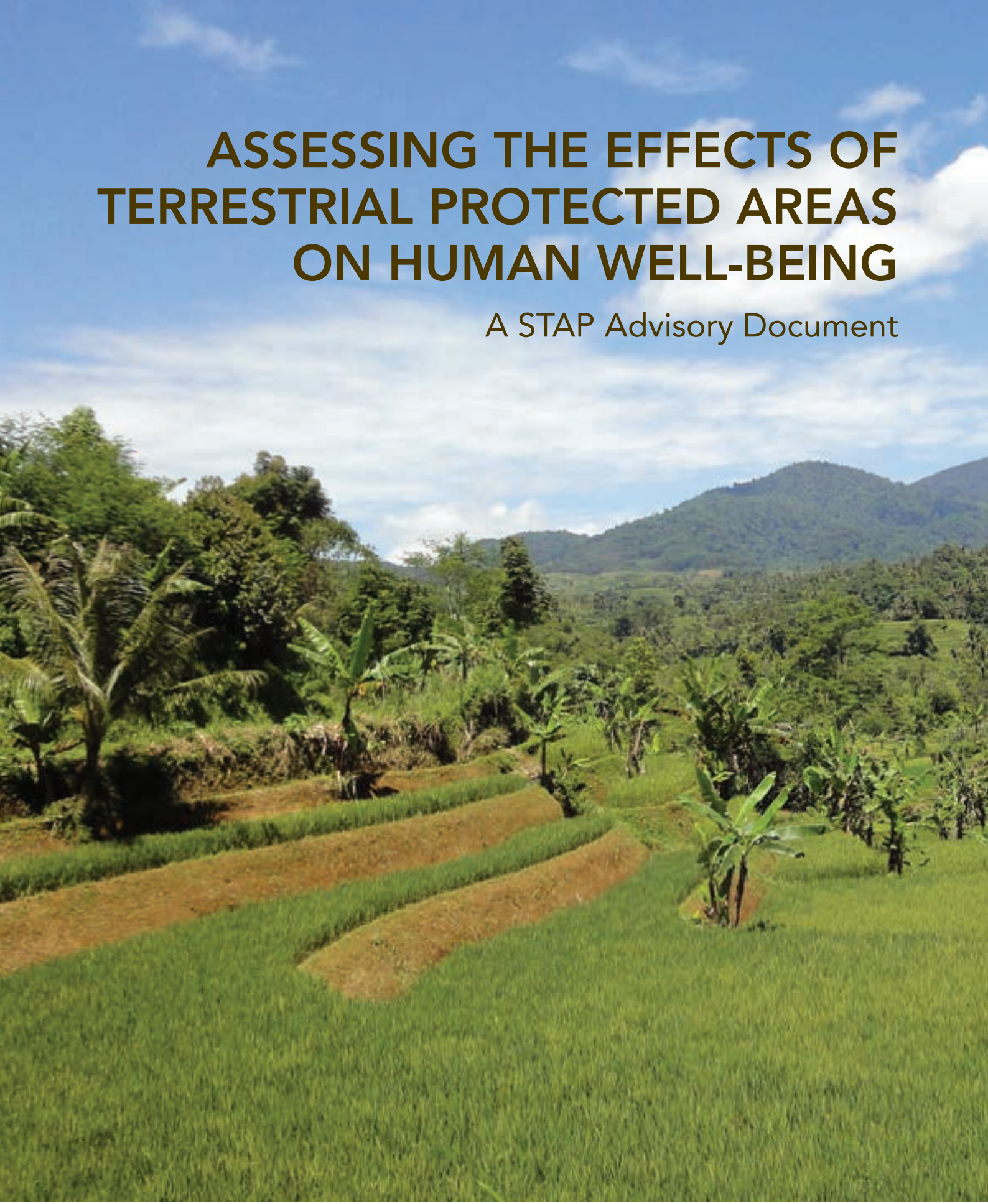
ASSESSING THE EFFECTS OF TERRESTRIAL PROTECTED AREAS ON HUMAN WELL-BEING

A STAP Advisory Document



Scientific and Technical Advisory Panel

An independent group of scientists which advises the Global Environment Facility

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ASSESSING THE EFFECTS OF TERRESTRIAL PROTECTED AREAS ON HUMAN WELL-BEING

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Assessing the Effects of Terrestrial Protected Areas on Human Well-being

A STAP Advisory Document Prepared on behalf of the Scientific and Technical Advisory Panel (STAP) of the Global Environment Facility (GEF) by:

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DISCLAIMER

The contents of this publication are believed, at the time of publication, to reflect accurately the state of the science on the impacts of terrestrial protected areas on human well-being. Nevertheless, STAP accepts responsibility for any errors. This publication was prepared for the STAP by the authors, serving as independent experts. The views and positions contained herein do not necessarily reflect the views of their affiliated institutions.

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ABOUT STAP

The Scientific and Technical Advisory Panel comprises seven expert advisors supported by a Secretariat, which are together responsible for connecting the Global Environment Facility to the most up to date, authoritative and globally representative science.

The Global Environment Facility (GEF) unites 183 countries in partnership with international institutions, civil society organizations (CSOs), and the private sector to address global environmental issues while supporting national sustainable development initiatives. An independently operating financial organization, the GEF provides grants for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants.

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FOREWORD

The creation of protected areas (PAs) has been a central strategy of biodiversity conservation for more than a century. Increasingly, in the last few decades of the 20th century a new requirement was added – that the creation and maintenance of PAs should strive to alleviate poverty, and should in no case exacerbate it. The Durban Accord agreed at the Vth International Union for Conservation of Nature (IUCN) World Parks Congress in 2003 was a milestone in the process of mainstreaming PAs in development agendas.

