and the Asian BirdLife Partners who gave us invaluable feedback and insights from their experiences of similar work in their own countries.

An essential contribution has been the support of UK collaborators involved in the development of the 'toolkit' of methods for assessing ecosystem services, which was part of a Cambridge Conservation Initiative project, and we therefore acknowledge considerable input from Andrew Balmford and Kelvin Peh, Cambridge University, Richard Bradbury, RSPB, Claire Brown and Matt Walpole, UNEP-WCMC, Francine Hughes, Anglia Ruskin University, and Mark Mulligan and Bhopal Pandey, Kings College London.

Finally, BCN and BirdLife International are very grateful to the Darwin Initiative for selecting this project for funding, which has enabled us to pioneer a new approach to our conservation efforts in Nepal, and which we hope will serve as a model more widely.



Government of Nepal
Ministry of Forests and Soil Conservation

Ref. No.

Tel: { 4220667
4224892
4262428
4224864
4223862
Fax: 4223868

P.O. Box No. 3978
Singha Durbar, Kathmandu
Date:-

Foreword

Nepal is rich in biodiversity and ecosystem services due to its diverse topography, landscapes and climatic variations. The economic, health and social benefits that we derive from our ecosystem services are vital for the well-being of many Nepalis. This is particularly so for poor communities whose livelihoods depend on natural habitats.

The Government has long recognised the importance of ecosystem services and, since the early 1970s, has developed national laws, policies and plans for the sustainable conservation of its natural resources, and established a network of Protected Areas and Community Forests.

Despite these efforts, there has been a big decline in biodiversity as a result of human pressures and encroachment. It is clear that a more integrated approach to ecosystem management is needed, so that more effective decisions can be made to reduce pressures, conserve biodiversity and enhance the benefits that people receive from nature.

Our local and national decision-makers need to be informed about the relevance of biodiversity and ecosystem services when considering the management of our protected area system, natural habitats and water resources, the expansion of our tourism industry and plans for climate change adaptation.

This report is an important milestone in improving our understanding of ecosystem services in Nepal, based on an assessment of the ecosystem services at 27 Important Bird Areas, spread across the country. It is a 'must read' report for decision-makers at all levels as it explains the concepts and results clearly, and provides interpretation and recommendations across a number of policy sectors and detailed case studies for four key sites.

I am confident that we can use this work for better policy formulation and site management, improving the livelihoods of people, meeting Nepal's international commitments to biodiversity conservation and climate change mitigation and adaptation, and ensuring a more sustainable future.

Dr Krishna Chandra Paudel
Secretary
Ministry of Forests and Soil Conservation

Overview

The report describes the relationship between ecosystem services and human well-being, explains the importance of ecosystem services for decision-makers, and explores the links with biodiversity. It provides an introduction to Nepal's natural habitats and the ecosystem services that they provide at a broad scale, as well as national and local planning which sets the context for land-use. The study presented here focused its work at 27 Important Bird Areas which are sites that help to maintain biodiversity and deliver a range of other important ecosystem services. The report discusses the state of these sites, the pressures upon them, the changes that will happen if these continue, and the consequences for people. The results are interpreted in relation to a number of policy sectors and key recommendations are put forward that take better account of the value of ecosystem services.

Art work by Esther Tyson

In May and June 2012, Esther Tyson, a British artist collaborating with BirdLife, worked alongside Bird Conservation Nepal, recording in pen and ink sketches, scenes of people and nature, before holding an exhibition of her work in Kathmandu.

Top right: Boys fishing with bamboo canes, using wild bait scraped from beneath nearby rocks. Fish provide an important source of protein to local and indigenous communities.

Bottom right: Throughout the region water is a critical resource for people. Here a woman is using sticks to agitate and then washing wool in a trough fed by a natural spring.

Ecosystems and the services they deliver underpin our very existence. We depend on ecosystem services to produce our food, regulate our water supplies and climate, and protect us from extreme weather. We also value them in less obvious ways: contact with nature can contribute to spiritual experience, provide recreational enjoyment and is known to have a positive impact on long-term health and happiness.

Despite their importance, ecosystem services are consistently undervalued in conventional economic analyses and decisions. In Nepal, the majority of the population lives in rural areas and derives its livelihood directly from ecosystems services. Understanding, assessing and monitoring ecosystem services can lead to better policy formulation, resulting in land-use and management options that deliver more effective conservation, resilient livelihoods and poverty reduction.

The continued delivery of ecosystem services depends on the integrity of the ecosystems supplying those services and this in turn depends on the maintenance of biodiversity. Declines in biodiversity, such as those taking place in Nepal and globally, are resulting in the reduction and degradation of ecosystem services. Birds, which are involved in many ecosystem functions, can be considered as important indicators of the general state of ecosystem health.

Nepal is richly endowed with a variety of natural ecosystems that provide invaluable ecosystem services to local people and to the nation as a whole. Forests, grasslands, wetlands and the high mountains are all important habitats for Nepal's spectacular wildlife, appreciated by people everywhere and provide a range of ecosystem services which are integral to the livelihoods of local communities.

Twenty-seven areas have been identified as 'Important Bird Areas'—places that help to maintain biodiversity and deliver a range of other important ecosystem services. Nepal's Important Bird Areas can tell us a lot about the state of biodiversity across the country, and how habitats and ecological systems are linked to the provision of services, and to whom, and so can inform both site and landscape-scale decision-making.

Nearly half of Nepal's Important Bird Areas are considered to be in a very unfavourable state, with the condition of most of these worsening as pressures on them increase. The pressures on Important Bird Areas are affecting their ability to continue delivering ecosystem services. Some services, such as recreation and tourism, are being delivered well, but others are not, or are in decline.

Pressures affecting Nepal's Important Bird Areas include human disturbance, conversion of land for agriculture, overexploitation of resources and climate change. Across the network of Important Bird Areas, the area of forest and grasslands, and the quality of wetlands, are expected to decrease if current pressures and trends continue.

Changes in the delivery of ecosystem services often entail trade-offs between different services or groups of people that benefit from the services, or with the conservation of important biodiversity. Changes that have positive impacts on some people may have negative impacts on others, or threaten the survival of certain species. Overall, the changes predicted to occur in the foreseeable future will have the biggest negative impact on the poorest rural communities.

The challenge is to ensure that the true value of ecosystem services becomes fully incorporated into decision-making at all levels. Management actions taken and policy decisions made now will have implications far into the future for biodiversity, ecosystem services and human well-being. It is important that the consequences are understood, so that the country's natural ecosystems can continue to deliver benefits for its people into the future.



Key recommendations

Key

These recommendations are put forward for consideration by conservation NGOs, like Bird Conservation Nepal, working in collaboration with the Government of Nepal and local communities. They have been developed in consultation with the many stakeholders involved in the project, within the context of Nepal's national laws, policies and plans, and reflecting obligations to international environmental conventions. They are intended to reflect the scientific results of this study, in a policy-relevant way, and to have potential for practical application and tangible outcomes.

Top right: A woman carefully plants rows of cabbages in her small field. Depending on soil fertility throughout the valleys, a wide range of root and other crops are grown, often in garden plots.

Bottom right: Bamboo is a natural resource widely harvested for use in building and weaving, and here an elderly man is shaping flexible bamboo whips for use in matting and fencing.

For protected areas

- Examine the distribution of ecosystem service benefits, and establish ecosystem service-based development initiatives that maximise and re-distribute benefits in ways that are equitable for the local communities, reduce pressures on biodiversity and incentivise conservation
- Develop community-NGO-Park Authority collaborations to ensure monitoring of biodiversity and ecosystem services, in order to report on trends and management effectiveness

For forests

- Establish 'green enterprises' and other sustainable livelihood options to minimise the pressures
- Work with community Forest User Groups to improve the sustainable management and local governance of forest resources for the benefit of both people and wildlife
- Work with local communities to restore natural forest, develop native species plantations for local needs and discourage illegal logging of timber
- Apply appropriate biodiversity and social safeguards to national REDD+ activities

For grasslands

- Raise awareness of policy- and decision-makers of the importance of grasslands for biodiversity and ecosystem services, and the benefits to poor communities
- Engage in / stimulate dialogue on the formulation of national policies for grasslands, covering both protected and non-protected areas, in the mountains and Terai, that take account of conservation of biodiversity and delivery of ecosystem services to poor people
- Support local communities in the sustainable management of grasslands for the benefit of both people and biodiversity, providing technical support and building their skills

For wetlands

- Raise awareness through the CEPA Strategy and Dissemination Framework (2011–2015, DNPWC) of policy- and decision-makers of the value of wetlands for biodiversity and ecosystem services, and the benefits to poor communities
- Support wetland-dependent indigenous communities in the sustainable management of wetland resources for the benefit of both people and biodiversity, providing technical support (e.g. CSUWN's Wetlands Economic Valuation Tool, and Wetland Inventory, Assessment and Monitoring framework) and building their skills
- Promote sustainable wetland-based tourism and recreation with a focus on wildlife/ birdwatching activities, ensuring that benefits are captured locally

For high mountains

- Contribute to the development of the Mountain Initiative, specifically through work / projects at high mountain sites that conserve biodiversity, maintain ecosystem services and help mountain communities build resilience to climate change
- Promote sustainable mountain tourism, with a focus on managed wildlife activities, minimising disturbance and ensuring that benefits are captured locally

For water

- Explore the opportunities for sharing the benefits of providing / regulating / purifying water more fairly through mechanisms such as 'Payments for Ecosystem Services' between upstream providers and downstream users
- At appropriate sites, explore the opportunities for developing integrated use of water resources (e.g., irrigation, drinking water, micro hydroelectricity), conservation of biodiversity and climate change adaption, ensuring that benefits are captured locally

For tourism and recreation

- Consider how increased tourism might impact on Nepal's protected areas and other sites important for biodiversity conservation, and work with the Nepal Tourism Board to develop a strategy that invests more of the revenue generated (entry fees) for the conservation and management of the respective areas, ensuring that expansion is sustainable and does not compromise important biodiversity and ecosystem services
- At selected sites, develop low impact nature-based activities that provide income to local communities (local guides, local accommodation etc.)

For climate change

- Provide support to vulnerable communities for ecosystem-based approaches for adaptation, linked to Local Adaptation Plans of Actions, demonstrating the values of using and conserving biodiversity and ecosystems to help people adapt to climate change impacts
- Coordinate and collaborate with the concerned Government ministries and departments, and the 'REDD Cell', to implement REDD-related activities

At some sites

- At Shivapuri Nagarjun National Park IBA, establish a buffer zone to share the economic benefits of the park more fairly with the local communities
- At Koshi Tappu Wildlife Reserve and Barrage IBA, develop sustainable alternative livelihoods such as fisheries with a focus on indigenous minorities, thereby reducing pressures on threatened wetland and grassland wildlife
- At Phulchoki Mountain Forests IBA, improve the recreational infrastructure around the forest, so that the Forest User Groups can capture the benefits from tourism more effectively to encourage / reward sustainable management of the forest resources
- At Rara National Park IBA, restore community forestry to empower local communities to manage the buffer zone sustainably and reduce illegal logging and degradation inside the core zone
- For Tamur and Mai Valleys, and Phulchoki Mountain Forests, explore the possibility of establishing Conservation Areas that retains the rights of the local community Forest User Groups, and allows income generation from well managed tourism
- For the Farmlands of Lumbini, including the Khadara Phanta grasslands, explore options for better protection



Ecosystems and the services they deliver underpin our very existence

We depend on ecosystem services to produce our food, regulate our water supplies and climate, and protect us from extreme weather. We also value them in less obvious ways: contact with nature can contribute to spiritual experience, provide recreational enjoyment and is known to have a positive impact on long-term health and happiness.

What are ecosystem services?

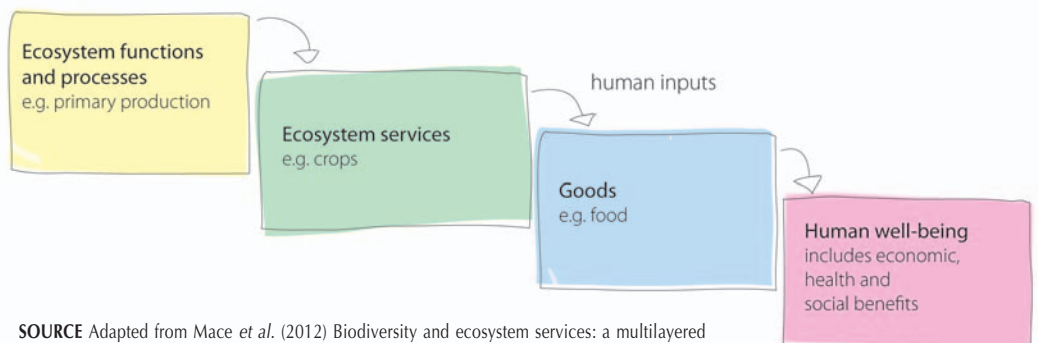
Ecosystem services are the benefits that people receive from nature—for example the provision of crops and the regulation of climate as well as opportunities for cultural, spiritual and recreational experiences.

A number of ecological and environmental processes and functions, such as soil formation and nutrient cycling, underpin the ability of an ecosystem to deliver services which result in 'goods' that are valued by people. The economic, health and social benefits that we derive from ecosystem services are vital for human well-being (see figure).

For example, primary production of the cereal grain rice delivers an ecosystem service in the form of a crop but, before it can be consumed, other human inputs (cultivation, harvesting, threshing, transport) are also required, resulting in the production of a 'good' (in this case food). Rice is a highly valued 'good' as it is the most important staple food for much of the world's population, and makes an important contribution to many local and national economies.

Some goods, such as rice, are traded in markets and so are easy to measure and value. Others, such as pest regulation and aesthetic beauty, are non-market based and less easily measured and valued.

Conceptual framework of ecosystem services














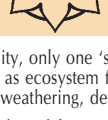


SOURCE Adapted from Mace *et al.* (2012) Biodiversity and ecosystem services: a multilayered relationship. *Trends in Ecology and Evolution* 27(1): 19–26.

Rice is the most important staple food for a large number of Nepalese people, and makes an important contribution to both local livelihoods and the national economy through exports (Andy Graham)



Different types of ecosystem services

Supporting		Maintenance of genetic diversity	Ecosystems are the source of genetic diversity from which a variety of commercial species can be developed. In Nepal, genetic diversity of crops increases production and decreases susceptibility to pests and climate variation.
Provisioning		Cultivated food Harvested wild food	In Nepal, the basic cereal crop on which almost all of the population relies is rice, a cultivated food. There are also over 440 species harvested as wild foods, including mushrooms and edible ferns.
		Raw materials	Timber (a fibre) and fuelwood (an energy source) are hugely important for the Nepali rural population. The Himalayan Giant Nettle is widely used throughout the mountainous regions of Nepal as a source of fibre (puwa) for weaving ropes, thread, porter's tumplines, mats, sacks, and bhangra (traditional Gurung clothing).
		Natural medicines	Many communities use natural medicines to treat ailments. Tibetan natural medicine practitioners called 'amchis' and their medical system is commonly practiced in the mountainous regions of Nepal.
		Water flows	Water is vital to sustain life, and is needed for domestic use, drinking and irrigation. Due to its position in the Himalayas, the mountains of Nepal produce important water flows for the country and beyond.
	Regulating		Local climate and air quality regulation
		Global climate regulation	Forests contribute to regulating the global climate through sequestration of greenhouse gases (CO₂, NO₂, CH₄) and storage of carbon. In Nepal, over 40% of the area is forested and so the country makes a major contribution to this important service.
		Water purification and waste treatment	Good water quality as a result of natural water purification processes provides safe drinking water and waste treatment. This is important in maintaining healthy ecosystems, protecting species and human health.
		Erosion control	Forests can help to prevent or control movement of materials from a surface to another location as a result of wind or water. Although erosion is often a natural process and can also have benefits, there is evidence across many hill slopes in Nepal that erosion is leading to water pollution and soil loss.
		Reducing the impact of weather events	Ecosystems can help to buffer against negative impacts from weather events and can help people adapt to the impacts of climate variability and change, e.g. by providing protection from storms and flooding. The forested Churia hills help to protect the lowland areas from flooding.
		Biological control	Regulation of pests and vector-borne diseases is an important benefit that we take for granted. In Nepal, waste disposal by vultures helps to reduce populations of pests and reduces the risk of diseases spreading.
Cultural			Nature-based recreation/ tourism
		Aesthetic benefits / inspiration / mental health	Ecosystems can provide aesthetic beauty and mental / intellectual stimulation that lift the human spirit. The beauty of Phoksundo Lake in Shey Phoksundo National Park and Rara Lake in Rara National Park appeal to Nepali people regardless of whether they are able to visit these remote sites.
		Spiritual / religious experience	Ecosystems play an important role in cultural and spiritual traditions and in providing religious and spiritual solace for people. The Goshainkunda Lake in Langtang National Park is visited by many pilgrims from various parts of the country in the Janai purnima festival.

