Using information on ecosystem services in Nepal to inform biodiversity conservation and local to national decision-making

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Abstract Policy-makers are paying increasing attention to ecosystem services, given improved understanding that they underpin human well-being, and following their integration within the Aichi Targets of the Convention on Biological Diversity. Decision-makers need information on trends in biodiversity and ecosystem services but tools for assessing the latter are often expensive, technically demanding and ignore the local context. In this study we used a simple, replicable participatory assessment approach to gather information on ecosystem services at important sites for biodiversity conservation in Nepal, to feed into local and national decision-making. Through engaging knowledgeable stakeholders we assessed the services delivered by Nepal's 27 Important Bird and Biodiversity Areas, the pressures affecting services through impacts on land cover and land use, and the consequences of these for people. We found that these sites provide ecosystem services to beneficiaries at a range of scales but under current pressures the balance of services will change, with local communities incurring the greatest costs. The approach provided valuable information on the trade-offs between ecosystem services and between different people, developed the capacity of civil society to engage in decision-making at the local and national level, and provided digestible information for Nepal's government. We recommend this approach in other countries where there is a lack of information on the likely impacts of land-use change on ecosystem services and people.

Keywords Beneficiaries, biodiversity, Convention on Biological Diversity, ecosystem services, Important Bird and Biodiversity Area, livelihoods, policy, rapid appraisal

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Introduction

Ecosystems and the services they deliver underpin our existence. We depend on ecosystem services to produce our food, regulate our water supplies and climate, and protect us from the effects of extreme weather (TEEB, 2010). We also value them in less obvious ways: contact with nature can contribute to spiritual experience, give a sense of place, provide recreational enjoyment and deliver positive impacts on long-term mental and physical health (Daniel et al., 2012). The Millennium Ecosystem Assessment (2005) estimated that 63% of ecosystem services globally are declining, with significant detrimental effects on well-being. However, despite our dependence on ecosystem services they have been consistently overlooked and undervalued in decision-making as a result of perceived conceptual and empirical problems in assessing their substantial economic, social and health values (Costanza et al., 1997).

In 2010 Parties to the Convention on Biological Diversity (CBD), comprising nearly all the world's governments, adopted a Strategic Plan for Biodiversity for 2011–2020, recognizing the need to reverse the trend in biodiversity decline and ecosystem degradation (CBD, 2010). This global framework includes the 20 Aichi Biodiversity Targets, of which several refer directly to ecosystem services. The Parties to the CBD have committed, by 2015, to have 'developed, adopted as a policy instrument, and commenced implementing an effective, participatory and updated National Biodiversity Strategy and Action Plan' (Target 17). Other policies will also need to take ecosystem services into consideration. For example, at the Rio+20 Conference in 2012, member states agreed to develop a set of post-2015 Sustainable Development Goals to build upon the Millennium Development Goals.

Nepal, a co-signatory of the CBD, is endowed with a variety of natural ecosystems and home to some of the world's most charismatic species, including the Royal Bengal tiger *Panthera tigris tigris*, greater one-horned rhinoceros *Rhinoceros unicornis*, Asian wild elephant *Elephas maximus* and snow leopard *Panthera uncia*, and 871 species of birds. Nepal's ecosystems are also integral to the livelihoods of local communities and to the nation as a whole. The majority of the population of Nepal live in rural areas, and forests are important for the livelihoods of 80% of Nepalese people (Poverty-Environment Initiative, 2010). The same rural population also depends on subsistence agriculture (IFAD, 2013), often resulting in changes in land-use practices leading to the loss of natural habitats and to trade-offs in the way that livelihoods are derived. Nepal faces challenges in conserving its biodiversity as a result of, inter alia, topsoil erosion, high population pressures, poverty, lack of integrated land- and water-use planning, and weak institutional capacity (HMGN/MFSC, 2002). In 2010 149 species (17%) of Nepal's birds were considered nationally threatened (BCN & DNPWC, 2011). The Government of Nepal is currently revising its National Biodiversity Strategy and Action Plan and has invited national and international organizations to engage through a consultation process. However, there is little information on the current status of ecosystem services in Nepal and the expected impacts of continued land cover change. Therefore, Bird Conservation Nepal (BirdLife in Nepal), one of the invited parties, conducted a rapid assessment of the current status of biodiversity and ecosystem services at key biodiversity sites as a contribution towards filling this knowledge gap.