GEF activities whose purpose is to improve the sustainability of protected areas amount to approximately 20% of total investments in the proposed GEF-6 biodiversity portfolio. The GEF has a strong interest, therefore, in ensuring that the intended enhancement of the supply of global environmental benefits does not come at the price of decreased well-being for local communities, and that it increases these communities' well-being whenever possible.

Assessing the Effects of Terrestrial Protected Areas on Human Well-being summarises the evidence base for positive, negative or neutral impacts of the establishment or maintenance of terrestrial PAs on a wide range of dimensions of human well-being at local to regional scales. The study described here applied state-of-the-art methods of systematic review to the largest body of literature on the topic considered to date. It was unprecedented in incorporating not only quantitative evidence of impacts, but also the views of diverse social actors. The methods, information-gathering strategy and results were subjected to review by the network of GEF partners. The results were extensively reviewed by members of the Scientific and Technical Advisory Panel (STAP) of the GEF and independent referees.

Despite its large size – amounting to several hundred publications – the body of literature on the impacts of PAs on local communities is highly fragmented. Only a surprisingly small set of studies (fewer than 50) were of sufficient quality to be used in the analysis, in terms of richness of information and/or susceptibility to bias due to study design. This evidence base is considered insufficient for rigorous testing of hypotheses about the effects of PAs on the well-being of local communities.

However, the qualitative synthesis of people's views provides an unusually rich picture of possible impacts of PAs on different dimensions of well-being. Some impacts, such as changes in incomes or tensions arising from top-down governance models, are well known. Others (e.g. impacts on health, and differential empowerment of groups within communities) have been less well explored. Overall, this qualitative synthesis is a source of new hypotheses, to be tested through action-oriented research projects.

The following key messages and implications for the GEF were determined:

- One of the main expectations of the study was that it could identify types of interventions which are prone to produce negative results and therefore should be avoided, and other types which are consistently associated with positive impacts and therefore should be used and adapted in the future. The empirical evidence to date is insufficient to draw scientifically valid lessons in this respect, and is therefore unsuitable for directly informing policy on how to achieve win-win outcomes for biodiversity and the well-being of local communities.

- The remarkable effort to place land under various forms of protection has not been accompanied by a proportional effort to document social consequences. The overall answer to the question of whether the net impact of protected areas (both within and beyond the GEF portfolio) on the well-being of local communities is positive, negative or neutral is simply that 'we do not know'.

- In view of the importance of protected areas in the GEF portfolio and the increasing focus on integrating these areas into broader biodiversity mainstreaming efforts, it is imperative to implement a learning system with regard to the types of PA interventions that systematically lead to added benefits for (or negative impacts on) local communities. This study did not elaborate on how best to design such learning systems since this has been well covered in previous STAP advisory documents (e.g. Ferraro 2011). However, it identified a rich source of hypotheses for setting up learning systems. The evidence base gathered in this report provides a range of possible narratives and pathways of the impacts of PAs, both positive and negative, on human well-being. The GEF's extensive protected area portfolio furnishes an excellent opportunity to test PAs in a highly structured way around the world to ensure the rapid and effective development of learning systems.

- The establishment of a valid baseline, and standard reporting of key information about methods, sites, data collection tools, and data management plans to ensure continued access to information once projects are completed, are indispensable building blocks for a knowledge system on PAs.

The GEF Scientific and Technical Advisory Panel (STAP) is ready to contribute to the implementation of a knowledge system on the basis of the GEF portfolio of PAs, as part of its commitment to implementation science that builds on the best available approaches and tools in order to continually learn from, and thus enhance, GEF protected area interventions.

Rosina Bierbaum
STAP Chair

Sandra Diaz
STAP Member

Photo: 2010 Cunningham

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Note: The appendices referred to in the text are not included in the printed version of this document, but are available on-line at http://www.stapgef.org

ACRONYMS

ACICAFOC	Asociación Campesina e Indígena de Agroforestería Comunitaria Centroamericana
BACI	Before-after-control-intervention
CBD	Convention on Biological Diversity
CBNRM	Community-based natural resources management
CEE	Collaboration for Environmental Evidence
CI	Conservation International
CT	Controlled trial
DDC	Direct data collection
EC	Development Experience Clearinghouse
Dfid	Department for International Development (United Kingdom)
EPPI	Evidence-informed Policy and Practice Information
ETFRN	European Tropical Forest Research Network
FAO	Food and Agriculture Organization of the United Nations
GMA	Game management area
HDI	Human development index
IFAD	International Fund for Agricultural Development
IIED	International Institute for Environment and Development
NGO	Non-governmental organization
IUCN	International Union for Conservation of Nature
ODI	Overseas Development Institute
ODS	Other data sources
PA	Protected area
PECO	Population, exposure, comparator, outcome

RCT	Randomised controlled trial
SRM	Self-reported measure
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
WCMC	World Conservation Monitoring Centre
WCPA	World Commission on Protected Areas
WDPA	World Database on Protected Areas
WPC	World Parks Congress
WTA	Willingness to accept
WTP	Willingness to pay

Photo: jbdodane

EXECUTIVE SUMMARY

Background

Establishing protected areas (PAs) has been one of the most common and successful interventions since the very beginning of the conservation movement. The process of protecting areas from threats posed by human activities will, by definition, inhibit some of these activities and therefore potentially have adverse impacts on the well-being of people living in or near PAs. However, these impacts could be balanced through the maintenance of valuable ecosystem services or the introduction of new livelihood options. Consequently, there is an on-going debate about whether the net impact of PAs on human well-being at local or regional scales is positive or negative. This advisory document reports on the conduct and results of a systematic review of evidence of the impacts on human well-being arising from the establishment or maintenance of terrestrial PAs.