For simplicity, only one 'supporting' service is shown here as it was specifically referred to in the expert consultation. Other services are not included because in this framework they are considered as ecosystem functions and processes (see figure opposite) which underpin all of the above services. These functions and processes include: pollination, nutrient cycling, soil formation, weathering, decomposition, primary production (the process by which plants use sunlight to convert inorganic matter into new biological tissue), and many more.

SOURCE Adapted from TEEB (2010) *The Economics of Ecosystems and Biodiversity: ecological and economic foundations*. London and Washington: Earthscan.

Despite their importance, ecosystem services are consistently undervalued in conventional economic analyses and decisions

In Nepal, the majority of the population lives in rural areas and derives its livelihood directly from ecosystems services. Understanding, assessing and monitoring ecosystem services can lead to better policy formulation, resulting in management that delivers more effective conservation, resilient livelihoods and poverty reduction.

Why are ecosystem services important?

In Nepal, the majority of the population derive their livelihoods from natural habitats, such as forests, grasslands and wetlands (see box).

The importance of ecosystem services to Nepal's national economy

- **More than 80%** of Nepalese people derive their **livelihoods** from natural habitats
- **Biomass** provides nearly **90%** of total energy consumption
- **Water crisis** has emerged as a national problem
- **Environmental health** costs associated with poor environmental management are a significant burden on the national economy

Despite our dependence on ecosystem services, they are consistently overlooked and undervalued in decision-making that affects their provision. This may be because ecosystem services are not understood, or they are taken for granted, or because they are not included in economic equations when key decisions on land use are made. As a result, poor choices are often made which destroy or degrade natural habitats, resulting in the decline of many services, along with the biodiversity that supports them, often with severe impacts on poor and vulnerable people. Understanding, assessing and monitoring ecosystem services can lead to better policy formulation, resulting in land-use and management options that deliver more effective conservation, resilient livelihoods and poverty reduction (see box).

Measuring and monitoring ecosystem services can:

- **lead to better land-use planning** decisions to support both biodiversity conservation and ecosystem service delivery
- identify and inform management strategies to **enhance economic sustainability and human well-being**
- **provide information on additional benefits** from business-as-usual approaches to biodiversity conservation
- identify those affected by land use management decisions, and so help **spread the costs and benefits** more fairly among stakeholders
- provide information to **raise awareness and build public and Government support** for evidence-based policy and management decisions

Wood harvested from forests and other ecosystems has considerable value for many Nepalese people who use it in cooking and heating their homes (David Thomas)





Assessing services, such as the carbon stored in Shivapuri Nagarjun National Park, can help to inform land management that reflects the value of natural capital (Hum Gurung)

Taking account of ecosystem services

National accounting systems measure the economic activity of a nation as an indicator of progress. They take account of physical and financial capital as assets, but generally overlook the natural capital that our environment provides. Similarly, national accounts fail to reflect social factors such as income distribution and poverty. However, there is a growing awareness of the importance and relevance of including ecosystem services in decision-making, and a

Payments for Ecosystem Services

Payment for Ecosystem Services (PES) is the term used to describe an arrangement where a transaction occurs through which beneficiaries of a service (or bundles of services) *buy* from the providers of that service. People who benefit from a service therefore compensate those who provide it, giving them an incentive to manage land and resources in a way that ensures its continued provision. Although this concept is simple in theory, establishing effective and equitable PES schemes is difficult in practice, and there are relatively few local examples. Some national PES schemes have been established elsewhere, with varying levels of success. Costa Rica provides one of the best known examples for developing countries. Payments from the Government are made to farmers who conserve forests on their land to protect watersheds, biodiversity, carbon sequestration and storage, and scenic landscape/tourism services.

Currently, PES schemes are often dependent on funding from multilateral agencies (such as the World Bank and Global Environmental Facility) though funds can also be levied from national taxes or from private companies. For example, there are many companies that sell carbon credits to commercial and individual customers who are interested in lowering their carbon footprint on a voluntary basis. Increasingly, conservation is looking towards businesses to provide the finance needed to conserve biodiversity and ecosystem services due to their high impact on the environment and dependency on it. At the international level, some businesses and Governments are becoming engaged in long-term, sustainable financing for conservation through PES schemes, such as the REDD+ mechanism (Reducing Emissions from Deforestation and Forest Degradation) currently in development.

move towards 'green accounting' which recognises the economic value of nature by measuring ecosystem services (such as clean water, clean air and greenhouse gas sequestration), in addition to traditional measures of the market value of a country's goods and services. The concept of a Green Economy, i.e. an economic model based on sustainable development that takes account of the values of natural resources, has the potential to result in policies that improve human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. This will only be achieved if there is investment to maintain and enhance ecosystems; however, in some cases, income can also be generated from the provision of ecosystem services (see box).



Protected areas often provide important benefits for local people, such as the community of Murma village near Rara National Park who collect pine needles from the forest to combine with manure to fertilise their fields. Without pine needles their crop yield would decrease (David Thomas)

The continued delivery of ecosystem services depends on the integrity of the ecosystems supplying those services and this in turn depends on the maintenance of biodiversity

Declines in biodiversity, such as those taking place in Nepal and globally, are resulting in the reduction and degradation of ecosystem services. Birds, which are involved in many ecosystem functions, can be considered as important indicators of the general state of ecosystem health.

The links between ecosystem services and biodiversity

The relationship between biodiversity—the variety and variability of living organisms—and ecosystem services is complex because biodiversity can contribute to delivering benefits to people in a number of ways, for example:

- biodiversity plays a **functional role** in underpinning the delivery of many ecosystem services which in turn have value to people (e.g. in pollinating crops or disposing of waste)
- biodiversity can be considered as an **ecosystem service** due to its contribution to ‘goods’ (such as wild species which are the source of natural medicines or improved crop strains)
- biodiversity can also be considered as a **‘good’** as it has direct cultural (spiritual, aesthetic, recreational) and existence values (the benefits that people receive from knowing that a particular organism exists)



(Jessie Eastland/Wikimedia.org)



(David Thomas)



(Jyotendra Jyu Thakuri)



(B_cool/flickr.com)

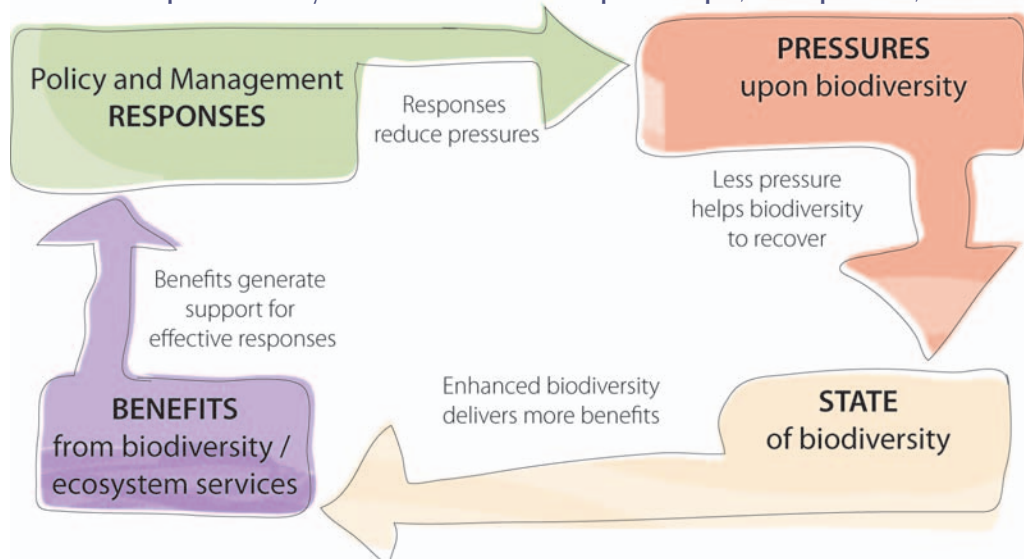
Declines in biodiversity can substantially alter the structure and functioning of whole ecosystems and therefore their ability to provide ecosystem services (see box). Such declines are taking place in Nepal and elsewhere at an accelerating rate. It is vital that appropriate policy and management decisions are taken to maintain biodiversity and ensure that it can continue to deliver benefits into the future (see figure).

How biodiversity impacts ecosystems: some facts and trends

- Biodiversity increases the stability of ecosystem functions through time
- Biologically diverse ecosystems are more productive because they contain key species that have a large influence on productivity
- Biodiversity loss reduces the efficiency by which ecosystems, e.g., produce biomass, decompose and recycle nutrients
- As biodiversity loss increases, the impacts on ecosystem functions accelerate
- Impacts of biodiversity loss on ecosystem processes and functions might be sufficiently large to rival the impacts of many other global drivers of environmental change

SOURCE Cardinale *et al.* (2012) Biodiversity loss and its impact on humanity. *Nature* 486. Based on a review of >1,700 papers to summarise the balance of evidence linking biodiversity to the goods and services provided by ecosystems.

The relationship between ecosystem services and the state of pressures upon, and responses for, biodiversity



SOURCE Adapted from Sparks *et al.* (2010) Linked indicator sets for addressing biodiversity loss. *Oryx* 45(3): 411–419.

Birds as indicators of ecosystem health

Birds are an important component of biodiversity. They are involved in many ecosystem functions through their role as scavengers (see box), pollinators and seed dispersers, and in pest control. In Nepal birds such as the Asian Openbill, Lesser Adjutant and Sarus Crane feed in agricultural fields and control many harmful insects and other invertebrates that would otherwise damage crops and reduce yields. Birds are also important as an ecosystem service 'good' in their own right in terms of the pleasure they give to millions of birdwatchers and nature lovers around the world, and are often the basis for lucrative eco-tourism ventures. Many people enjoy just having birds around them and their homes, such as Oriental Magpie Robin which occurs in the mid-hills and lowland villages and towns in Nepal.

As well as being of value in themselves, birds can also be considered as important indicators of the more general state of ecosystem health. Knowledge of the state of a country's birds can therefore give an indication of how well the country's ecosystems are delivering benefits to people.

Vultures: a special case

Vultures fulfil an extremely important ecological role. As scavengers, they keep the environment free of carcasses and waste, restrict the spread of diseases such as anthrax and botulism, and help control numbers of pests, such as rats and dogs, by reducing the food available to them. They are of cultural value to some communities and have important eco-tourism value too. Vultures in South Asia have declined drastically (some species by up to 99%) in recent years predominantly as a result of widespread use of the non-steroidal anti-inflammatory drug diclofenac in livestock. Vultures become exposed to the drug by feeding on large animal carcasses, particularly cattle, treated with the drug. Their decline not only risks extinction of the global population of several vulture species, but also has negative impacts for human well-being.



Fewer vultures result in:

White-rumped Vulture
(Jyotendra Jyu Thakuri)

Economic impacts

- Burial/incineration results in loss of supply of dead cattle for tanning industry
- Profitability for traditional professions (e.g. bone collecting) reduced
- Carcass disposal costs
- Fewer tourists attracted by viewing vultures

Health impacts

- Uneaten carcasses can be sources of a range of infectious diseases
- An increase in other scavenger populations (e.g. feral dogs) may increase risk from disease exposure including rabies

Social impacts

- Cultural and religious values lost
- Utility values to Parsee communities in India lost
- Existence value diminished

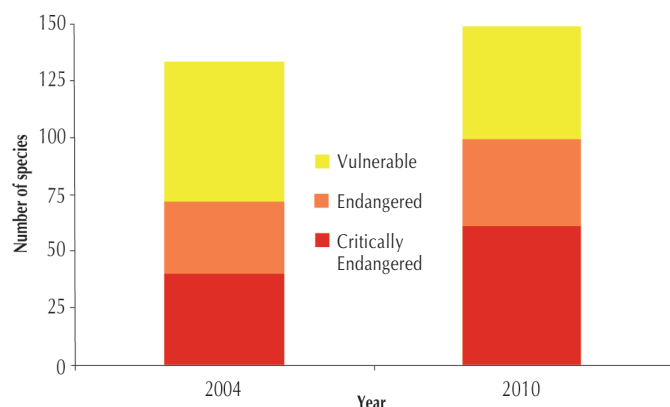
Environmental impacts

- Pollution from rotting carcasses (air, soil, water)

What is the status of Nepal's birds?

Nepal is renowned internationally for its rich diversity of bird species. A total of 871 species has been recorded in the country, over 8% of the world's known birds in just 0.1% of its land mass. In 2010, a review of the status of Nepal's birds showed that 149 species—nearly one in five—were considered threatened at the national level, an increase of over 10% compared with a similar assessment undertaken in 2004. Around 100 of these species were thought to be on the very edge of extinction (see figure and p.34 for information on determining the status of Nepal's birds).

The national Red List status for Nepal's birds in 2004 and 2010



SOURCE BCN and DNPWC (2011) *The state of Nepal's birds 2010*. Kathmandu: Bird Conservation Nepal and Department of National Parks and Wildlife Conservation.

Nepal is richly endowed with a variety of natural ecosystems that provide invaluable ecosystem services to local people and to the nation as a whole

Forests, grasslands, wetlands and the high mountains are all important habitats for Nepal's spectacular wildlife, appreciated by people everywhere and provide a range of ecosystem services which are integral to the livelihoods of local communities.

Forests: In Nepal, forests cover nearly 40% of the land area and provide a number of important ecosystem services, including provision of goods such as timber and fuelwood and local climate and water regulation. Forests also have great cultural and spiritual importance, as places of pilgrimage, and store large amounts of carbon in their living biomass, thereby playing a role in global climate regulation by reducing net 'greenhouse gas' emissions to the atmosphere. They are a very important habitat for wildlife—over half of the nationally threatened bird species occur in forest. However, there are a number of trade-offs associated with the use of forest services, particularly in relation to production values. Enhancing one service, for example the supply of timber, through conversion of natural forest to plantations will affect other services, such as harvested wild goods and nature-based tourism.

Grasslands: In Nepal, natural grasslands cover approximately 14% of the land area, ranging from subtropical savannas in the flood plains and terraces of the Terai to temperate grasslands and alpine meadows in the cold, arid steppe of the Himalayas. Grasslands are integral to the livelihoods of local communities, for example through providing grazing for livestock, as a source of medicinal and aromatic plants, and supporting populations of prey species (e.g. ungulates) for predators such as tigers. The spread of cultivation in Nepal's lowlands has led to the once extensive lowland grasslands becoming greatly reduced and fragmented. Today, grasslands only exist in their natural state within protected areas in the Terai. Here they are still home to a huge number of birds, including the globally threatened Bengal Florican and Swamp Francolin, and threatened mammals such as the Indian Rhinoceros, Tiger and Asian Elephant. Higher altitude grasslands are also home to a diverse range of wildlife, providing forage for wild ungulates such as Wild Yak and Himalayan Tahr.

Wetlands: There are many wetlands in Nepal providing critical services to local people, including fodder for livestock and fibre for building, helping to regulate and purify water flows, often reducing the risk of flooding and enabling clean water to be accessed year-round. They are also an important habitat for large numbers of migratory birds and other wetland-dependent species, such as Asian Water Buffalo and Ganges River Dolphin. Many wetlands are under severe pressure from drainage and reclamation, inappropriate use or fisheries management, and water extraction.

High mountains: The high altitude mountain habitats of Nepal include large alpine and semi-desert areas, as well as extensive areas of temperate forest. The Himalayas have great beauty and grandeur, holding spiritual and cultural value for the people living in and around them and for the thousands of visitors who travel to the region every year. Mountain dwellers, who comprise 7% of Nepal's population are particularly heavily dependent on natural resources, perhaps more so than people in other regions of Nepal. Mountain ecosystems are also very susceptible to environmental pressures, with changes in the climate and provision of ecosystem services having significant impacts on local communities as well as those living downstream.

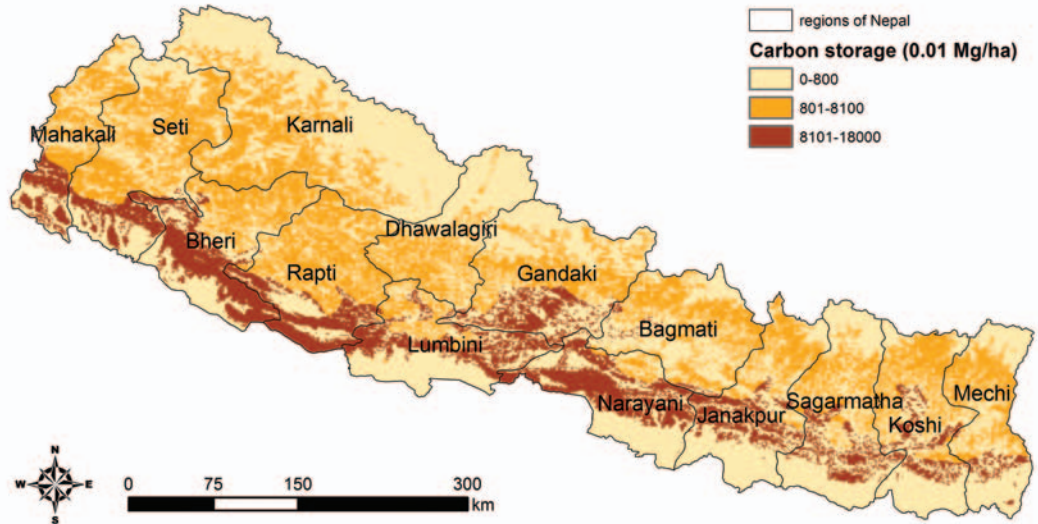
Nepal's rich biodiversity and its varied ecosystems, such as forests, grasslands, wetlands and high mountains, provide vital services and livelihoods for people (clockwise from top left: David Thomas, Jyotendra Jyu Thakuri, Andy Graham, Hum Gurung)



How much do we know about ecosystem services in Nepal?