The assessment was carried out across Nepal's network of 27 Important Bird and Biodiversity Areas (IBAs). IBAs are key sites for bird conservation that are identified using standardized global criteria (Fishpool & Evans, 2001; Bennun et al., 2013) considering numbers of globally threatened, biome-restricted and congregatory bird species. Birds can provide a useful indication of broad environmental change (Bennun & Fanshawe, 1997; Donald et al., 2001; Gregory et al., 2003) and at a national scale can be good indicators of the richness and distributions of other species (Bibby et al., 1992). Surveying and monitoring of birds, which are particularly diverse in Nepal, with many habitat specialists, can therefore provide important information about the general condition of habitats (BCN & DNPWC, 2011). Furthermore, the network of IBAs provides an appropriate focus for exploring how habitats and ecological systems are linked to the provision of services, and to people. Thus they can inform both site and landscape-scale decision-making.

By engaging with knowledgeable stakeholders we assessed the current provision of ecosystem services, past trends and the impact that current land-use changes are having on delivery of ecosystem services. This work was part of a 3-year study (2010–2012) conducted by Bird Conservation Nepal and BirdLife International to assess, measure and value multiple ecosystem services in Nepal's IBAs (Thapa et al., 2013).

Study area

Nepal is a landlocked country in South Asia bordered to the north by China and to the south by India. It is unique in having a wide variety of biomes in a small area (147,181 km²). The Himalayas, covered with rock and ice and montane grasslands in the north, give way to temperate broadleaf and coniferous forests in the mid-hills region, and to the lowland savannahs and subtropical forests in the southern terai region. Nepal is particularly important for bird species (with > 8% of the world's birds occurring within its territorial borders, which amount to only 0.1% of global land area). Twenty-seven IBAs have been identified (Fig. 1), ranging from 100 ha (Urlabari Forest Groves) to > 700,000 ha (Annapurna Conservation Area), and cover forests (22 IBAs), grasslands (4) and freshwater ecosystems (10). Thirteen of these IBAs are protected areas (sites that are managed by the Department of National Parks and Wildlife Conservation).

Methods

To inform local and national plans and policies, countries need information on the status and trends of their biodiversity and ecosystem services. In this regard, measuring and monitoring ecosystem services delivered by a country's most important areas for biodiversity can provide highly relevant information. Although methods exist for identifying, measuring and valuing ecosystem services, the majority are technical, expensive, and often do not capture stakeholder opinion, use local information or reflect local contexts (Bagstad et al., 2013; Peh et al., 2013). Furthermore, there is no standardized approach to monitoring or assessing ecosystem services at any scale, nor are there many reliable studies that supply empirical data (Feld et al., 2010; Layke et al., 2012). Methods are commonly based on modelling approaches or 'benefits transfer' in which economic values are estimated by transferring available information from studies already completed in another location or context. Both approaches have major limitations (Eigenbrod et al., 2010; Seppelt et al., 2011). This study was undertaken using a participatory rapid appraisal approach to assess ecosystem services, developed as part of a more comprehensive methodology to measure and value specific services at individual sites (TESSA—Toolkit for Ecosystem Services Site-based Assessment; Peh et al., 2013). The approach is low-cost and targeted at non-specialist users. It focuses on understanding the impacts of past and potential future land-use and resource management changes on ecosystem services at the site scale. This comparative methodology permits assessment of the net consequences of changing land uses for people at a range of spatial scales (local, national, global), an important consideration in ecosystem service assessments (Hein et al., 2006). TESSA can be used to provide a rapid overview of ecosystem services across a number of sites and to undertake more detailed field work at specific sites to collect locally relevant