Methods of the review

Following an *a priori* protocol, systematic searches were conducted of databases and the websites of relevant stakeholder organisations. Calls for submission of information were also made to obtain evidence of the impacts of PAs since the United Nations Conference on Environment and Development (UNCED), the Earth Summit in Rio de Janeiro in 1992. After screening of article titles, the review was divided into two separate processes:

- a qualitative synthesis of the explanations and meanings of impacts, derived from qualitative studies of people's views and related observations and documentary analysis;
- a review of the quantitative evidence of impacts.

Abstracts and full texts were assessed against *a priori* inclusion criteria and conceptual models of potential impacts. Relevant studies were critically appraised, and their data extracted and sorted according to the types of impacts reported.

The qualitative synthesis included articles that were rich in narrative concerning impacts, while the quantitative review of evidence of impacts included studies of low to medium susceptibility to bias based on study design. No quantitative synthesis of the evidence of impacts was possible with the evidence available.

Two narrative syntheses were produced – qualitative and quantitative – and their outputs were compared in a meta-synthesis.

Results

A total of 18,895 articles from all sources were identified through web searches and calls for information. Following title screening, 3370 articles remained. After abstract and full text screening, the qualitative evidence review mapped 306 relevant articles and synthesised in detail 34 that were scored as high quality. The quantitative evidence review critically appraised 79 studies from 70 articles at full text and included 14 studies of low/medium susceptibility to bias.

The qualitative synthesis was essentially formative (i.e. it acted as a template for empirical investigation and hypothesis testing). The review of quantitative impacts was more summative (i.e. it attempted to test hypotheses of impact as well as to assess the balance of positive and negative impacts).

The qualitative synthesis identified implementation issues and characteristics of well-being associated by research participants with either (a) tensions arising from governance models imposed and enforced by external authorities; or (b) a vision of sustainability sought through participatory management and empowerment, commonly known as community-based natural resource management (CBNRM). Perceived impacts on well-being were portrayed in terms of environmental capital (including resource use and access to land), economic capital, social capital, health and inequality.

Studies presenting quantitative impacts reported evidence for a wide range of themes (ecosystem goods and services, livelihood strategies, access to land and restrictions on that access, health and safety, society and development, attitude to PAs, and economic valuations).

Consequently, the meta-synthesis reveals that a range of factors can lead to reports of both positive and negative impacts of PAs on human well-being, and might enable the generation of hypotheses regarding cause and effect relationships, but the resulting hypotheses cannot be tested with the current available evidence in the quantitative literature.

This review had several limitations that may have influenced its findings:

- The diverse sources of studies made it difficult to estimate the comprehensiveness of the search;
- The search was limited to English language articles and non-English language articles translated into English;
- Due to the diversity of the literature, it was not possible to estimate publication bias.

Conclusions

The evidence base provides a range of possible pathways of the impacts of PAs on human well-being (both positive and negative). However, it provides very little support for decision making on how to maximise positive impacts or minimise negative ones. The research reported to date constitutes a diverse and fragmented body of evidence that is not fit for the purpose of informing policy decisions on how to achieve win-win outcomes for biodiversity and the well-being of local communities.

In order to better assess the impacts of protected areas on human well-being, the authors have made the following recommendations for improving primary research study design and reporting:

- Studies should report sufficient methodological detail regarding the location of sample sites (particularly in relation to the protected area boundaries), the degree of replication, the data collection tool (e.g. questionnaires could be included), the method of sample selection (e.g. random or purposeful), and the times and duration of sampling;
- Where changes following the establishment (or transformation) of protected area governance are investigated, adequate baselines should be assessed;
- 'Control' or 'comparator' populations are vital to enable conclusions to be drawn about impacts in the absence of the intervention;
- When designing the study, the allocation of resources to pseudoreplication (improving precision) versus true replication (improving accuracy) should be considered carefully;
- A statistician should be consulted during study design so that the study can be optimized for the planned analyses.

Photo: Billtacular

Photo: 25kim

1. BACKGROUND

The concept and practice of protecting areas for the purpose of conservation has been at the heart of conservation policy since its inception in the 19th century. The idea that intervening to protect areas from human activity is an effective way to conserve habitats and species – and prevent habitat loss and species extinction – is arguably as pervasive today as when the first protected areas (PAs) were established (MEA 2005).

The central place of protected areas in the conservation movement is reflected by the increase in both the number of PAs and the total area of land and sea under protection. The proportion of the total land area under some form of protection has now reached nearly 13% (Jenkins and Joppa 2009, Bertzky et al. 2012).

The process of protecting areas from the threats posed by human activities will, by definition, inhibit some of these activities. Therefore, this process has the potential to negatively impact human well-being. Many historical records suggest that only a few protected areas were uninhabited wilderness before their designation as PAs. The early history of PAs, for example in the United States and East Africa, includes forced evictions and the persecution of local communities by colonial powers (Brockington et al. 2006). This scenario has continued in a number of countries with, in some cases, colonial powers being replaced by multinational corporations or even international conservation non-governmental organisations (NGOs) (Dowie 2009).

Prior to 1992, the establishment plans of protected areas did not normally have objectives concerning human well-being. The negative impacts of PAs on human well-being gained official recognition in the Convention on Biological Diversity (CBD), one of the three 1992 United Nations Conference on Environment and Development (UNCED) Conventions. The principle that PAs should do no harm to local people was established at the Vth World Parks Congress

in Durban, South Africa, in 2003, during which the Durban Accord was agreed (WPC 2003).[1]

Nevertheless, negative impacts may be balanced by positive ones. PAs may also improve human well-being and alleviate poverty (Turner et al. 2012). By preventing the conversion of natural habitats, they could improve the provision of some valued ecosystem services to some users. For example, downstream farmers could benefit from the conservation of forested watersheds (Kramer et al. 1995). PAs may also directly introduce new livelihood options into a region through the expansion of tourism or research, or lead to improvements to infrastructure that may indirectly result in economic development.