It has been estimated that Nepal stores 485 million metric tonnes of carbon (in living biomass, FAO 2006), equivalent to almost 50% of the EU's greenhouse gas emissions in 2009, thereby contributing to global climate change regulation. There are now on-line tools that can illustrate this spatially, showing that not all areas are equally important for all services, with carbon storage in the Terai and High Himalaya (where fewer trees occur) being relatively low compared to that of the Siwalik, Middle and High Mountains.

Biomass carbon stored in above and below-ground living vegetation

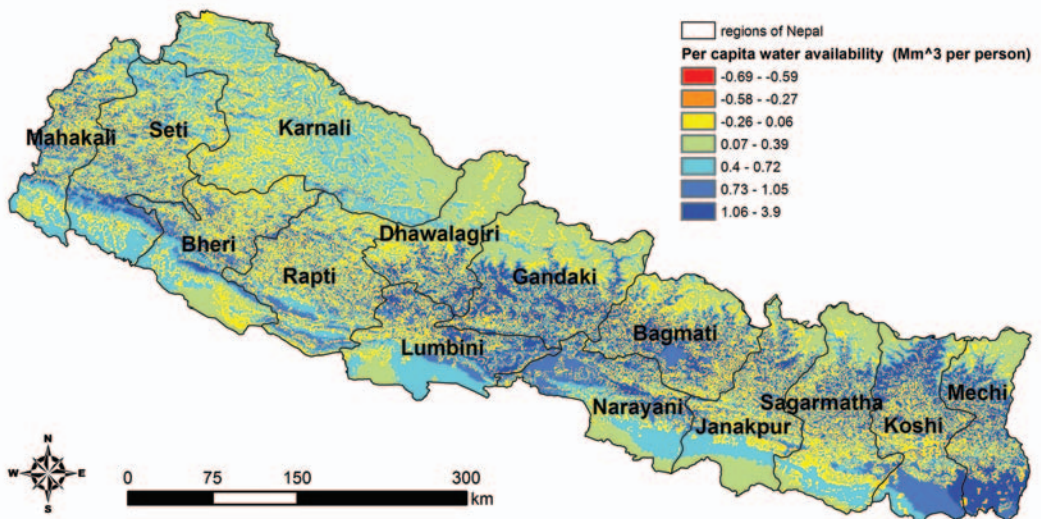


SOURCE Ruesch and Gibbs (2008) IPCC Tier-1 global biomass carbon map for 2000. Available online from the Carbon Dioxide Information Analysis Center <http://cdiac.ornl.gov>.

Similarly, it is possible to illustrate water flows spatially, showing that some areas, such as the central region of Nepal, are very important for providing water to surrounding areas (including the Kathmandu Valley).

Per capita water availability according to regional administrative boundaries

Where water balance is shown as negative, water use is supported by upstream sources and/or groundwater



SOURCE Waterworld version 2.3 (2012). Available on-line from <http://www.policysupport.org/waterworld>.

As well as general analyses, there have been a number of more specific projects in Nepal that deal with ecosystem services. Some relate to opportunities for developing or piloting Payment for Ecosystem Service schemes (PES, see p.9), such as carbon credit projects taking advantage of emerging markets for forest carbon (e.g. by the Asia Network for Sustainable Agriculture and Bioresources, ANSAB). Others relate specifically to mountain habitats (e.g. by the International Centre for Integrated Mountain Development, ICIMOD) or wetlands (e.g. by the Conservation and Sustainable Use of Wetlands in Nepal project, CSUWN).

Twenty-seven areas have been identified as 'Important Bird Areas'—places that help to maintain biodiversity and deliver a range of important ecosystem services

Nepal's Important Bird Areas can tell us a lot about the state of biodiversity across the country, and how habitats and ecological systems are linked to the provision of services, and to whom, and so can inform both site and landscape-scale decision-making.

What are Important Bird Areas?

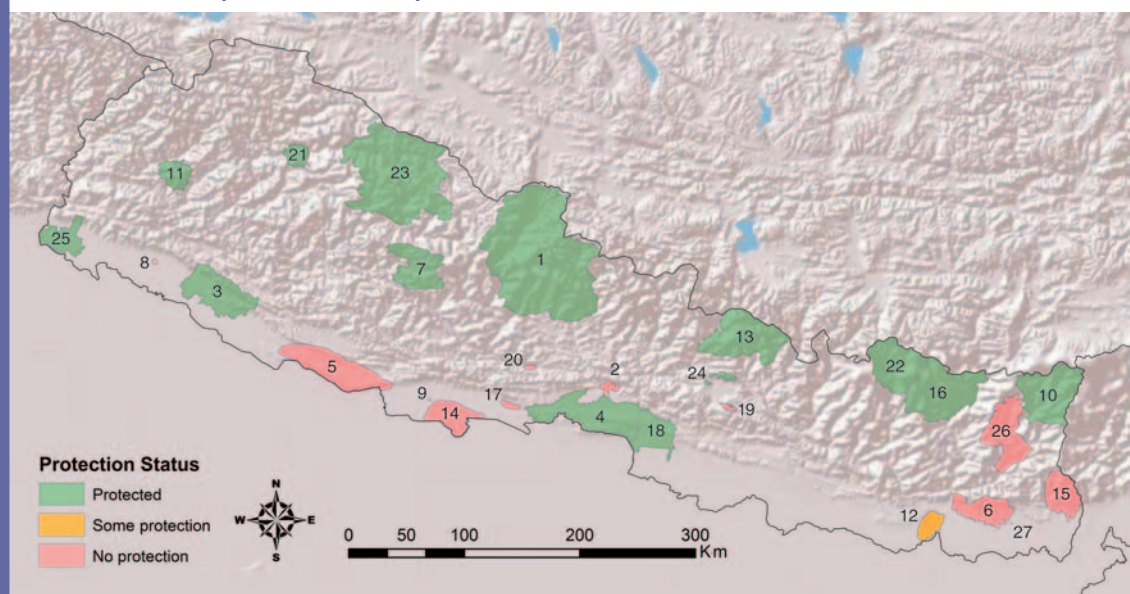
Biodiversity is not uniformly distributed across the planet. Some places are therefore more significant than others for its conservation. The presence of bird species of global conservation concern can be used to identify sites—Important Bird Areas or IBAs—critical both for their own conservation and, because of the way that key biodiversity in other groups often co-occurs with birds, the conservation of much else besides. In Nepal, a network of 27 such sites (covering more than 2.6 million ha) has been identified in the alpine zone and temperate forests of the High Mountains, subtropical and tropical moist forests, semi-arid woodland and scrub, lowland grasslands and freshwater ecosystems (see p.34 for information on identifying IBAs). These sites are critically significant, both individually and as a network, for bird conservation in the country.

IBAs have a close relationship with Nepal's network of Protected Areas (20 sites covering more than 3.4 million ha). A total of 14 IBAs (covering 2 million hectares) is wholly within Protected Areas (sites that are designated and managed by the Department of National Parks and Wildlife Conservation). Overall, more than 80% of the IBA network overlaps with the Protected Area network (see map). Almost all of the remaining IBAs contain Community Forests managed by Forest User Groups (see p.24 Forests). The IBAs in Nepal can therefore tell us a lot about the Protected Areas of Nepal. Measuring and monitoring ecosystem services at IBAs can also provide valuable information on ecosystem services, relevant to conservation at the site and landscape scales (see box).

The relevance of sites to conservation at the landscape scale

Ecosystem services are delivered spatially across a landscape within a matrix of diverse human social, political and ecological interactions. Although studies looking at this large-scale can be useful in understanding the broader context in which ecosystem services sit, measuring services at this scale is mostly reliant on modelling approaches, which are often limited by the coarse-scale of the data that is fed into the models. Empirical results from site-level studies, such as this one, can help demonstrate more clearly how habitats and ecological systems are linked to the provision of services, and to whom, and so can more reliably inform both site and landscape decision-making.

The location of Nepal's IBAs and their protection status



- | | | |
|-----------------------------------|---|-------------------------------------|
| 1 Annapurna Conservation Area | 11 Khaptad National Park | 20 Rampur Valley |
| 2 Barandabhar Corridor Forest | 12 Koshi Tappu Wildlife Reserve and Barrage | 21 Rara National Park |
| 3 Bardia National Park | 13 Langtang National Park | 22 Sagarmatha National Park |
| 4 Chitwan National Park | 14 Farmlands of Lumbini | 23 Shey-Phoksundo National Park |
| 5 Dang Deukhuri | 15 Mai Valley Forest | 24 Shivapuri Nagarjun National Park |
| 6 Dharan Forest | 16 Makalu Barun National Park | 25 Sukla Phanta Wildlife Reserve |
| 7 Dhorpatan Hunting Reserve | 17 Nawalparasi Forest | 26 Tamur Valley and Watershed |
| 8 Ghoda Ghodi Lake | 18 Parsa Wildlife Reserve | 27 Umlabari Forest groves |
| 9 Jagdishpur Reservoir | 19 Phulchoki Mountain Forests | |
| 10 Kanchenjunga Conservation Area | | |

SOURCE IBA information from BirdLife's World Bird Database (2012), Protected Area information from Department of National Parks and Wildlife Conservation, Nepal (2012). IBA protection status is based on Protected Areas listed in the World Database of Protected Areas (UNEP-WCMC) but excludes areas that are protected and managed under Community Forestry.

What birds and biodiversity do Nepal's Important Bird Areas conserve?

Knowledge of the bird fauna of Nepal's IBAs is still incomplete. However, an amazing 547 bird species has been recorded from Chitwan National Park IBA. The network of IBAs in Nepal is known to be home to some 30 globally threatened bird species and includes important populations of Nepal's only endemic bird species, Spiny Babbler.

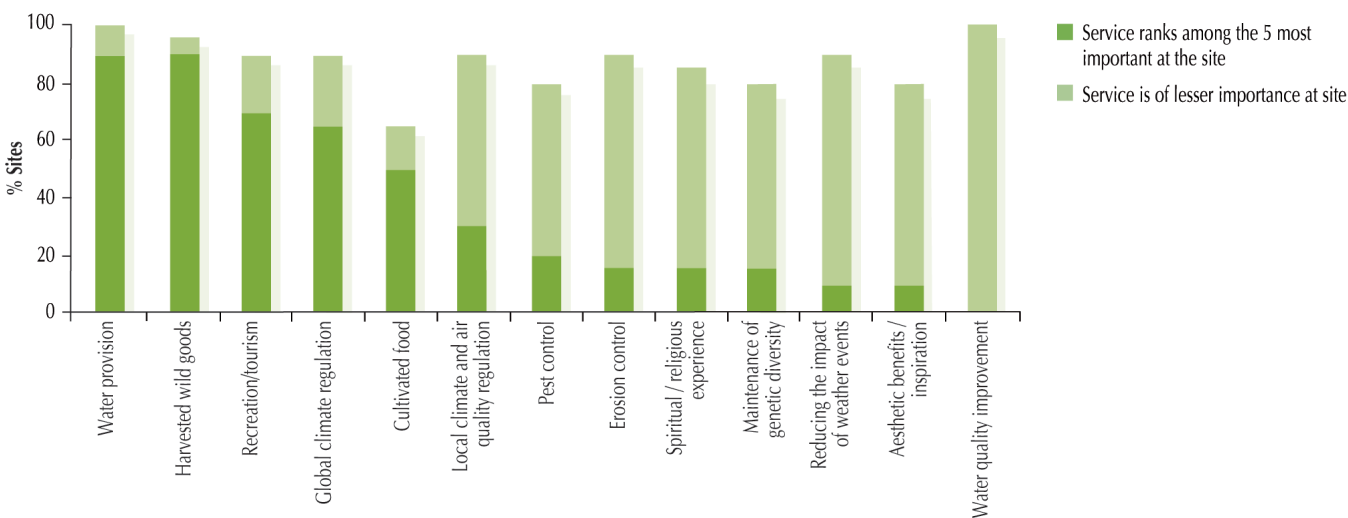
Although it is the bird fauna that defines the IBA network, the conservation of these sites should help ensure the survival of a correspondingly large number of species in other groups. For example, lowland IBAs such as Chitwan National Park, Bardia National Park and Suklaphanta Wildlife Reserve support globally threatened large mammals such as Indian Rhinoceros, Tiger and Asian Elephant and reptiles including the Mugger Crocodile and Gharial. High altitude IBAs, for example, Kanchenjunga Conservation Area, Shey Phoksundo National Park and Langtang National Park also harbour globally threatened mammals such as Snow Leopard, Himalayan Tahr and Himalayan Musk Deer. The Mai Valley IBA in east Nepal is a hotspot for medicinal and aromatic plants.



What ecosystem services do Nepal's Important Bird Areas deliver?

Many important ecosystem services are delivered across the network of 27 IBAs. For example, water provision is delivered at all the IBAs and has been identified as the most important service for 90% of them. Harvested wild goods, including food, fibre, natural medicines and fuelwood for cooking and heating, recreation/tourism and global climate regulation are also recorded as being of high importance across the majority of sites. Local climate and air quality regulation, erosion control, spiritual/religious experience, reducing the impact of weather events and improving water quality are also delivered by ecosystems in most sites, though are generally considered of lesser importance (see figure, and p.35 for information on assessing ecosystem services using a rapid appraisal).

Proportion of IBAs delivering different ecosystem services and their relative importance



SOURCE Based on information provided at an expert consultation workshop.

An example from Shivapuri Nagarjun National Park IBA

Shivapuri Nagarjun National Park is an IBA near Kathmandu, the capital of Nepal. It is mostly forested, with over 300 species of bird and more than 20 species of mammal recorded. The forests are a carbon store and so contribute to global climate regulation, and the park is well used for recreational activities. However, water is undoubtedly the most important service, as the park provides nearly 60% of the annual freshwater requirements of 2.5 million people.



"The Government of Nepal had the foresight to designate the watershed as a National Park in 2002. Now we can all appreciate its value for biodiversity and a range of other ecosystem services" says Gopal Bhattarai, Warden. "It's vital that we manage this protected area carefully, for the benefit of both local and downstream communities".

For more details of this study, see p.28.