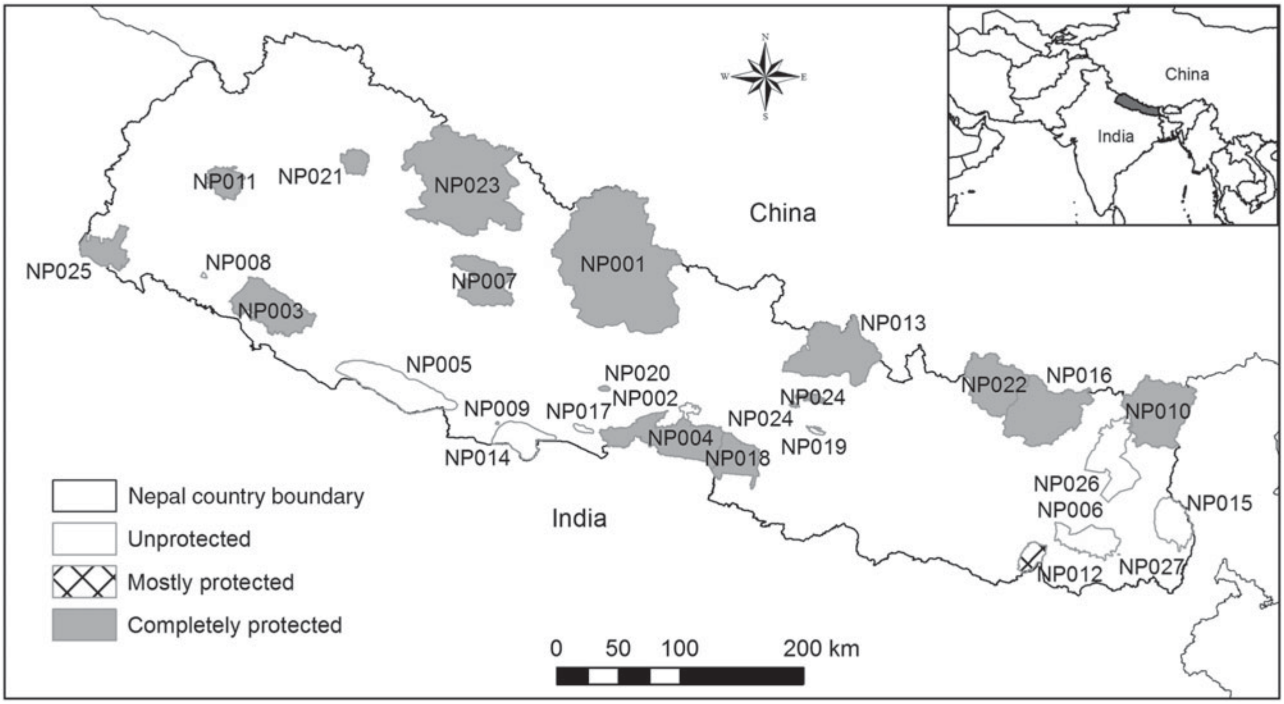

FIG. 1 The location of Nepal's 27 Important Bird Areas and their protection status. NP001, Annapurna Conservation Area; NP002, Barandabhar Forest and Wetlands; NP003, Bardia National Park; NP004, Chitwan National Park; NP005, Dang Deukhuri Foothill Forests and West Rapti Wetlands; NP006, Dharan Forests; NP007, Dhorpatan Hunting Reserve; NP008, Ghodaghodi Lake; NP009, Jagdishpur Reservoir; NP010, Kanchenjunga Conservation Area; NP011, Khaptad National Park; NP012, Koshi Tappu Wildlife Reserve and Barrage; NP013, Langtang National Park; NP014, Farmlands in Lumbini; NP015, Mai Valley Forests; NP016, Makalu Barun National Park; NP017, Nawalparasi Forests; NP018, Parsa Wildlife Reserve; NP019, Phulchoki Mountain Forests; NP020, Rampur Valley; NP021, Rara National Park; NP022, Sagarmatha National Park; NP023, Shey-Phoksundo National Park; NP024, Shivapuri Nagarjun National Park; NP025, Shukla Phanta Wildlife Reserve; NP026, Tamur Valley and Watershed; NP027, Urlabari Forest Groves. The inset indicates the location of Nepal.

quantitative and qualitative data. By combining results from multiple sites using this approach it is possible to demonstrate how habitats and ecological systems are linked to the provision of services and to whom, to inform both site- and landscape-scale decision-making.