Recently there has been considerable debate on whether, apart from their effects on global environmental benefits, the net impact of PAs on human well-being at local or regional scales is positive or negative (Adams et al. 2004, West et al. 2006, Sutherland et al. 2009, Ferraro et al. 2011). There is concern that continuing with a policy of PA establishment could conflict with poverty alleviation goals (Adams et al. 2004). The Convention on Biological Diversity Aichi targets, adopted in 2010, include as Target 11 (CBD 2014):

By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially 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 other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Future policy decisions related to the support and management of PAs need to be informed by the best available evidence on their impacts on human well-being. That a number of major negative impacts on local communities have been caused by the existence of some protected areas is not in dispute. However, of particular interest to policy makers is the balance of positive and negative impacts on human livelihoods arising from the establishment and management of a PA, the distribution of benefits and costs, and factors that can cause all of these factors to vary.

This advisory document reports on the conduct and outcome of a systematic review of evidence for impacts on human well-being due to the establishment or maintenance of terrestrial PAs. Establishing the state of the evidence base through systematic review will inform decision making concerning future investment in PAs and future research needs. The review questions were formulated by the Scientific and Technical Advisory Panel (STAP) of the Global Environment Facility (GEF).

At the outset of the review, the following broad categories were chosen by STAP as a starting point for a conceptual model concerning the potential impacts of PAs (or changes in their status) on people and/or the communities of which they are part. These categories and associated questions were used to guide the development of specific evidence inclusion criteria. (The categories were subsequently modified based on an in-depth understanding of the literature in order to code and present the available evidence; see 'Methods' below.)

Livelihood strategies

Did the establishment or change in status of the PA, or change in management activities within the PA, generate or decrease specific production opportunities (e.g. demand for labour, viability of herding activities and associated products, demand for particular foods, handicrafts, services or products)? Did the PA influence (i.e. increase or decrease) migration generally and that of particular social groups? Have there been differential impacts (positive or negative) on the most vulnerable groups in local communities (e.g. women, children, the poorest sectors of those communities)?

Social capital

Did the establishment and management of the PA affect the development of social networks? Were there positive or negative impacts on education and capacity building (e.g. through generating or decreasing opportunities for formal and/or informal

[1] The IUCN World Congress on Protected Areas (or IUCN World Parks Congress, as it has become known) is a ten-yearly event that provides a major global forum for setting the agenda for protected areas. The 2003 Durban Accord affirms 'the irreplaceable role of protected areas in the implementation of the Millennium Development Declaration, the Johannesburg Plan of Implementation, the Convention on Biological Diversity, the Convention to Combat Desertification, the Ramsar Convention on Wetlands, the World Heritage Convention and other global agreements.' The Durban Accord was accompanied by the Durban Action Plan, which includes the statement that the 2003 Congress placed protected areas 'at the centre of international efforts to conserve biodiversity and promote sustainable development'. The next IUCN World Parks Congress will be held on 12-19 November 2014 in Sydney, Australia.

education)? Has protected area establishment differentially affected more vulnerable groups (e.g. women, children, the poorest sectors within local communities) in positive or negative ways?

Empowerment

Did the PA empower or disempower local communities and any particular social groups? Were new organisations/institutional arrangements that represent the interests of communities and any particular social groups created, or existing ones undermined? Have such organisations developed activities aimed at improving their livelihoods (e.g. through legislation to support local livelihoods, land tenure, co-management of local resources, other social benefits) or have existing activities been negatively affected?

Human rights

While recognising that the scope of human rights is very broad, the review focused on the following question: were the rights (e.g. to food, healthcare and education) of any local stakeholders affected either positively or negatively by the PA?

Access to ecosystem goods and services and natural resources essential for well-being

Did the PA have any positive or negative impacts on access to ecosystem goods and services and natural resources? For example, were there changes in the costs (in terms of money, level of effort, or time) of obtaining firewood, clean water and other resources/services? Was access to culturally significant locations (e.g. sacred grounds) affected? Was self-sufficiency in food (e.g. through local farming, livestock raising, hunting or gathering) or access to medicinal plants affected? Was this a consequence of direct impacts of the PA due to legal prohibition of access, or of indirect impacts due to changes in infrastructure and/or institutions? Have any of these positive or negative impacts been disproportionably high or low on particular sectors of society?

When impacts are measured, account needs to be taken of the fact that terrestrial PAs vary in their status, management and objectives. For example, many were established with a primary aim of landscape or biodiversity conservation, possibly at a time when potential impacts on local human well-being were not widely considered. Types of PAs have been categorised by the World Commission on Protected Areas (WCPA) of the International Union for Conservation of Nature (IUCN) and are used to classify entries in the World Database on Protected Areas (WDPA).

These IUCN categories reflect the range of management objectives of different PAs, from strict protection of nature or wilderness, conservation of ecosystems, protection of national monuments or management of important habitat or species (categories I-IV) through to objectives which place human use of the landscape much more centrally (categories V-VI).[2] Since 1992 the requirement that PAs 'deliver benefits to resident and local communities consistent with the other objectives of management' has progressively become a common objective (Dudley 2008), with categorisation representing a gradation of increasing human intervention.