Nearly half of Nepal's Important Bird Areas are considered to be in a very unfavourable state, with the condition of most of these worsening as pressures on them increase

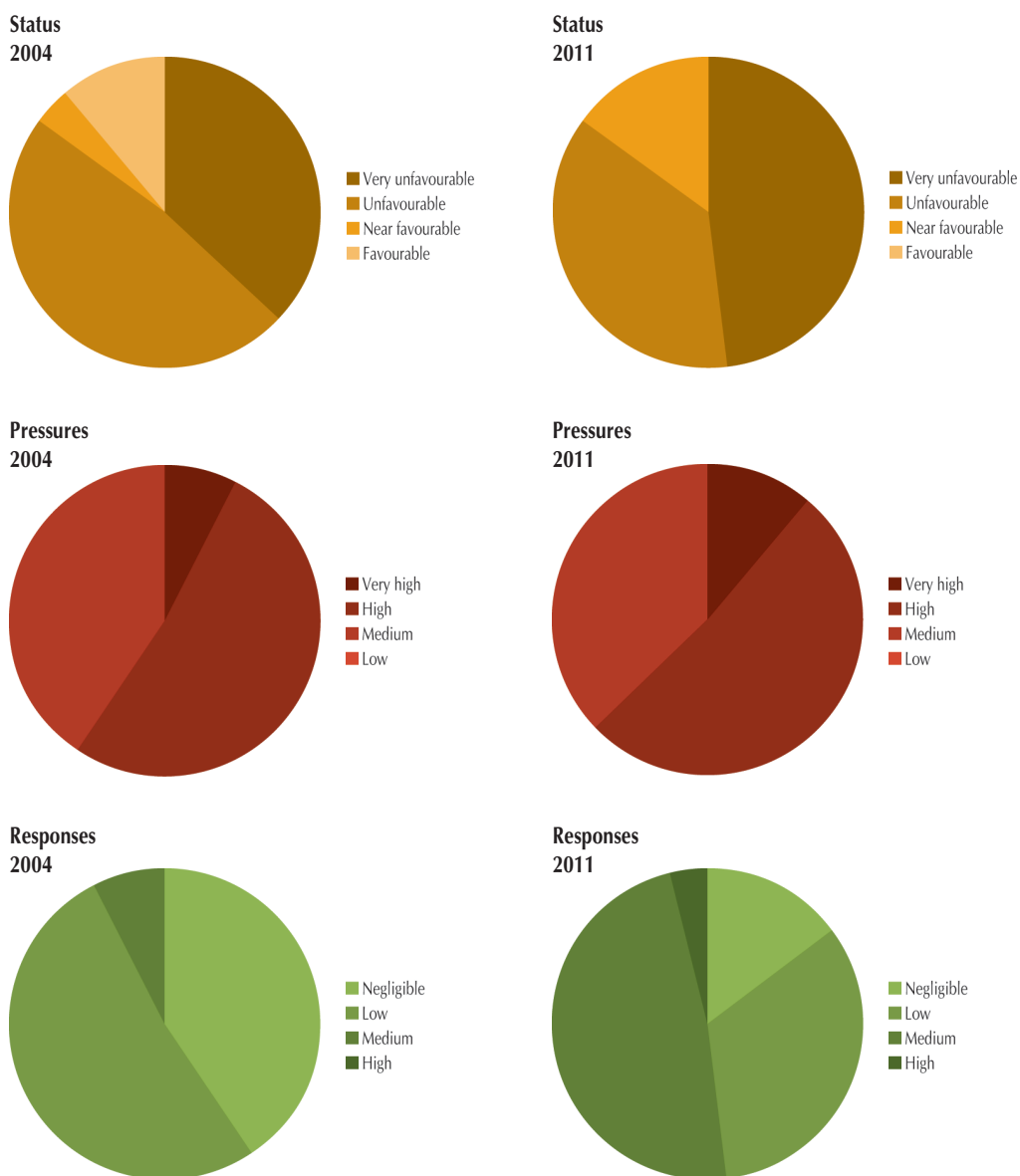
The pressures on Important Bird Areas are affecting their ability to continue delivering ecosystem services. Some services, such as recreation and tourism, are being delivered well, but others are not, or are in decline.

What is the status of Nepal's Important Bird Areas?

In 2011, an assessment of the status of Nepal's Important Bird Areas (IBAs) showed that nearly half of them (13) are considered to be in a very unfavourable condition, three more than in 2004, meaning that less than 40% of the area of key habitats or populations of key bird species remain. Furthermore, it is clear that some threats are worsening, with nearly three-quarters of IBAs believed to be subject to high or very high pressures owing to human activities. However, positive responses are increasing too, with the majority of IBAs receiving some protection, management or conservation action compared with fewer than two-thirds in 2004 (see figure and p.34 for information on monitoring IBAs).

The protected IBAs have, in general, lower pressures and better responses than the unprotected sites, as assessed in both 2004 and 2011. However, despite increasing responses through conservation actions, the state of birds and habitats at both protected and unprotected IBAs has not improved.

The state of IBAs, pressures upon them, and responses in place in 2004 and 2011

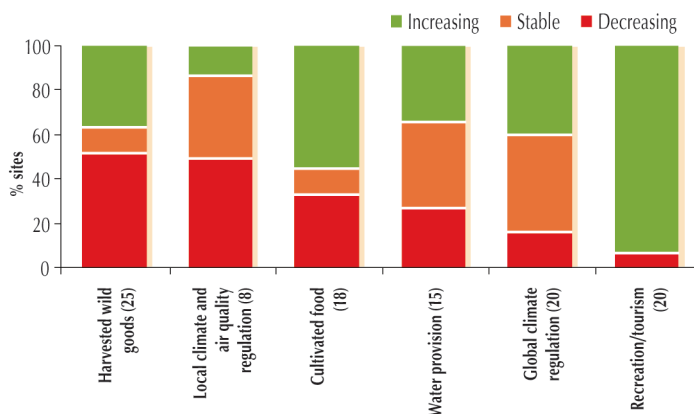


SOURCE Analysis of data held in BirdLife's World Bird Database (2012).

What are the trends in the availability of ecosystem services at Nepal's IBAs?

In 2011, an expert consultation indicated that the supply of harvested wild goods, including food, fibre, fuelwood and natural medicines, was likely to be decreasing at over half of the IBAs that deliver these as one of the most important services. Around one-third of sites showed an increase in this service. Recreation and tourism is reportedly on the increase at 95% of IBAs where it occurs. There is also a reported increase in supply of cultivated foods at some sites although this is likely to be at the expense of other services. Global climate regulation is believed to be stable or increasing across most of the sites, as is water provision (see figure).

Proportion of IBAs delivering ecosystem services with increasing, stable or decreasing trends over the past five years



Numbers in brackets represent the number of sites at which the service was recorded as being the 5 most important. Only these sites are included in each column, and only services that were important at >5 sites are presented.

SOURCE Based on information provided at an expert consultation workshop.



Local stakeholders discuss the changes to habitats and impacts on ecosystem services occurring at Koshi Tappu Wildlife Reserve over recent years (Jenny Birch)



A similar exercise with local stakeholders at Rara National Park (David Thomas)

An example from Koshi Tappu Wildlife Reserve IBA

Koshi Tappu Wildlife Reserve is an IBA and Ramsar site in the Terai of south-east Nepal. A mosaic of open water, riverine habitats and seasonally flooded grasslands, it supports tens of thousands of waterbirds and is also important for the globally threatened Ganges River Dolphin and home to Nepal's last population of wild Asian Water Buffalo. However, since the 1990s the number of waterbirds visiting the reserve has dropped dramatically.

“Wetland species undoubtedly face the greatest threats in Nepal. One example is Black-bellied tern which occurs on lakes and rivers in the lowlands, and which has all but disappeared from Koshi, as a result of widespread food shortages” says Top Khatri, National Programme Manager for the ‘Conservation and Sustainable Use of Wetlands in Nepal’ project. *“The food of the tern—fish—is also an important resource for people, particularly those from poorer communities, and the birds are indicating that this important resource is diminishing. To reduce the conflict between livelihood needs and conservation objectives, we need to develop sustainable options that can deliver material benefits to local people whilst preserving the ecological integrity of the wetlands”.*

For more details of this study, see p.29.



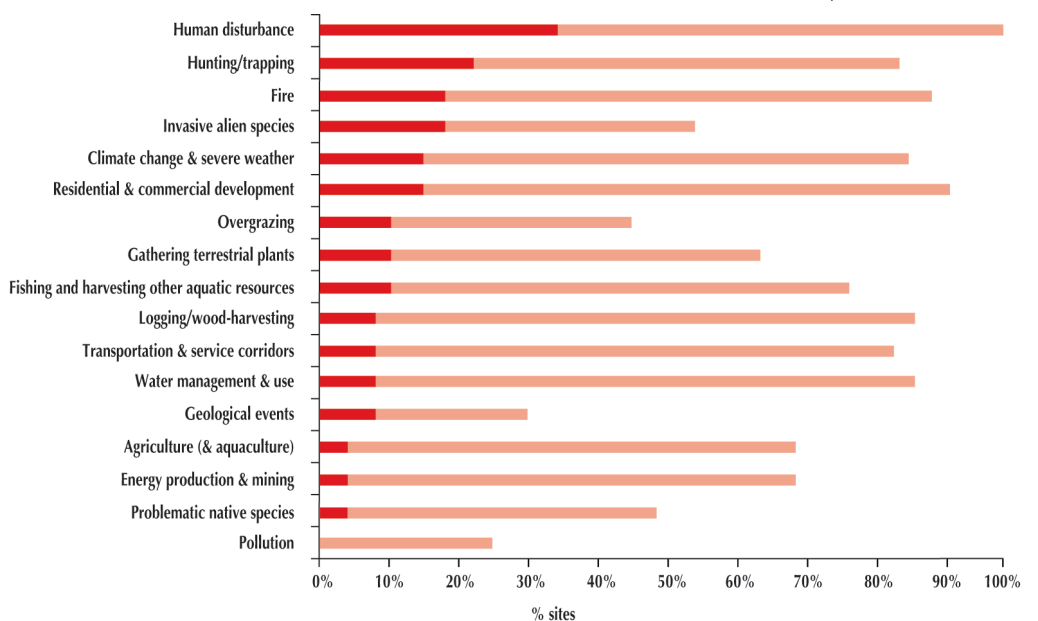
The pressures affecting Nepal's Important Bird Areas include human disturbance, conversion of land for agriculture, overexploitation of resources and climate change

Across the network of Important Bird Areas, the area of forest and grasslands, and the quality of wetlands, are expected to decrease if current pressures and trends continue.

What are the main drivers leading to changes in ecosystem services?

Many different pressures have been identified as having an impact on Important Bird Areas (IBAs) in Nepal (see figure and box opposite). Human disturbance, residential and commercial development, unsustainable logging and water use are all considered to be common threats to IBAs, occurring at over three-quarters of them. Human disturbance is one of the major pressures influencing the delivery of ecosystem services at one-third of the IBAs, whilst over-exploitation of species by hunting and trapping is considered a severe threat at over 20%. Other important factors include fire and invasive alien species, such as Water Hyacinth in wetlands and the climber *Mikania micrantha* which can very rapidly smother all terrestrial habitats. Transportation and service corridors, including the construction of roads, is reported as a threat to three-quarters of the IBAs. Human-induced climate change is reported as a driver of change across 70% of sites and may pose the greatest long-term challenge (see box below). Over-fishing is also a widespread issue across those sites with wetland habitats.

Pressures affecting the delivery of ecosystem services at Nepal's IBAs ■ Driver ranks among the most important at the site
 Classification of threats follows that used by the IUCN Red List ■ Driver is of lesser importance at the site



SOURCE Based on information provided at an expert consultation workshop.

The impacts of climate change

As a result of climate change, it is anticipated that many species will decline or disappear from areas where they are found today. This will have an impact on the ability of ecosystems to continue delivering the goods and services which people, especially the poorest, depend on. Intact, well-connected ecosystems show greater resilience in the face of change than fragmented and heavily altered ones, and are more likely to be able to continue providing ecosystem services. Moreover, biodiversity and ecosystem services can also be used as part of an overall adaptation strategy to help people adapt to the negative impacts of climate change, so called ecosystem-based approaches for adaptation to climate change. For example, conserving plant diversity in grasslands that include drought-resistant species will support livestock farmers to cope with disruptions in seasonal rainfall patterns. Furthermore, natural infrastructure such as forests that manage water flows and absorbent wetlands can form an effective first line of defence against mudslides and flash floods. Ecosystem-based approaches for adaptation can be accessible, enduring and cost-effective to local communities as they can be locally managed in comparison to the high start-up and maintenance costs of, and the technological expertise required for, hard infrastructural adaptation. The crucial importance of such approaches has been stressed by the CBD's Ad-hoc Technical Expert Group (AHTEG) on Biodiversity and Climate Change, and by many conservation and development organisations.

The most threatened IBAs in Nepal

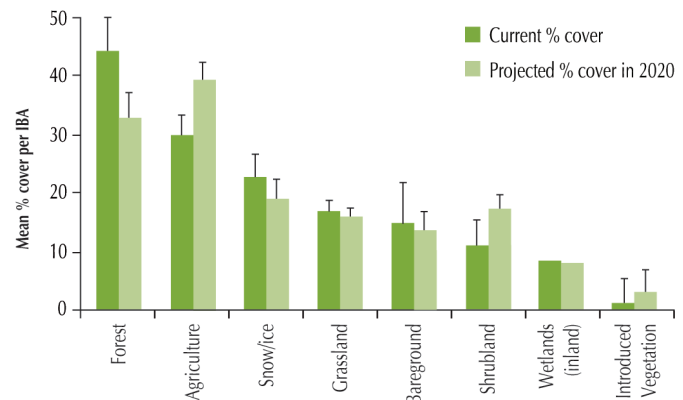
- **Dharan forests:** PROTECTION STATUS: **unprotected.** CONSERVATION STATUS: **high pressure, very unfavourable state, negligible response.** Sal forest is being lost due to encroachment for settlements and cultivation and the development of a road.
- **Dhorpatan hunting reserve:** PROTECTION STATUS: protected. CONSERVATION STATUS: **high pressure, very unfavourable state, low response.** There are many pressures on this reserve, including illegal collection of firewood and timber, and crop farming due to favourable climatic conditions.
- **Mai Valley forests:** PROTECTION STATUS: **unprotected.** CONSERVATION STATUS: **high pressure, very unfavourable state, negligible response.** The site is a Community Forest, and whilst the approved forest management plan is leading to some positive changes (e.g. removal of Japanese Sallo and replacement with native broadleaved forest), in many parts of the IBA illegal farming on hill slopes is taking place. Increased farming of cash crops like cardamom and tea is also changing the habitat into a monoculture.
- **Farmlands of Lumbini:** PROTECTION STATUS: **unprotected.** CONSERVATION STATUS: **high pressure, unfavourable state,** medium response. The major threats at this site are rapid urbanisation, the impact of increasing numbers of tourists and, most important, changes in agriculture such as cash crop production and increasing use of chemicals.
- **Tamur Valley and watershed:** PROTECTION STATUS: **unprotected.** CONSERVATION STATUS: **high pressure, very unfavourable state, negligible response.** Loss and degradation of broadleaf and rhododendron forest is expected as a result of expanding settlements, infrastructure development, particularly roads, and unregulated and unsustainable harvesting practices.



Logging is a threat to many IBAs in Nepal (David Thomas)

Overall, it is anticipated that by 2020 there will be a trend towards reduced forest cover and increased agricultural land across the network of IBAs. It is also predicted that the area of shrubland will increase as forests become degraded and that introduced plants will become more widespread. The projected decrease in snow, ice and grasslands across high altitude IBAs is a reflection of the likely impact of climate change on montane ecosystems across the country (see figure).

How habitats within IBAs might change by 2020 as a result of current drivers of change



SOURCE Based on information provided at an expert consultation workshop.

An example from Rara National Park IBA

Rara National Park is the smallest Protected Area in Nepal containing the country’s largest and most enigmatic lake. It has forest, grassland and wetland habitats and is important for Cheer Pheasant and Himalayan Monal, and other wildlife including Red Panda and Clouded Leopard. Historically, low intensity use of the meadows and forests by local communities has contributed to protecting the environment in this region. However, pressures on the relatively intact habitats inside the core zone are increasing due to over-harvesting and changes in land use in the surrounding buffer zone.



“In the buffer zone, the impacts of illegal timber extraction can be seen close to the towns where timber is in high demand” says Bhogendra Rayamajhi, Assistant Warden. *“There is a risk that, by 2020, forests in the buffer zone will be much reduced and communities will encroach more and more into the core area for their livelihood needs, threatening the biodiversity and also the future of the important services this site delivers”.*

For more details of this study, see p.30.

Changes in the delivery of ecosystem services often entail trade-offs between different services or groups of people that benefit from the services, or with the conservation of important biodiversity

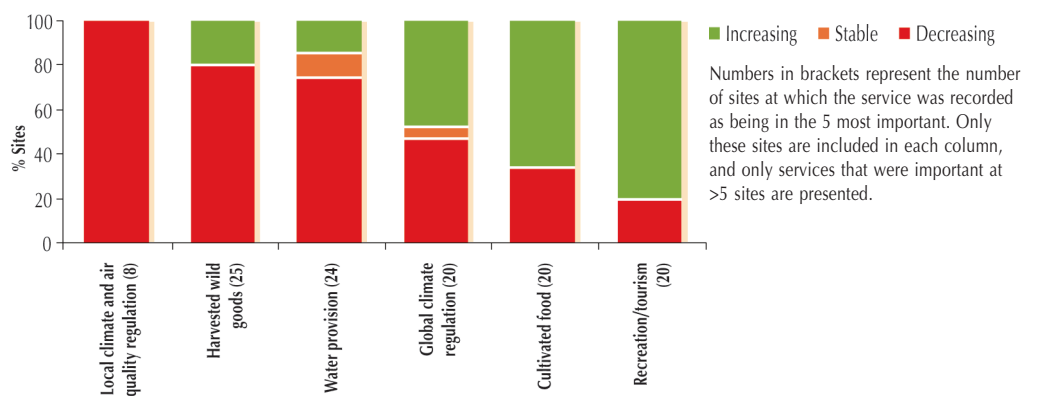
Changes that have positive impacts on some people may have negative impacts on others, or threaten the survival of certain species. Overall, the changes predicted to occur in the foreseeable future will have the biggest negative impact on the poorest rural communities.

Trade-offs between services

Land use decisions result in changes in the relative mix of services provided by ecosystems—it is not possible to maximise all services at the same time. While there may be synergies between some services, there will also be trade-offs when increases in some services come at the expense of others. These trade-offs can involve both spatial aspects (for example, people living further away might benefit from a land use change, whilst people living locally at a site lose out) and temporal aspects (people living now receive the benefit, but at the expense of people living in the future).