In February 2012, 24 participants attended a stakeholder workshop in Chitwan National Park and carried out a rapid appraisal of ecosystem services across the 27 IBAs. The participants were selected for having up-to-date ecological knowledge of the IBAs and the threats they face. They were either site managers of the IBAs (park wardens, forest officers, and staff from the managing organization; e.g. National Trust for Nature Conservation in the case of Annapurna Conservation Area) or members of the local community with whom Bird Conservation Nepal has worked for many years. Engaging such local stakeholders through participatory research is important because it produces solutions that are better suited to the operational scale of natural resource management (Danielsen et al., 2010), enhances the quality of environmental decisions (Reed, 2008) through providing locally relevant information, leads to the interpretation and application of results in the knowledge of local contexts (Kainer et al., 2009), and empowers and motivates local stakeholders to support and become involved in resource conservation by fostering a process of inclusion, respect, ownership and trust-building (Danielsen et al., 2013). In this study, as a result of time and funding restrictions, the participatory assessment undertaken was necessarily limited, engaging a sample of stakeholders without employing complicated formal consultation protocols. Nevertheless, we believe that the overall results are sufficiently robust as a national overview for the IBA site network, and sufficient to identify priorities for further investigation.

The rapid appraisal was conducted in two stages: (1) a review and verification of the current land cover of the site and the most significant drivers affecting land cover. For this we provided a map of the site, using geographical information system data from the ESA Globcover Project (led by MEDIAS-France/POSTEL) and the IUCN–CMP Unified Classification of Direct Threats, Level 1 (IUCN, 2011). Using the same principles as for IBA monitoring (BirdLife International, 2006), participants scored each driver on a scale of 0–3 according to the timing, scope and severity of impact, and summed the three scores for each driver, where 0 represents no impact and 9 represents

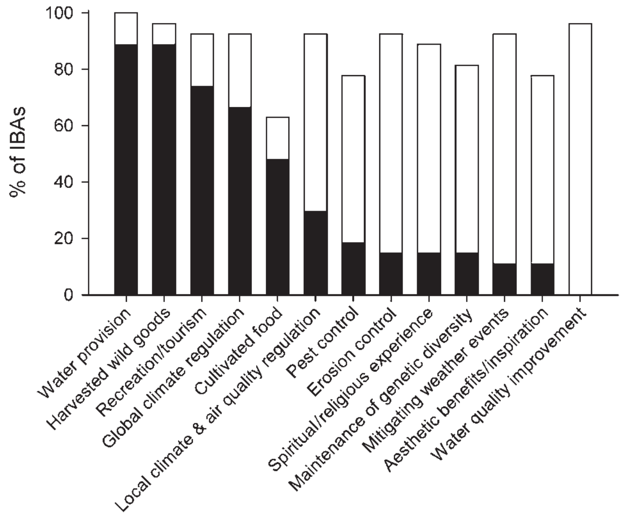

FIG. 2 Percentage of the 27 IBAs delivering various ecosystem services. Black shading represents where the service ranks among the five most important at the site according to expert opinion.

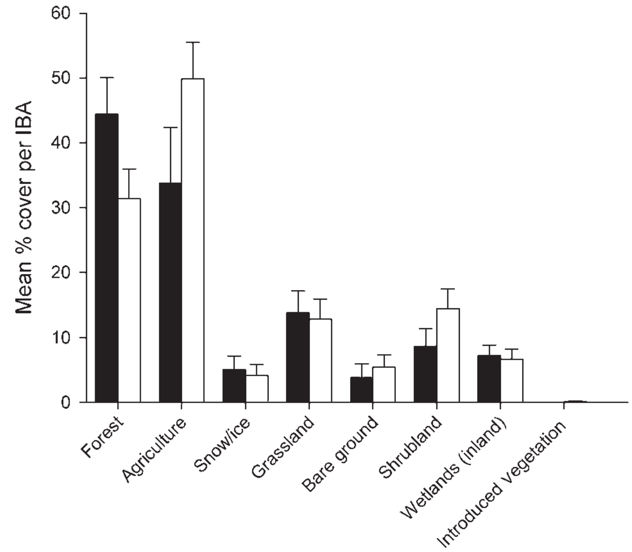

FIG. 3 How habitats within IBAs may change as a result of current land-use change, showing mean (± SE) percentage cover in 2010 (black) and projected cover in 2020 (white) for vegetation and landforms.

maximum impact; (2) scoping and classifying the importance of the ecosystem services delivered by the site, now and projected for 10 years in the future, given likely trends, and the impacts on stakeholders at a range of scales. Participants were given a basic introduction to the concept of ecosystem services and were invited to suggest all the services they perceived at a site (using their own terminology) and to identify those that were considered most important. Specific examples were named where participants felt it was important to distinguish them. These were then fitted to a standard framework compiled by the authors and based on The Economics of Ecosystems and Biodiversity classification (TEEB, 2010). A synthesis of the status and trends of ecosystem services across the 27 IBAs was produced. Common issues were identified, and recommendations for different policy sectors were developed (see BCN & DNPWC, 2012 for further details).