In this guidance document it is recognised that the effects of PAs on human well-being are likely to be highly context dependent and to vary over the lifetime of the protected area. For example, initial establishment may have significant and immediate negative impacts on communities within and near the PA, but in the longer term there may also be positive impacts on their well-being. Similarly, the spatial context of the PA and communities in and around it influence impacts. Some communities are located in the PA, and some in buffer zones, while others are more distant. Other PAs may be close by and exert an influence. The presence or absence of infrastructure may influence the spatial scale over which impacts occur. Impacts that are negative 'locally' may need to be balanced against impacts that are positive, but are experienced more widely or more remotely.

Given the diversity of PAs, and the context of their establishment and of the communities affected, the review reported here did not aim to estimate a mean effect of protected area establishment on local communities, but to critically appraise the range of effects that have been reported. The nature and scope of the question posed and categories chosen (including, as they do, issues of empowerment and social capital) suggested to the reviewers that a combination of quantitative and qualitative evidence is likely to provide the most reliable basis on which to inform future decision making.

[2] See Box 1 in Section 4.1.3.

Photo: Dietmar Temps

2. OBJECTIVE OF THE REVIEW

The primary research question was: What are the impacts of terrestrial protected areas on human well-being?

The objective of the review was to synthesise the empirical evidence of positive, negative or neutral impacts of PAs on human well-being at the local to regional scales, with an emphasis on local communities and using as broad a definition of well-being as possible (see categories to be considered, in Chapter 1). The reviewers were also interested in two secondary questions:

- How are costs and benefits distributed among and within local communities living inside PAs and in buffer zones (e.g. by socio-economic status, gender, age)?
- How do costs and benefits vary with governance, resource tenure arrangements and site characteristics?

As the aim was to assess the human well-being impacts of PAs in their current form and capture lessons for future interventions, relevant evidence could be provided by studies that generated hypotheses about impacts, as well as those that tested hypotheses about impacts.

Photo: Sarfraz Hayat

3. METHODS

3.1 Design of the study

An *a priori* protocol was established, peer-reviewed and posted by the Collaboration for Environmental Evidence (CEE) website on its website (Pullin et al. 2012, CEE 2014).

- a *qualitative* synthesis of people's views, observations and related documentary evidence, led by the Evidence-informed Policy and Practice Information and Co-ordinating Centre (EPPI-Centre), Institute of Education, University of London;
- a synthesis of *quantitative* evidence of impacts, including people's attitudes and views, led by Bangor University.

These processes are referred to in the report as 'qualitative' and 'quantitative', as reflected in the protocol and the methods described below.

A single systematic search was conducted to identify potentially relevant studies in order to answer the review questions. Initial screening of titles was undertaken by Bangor University. Further supplementary searching, screening, coding and synthesis was conducted independently by each review team. Thus, the searching phase and initial screening by title were not separate, but thereafter the report sections reflect the different approaches.

3.2 Searches

Search terms were selected to capture all information pertaining to PAs (the intervention) and relevant outcomes associated with human well-being. No search terms were used for the study populations (in this case, local communities), as these were not likely to be included in the title or abstract. Therefore, their incorporation in the search might have risked excluding relevant studies. The use of an asterisk denotes a

wildcard character that prevents plurals or alternative word endings being excluded. The search terms were as follows:

Exposure: protected area,* nature reserve,* wilderness area,* national park,* natural monument,* natural feature,* management area,* world heritage site,* biosphere reserve,* biodiversity conservation

Outcomes: poverty, human well,* socio-econom,* economy,* human health, livelihood,* social capital, social welfare, empowerment, equity, ecosystem service,* perception,* attitude*

Where the databases searched could accommodate all search terms simultaneously, they were separated using Boolean operators. The search terms were grouped by intervention and outcome, and these groups were referred to as 'sets'. The Boolean operator 'OR' was used to separate search terms within a set, and the operator 'AND' was used to separate the two sets, ensuring that the search returned references including at least one term from each set.

In many cases, the literature databases could not accommodate all the search terms listed above. Search strings therefore had to be adapted as necessary. In some cases this meant using pairs of search terms, one from each set, separated by 'AND'. Occasionally search terms had to be entered individually and/or the database did not accommodate Boolean operators. In these cases, only the search terms pertaining to the intervention were used. (For full details of the search, see **Appendix 1**.)

Where studies were reported in other languages, relevance was assessed initially from their titles and abstracts (translated if necessary). Non-English language articles that could not be considered in this review were recorded for future assessment (see **Appendix 2**.)

For the qualitative synthesis, non-English articles were translated using the Google Translate online translation tool. Google Translate was tested for accuracy using a sample article that included both English and non-English abstracts. By translating the non-English abstract and comparing it with the English abstract provided in the same article, it was possible to determine how well the tool 'understood' and conveyed the same meanings in the text. Google Translate was found to be a fairly accurate tool, although more accurate for some languages than others. Using Google Translate, non-English articles were translated and then screened on full text and included or excluded.

3.2.1 Estimating the comprehensiveness of the database search

All search terms were included in a search string formatted according to the requirements for searching in the Web of Knowledge database. A set of 18 references was identified by the review team as relevant to the review question and used as a 'test library' to check whether the search strings captured the expected studies.

The test library did not consist entirely of studies that would be included at every stage of the systematic review and data extraction. There were some studies which were expected to be captured in the search but did not include a suitable intervention, or were not primary literature. While it was not required for the database search to capture these articles, this was a valuable test of how specific the search strings were to the subject area while retaining the sensitivity required to capture all available literature.

The balance between specificity and sensitivity is key to achieving a comprehensive search while avoiding capturing too many spurious hits. The search string employed (see **Appendix 1**), consisting of the terms listed above, was the last of 16 iterations. It was arrived at using the test library to evaluate the search results returned by Web of Knowledge.