Given the current drivers of change which are already having an impact on species, sites and ecosystems, it is expected that, if current trends continue and predicted land use changes take place, by 2020 some ecosystem services will decrease, while others will increase at Important Bird Areas (IBAs, see figure). For example, there would be a decline in local climate and air quality regulation at all sites where this service has been identified as being important, as a result of natural ecosystems becoming degraded. Harvested wild goods (including wild food and natural medicines) and water provision are important services at a large number of IBAs and would also decline at the majority of these sites. Conversely, cultivated food would become more widespread within IBAs, associated with land use changes to agriculture. Recreation/tourism would also increase across the IBA network in the future, continuing the increase that has been recorded over the past five years at many of the sites.

Likely future trends in ecosystem service availability (to 2020) at IBAs, if current drivers of change continue



SOURCE Based on information provided at an expert consultation workshop.

Poor communities in Mugu District close to Rara National Park depend heavily on the Park and Buffer Zone for providing livelihood benefits. Unsustainable use is likely to affect them the most in the long term

(Alison Stattersfield)



Trade-offs between people

Overall, the changes predicted to occur in the foreseeable future would have the biggest negative impact on local communities living in or near IBAs (see figure). Local climate and air quality regulation, harvested wild goods and water provision services all benefit local people who would be significantly affected by predicted patterns of change, even though some local communities may benefit by increased services from cultivation. Some benefits would also be anticipated at the local level from increased tourism.

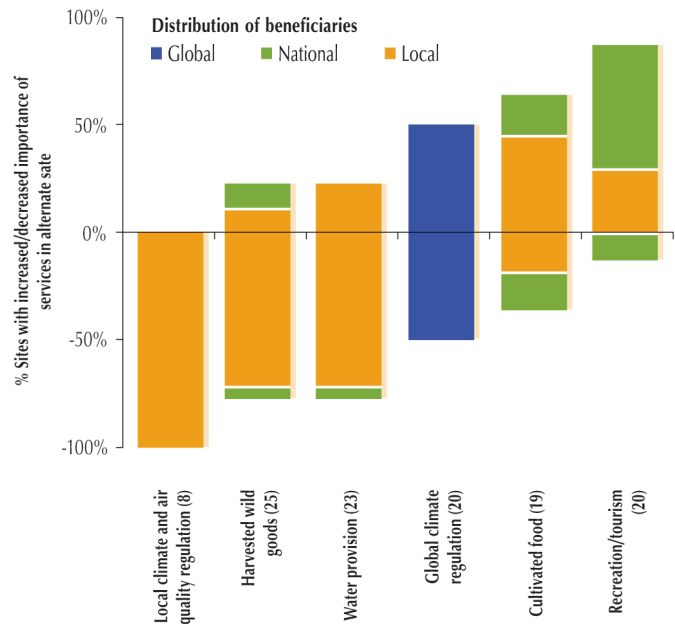
In general, for national level users there are both increases and decreases of services across sites, but national stakeholders would gain overall in relation to tourism and recreation. The global community is impacted by the ability of the sites to provide global climate regulation in the future, with results showing a fairly even balance between the numbers of sites where this service is predicted to increase (e.g. due to forest regeneration) and decrease (due to deforestation and degradation).

Trade-offs with biodiversity

In some situations, ecosystem service delivery may conflict with biodiversity conservation objectives. For example, management of a site might enhance one especially valuable service (e.g. harvesting of grasses) while having a negative impact on populations of threatened species at the site (e.g. grassland-dependent birds). There is sometimes a need for compromise between delivering key ecosystem services and maintaining important biodiversity, without the former becoming a serious threat to biodiversity and / or being unsustainable in the longer term.

Proportion of IBAs at which delivery of the most important ecosystem services is projected to increase or decrease, and the location of the beneficiaries who will gain or lose

Numbers in brackets represent the number of sites at which the service was recorded as being in the 5 most important. Only these sites are included in each column, and only services that were important at >5 sites are presented. At no site was the delivery of the 5 most important ecosystem services projected to remain stable.



SOURCE Based on information provided at an expert consultation workshop.

An example from Phulchoki Mountain Forests IBA

Phulchoki Mountain Forests is an IBA which lies 16 km south-east of Kathmandu. It has significant populations of key forest bird species and a huge diversity of threatened orchids. It is also important for many ecosystem services including harvested wild goods, nature-based recreation and water provision.

Historically, the lower slopes of the forest were heavily degraded, much as on other hills surrounding the Kathmandu Valley. However, the state of the forests at Phulchoki has improved following the establishment of community forestry some 15 years ago, in clear contrast to the surrounding degraded and converted land. In this case, restoration of the forests and handing over the management to community Forest User Groups (FUG) has enabled local people to capture (and control) many of the direct benefits from harvested wild goods and from recreational visitors, as well as receive the benefits from improved water quality compared to previously. Many of these benefits have been realised by women in the community, who are responsible for collecting the harvested wild goods and water for their families. These increased benefits are being realised at the cost of reduced agricultural production (which has affected immigrant settlers) and production of timber and charcoal (affecting mainly traders servicing the demand from Kathmandu). For example, in the past heavy use of forest resources was made by Kami (blacksmiths) and Sunar (goldsmiths) castes, from forest-adjacent communities and from further afield, for the production of charcoal. These people no longer have access unless they are living locally and are members of a Forest User Group.



"We collect fuel wood from the forest. We also collect grass to feed our cattle and make compost. So we are benefiting from the forest in many ways. The cool wind that blows from the forest is good for everyone. Thanks to the forest we get a regular supply of water, otherwise the streams would have dried up. Now all the streams are flowing. People come here to watch the beautiful scenery and birds. Many people from Kathmandu also come for picnics" says Ganesh Bahadur Silwal, President of the Godawari Kunda FUG.

For more details of this study, see p.31.

The challenge is to ensure that the true value of ecosystem services becomes fully incorporated into decision-making at all levels

Policy decisions made and management actions taken now will have implications far into the future for biodiversity, ecosystem services and human well-being. It is important that the consequences are understood, so that the country's natural ecosystems can continue to deliver benefits for its people into the future.

National planning in Nepal

Since the early 1970s, Nepal has developed national laws, policies and plans that demonstrate a commitment to the conservation of natural resources (see box opposite). It is also a signatory to six international environmental conventions (see Appendix 3). The National Planning Commission is the advisory body or 'think tank' for national planning and, in this capacity, coordinates with all the relevant Government ministries and agencies. It emphasises the three pillars of sustainable development—economic, social and environmental management.

A key document is the Five-Year Development Plan which presents all the national policies, plans and programmes. Nepal's Tenth Plan (2002–2007) internalised the Sustainable Development Agenda for Nepal (which aims to guide and influence national-level planning up to 2017, see box) and adopted various policies and programmes to facilitate sustainable economic growth. The Three-Year Interim Plans (2007/08–2009/10 and 2010/11–2012/13) provide continuation and aim to contribute to reducing poverty and bringing sustained peace through employment-centered inclusive and equitable economic growth. The National Conservation Strategy which was endorsed by the Government in 1988 is now being reviewed to address the changing contexts, emerging opportunities and challenges.

Through these various processes, the importance of ecosystem services is increasingly being recognised and mainstreamed into national policies for livelihood improvement and poverty reduction. For example, the Government, through the Ministry of Forests and Soil Conservation (MoFSC), has initiated the revision of its National Biodiversity Strategic Action Plan (NBSAP), and will be considering the Convention on Biological Diversity global 'Aichi Biodiversity Targets' from a national perspective. This sets an important context for the Government of Nepal's commitment to protect ecosystem services and biodiversity, and to ensure the equitable sharing of all ensuing benefits on a sustainable basis. The MoFSC is also in the process of formulating a new policy on 'Payment of Ecosystem Services' in order to establish a mechanism to share the maximum benefits from biodiversity conservation.

Some broad goals for sustainable development

- Land use is planned and managed at the local and national level such that resource bases and ecosystems are improved, with complementarity between high- and lowlands, that forest biomass grows, that agricultural and forest lands are protected from urban sprawl, and that biodiversity is conserved at the landscape level by recognising threats from habitat fragmentation and loss of forest cover
- A system of Protected Areas (including National Parks and Conservation Areas) is maintained and further developed to safeguard the nation's rich biodiversity.
- Local communities near Protected Areas are involved in both the management and economic benefit sharing of the area.
- Every citizen has adequate availability of forest products to meet his or her basic need, and also has the opportunity to enjoy aesthetic and spiritual experiences in nature

SOURCE HMG/NPC/MOPE (2003) *Sustainable Development Agenda for Nepal*. Kathmandu: His Majesty's Government of Nepal.

The costs of conservation

The Convention on Biological Diversity recognises that substantially increased investment in conservation is urgently needed if the global targets set for 2020 are to be realised. Target 20 requires that *'the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011–2020... should increase substantially from the current levels'*.

A 2012 study by BirdLife International and other organisations under the Cambridge Conservation Initiative umbrella estimated that the financial cost of conserving Nepal's 15 protected and partially-protected IBAs would be US\$ 10–15 million each year. Currently, it is estimated that US\$ 6 million is spent on the protection and management of these sites, reflecting the need to increase financial investment. Consideration of the conservation needs of Nepal's unprotected IBAs (a further 12 sites) would increase this figure substantially. However, studies are increasingly showing that the net benefits received from protecting and managing sites are likely to greatly outweigh the costs, making this investment cost-effective and worthwhile.

Local planning in Nepal

The Ministry of Local Development is responsible for the implementation of local development programmes and projects through decentralised local governance systems. The Local Self Governance Act 1999 entrusts local bodies to make decisions which will affect the lives of the people. The Act also empowers local bodies such as District Development Committees (DDC) and Village Development Committees (VDC) to manage natural resources within their jurisdiction and mobilise both human and financial resources. However, there has been overlap of roles and responsibilities with other Government line agencies in the management and use of resources, and this has sometimes resulted in difficulty in coordinating effective management of biodiversity and ecosystem services at the site level. One example is the Jagdishpur Reservoir Important Bird Area (IBA), which is also a Ramsar Site, and which is managed by the District Forest Office and the District Irrigation Office for completely different purposes.



VDC members can make important decisions about the local use of natural resources. These members attend a stakeholder workshop at Rara National Park to discuss the use of resources by different people (David Thomas)

Legislation, policies and plans—relevant to conserving biodiversity and delivering ecosystem services—in Nepal

Enactment of National Park and Wildlife Conservation Act, 1973
 National Park and Wildlife Conservation Rules, 1974
 The National Forestry Policy (NFP), 1976
 Leased Forest Rules, 1978
 Watershed Conservation Act, 1982
 King Mahendra Trust for Nature Conservation Act, 1982
 Soil and Watershed Conservation Regulation, 1985
 National Conservation Strategy, 1987
 Nepal Environmental Policy and Action Plan (NEPAP), 1993
 Forestry Policy, 1992
 Hydropower Development Policy, 1992
 Industrial Policy, 1992
 National Shelter Policy, 1996
 Buffer Zone Management Regulation, 1996
 National Solid Waste Management Policy, 1996
 Environment Protection Act, 1996
 Environmental Protection Rules, 1997
 Buffer Zone Management Guidelines, 1999
 Formulation of Sustainable Development Agenda for Nepal (SDAN), 2002
 Nepal Biodiversity Strategy, 2002
 Nepal Biodiversity Strategy Implementation Plan, 2006–2010
 Water Resources Strategy, 2002
 National Wetland Policy, 2003
 Leasehold Forestry Policy Guidelines, 2003
 National Action Program on Land Degradation and Desertification, 2004
 National Agricultural Policy, 2004
 Community Forestry Guidelines, 1996 revised in 2002 and 2005
 National Water Plan 2005
 Agro-biodiversity Policy, 2007
 National Adaptation Programme of Action (NAPA), 2010
 Climate Change Policy, 2011
 Water Resources of Nepal–Climate Change, 2011

The Ministry of Local Development and local bodies allocate budgets to implement a wide range of local development initiatives concerned with, for example, drinking water, rural roads, irrigation, micro hydroelectricity and other community-identified small-scale projects. The local bodies also generate income from natural resources within their jurisdiction. However, many of the projects do not consider negative impacts on the environment and the values of ecosystem services which may be lost.

Moving to a more sustainable future

Attaining the right balance between use and conservation is always challenging but nonetheless necessary. The following are some proposed solutions to remove barriers to moving in this direction:

- A stronger policy commitment and growing realisation among planners on the need for integrating environment and development
- More coordinated policy-making taking into account all the international conventions, facilitating environmental standards, mainstreaming environmental issues in development programs, and monitoring compliance
- A growing recognition of the importance of a multi-stakeholder approach in environmental planning and management
- Strengthening, expanding and improving good practices like community forestry to make them more inclusive, integrated and sustainable
- Controlling unsustainable commercial exploitation of benefits from ecosystem goods and services, thereby putting people and the planet before profit

SOURCE Drawn from NPC (2011) *Nepal Status Paper—United Nations Conference on Sustainable Development 2012 (Rio+20): Synopsis*. Kathmandu: National Planning Commission, Government of Nepal.

Protected areas

The National Parks and Wildlife Conservation Act 1973 and Buffer Zone Management Regulation 1996 are the legal tools for Protected Area declaration and management. There are several different types of 'protected area' in Nepal, including: National Parks, Wildlife Reserves, Conservation Areas and Hunting Reserves. To date, Protected Areas constitute more than 23% of the total land area of the country (more than 3.4 million ha). For those Protected Areas with buffer zones, 30–50% of the total income is shared with local communities (through Buffer Zone Management Committees) to implement community development activities. Altogether, 12 buffer zones have been declared so far, embracing over 80 Village Development Committees in 27 districts and over 700,000 people.

Communities adjacent to protected areas benefit directly from the services flowing from the protected habitats. However, they often also bear the costs of restricted access to local resources. A challenge for Protected Area managers is therefore to balance the requirements to conserve biodiversity, with the wider benefits of the site and the immediate needs of the local community.

Coverage of protected areas in Nepal is already well above that set by the CBD's global 'Aichi Biodiversity Target' 11 for 2020 (17%). However, Target 11 also stipulates that 'areas of particular importance for biodiversity and ecosystem services are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas', and hence meeting this target is still a challenge for Nepal. There are also more than 1.23 million ha of Community Forest in Nepal (nearly 22% of the total forest area) which are managed for a range of objectives, products and services, including for biodiversity conservation (see Forests below).

This study shows: Nepal's protected Important Bird Areas (IBAs) are currently providing a wide range of benefits at the local, national and global level. For example, many of the protected IBAs (e.g. Chitwan National Park and Annapurna Conservation Area) are popular destinations for recreation and tourism, providing important sources of national and local income (through, e.g. creating local jobs, supporting national businesses and generating spending in the wider economy), and this service is expected to increase by 2020.



(Jenny Birch)

Key recommendations

- At Protected Areas, examine the distribution of ecosystem service benefits in more detail, and establish ecosystem service-based development initiatives that maximise and redistribute benefits in ways that are sustainable, equitable, reduce pressures on biodiversity and incentivise conservation
- At all Protected Areas, develop community-NGO-Park Authority collaborations to ensure regular monitoring of biodiversity and ecosystem services, in order to report on trends and management effectiveness
- For Tamur and Mai Valleys, and Phulchoki Mountain Forests, explore the possibility of establishing Conservation Areas that retains the rights of the local community Forest User Groups, and allows income generation from well managed tourism
- For the Farmlands of Lumbini, including the Khadara Phanta grasslands, explore options for better protection

Forests

Nepal has 5.83 million ha of forested land. This is divided into national and private forests with five sub-categories on the basis of management regimes, including Government managed forests, community forests, protected forests, leasehold forests and religious forests. Nepal has a well-defined policy and legal framework for the forestry sector, which is guided by the Master Plan for the Forestry Sector 1989 and periodic national plans. The Ministry of Forests and Soil Conservation is responsible for a number of relevant policies including the Leasehold Forestry Policy Guidelines 2003, Herbs and non-timber forest product / NTFP Development Policy 2004, and Gender and Social Inclusion Strategy in the Forestry Sector 2004–2019. The Forest Act 1993 supports the handover of the national forest to



(David Thomas)

adjoining Forest User Groups (FUGs) which are empowered to manage parts of the forest estate themselves. Some 18,000 FUGs have been established to date, the majority belonging to the Federation of Community Forestry Users, Nepal (FECOFUN), which acts as a conduit for local communities to input into policy processes. Community forestry has been successful in: restoring degraded land and greenery; increasing and conserving biodiversity; increasing the supply of forest products; empowering rural women, the poor and disadvantaged groups; promoting income generation and community development activities; and in improving livelihoods of people in rural areas. Nepal is also engaged in REDD+ activities which aim to reduce emissions from deforestation and forest degradation, support the conservation and sustainable management of forests, and enhancement of forest carbon stocks.