Results

The data show that many important ecosystem services are delivered across the network of 27 IBAs (Fig. 2). For example, water provision (regulated supply of water by ecosystems to users as and when required, including minimizing flooding during the wet season and maintaining supply during the dry season) is delivered at all the IBAs and was identified as the most important service provided at 24 (89%) sites. Harvested wild goods (including food, fibre, natural medicines and fuelwood for cooking and heating), tourism and recreation, and global climate regulation were recorded at > 90% of sites and were among the five most important services at 23 (85%), 20 (74%) and 18 (67%) sites, respectively. Although cultivated food (crops and livestock) was reported at considerably fewer sites overall (17, 62%), it was among the five most important services in 13 (76%) of these. 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 at almost all sites. However, these services were regarded by stakeholders as of lesser importance. The reasons behind this were not explored at the workshop because of time constraints.

Many different types of human activity were identified as likely to affect the delivery of ecosystem services at IBAs in the future. Human disturbance (100%), residential and commercial development (93%), uncontrolled fire (89%), unsustainable wood-harvesting (including logging, 85%), hunting and trapping of species (85%) and poorly managed water use (85%) were all considered to be common factors driving land-use change and affecting the habitat condition in IBAs, with at least one of these activities occurring at 80% of the sites and a third of sites having human disturbance as one of the most significant factors leading to changes in ecosystem service provision. Human-induced climate change was reported as a factor at 23 (85%) sites and as a major concern at four of those (17%). Overfishing was reported as a pressure at 21 (78%) sites and expansion and intensification of agriculture and/or aquaculture was reported as a pressure at 70% of sites and as one of the most significant drivers at one site.

These drivers were judged by stakeholders as likely to result in significant changes in land cover and land use over the coming 10 years. Participants judged that by 2020, if current trends continue, there would be a net conversion of forested land into cultivated land, resulting in a 29% reduction of forest cover and 30% increase in agriculture

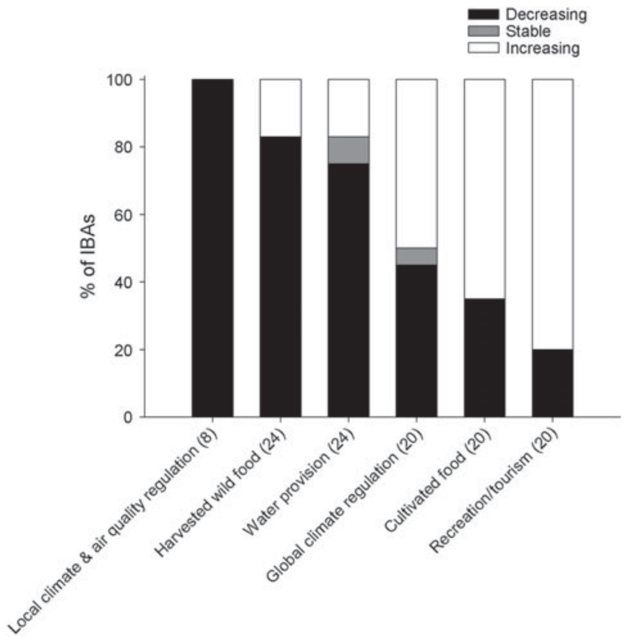

FIG. 4 Percentage of IBAs delivering ecosystem services with decreasing, stable and increasing trends projected for 2020. Numbers in parentheses represent the number of sites at which the service was recorded as being most important. Only services that occur at > 5 sites are presented.