3.2.2 Publication databases searched

The search included the following computerised databases:

- Web of Knowledge
- Scopus
- Agricola
- CAB Abstracts
- PubMed
- ECONLIT
- Directory of Open Access Journals (DOAJ)
- LILACS (Latin American & Caribbean Health Sciences Literature – Spanish language).

A supplemental search was undertaken, using an expanded set of intervention and outcome terms, to test how many additional relevant articles they might provide. The following intervention and outcome terms were entered into Web of Knowledge:

Exposure: ecotourism, eco-tourism, eco tourism, wildlife tourism, trophy hunting, conservation corridor,* community conservanc*

Outcomes: natural resource, farm, enterprise,* human AND migration, gender, discriminat*

The articles obtained were then assessed as above.

3.2.3 Specialist searches

Internet searches using online search engines were not performed as part of the review. It was felt that the non-transparent and transient nature of search engine functionality would result in an unacceptable lack of replicability.

Thus, there was a focus on an extensive search of *specialist sources* to identify grey literature and reduce possible publication bias.

A list of 33 relevant organisations was identified (**Table 1**). These organisations' websites were searched by members of the qualitative and quantitative review teams and/or contacted by email with requests for relevant literature.

The organisations' websites were searched using a hierarchical approach, from the original search string down to individual words. Where this was not possible, the following individual terms were searched:

national park,* protected area,* reserve*

Boolean operators and wildcards were used where possible. All returns were assessed except where searches resulted in large numbers of results (i.e. > 100), when the first 50 returns were scanned for relevance.

In each case results were assessed at title and then full text, for relevance. Full texts were visually scanned for relevant data, along with within-document searches for the following terms:

park, protect, reserve

Due to the disparate modes of operation of the website search engines, a wide range of approaches was necessary (see **Appendix 3**).

TABLE 1. ORGANIZATIONS WHOSE WEBSITES WERE SEARCHED FOR RELEVANT LITERATURE OR WHICH WERE CONTACTED FOR ADDITIONAL INFORMATION

Organisation	Website
Asociación Campesina e Indígena de Agroforestería Comunitaria Centroamericana (ACICAFOC)	www.acicafoc.org/
Conservation International (CI)	www.conservation.org/
Cultural Survival	www.culturalsurvival.org/
Department for International Development (Dfid) (United Kingdom)	www.dfid.gov.uk/
Development Experience Clearinghouse (DEC)	http://dec.usaid.gov/index.cfm
EcoTerra	www.ecoterra.net/
Eldis (Livelihoods Connect)	www.livelihoods.org/
Environment Knowledge Hub	http://ekh.unep.org/
European Tropical Forest Research Network (ETFRN)	www.etfrn.org/etfrn/index.html
First Peoples Worldwide	www.firstpeoplesworldwide.org/
Food and Agriculture Organization (FAO)	http://fao.org/
Forest Peoples Programme	www.forestpeoples.org/
GEF Evaluation Office	www.thegef.org/gef/gef_Documents_Publications
GEF Small Grants Programme	http://sgp.undp.org/

Table 1 continued

Organisation	Website
Indigenous Knowledge	http://indigenousknowledge.org/
International Fund for Agricultural Development (IFAD)	www.ifad.org/
International Institute for Environment and Development (IIED)	www.iied.org/
International Union for Conservation of Nature (IUCN)	www.iucn.org/
Nature Valuation and Financing Network	www.naturevaluation.org/
Overseas Development Institute (ODI)	www.odi.org.uk/
Pacific Forestry Centre	www.pfc.cfs.nrcan.gc.ca/
Poverty and Conservation	http://povertyandconservation.info
Poverty-Well-being Platform	www.poverty-well-being.net
RECOFTC – The Center for People and Forests	www.recoftc.org/site/
Rights and Resources Initiative	www.rightsandresources.org/
Survival International	www.survivalinternational.org/
Tropenbos International	www.tropenbos.org/
United Nations Development Programme (UNDP)	www.undp.org/
United Nations Environment Programme	www.unep.org/
United States Agency International Development (USAID)	www.usaid.gov/
Waldbau-Institut, University of Freiburg	www.waldbau.uni-freiburg.de/
World Bank	http://web.worldbank.org/ (http://documents.worldbank.org/curated/en/home)
World Conservation Monitoring Centre (WCMC)	www.unep-wcmc.org/

3.2.4 Bibliographic searches

Where studies identified in the search used data reported in earlier primary literature, the original reference was sought and included in the data extraction process. These references were catalogued in a separate Endnote library. Five key reviews were identified from the above searches. The references within the five relevant reviews were examined to identify pertinent articles for inclusion in the review (see **Appendix 4**). These references were assessed at title, abstract and full text level where not already included in the above database and website searches.

3.2.5 Search update

The original search was carried out in October/November 2011. In May 2013 an update of the searches was undertaken in order to supplement the review with all relevant evidence that had been published since.

The original search string was combined with the supplemental search string and entered into the Web of Knowledge database. (Details concerning this search string and the number of hits returned can be found in **Appendix 1**.)

3.3 Screening

3.3.1 Inclusion criteria

The following inclusion criteria were applied to the articles captured by the search.

Populations

Populations refer to human populations/communities currently or previously living in or near terrestrial PAs. To avoid subjectivity in deciding what was 'local', studies were included if the subject was a relevant community existing in the same country as the PA(s) on which the article focused.

Exposure

Exposure refers to the establishment/implementation, presence or change in status of terrestrial PAs with IUCN classifications I-VI. Specifically, studies were included only if collection of data on the impacts of PAs had been undertaken during or after 1992. That included changes in the status of PAs.