This study shows: Across the network of IBAs, the area of forest cover is expected to decrease by about one-third by 2020 if current pressures and trends continue. Some ecosystem services delivered by forests at IBAs would decline as a result, including benefits that are particularly important to local people, such as supply of harvested wild goods, quality of climate and air, and patterns of water flows. On the other hand, benefits would be realised from cultivated food as a result of increased agricultural land.

Key recommendations

- Establish 'green enterprises' and other sustainable livelihood options to minimise the pressure on forests
- Work with community Forest User Groups to improve the sustainable management and local governance of forest resources for the benefit of both people and wildlife
- Work with local communities to restore natural forest, develop native species plantations for local needs and discourage illegal logging of timber
- Ensure that appropriate biodiversity and social safeguards are applied to national REDD+ activities

Grasslands

Although grasslands are important habitats for biodiversity and ecosystem services, Nepal has no national policies for the sustainable use and management of grasslands. Indeed, policy-makers are often unaware of their importance. In the grassland protected areas of the Terai (e.g. Chitwan National Park and Koshi Tappu Wildlife Reserve), management attempts to strike a balance between the needs of local people and the conservation of biodiversity by allowing people to harvest grasses for a limited period of time each year.

This study shows: Across the network of IBAs, the area of grasslands is anticipated to decline if current pressures and trends continue. Some ecosystem services delivered by grasslands would decline as a result, notably the provision of wild harvested goods such as fodder for livestock which are vital for local communities.



(Jyotendra Jyu Thakuri)

Key recommendations

- Raise awareness of policy- and decision-makers of the importance of grasslands for biodiversity and ecosystem services, and the benefits to poor communities
- Engage in / stimulate dialogue on the formulation of national policies for grasslands, covering both protected and non-protected areas, in the mountains and Terai, that take account of conservation of biodiversity and delivery of ecosystem services to poor people
- At grassland sites, support local communities in the sustainable management of grasslands for the benefit of both people and biodiversity, providing technical support and building their skills

Wetlands

There has been a long history of establishing national policies and legislation for wetlands in Nepal indicating the early recognition of their importance. An early example is the Water Resources Act 1992 which sets out guidelines for the sustainable use of water and promotes environmental impact assessments. Perhaps of most significance is the commitment that Nepal has shown to the conservation of wetlands, especially waterfowl habitats of international importance, by signing the Ramsar Convention on Wetlands of International Importance. Under this convention, each signatory agrees to promote the sustainable use of all wetlands in their territory, and to designate suitable wetlands for inclusion in a List of Wetlands of International Importance (so-called 'Ramsar sites') according to fixed criteria, and to promote the conservation of these sites, including through monitoring and notification of changes to threats to sites. There are currently nine wetlands in Nepal which have been designated as Ramsar sites of which all are IBAs, namely Koshi Tappu Wildlife Reserve, Ghoda Ghodi Lake, Jagdishpur reservoir, Gokyo Lake (Sagarmatha National Park), Rara Lake (Rara National Park), Phoksundo Lake (Shey-Phoksundo National Park), Gosainkunda Lake (Langtang National Park), Mai Pokhari (Mai Valley Forests) and Bees Hazari Lake (Barandabhar Forests and Wetlands).

The primary goal of the National Wetland Policy 2003, reflecting Nepal's obligations under the Ramsar convention, is to conserve and manage wetland resources wisely and in a sustainable way with the participation of local people. Following on from this, the Government has initiated a number of projects to mainstream wetland resources in national policies and programmes, for example the Conservation and Sustainable Use of Wetlands in Nepal (CSUWN) project, which has been instrumental in establishing institutional and policy support, along with grassroots sustainable livelihoods activities, and which has prepared a Conservation, Education, Participation and Awareness (CEPA) Strategy and Dissemination Framework (2011–2015) for the Department of National Parks and Wildlife Conservation (DNPWC), the Ramsar Authority of Nepal.

This study shows: Wetlands in IBAs are not anticipated to change significantly in terms of land cover but many of the services provided by them are expected to decline if current pressures and trends continue. There are, however, opportunities for recreation and tourism to increase, for example at the Ramsar sites, where nature-based recreation is becoming increasingly popular.



(Andy Graham)

Key recommendations

- Raise awareness through the CEPA Strategy and Dissemination Framework (2011–2015, DNPWC) of policy- and decision-makers of the value of wetlands for biodiversity and ecosystem services, and the benefits to poor communities
- At wetland sites, support wetland-dependent indigenous communities in the sustainable management of wetland resources for the benefit of both people and biodiversity, providing technical support (e.g. CSUWN's Wetlands Economic Evaluation Tool, and Wetlands Inventory, Assessment and Monitoring framework) and building on their skills
- At wetland sites, promote sustainable wetland-based tourism and recreation with a focus on wildlife/birdwatching activities, ensuring that benefits are captured locally

High mountains

The 'Mountain Agenda' (Chapter 13 of Agenda 21 adopted at the UN Conference on Environment and Development in Rio de Janeiro in 1992) calls on the international community to recognise upstream-downstream interdependency and develop enhanced policies, institutional structures, funding mechanisms and support systems that promote multi-stakeholder involvement in managing trans-boundary resources. In 2012, the UN Conference on Sustainable Development (Rio+20) called for a review of the Mountain Agenda to better recognise the services that mountains provide. The Government of Nepal also proposed the establishment of a 'Mountain Initiative' as a global initiative covering the common interests of mountainous countries and regions. The Initiative is expected to provide a framework within which mountain countries and regions, in collaboration with relevant agencies, can work together to respond to the many changes which are occurring in mountains. The Initiative aims to build the resilience of mountain communities, while maintaining the vital mountain-based ecosystem services that flow to billions of people living downstream.



(Hum Gurung)

This study shows: The high mountain Important Bird Areas (IBAs) are subject to a range of pressures on wildlife and ecosystem services, including clearance of forest for cultivation, grazing impacts and human disturbance which could be related to increasing recreation and tourism that has occurred over the recent past. Climate change was reported as an anticipated major impact for several sites, where snow and ice cover is expected to reduce as a result of the altered climate pattern.

Key recommendations

- Contribute to the development of the Mountain Initiative, specifically through work / projects at high mountain sites that conserve biodiversity, maintain ecosystem services, support the livelihoods of the some of the poorest people in Nepal, and help mountain communities build resilience to climate change
- At high mountain sites, promote sustainable mountain tourism, with a focus on managed wildlife activities, minimising disturbance and ensuring that benefits are captured locally

Water

Nepal's rugged topography, young geology and monsoon climate all combine to produce high rates of runoff, with the Himalayan mountain range serving as a water tower to billions of people living downstream of its slopes. Water is therefore one of the principal natural resources supporting the economy of Nepal. Despite this, Nepal has been facing a scarcity of water in both rural and urban areas particularly in the pre-monsoon months. It appears that, with changing climatic conditions, perennial rivers and streams often have reduced flows. Hence, careful planning will be needed to ensure that any development of the water and energy sectors does not damage fundamental water services. At present, approximately 33% of Nepal's agricultural production is based on irrigation. Potential expansion of Nepal's irrigation systems represents one of the primary means of intensifying agricultural production and increasing food supplies to match future population growth. Similarly, 84% of Nepal's electricity is currently provided from hydroelectric generation. A potential increase in hydropower generation capacity would allow Nepal to meet its domestic energy demands as well as increase its revenues by exporting surplus energy to India and other neighbouring countries. These water-based benefits can only be achieved if the provision and regulation of water flows are protected. The Water and Energy Commission Secretariat (WECS) was set up in 1981 with the broad objective of developing water and energy resources in an integrated and accelerated manner. Its primary responsibility is to assist the Government of Nepal, the Ministry of Water Resources and other related agencies in the development of policies and plans for the water and energy sectors. So far, the WECS has developed a number of important water related policies including the National Water Plan 2002, Water Resources Strategy 2002 and the Water Resources of Nepal-Climate Change 2011.



(@TheDreamSky/flickr.com)

This study shows: Provision of water and the regulation of water flows are services delivered across all Nepal's IBAs, and are ranked among the most important services at almost all sites. The anticipated decline in this service across a significant number of sites will have an impact on people across Nepal, from the local to the national level. For example, Shivapuri-Nagarjun National Park protects the water source that supplies the majority of household water for residents in the Kathmandu Valley. Without adequate protection, forest clearance and degradation is likely to lead to water supply problems for millions of domestic users, as well as downstream problems from flooding, increased sedimentation and landslides.

Key recommendations

- At appropriate sites, explore the opportunities for sharing the benefits of providing / regulating / purifying water more fairly through mechanisms such as 'Payments for Ecosystem Services' between upstream providers and downstream users
- At appropriate sites, explore the opportunities for developing integrated use of water resources (e.g., irrigation, drinking water, micro hydroelectricity), conservation of biodiversity and climate change adaption, ensuring that benefits are captured locally

Tourism and recreation

Nature-based tourism and outdoor recreation are important activities in Nepal, underpinned by the country's rich biodiversity and spectacular landscapes. Some of the major tourism activities are trekking, safari drives, elephant safaris, water sports, rock climbing and homestays. Protected Areas, including many IBAs, are major destinations for adventure and wildlife tourism, trekking and water-based recreation. The economic benefits from tourism and recreation are crucial for many local communities, as well as an important source of foreign currency for the Government. The Ministry of Tourism and Civil Aviation is responsible for formulating policies and strategies to promote tourism, and the new tourism policy endorsed in 2009 aims to develop tourism as an important agent of national development, diversifying tourism in rural and mountain areas. The Nepal Tourism Board, which was established in 1999, promotes tourism in Nepal and internationally through public-private partnership, and is working to meet the Government target to attract two million visitors by 2020 as envisaged in the Tourism Vision 2020.



(David Thomas)

This study shows: Tourism and recreation is a service delivered by the majority of IBAs although some, such as Koshi Tappu Wildlife Reserve and Rara National Park, receive negligible numbers of fee-paying international tourists and are therefore not capturing the full potential benefits from this service. The anticipated increase in tourism at IBAs by 2020 is reflected in the plans of the Nepal Tourism Board to attract more visitors. Although an increase in this service can be considered positive, large increases in visitor numbers will increase the risk of disturbance unless carefully managed.

Key recommendations

- Consider how increased tourism might impact on Nepal's Protected Areas and other sites important for biodiversity conservation, and work with the Nepal Tourism Board to develop a strategy that invests more of the revenue generated (entry fees) in the conservation and management of the areas in question, ensuring that expansion is sustainable and does not compromise important biodiversity and ecosystem services
- At selected sites, develop low impact nature-based activities that provide income to local communities (local guides, local accommodation etc.)

Climate change

Nepal is active as a Party to the UN Framework Convention on Climate Change (UNFCCC). Relevant legislation includes the Climate Change Policy 2011, the Environment Protection Act 1996 and the Environment Protection Rules 1997. The Government body responsible for climate change and ecosystem-based adaptation is the Ministry of Environment (a specific Climate Change Management Division was established in 2010). In 2009, the Government established the Climate Change Council, under the chairmanship of the Prime Minister, to coordinate the formulation and implementation of climate change-related policies. In 2010, a National Adaptation Programme of Action (NAPA) was endorsed by the Government, leading to the development of Local Adaptation Plans of Action (LAPAs) to implement activities on the ground.



(©Mathias Zehring)

Nepal is included in the Carbon Partnership Facility (CPF) programme of the World Bank, with the Ministry of Forests and Soil Conservation (MoFSC) taking the lead role in implementing national activities related to REDD+. The Ministry has already submitted Nepal's Readiness Preparation Proposal (R-PP, 2010–2013) to the World Bank, which provides a roadmap for developing and implementing the REDD strategy. The success of the REDD mechanism will depend on the availability of reliable data on forest cover and biomass changes. To build capacity in this regard, the Government has been organizing REDD orientation training in various regions of Nepal and has established a 'REDD Cell' (a unit within the MoFSC) which, in collaboration with other stakeholders, has prepared Forest Carbon Measurement Guidelines.

This study shows: Climate change is considered a severe threat to habitats and species at a number of IBAs. Although this is a long-term driver, it is likely to alter the ability of sites to provide various services such as harvested wild goods and water, with profound impacts on local people. Climate change will also exacerbate other threats: for example, forest clearance and forest and wetland degradation will increase the incidence of flooding events from extreme rainfall.

Key recommendations

- At selected sites, including those with forest and wetlands, and in the high mountains, provide support to vulnerable communities for ecosystem-based approaches for adaptation, linked to Local Adaptation Plans of Actions, demonstrating the values of using and conserving biodiversity and ecosystems to help people adapt to climate change impacts
- Coordinate and collaborate with the concerned Government ministries and departments, and the 'REDD Cell' to implement REDD-related activities



(Jenny Birch)

Shivapuri Nagarjun National Park IBA

Some facts and figures

AREA: 15,900 ha

PROTECTION STATUS: National Park

CONSERVATION STATUS: low pressures, near favourable state, medium response

MAIN METHODS FOR ASSESSING ECOSYSTEM SERVICES: key informant meetings, rapid appraisal, carbon transects (19), household surveys (23), water modelling, visitor surveys (68)

SURVEY STAFF: 5

SURVEY TIME: 49 person days



The Site: This Important Bird Area (IBA) is located in the central region of Nepal close to the capital city, Kathmandu. It is the only protected area in the country that falls entirely within the mid-hills mountain range. It protects a major water source feeding the rivers into the Kathmandu Valley, hence supplying the population downstream with clean fresh water. Predominantly forest, this site is an IBA for its significant populations of forest bird species, including Nepal's only endemic bird species, Spiny Babbler. Globally threatened White-rumped Vulture and Hodgson's Bushchat have also been recorded in the park.

The Issues: The IBA is surrounded by a human-dominated landscape with pressure from the nearby communities to access natural resources, which they have been restricted from doing since the park's creation.

This study: The benefits that people receive from carbon storage and greenhouse gas flux, nature-based recreation, water provision and cultivated goods were assessed by comparing the current state of the park to the most plausible alternative state—a mosaic of agriculture and urban land with small forested patches remaining. With the loss of forest, the value of this site would be greatly diminished for global climate regulation with a huge decline in carbon storage (60% decrease overall) and greenhouse gas sequestration (74% decrease), equivalent to some \$220 million in total for the former and \$1.6 million per year for the latter. There would also be increased sedimentation in the rivers as a result of soil erosion, requiring additional treatment costs to make the water usable. No nature-based recreation would occur, which would represent a loss to the national economy of almost \$2 million / year. However, in the alternative state, there would be increased agricultural production of \$2 million / year and a one-off benefit from harvesting the wood of deforested trees.

Interpreting the results: The current protected status of this IBA provides a number of important benefits (not least in the conservation of key biodiversity). However, at the local level, communities are losing the opportunity to convert land for farming or harvest wild products. Establishing a buffer zone around the park would share the economic benefits more fairly as Buffer Zone Management Committees would receive a proportion of the annual income to the park to use towards community development programmes. With careful management, this could reduce the pressure on the park, enabling it to continue to conserve nature and protect an important watershed for the nation.



(Jyotendra Jyu Thakuri)

Koshi Tappu Wildlife Reserve and Barrage IBA

Some facts and figures

AREA: 21,000 ha

PROTECTION STATUS: Wildlife Reserve (protected) and barrage (unprotected)

CONSERVATION STATUS: high pressures, unfavourable state, medium response

MAIN METHODS FOR ASSESSING ECOSYSTEM SERVICES: stakeholder workshops (9), key informant meetings, rapid appraisal, household surveys (154)

SURVEY STAFF: 3

SURVEY TIME: 30 person days



The Site: This Important Bird Area (IBA) was created as a result of the construction of the Koshi Barrage in 1958, which provides water to India. It was designated as a Ramsar Site in 1987. This site is an IBA because it is a very important wetland for migrating waders and waterfowl, and is a critical site for the globally threatened Swamp Francolin. It also harbours other threatened species, including the Ganges River Dolphin and holds the last remaining population of wild Asian Water Buffalo in the country.

The Issues: The majority of the 16,280 households living inside the buffer zone cultivate rice crops and utilise the reserve for other resources, including fish, fodder and firewood. 61% are classified as wetland-dependent communities. However, reduction in the numbers of waterbirds indicates a reduction in fish with severe consequences for both wildlife and humans.

This study: The value of ecosystem services delivered by the site was compared to those delivered by comparable habitats outside the reserve. Local people benefit from fishing and harvesting grasses which may be having a negative impact on the biodiversity. Benefits from international tourism are low but significant. However, they mainly accrue nationally.

Interpreting the results: Local people are highly dependent on the natural resources of the reserve and it provides many more benefits than the surrounding areas outside of the Protected Area which have been heavily degraded. However, improving the management of the site for important bird species will require more regulated harvesting within key areas of the reserve. Where costs for local people are significant, initiatives may be needed which help redress the imbalance. For example, alternative livelihoods projects based on use of invasive plant species or fish farming and engagement in the tourism sector may help to reduce pressures whilst giving local people a fair share of the benefits.