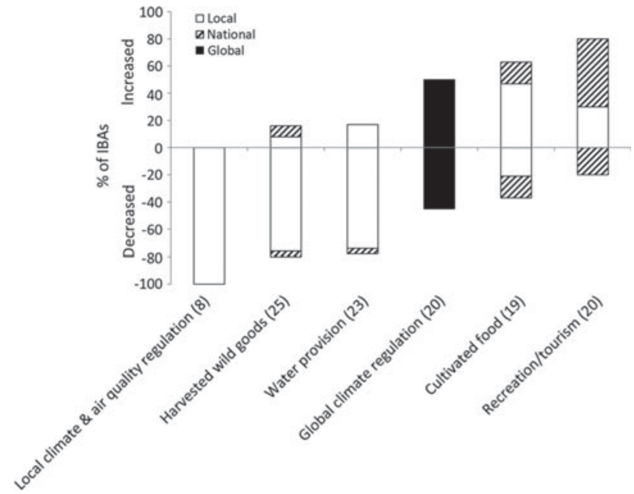

FIG. 5 Percentage of IBAs with increased or decreased delivery of the most important ecosystem services under alternative land use and the likely impacts on beneficiaries at the global, national and local scales. Numbers in parentheses represent the number of IBAs at which the service was recorded as being in the five most important. Only services that occur at > 5 sites are presented.

overall (Fig. 3), including in the largest IBA, Annapurna Conservation Area. It was also expected that there would be an increase in the area of shrubland across 18 (67%) IBAs as forests become degraded as a result of unsustainable use, and introduced plants become more widespread. A projected decrease in snow, ice and grasslands at high altitudes as a result of climate change and increasing pressure from grazing was considered likely at five (83%) of the six IBAs located in montane ecosystems, with serious implications for downstream water availability in both the short and long term.

Anticipated changes will affect different services in different ways. For example, a decline is projected in local climate and air quality regulation at all eight of the 25 sites where this service was identified as being currently important (32%; Fig. 4). Harvested wild goods and water provision (which were identified as important services at most IBAs) are also expected to decline at the majority of these sites (77% of 26 sites and 67% of 27 sites, respectively). Conversely, it is projected that benefits from cultivated food will increase at 76% of IBAs, associated with agricultural expansion. Nature-based recreation was also projected to increase at 64% of IBAs, continuing a trend that has been recorded over the past 5 years at many of the sites (DNPWC, 2012).

An important finding is that not all stakeholders are affected equally. For national level stakeholders this study shows that across the IBAs there is expected to be a net benefit overall, mostly as a result of increased nature-based tourism, providing income for tour operators and companies that predominantly operate from Kathmandu and other large cities, thus providing limited benefit to local communities (Fig. 5). Climate regulation is the main service affecting beneficiaries at the global scale, and the collated results show a fairly even balance between the number of sites where this service is predicted to increase (e.g. as a result of some instances where grasslands were predicted to become scrub or to be reforested) and decrease (as a result of deforestation and degradation) under the most plausible future scenarios. Overall, the changes predicted to occur in the next decade would have the biggest negative impact on local communities living in or around IBAs compared to beneficiaries located at greater distances (Fig. 5). The three services expected to decrease in availability across the highest proportion of sites (local climate and air quality regulation, harvested wild goods and water provision) mostly benefit local people (either through direct income, subsistence or other livelihood benefits such as health). Conversely, cultivated food would increase overall, with benefits to both local and national beneficiaries. This cannot be overlooked in a country where subsistence agriculture is so important to local livelihoods (IFAD, 2013). However, on balance with the other services this benefit would not be sufficient to compensate for the broader losses.

Discussion

The rapid appraisal we used produced broad yet valuable information about the impacts of future land-use change on ecosystem services in the network of IBAs in Nepal. The study shows that, according to expert knowledge, Nepal's IBAs currently provide a wide range of benefits at the local, national and global levels, in addition to supporting important biodiversity. However, it is anticipated that many of these services will decline over the next decade if current pressures continue. This is not surprising given that during 2004–2011 monitoring data from Nepal's 27 IBAs suggested that the state of bird populations and their habitats worsened despite increased conservation actions (BCN & DNPWC, 2011). Land-use change that is affecting species, habitats and ecosystems is also resulting in changes in the ecosystem services these sites provide.