The impacts of individual PAs were treated independently where possible, but in some cases studies looked at multiple PAs in such a way as to prevent the separation of impacts. Projects established within or surrounding PAs as a result of the existence of the PAs were also included.

Types of studies

Studies were considered for inclusion in the review if they satisfied one of the following criteria:

- They evaluated the impacts of PAs on human well-being (outcome evaluations used the following study designs with appropriate comparators, i.e. a comparable state with which the intervention or exposure could be compared: randomised controlled trials [RCTs]/controlled trials [CTs], control-intervention site comparisons, interrupted time series, before-after-control-intervention [BACI] designs);
- They reported economic valuations of welfare changes in monetary terms, based on stated or revealed preferences or production function approaches in which the comparator could be modelled and/or was implicit in survey responses (hypothetical);
- They sought to identify PA factors that influence human well-being;
- They sought evidence to support explanations or the meanings of impacts based on people's views concerning PAs and human well-being, as well as observations or related documentary analysis.

Studies were included that obtained data through direct measurement, self-reported measures by respondents, and other data sources that were not accessible but for which the methods (e.g. national census data) were adequately reported.

Additional inclusion criteria for quantitative evidence

Comparators were classified as temporal, spatial or modelled/hypothetical. Temporal comparators included time series, before and after, change over time (i.e. single time point), and reported/perceived changes. Spatial comparators included dichotomous (i.e. inside/outside and near/far) and continuous (i.e. linear distance) variables. BACI comparators included both spatial and temporal comparisons. Studies may account for confounding variability between comparator and exposure populations by using matching techniques, testing for differences in confounding variables, or including these variables in statistical models.

While economic valuation studies may lack before-after or matched site comparators, economic valuations are inherently relative to a counterfactual (which may be modelled or subjective). Not all of these inherent comparators were suitable for this review, however. Many studies purport to value a PA. Nevertheless, on closer inspection they often value the benefits of the ecosystem-protected area complex as a single entity, and may present no information with which to estimate the value of the ecosystem in the absence of the PA as an appropriate comparator. These studies were rejected on the grounds that they lacked an appropriate comparator (the comparator was usually the complete and sudden non-existence of the ecosystem, which was deemed inappropriate for the purposes of the review).

The minimum inclusion criterion was that the study made some attempt to model what would happen to the ecosystem in the absence of the PA (e.g. estimating rates of degradation before the PA was established and extrapolating these into the future to calculate that portion of the total value of the site which was attributable to the PA). Other economic valuation studies might value the opportunity costs of the PA. In these cases, the instantaneous loss of access to resources following the establishment of the PA was an appropriate comparator.

Outcomes

Outcomes are specific human well-being indicators linked to the broad categories (livelihood strategies, social capital, empowerment, human rights, access to ecosystem goods and services and natural resources) set out in Chapter 1. Examples are the United Nations Development Programme (UNDP) Human Development Index (HDI) and other indicators that consider, for example, income, education, health, longevity, gender equity, food security, livelihood diversity, subjective/reported measures of well-being, resilience, measures of social capital, and indicators of human rights.


Photo: Jef King

Additional exclusion criteria for qualitative evidence

Studies reporting people's views were excluded if they:

- focused solely on the development or validation of a measurement tool without also presenting views separately from the validation of the tool;
- reported trials or other outcome evaluations, unless it was clear from the abstract that they collected data about views as part of a process evaluation.

3.3.2 Preliminary screening process

Articles captured by the searches were stored in an Endnote library. Replicates were removed and titles examined for relevance to the inclusion criteria. Potentially relevant titles were then separately screened as to whether they contained evidence of people's views and/or quantitative evidence of impacts, as described in the following sections.

3.3.3 Screening articles for qualitative evidence

Following preliminary screening by title, articles were screened by abstract and then by full text for evidence of people's views about PAs. Any articles missing an abstract were accepted for full text screening. The inclusion and exclusion criteria were re-applied to the full texts (70.3% were obtainable), and those that did not meet inclusion criteria were excluded.

A coding tool was developed in order to ascertain what relevant information was held within articles (see **Appendix 5**). EPPI-Reviewer (Thomas et al. 2010) software was used for screening, using a single web location to house the documents and monitor the progress of the review. (Rejected articles and their corresponding reasons are listed in **Appendix 6**.)

The systematic search and screen identified many studies relevant to the review question. The studies identified covered a broad range of geographical areas and types of PAs, and sampled diverse population groups using a variety of qualitative research methods. The characterisation of studies by methodological and contextual features provided the starting point for deciding which studies to include in the qualitative synthesis (see **Section 4.2.1** for further details).

Descriptive information about included studies was collected and presented as a 'systematic map' of research into the explanations of impacts and their meanings by people living in or near PAs. This map provided a basis for informed discussion and decision making between the two review teams concerning the focus of the qualitative synthesis, which provides a detailed investigation of a more focused subset of this wider literature. As the synthesis was focused and narrowed down, a second set of inclusion criteria was developed and applied to the studies initially identified.

Understanding perceptions of the impacts of protected areas requires appropriate research methods and full reporting of context. Further, understanding the meaning of protected areas for well-being requires qualitative data collection methods that allow people to express their views freely rather than merely responding to predetermined categories, as well as analysis that will provide 'thick' or 'rich' findings. Thick findings have been defined as rich, detailed descriptions of specifics (as opposed to summary, standardisation, generalisation of variables): they capture 'the sense of what occurred and the drama of events, thereby permitting multiple interpretations' (Neuman 1997). Therefore, studies selected for in-depth review used qualitative research methods which elicited the views of people living in or near protected areas where:

- the IUCN category, and the date this was assigned, were known;

- the methods and date of data collection were clearly reported;
- the analysis produced 'thick' or 'rich' findings;
- findings were linked to specific people (e.g. distinguishing ethnicities, employment or locations).