(Jyotendra Jyu Thakuri)

Rara National Park IBA

Some facts and figures

AREA: 10,600 ha

PROTECTION STATUS: National Park

CONSERVATION STATUS: high pressures, unfavourable state, medium response

MAIN METHODS FOR ASSESSING ECOSYSTEM SERVICES: stakeholder workshop (1), key informant meetings, rapid appraisal, carbon transects (24), household surveys (251), water modelling

SURVEY STAFF: 5

SURVEY TIME: 56 person days



The Site: This Important Bird Area (IBA) was declared as a Protected Area in 1976 due to its unique natural beauty and the desire of the late King Mahendra to protect it. In 2006, a buffer zone was also declared. It is an important site for the conservation of the globally threatened Cheer Pheasant and harbours other charismatic species such as Red Panda and Clouded Leopard.

The Issues: Although Protected Areas are often highly effective in reducing the pressures on biodiversity and conserving species, there are often negative impacts on local people. Rara falls within the districts of Jumla and Mugu, which are two of the poorest in Nepal and resources are often scarce. There is already intense harvesting of timber from some areas of the buffer zone and various non-timber forest products (NTFPs) are also harvested in this area, with some permitted (as well as increasing illegal) extraction from the core zone of the park.

This study: The benefits that people receive from carbon storage and sequestration, harvested wild goods, cultivated goods, nature-based recreation and water services were assessed by comparing the core zone of the National Park, its buffer zone and the surrounding area. The study suggests that resource use in the buffer zone is unsustainable, resulting in the rapid degradation of its forests and increasing encroachment into the core zone.

Interpreting the results: To ensure the long-term wildlife value of the forest and sustainability of harvested wild goods for local people, a better forest management model is required. Restoring the 41 Community Forests that existed prior to the creation of the buffer zone could help to achieve this. In Nepal, buffer zones have been established around most of the National Parks to provide some financial compensation to communities for this loss of access. At a site where annual revenues are low (Rara currently has the lowest revenue of all the 10 National Parks in Nepal) the net additional financial benefit to living within the buffer zone is currently negligible, so investment in engaging local people in the developing tourism industry, and encouraging other income-generating activities is recommended.



(David Thomas)

Phulchoki Mountain Forests IBA

Some facts and figures

AREA: 4,296 ha

PROTECTION STATUS: 18% protected as Community Forests, remaining area is National Forest

CONSERVATION STATUS: medium pressures, near favourable state, low response

MAIN METHODS FOR ASSESSING ECOSYSTEM SERVICES: key informant meetings, rapid appraisal, household surveys (35), water modelling, visitor interviews (32)

SURVEY STAFF: 3

SURVEY TIME: 13 person days



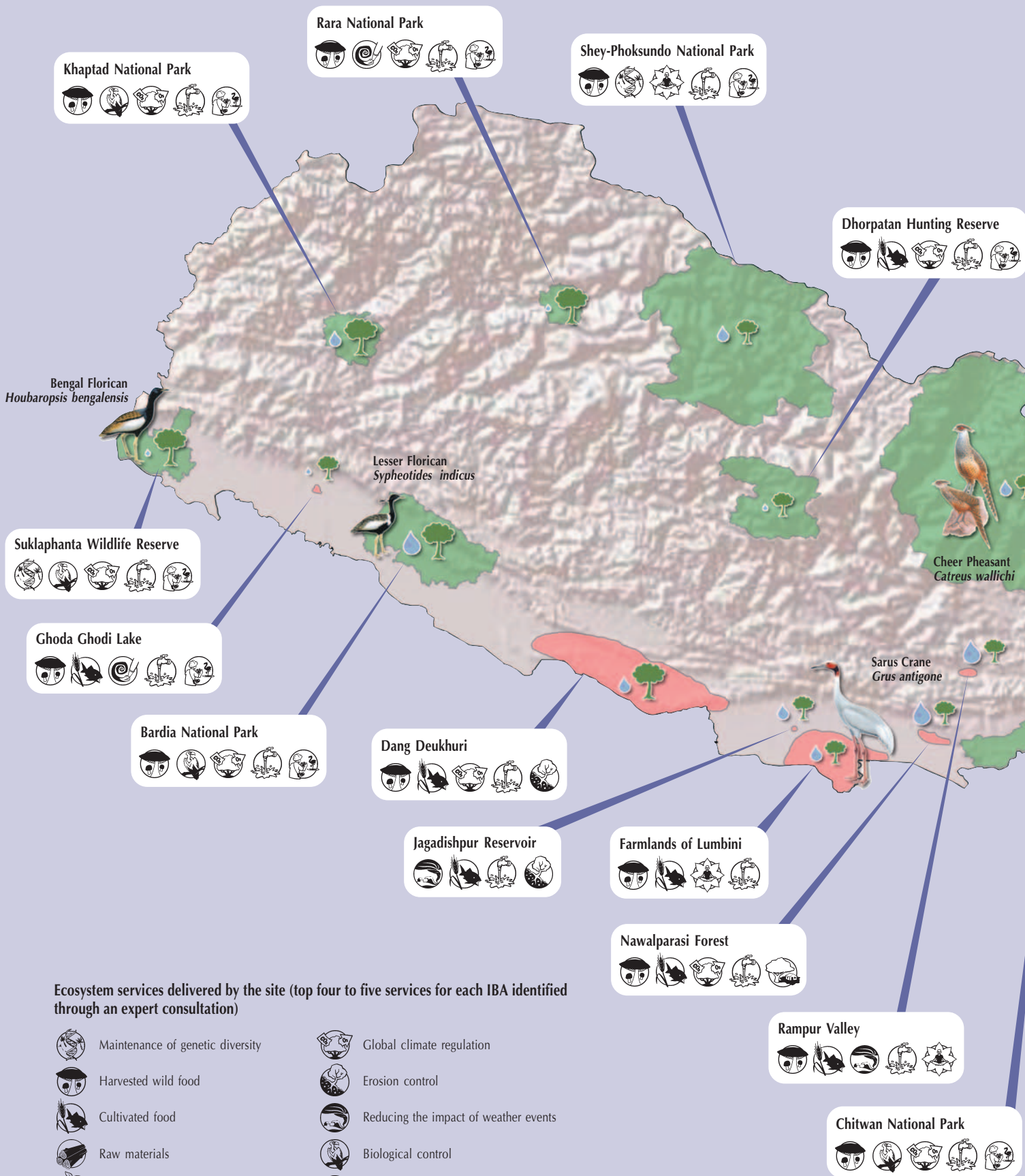
The Site: This Important Bird Area (IBA) lies 16 km southeast of Kathmandu and is the highest peak of the Kathmandu Valley. It supports a lush growth of different forest types and is recognised as an IBA due to its importance for forest bird species, including the endemic Spiny Babbler and restricted range Hoary throated Barwing.

The Issues: Some of Phulchoki's forests are managed by community Forest User Groups (FUGs). In Nepal, community forestry forms a principal part of a national strategy for livelihoods improvement, resource management and environmental protection. However, it is not always clear whether this governance system is working in the way intended.

This study: The benefits that people receive from ecosystem services were assessed by comparing their provision under the current state (Community Forests) to an alternative state. In the absence of community forestry, the forest would have been gradually converted to a mixture of degraded forest, farmland and built up areas. Current benefits received from carbon sequestration, water quality, harvested wild goods and revenues from recreational visitors (picnickers) would decline. However, in the alternative state, there would be increased benefits from agricultural production.

Interpreting the results: In general, community forestry has meant that more resources are now captured locally rather than by distant users coming to take resources (as was the case in the past), but not everyone benefits equally. There have been differential impacts according to localness, gender, economic status, occupation, caste and ethnicity. For example, heavy use of forest resources in the past was made by non-local Kami (blacksmiths) and Sunar (goldsmiths) castes for the production of charcoal. These people no longer have access unless they are living locally and are members of a FUG. Also, restrictions linked to Community Forestry have impacted poorer households (who are most reliant on harvesting wild goods) as their lower social status means that they are less influential when it comes to making management decisions. Hence, well-targeted local development should be implemented to deliver more equitable outcomes within the FUGs by enhancing the capture of ecosystem service values by the poorer members of the community and other vulnerable groups, while continuing to conserve the important biodiversity at the site. This could be achieved through improving the recreational facilities (e.g. bird hides, picnic areas) around the forest and engaging the poorer households in their management in order to increase local cash incomes.

Map of IBAs and selected data



Ecosystem services delivered by the site (top four to five services for each IBA identified through an expert consultation)

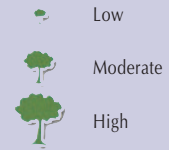
- | | |
|--|--|
| Maintenance of genetic diversity | Global climate regulation |
| Harvested wild food | Erosion control |
| Cultivated food | Reducing the impact of weather events |
| Raw materials | Biological control |
| Natural medicines | Nature-based recreation/ tourism |
| Water flows | Aesthetic benefits / inspiration / mental health |
| Local climate and air quality regulation | Spiritual / religious experience |

Map shows important services delivered to Nepal's 27 IBAs and their importance for carbon storage and water provision. Nationally protected bird species are also shown to highlight the importance of the IBA network in conserving birds and other biodiversity.

Picture credits: Daniel Cole (Cheer Pheasant, Satyr Tragopan, Himalayan Munal) and Carl D'Silva (Bengal Florican, Lesser Blorican, Sarus Crane, Great Hornbill, Black Stork, White Stork). Published in Grimmett *et al.* (2000) *Birds of Nepal*. Christopher Helm Publishers Ltd.

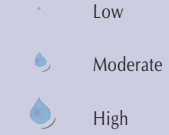
Carbon storage

SOURCE See p.13. Carbon (0.01 Mg/ha) classified according to the highest number of pixels falling within three categories within each IBA: low (0–800); moderate (3,700–8,100); high (10,500–18,000).



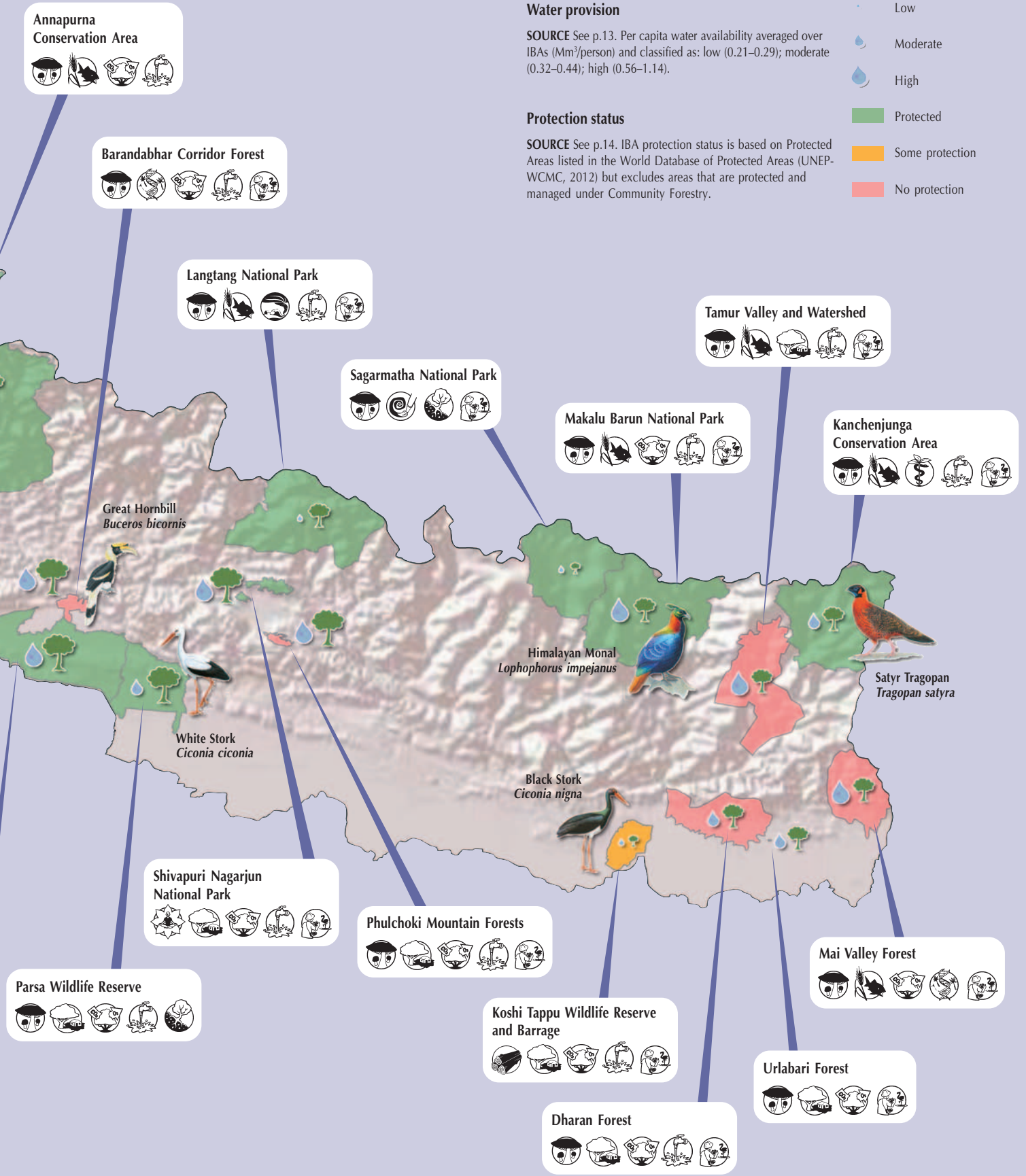
Water provision

SOURCE See p.13. Per capita water availability averaged over IBAs (Mm³/person) and classified as: low (0.21–0.29); moderate (0.32–0.44); high (0.56–1.14).



Protection status

SOURCE See p.14. IBA protection status is based on Protected Areas listed in the World Database of Protected Areas (UNEP-WCMC, 2012) but excludes areas that are protected and managed under Community Forestry.



Scientific methods

Determining the status of Nepal's birds

The national status of Nepal's birds was determined using the IUCN Red List criteria, and following IUCN's regional guidelines in their application. This involved considering a few issues that are not encountered at the global level, for example species that do not reproduce in the country, but are still dependent upon its resources for their survival. The IUCN Red List Categories and Criteria are intended to be an easily and widely understood system for classifying species at high risk of extinction, and is based on population sizes and / or range sizes, and rates of decrease in these.

In Nepal, the process involved undertaking a comprehensive literature search of all published material on Nepal's birds. From this an initial list of bird species potentially at high risk was drawn up by applying the IUCN Red List criteria. Then, records of these species, including number of individuals, date and location were extracted from all relevant references, plus information on trends and threats. In addition, numerous previously undocumented and valuable records, and comments, were obtained from many observers in Nepal. The initial list of potentially threatened species was revised as records were accumulated, and reviewed and agreed at a national workshop organised by Bird Conservation Nepal (BCN) in 2010.

Identifying Important Bird Areas

Important Bird Areas (IBAs) in Nepal were identified following standard methods developed by BirdLife International. The IBA identification process aims to locate, list and document all sites that are globally significant (both individually and as networks) for bird conservation. Wherever possible, IBAs are identified nationally, using data collected locally and applying site selection criteria agreed regionally and globally. To qualify as an IBA, a site must meet one or more of the four standard criteria developed by the BirdLife Partnership and which have been used to identify over 10,000 sites worldwide. These criteria address the two key issues in site conservation: vulnerability and irreplaceability. The four criteria cover (a) globally threatened species and (b) three classes of geographically concentrated—irreplaceable—species: restricted-range species, biome-restricted species and congregatory species.

In Nepal, in 2001, a national workshop was organised by BCN to discuss the identification of IBAs. First, existing Protected Areas were assessed against the IBA selection criteria using published and unpublished bird reports from these sites, as well as, subsequently, for other areas. For 15 Protected Areas, one or more criteria were met, while for others they were not or there was insufficient data to be sure (e.g. the Manasalu Conservation Area which remains as a potential IBA). An additional 12 unprotected sites were identified on the basis of very good survey reports of the presence of globally threatened as well as restricted-range species. Information on each site account was compiled and reviewed by bird experts with knowledge of the particular sites before final decisions were taken.

Monitoring Important Bird Areas

IBAs are being monitored in Nepal, following a standard methodology also developed by BirdLife International. At the national level, IBA monitoring data are essential to track and respond to threats, understand the status and trends of biodiversity, and assess the effectiveness of conservation efforts. The BirdLife system allows locally gathered data to be compiled nationally, regionally and globally, providing a powerful tool for reporting and advocacy. This regular monitoring can be done in very simple and inexpensive ways—and this is essential for sustainability. The minimal requirement is regular collection of information on at least one appropriate indicator for each of pressure (= threats), state (= condition) and response (= conservation action), and there are plans to extend the framework to cover benefits (= ecosystem services). While the results of monitoring are very important for IBA conservation, the monitoring process often has many helpful co-benefits too. These include creating awareness, developing technical capacity, engaging local communities and site management authorities, and building a national constituency for IBA conservation.