These findings will be fed into local planning and development initiatives in Nepal to highlight the net impacts of land-use change on the environment and the values of ecosystem services that could be lost, enabling better integration of environment and development needs. The results will also feed into national policy processes and plans such as those relating to Nepal's commitments to achieving the Aichi Biodiversity Targets through implementation of their National Biodiversity Strategy and Action Plan or in relation to the Sustainable Development Agenda (HMGN/NPC/MOPE, 2003). For example, the predicted decrease in overall forest cover could affect the delivery of Target 5 (to at least halve the rate of loss of all natural habitats, including forests) and Target 15 (to enhance carbon stocks thereby contributing to climate change mitigation; CBD, 2010). This would also result in a decline in benefits that are particularly important to local people, such as supply of harvested wild goods (including wild food and natural medicines), air quality and climate regulation, and water provision.

Policy decisions 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. Protected areas can help to conserve biodiversity and ensure that sites continue to provide ecosystem services. Target 11 of the Aichi Targets requires at least 17% of terrestrial areas to be conserved effectively and managed equitably. Although Nepal has already gazetted 23% of its land as protected areas (CBD, 2013), many of these sites suffer from high levels of human disturbance, and conservation responses have not yet had a positive impact on the status of biodiversity within them (e.g. Chitwan National Park; Bhattarai & Kindlmann, 2013). Among the reasons for this are the limited resources available to effectively manage and enforce protection of these areas in the face of high opportunity costs to local people (BCN & DNPWC, 2011).

Water provision, highlighted in Target 14 as an essential ecosystem service to be safeguarded, is arguably the most important service provided by IBAs in Nepal. Unsurprisingly, water provision was ranked among the most important at almost all sites. With changing climatic conditions river flows are likely to be affected, as up to 50% of the average annual flows in Nepal's rivers are reliant on snow and glacial melting (Eriksson et al., 2009). The anticipated decline in this service across a significant number of sites will have both local- and national-level impacts. For example, the forested 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 more irregular water supply for millions of domestic users as well as increased sedimentation, increasing flood risk and landslides downstream during peak rainfall months (Peh et al., unpubl. data).

Looking at the impact on services independently can only provide partial understanding of the effects of land-use decisions on the benefits that people receive. More important is to present the overall picture of how the balance of services is affected and how this affects different groups of stakeholders in different ways depending on spatial and temporal scales. Trade-offs can be revealed in a number of ways, including between services, between different beneficiary groups, and across spatial and temporal scales (Kari & Korhonen-Kurki, 2013). While there are synergies between some services in this study (e.g. forests both providing global climate change mitigation and supporting local and national economies through international tourism) there are also trade-offs, whereby increases in some services come at the expense of others. For example, when forests undergo transformation to farmland this may result in trade-offs between cultivated food and the ecosystem services provided by forests, such as harvested wild goods and climate regulation. Although the agricultural expansion that is expected to drive these declines will itself bring some ecosystem service benefits, the net long-term cost and distribution of these benefits is important to consider. In current markets the economic benefits that are visible and accounted for mean that this conversion seems a rational decision. However, in some circumstances inclusion of externalities (hidden environmental values) may change the net balance of costs and benefits. Ecosystem service assessments can help to reveal these externalities. For example, at Phulchoki Mountain Forest IBA, TESSA was used in more detail to undertake field surveys and to collect quantitative data on the impact of alternative land uses on ecosystem service provision. The results showed that replacement of forest with cultivated land would have resulted in a 70% reduction in harvested wild goods, 75% less economic benefit from nature-based recreation and a 50% reduction in greenhouse gas sequestration, affecting local and global stakeholders alike. Economic valuation showed that the increase in cultivated goods would not outweigh these losses (Birch et al., 2014). In addition, it was reported that the main beneficiaries from any expansion of cultivation at Phulchoki would be national rather than local as outsiders would move into the area and take up new land for farming, demonstrating clear trade-offs between beneficiary groups. Hence, difficult decisions will have to be made on how to balance the long-term provision of ecosystem services by forested areas, wetlands and natural grasslands with the need to address development targets such as producing food for a growing population. There is increasing evidence that integrated approaches to biodiversity conservation and poverty alleviation can result in mutual benefits (Roe et al., 2013). For example, creation of alternative sources of income for local communities that are currently reliant on subsistence agriculture can lead to improved biodiversity conservation at a site alongside livelihood benefits (Roe et al., 2013). In Nepal, current trends in tourism numbers suggest that one viable option may be to develop the capacity of local communities to provide services to the tourism sector and receive financial benefits for doing so. However, this may not always be the case and it remains a challenge for nations to deliver on national targets for sustainable development and conservation of biodiversity.

Our data derive largely from expert knowledge rather than empirical scientific data, and so there are a number of caveats in interpreting the results (for a discussion of these, see Burgman et al., 2011). Although the participants we engaged were arguably the best-informed stakeholders for each of the sites considered, their perspectives on ecosystem services and future change, their ability to predict how future changes may affect services and their understanding of likely effects on wider stakeholders might be limited, leading to some inconsistencies in the reported results. There is also a risk of bias, given the type of participants involved (mostly conservation and wildlife management professionals).

However, there are many advantages to engaging stakeholders in applied conservation research (Danielsen et al., 2013), including gaining vital local support for mechanisms of conservation. Furthermore, local and scientific knowledge can be integrated to provide a more comprehensive understanding of complex and dynamic socio-ecological systems and processes (Reed, 2008). Our approach reflects the increasingly participatory methods being used in conservation science to generate meaningful data (BirdLife International, 2011). TESSA provides an accessible way to conduct rapid assessments and provides guidance for further empirical studies that allow a deeper understanding of the change in services at the local level (Peh et al., 2013). This combined approach is a cost-effective way of gathering policy-relevant data about environmental issues. By combining both expert opinion and empirical data, results can be presented in both qualitative and quantitative ways, bringing together principles of both social and natural science research.

This study helped to develop the awareness and capacity of the local stakeholders involved in the process to review and assess how sites important for biodiversity also provide benefits for human well-being. It is an approach that is simple and cost-effective to implement (Peh et al., 2013) and could be replicated elsewhere. However, rapid assessment should be viewed as a first step in assessing the ecosystem service provision of sites, with more detailed studies needed at specific locations to provide empirical data to inform site-level decision-making further (Peh et al., 2013; Birch et al., 2014).

The impact of our work on local and national planning in Nepal has been varied. This was the first implementation of the approach and therefore there are a number of areas that could be improved to catalyse more policy responses. Engagement of local experts in participatory assessments is likely to have been beneficial given the evidence that this can improve local conservation outcomes (Reed, 2008; BirdLife International, 2011). At the national level it would have been prudent to have involved a greater number of government departments from the outset, including representatives from the treasury and development planning departments. This would have enabled the results to be framed according to the needs of each of these departments, rather than presented from the point of view of the conservation sector.

Understanding, assessing and monitoring ecosystem services at the site-scale can provide useful information to understand better the environmental, economic and social impacts of land-use change across a network of sites. Assessments that use structured solicitation of expert-based opinion combined with quantitative assessments can help build up the evidence base on the wider benefits that conservation of biodiversity can bring. Such information will be vital for ensuring long-term biodiversity conservation, and the process of acquiring it will also have associated benefits. These include raising awareness, developing technical capacity, engaging local communities and site management authorities, and building a national constituency for conservation. Despite the limitations, the provision of timely information relating to the threats to Nepal's ecosystems and the potential impacts on ecosystem services meant that Bird Conservation Nepal was able to engage in early discussions about the revised National Biodiversity Strategy and Action Plan and hence contribute towards Nepal's commitment to improving the status of biodiversity by 2020. Thus, information gathered in this way, if communicated through appropriate avenues, has the potential to raise awareness and promote better policy formulation that delivers more effective conservation alongside sustainable development.

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Biographical sketches

Ishana Thapa leads Bird Conservation Nepal's work on IBA monitoring and local community engagement to support better biodiversity conservation and to enhance local benefits. Stuart Butchart leads the global science work at BirdLife International. Hum Gurung is a specialist in tourism management, nature conservation, sustainable development, environmental governance and protected area management. Alison Stattersfield coordinated BirdLife's global science work for more than 8 years, including collating and synthesizing information on threatened bird species and IBAs to inform conservation practice and policy. David Thomas builds capacity and networks for local-level action at priority sites for biodiversity conservation, leading on issues of governance, equity, rights, poverty reduction, gender and indigenous peoples. Jennifer Birch coordinates and develops BirdLife's scientific work on ecosystem services, providing technical support to the Partnership in relation to the link between biodiversity conservation and human well-being and mainstreaming of biodiversity into decision-making.