In Nepal, in many of the unprotected IBAs, BCN works with local conservation groups who have the best knowledge of the site and of any threats to or changes at them. For the protected IBAs, BCN keeps regular communication with the relevant official staff for any updates. BCN also distributes standard IBA monitoring and waterbird count forms to help with information gathering, and provides bird survey training to build knowledge and capacity. Staff from BCN also carry out regular bird surveys in IBAs themselves as well as support other individual bird experts to conduct surveys. In this way, a flow of information is generated upon which assessments are made, following synthesis and entry into the monitoring module of BirdLife's World Bird Database. In February 2012, a National IBA monitoring workshop was organised at Chitwan where all the participants from the respective IBAs were given training in compiling IBA monitoring data, and this forms the basis for the monitoring information presented in this report.

Representatives from Nepal's 27 IBAs attend a workshop to assess the current status of these sites for biodiversity (BCN archive)



Assessing ecosystem services

Many methods exist for identifying, measuring and valuing ecosystem services yet the majority are highly technical, expensive and not well grounded at the site level. This study was undertaken using a new 'toolkit' of methods for assessing ecosystem services, developed by a collaboration of academic institutions and conservation practitioners.

The toolkit provides practical guidance and methods that attempt to find a balance between simplicity and utility in developing robust scientific information for decision-makers. It focuses on understanding the impacts of actual and potential changes on ecosystem services at individual sites, owing to policy or management actions that affect the type of land use and its management at the site.

This methodology estimates the value of ecosystem services in the current state and the most likely alternative state of the site (for example, after conversion to agriculture), and presents the results as a comparison, so that decision-makers can assess the net consequences of such a change, and hence the costs and / or benefits of conservation for human well-being (see figure).

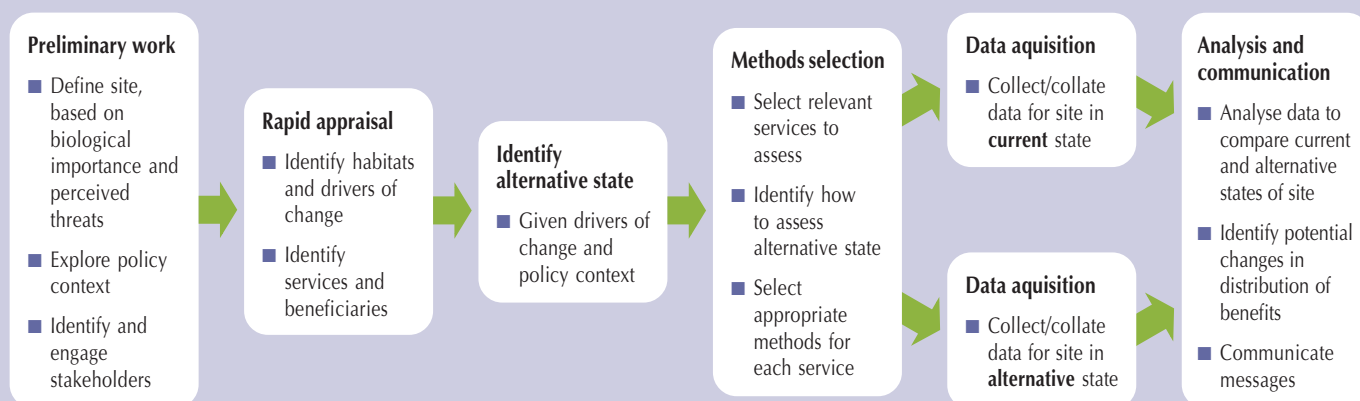
Rapid appraisal

To assess the importance of Nepal's 27 IBAs for delivery of ecosystem services, an expert consultation meeting was held that had representation from site managers or local conservation groups, or others with relevant knowledge, from all the IBAs. Together, these experts completed a 'rapid appraisal' of the site, including an overview of the habitats, the ecosystem services delivered by the site, drivers of change at the site and the potential impacts that this may have on stakeholders at a range of scales. It should be noted that this exercise was based on expert knowledge rather than on empirical scientific data. Some inconsistencies in the reported results may occur due to limitations in the knowledge of the participants and the difficulty in predicting how future changes may affect services.

Case Studies

Four IBAs were selected for further study, and appropriate quantitative methods were chosen from the toolkit to measure and value the ecosystem services they provide compared to a plausible alternative state (usually a change in the land cover). These methods are summarised opposite.

Stages in assessing ecosystem services at sites, as outlined in the 'toolkit'



Global climate regulation

Carbon storage in above-ground and below-ground biomass was estimated using one of three methods: (1) reference to IPCC standard tables; (2) 'transfer' of values from similar sites; (3) simple field surveys to quantify the mass of living vegetation in different habitats. Greenhouse gas emissions were estimated using IPCC values for appropriate habitat types. Data were extrapolated based on values per habitat per hectare and presented as economic values where relevant.

Water

Water provision and water quality were estimated using data from either water companies, questionnaire surveys or the online tool 'WaterWorld' which enables water provision, soil erosion and sedimentation to be modelled and a comparison made between current and alternative states.

Harvested wild goods

The harvesting of wild goods was quantified through participatory methods including stakeholder workshops and household surveys. Methods quantified the annual amount harvested, the unit value and related costs (including opportunity costs). The selected goods were extrapolated according to average per hectare values and were presented as economic values where relevant.

Cultivated goods

Cultivated goods were quantified through participatory methods including stakeholder workshops and household surveys or through information obtained from informed individuals. Methods quantified the annual amount cultivated, the unit value and related costs (including opportunity costs). Average values per hectare were applied to the area under cultivation and presented as economic values where relevant.

Nature-based recreation

Data on the number of visitors to a site were gathered through published reports on visits to sites or interviews with key informants. The economic contribution from tourism was deduced from interviews with visitors to estimate travel costs per visit. The proportion of that value coming from nature-based tourism was estimated through a simple choice question about the alternative state.

International environmental conventions

(ratified by Nepal)

Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), 1975

Date of ratification: 1975; **Obligations:** CITES aims to protect species from the detrimental effects of international trade by establishing a legal framework for preventing or controlling such trade. Each signatory country to the Convention must designate a management authority (Department of National Parks and Wildlife Conservation) to be in charge of a licensing system to regulate trade of species listed by the Convention, and a scientific authority to advise on the status of these species (Natural History Museum and Tribhuvan University) to ensure that any trade is sustainable.

UNESCO World Heritage Convention, 1972

Date of ratification: 1978; **Obligations:** Each signatory to this Convention recognises the duty of ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage situated in its territory. Signatory countries are encouraged to nominate sites within their national territory for inclusion on the World Heritage List and to establish management plans and reporting systems on the state of conservation of those sites. There are four World Heritage Sites in Nepal, of which three are IBAs, namely Lumbini, Chitwan and Sagarmatha National Parks.

Ramsar Convention on Wetlands of International Importance, 1971

Date of ratification: 1988; **Obligations:** Each signatory agrees to promote the sustainable use of all wetlands in their territory, and to designate suitable wetlands for inclusion in a List of Wetlands of International Importance (so-called 'Ramsar sites') according to fixed criteria, and to promote the conservation of these sites, including through monitoring and notification of changes to threats to sites. There are currently nine wetlands in Nepal which have been designated as Ramsar sites of which all are IBAs, namely Koshi Tappu Wildlife Reserve, Ghoda Ghodi Lake, Jagdishpur reservoir, Gokyo Lakes (Sagarmatha National Park), Rara Lake (Rara National Park), Phoksundo Lake (Shey-Phoksundo National Park), Gosainkunda Lake (Langtang National Park), Mai Pokhari (Mai Valley Forests) and Bees Hazari Lake (Barandabhar Forests and Wetlands).

Convention on Biological Diversity (CBD), 1992

Date of ratification: 1993; **Obligations:** The CBD's objectives are the conservation of biological diversity, the sustainable use of its components, and the sharing of the benefits from genetic resources. Signatory countries agree to develop national biodiversity strategies and action plans (NBSAPs) and to integrate the objectives of the Convention into relevant policies. Currently NBSAP content is guided by the CBD's 'Strategic Plan for Biodiversity 2011–2020' and its associated 20 'Aichi Biodiversity Targets'. Target 14 directly relates to ecosystem services: *By 2020, ecosystems that provide essential services, including services related to water and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities and the poor and vulnerable.* Target 11 also refers to ecosystem services: *By 2020, at least 17% of terrestrial and inland water areas... especially areas of importance for biodiversity and ecosystem services are conserved.*

United Nations Framework Convention on Climate Change (UNFCCC), 1992

Date of ratification: 1994; **Obligations:** UNFCCC works towards stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous human interference with the climate system, within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable sustainable economic development to proceed. Themes covered by the Convention include: reducing emissions, including from deforestation and forest degradation in developing countries, and adaptation (helping people and sectors adjust to the impacts of climate change). In 2007, Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD) became a key policy instrument in mitigating climate change when it was approved by the UNFCCC.

United Nations Convention to Combat Desertification (UNCCD), 1994

Date of ratification: 1996; **Obligations:** UNCCD aims to combat desertification (land degradation) and to mitigate the effects of drought. Countries work to implement the Convention through National, Sub-regional and Regional Action Programmes which spell out practical steps and measures to be taken to combat desertification in specific ecosystems. These action programmes should be aligned with the UNCCD's 10-Year Strategy which includes ambitions such as: Land productivity and other ecosystem goods and services in affected areas are enhanced in a sustainable manner contributing to improved livelihoods.



Some key references

- Baral, H. S. and Inskipp, C. (2005) *Important Bird Areas in Nepal: key sites for conservation*. Kathmandu: Bird Conservation Nepal.
- BCN and DNPWC (2011) *The state of Nepal's birds 2010*. Kathmandu: Bird Conservation Nepal and Department of National Parks and Wildlife Conservation.
- Birch, J. C., Thapa, I., Khatri, T., Adhikary, S., Gurung, H., Ram, A., Pandit, R. S., Stattersfield, A. J., and Thomas, D. H. L. (in prep.) Wetland values at Koshi Tappu Wildlife Reserve, Nepal. [*Oryx*].
- McCarthy, D. P., Donald, P. F., Scharlemann, J. W., Buchanan, G. M., Balmford, A., Green, J. M. H., Bennun, L. A., Burgess, N. D., Fishpool, L. D. C., Garnett, S. T., Leonard, D. L., Maloney, R. F., Morling, P., Schaefer, H. M., Symes, A., Wiedenfeld, D. A. and Butchart, S. H. M. (submitted) Financial costs of meeting global biodiversity conservation targets: current spending and unmet needs. [*Science*].
- MEA (Millennium Ecosystems Assessment) (2005) *Ecosystems and human well-being: synthesis report*. Washington, DC: Island Press. See <http://www.millenniumassessment.org>
- National Planning Commission (2011) *Nepal Status Paper- United Nations Conference on Sustainable Development 2012 (Rio+20), Synopsis*, National Planning Commission, Government of Nepal, Kathmandu.
- Peh, K. S.-H., Balmford, A. P., Bradbury, R. B., Butchart, S. H. M., Brown, C., Hughes, F. M. R., Stattersfield, A. J., Thomas, D., Walpole, M. and Birch, J. C. (2012) Measuring and monitoring ecosystem services at the site scale: a practical toolkit. Cambridge, UK.
- Peh, K. S.-H., Balmford A., Basnyat, M., Prakash Bhattarai, G., Bradbury, R. B., Brown, C. Butchart, S. H. M., Dhakal, M., Gurung, H., Hughes, F. M. R., Mulligan, M., Pandey, B., Stattersfield, A. J., Thapa, I., Thomas, D. H. L., Walpole, M. and Birch, J. C. in prep). Biodiversity conservation and ecosystem service co-benefits at the site scale: a rapid assessment from a Himalayan protected area in Nepal. [*Biological Conservation*].
- TEEB (The Economics of Ecosystems and Biodiversity) (2010) *The Economics of Ecosystems and Biodiversity: ecological and economic foundations*. London and Washington: Earthscan. See <http://www.teebweb.org/>
- Thapa, I., Gurung, H., Jyu Thakuri, J., Poudel, D., Rayamajhi, B., Stattersfield, A. J., Thomas, D. H. L. and Birch, J. C. (in prep.). Conservation and poverty: a rapid assessment of ecosystem services at a remote protected area in Nepal. [*PARKS*].
- Thomas, D. H. L., Thapa, I. Balmford, A., Bradbury, R. B., Brown, C. Butchart, S. H. M., Gurung, H., Hughes, F. M. R., Mulligan, M., Peh, K. S.-H., Stattersfield, A. J., Walpole, M. and Birch, J. C. (in prep.) What benefits do Community Forests provide, and to whom? A rapid assessment of ecosystem services from a Himalayan forest in Nepal. [*Global Environmental Change*].
- UK National Ecosystem Assessment (2011) *The UK National Ecosystem Assessment: Synthesis of the key findings*. Cambridge, UK: UNEP-WCMC.

Bird Conservation Nepal

Established in 1982, Bird Conservation Nepal (BCN) is the leading organisation in Nepal, focusing on the conservation of birds, their habitats and sites. We seek to promote interest in birds amongst the general public, encourage research on birds and identify major threats to biodiversity. As a result, we are the foremost scientific authority providing accurate information on birds and their habitats throughout Nepal. We provide scientific data and expertise on birds for the Government of Nepal through the Department of National Parks and Wildlife Conservation (DNPWC) and work closely in bird and biodiversity conservation throughout the country. BCN is a membership based organisation with a Founder President, patrons, life members, friends of BCN and supporters. Our membership provides strength to the society and is drawn from people of all walks of life from students, professionals and conservationists. Our members act collectively to set the organisation's strategic agenda. We are committed to showing the value of birds and their special relationship with people. As such, we strongly advocate the need for peoples' participation as future stewards to attain long-term conservation goals. As the Nepalese Partner of BirdLife International, BCN also works on a worldwide agenda to conserve the world's birds and their habitats.



For more information see: www.birdlifenepal.org

Department of National Parks and Wildlife Conservation, Nepal

The Department of National Parks and Wildlife Conservation (DNPWC), under the aegis of the Ministry of Forest and Soil Conservation, was established to conserve, restore and manage Nepal's rich and varied fauna and flora, across the landscape and in all the different ecological zones from the plain Terai to the high Himalayas. It is responsible for a network of protected areas including 10 National Parks, three Wildlife Reserves, one Hunting Reserve, six Conservation Areas and 12 buffer zones, covering an area of more than 3.4 million ha (>23 % of the total area of the country).



For more information see: www.dnpwc.gov.np

BirdLife International

BirdLife International is a global Partnership of conservation organisations that strives to conserve birds, their habitats and global biodiversity, working with people towards sustainability in the use of natural resources. We are the world's largest partnership of conservation organisations, with BirdLife Partners operating in over 115 countries and territories worldwide. Together the BirdLife Partnership forms the leading authority on the status of birds, their habitats and the issues and problems affecting bird life. Through working together on local, national, regional and global issues, we aim to improve the quality of life for birds, for other biodiversity, and for people.



For more information see: www.birdlife.org

Darwin Initiative

The Darwin Initiative is a UK Government funding programme that assists countries with rich biodiversity but poor financial resources to meet their objectives under one or more of the three major biodiversity Conventions: the Convention on Biological Diversity (CBD); the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES); and the Convention on the Conservation of Migratory Species of Wild Animals (CMS). The key objective of Darwin Initiative funded projects is to achieve biodiversity conservation, the sustainable use of its components and the fair and equitable sharing of benefits arising out of the utilisation of genetic resources. This report has been produced as a result of one such project ('Understanding, assessing and monitoring ecosystem services for better biodiversity conservation', 2010–2013), which was implemented by BCN, with support from the BirdLife Secretariat, and involvement of other BirdLife Partners.



For more information see: www.darwin.defra.gov.uk

Cambridge Conservation Initiative

The Cambridge Conservation Initiative (CCI) is a pioneering collaboration between the University of Cambridge and nine leading internationally-focused conservation organisations and networks based in the Cambridge area. CCI seeks to transform global understanding and conservation of biodiversity and the natural capital it represents to secure a sustainable future for all life on Earth. CCI partners together combine and integrate research, policy, practice and learning to create, deliver and promote innovative solutions for the conservation of biodiversity and to strengthen conservation capacity and leadership. The methods for assessing ecosystem services used in this study have been developed as part of a CCI project involving the University of Cambridge, Anglia Ruskin University, BirdLife International, UNEP-World Conservation Monitoring Centre and the Royal Society for the Protection of Birds.

Cambridge Conservation Initiative

For more information see: www.conservation.cam.ac.uk