3.3.4 Screening articles for quantitative evidence

Following preliminary screening by title, articles were also screened for quantitative evidence of impacts by abstract and then by full text. Any articles missing an abstract were accepted for full text screening. Where information in titles or abstracts was insufficient, articles were accepted for screening at full text.

A kappa test for consistency of decisions regarding inclusion/exclusion at abstract level returned a moderate level of agreement (n = 100, kappa = 0.442, 95% C.I. 0.270 to 0.614) between two independent reviewers. Twenty-eight studies were treated differently by the two reviewers. These studies were re-read and the reasons for inclusion or exclusion by each reviewer discussed by the review team in order to reach consensus on the interpretation of the titles and abstracts and informed the subsequent inclusion process.

Full text screening resulted in the rejection of articles that were not pertinent to the review in hand. Reasons for exclusion were recorded (**Appendix 6**). Relevant reviews were identified for use in the bibliographic searching phase described in Section 3.2.

An attempt was made to obtain all articles deemed relevant during abstract-level screening for assessment at full text. Articles that could not be obtained due to the limitations of time and the resources of the review are listed in **Appendix 2**.

3.4 Qualitative synthesis of the explanations and meanings of impacts

There are three distinctive approaches to synthesising findings from research (Gough et al. 2012):

- aggregating the findings of very similar studies where the key concepts are clearly defined in advance;
- configuring the findings of dissimilar studies by investigating the implications of the differences in their methods, context and findings in order to define key concepts and develop theoretical understanding;
- a combination of the two, which can be applied where there are important differences between studies, but nevertheless the studies share some concepts of well-being.

The third approach was chosen because some (but not all) key concepts had been decided upon and defined in advance:

- Protected areas with their clearly defined categories;
- populations;
- outcomes of interest.

Although these concepts had previously been identified, a synthesis method was required that would also allow new concepts to emerge from the data in order for the impacts on human well-being to be understood from the perspective of people living in or near the protected area in question.

Framework synthesis does this because the dimensions of a framework for structuring the synthesis can be identified by policy interests, research interests, and concepts emerging from the data (Oliver et al. 2008). Framework synthesis also takes into account differences in context, such as the different countries hosting PAs, the different categories of PA, and the different times and stages in their history when each area was studied. Based on framework analysis of primary research data (Ritchie and Spencer 1994), an initial conceptual framework, either built from assumptions held by stakeholders or borrowed from related bodies of knowledge, evolves during the synthesis as the reviewers become more familiar with the literature being reviewed (Oliver et al. 2008).

The five neat stages of framework analysis described for primary research (Pope et al. 2000) are in practice a more iterative process for making sense of a pile of studies (Thomas et al. 2011). The process starts by delving into the abstracts, and then the full texts, to identify key issues and recurrent themes, some of which emerge from the data while others are

purposely sought in response to the review question or prior knowledge.

Once most of the key themes are identified, studies are coded according to themes and the literature is subdivided into sections for in-depth analysis. The conceptual framework is refined in light of these themes. Coding continues iteratively, but systematically, as the framework becomes increasingly coherent and simultaneously accommodating of the available data. Subsections of the framework shape data tables under key themes so that concise summaries can be developed. Conclusions are drawn from the themes and the associations between them.

3.4.1 Data extraction strategy

The focus of the studies included was identified. The coding framework described above was applied to each study (also see **Appendix 5**). This framework covered:

- health (mental and physical health, safety, wildlife conflict);
- socio-economic position (livelihood strategies, social capital, human rights, empowerment, environmental capital, governance);
- inequalities;
- context.

Study text was extracted in the form of:

- participant data (e.g. direct quotes);
- authors' descriptions of findings;
- authors' conclusions, implementations and recommendations.

The coding framework was tested by two or more reviewers, who independently coded successive studies, compared and discussed how they applied the codes, and refined the framework and definitions of codes until a shared understanding was achieved across the team.

3.4.2 Qualitative synthesis

The qualitative synthesis began by developing the initial key concepts into a coherent framework that could accommodate the main approaches to establishing and maintaining PAs. **Figure 1** illustrates two contrasting approaches to terrestrial PAs:

- the imposition and enforcement of governance models by external authorities, producing various types of tensions;
- participatory approaches (e.g. community-based natural resource management) which seek a vision of sustainability through building on social capital and good health, within a regulatory framework.

Participatory approaches have been developed in response to the deleterious impacts on economic and environmental capital (e.g. agriculture, logging, tourism) and social capital (e.g. family and community relationships) resulting from restrictions and resettlement. This vision of sustainability may be on a relatively small scale, as in the case of IUCN category VI (protected areas with sustainable use of natural resources), where the aim is sustainability within these areas, or on a larger scale, as in the case of IUCN categories I or II (nature reserves, wilderness areas and national parks) and wider areas.

Participatory approaches have been developed against the backdrop of an evolving consensus on human rights that began with the protection of individual civil and political rights, followed by support for economic, social and cultural rights and the setting of these rights within a broader framework to harness the combined efforts of individuals, states and other entities to establish collective rights to self-determination, heritage and equity (Vasak 1977). The qualitative synthesis aims to assess the extent to which these approaches and their anticipated impacts are supported by perceptions of impacts on human well-being by people living in or near protected areas.

The coding framework was populated with research findings by dividing the articles into three overlapping subsets which clearly addressed:

- participation (e.g. human rights, empowerment, governance);
- health (e.g. physical and mental health, safety);
- socio-economic position (e.g. wildlife conflict, livelihood strategies, social and environmental capital).

Responsibility for each subset was given to a different member of the team, in order to seed the synthesis with studies focusing on findings in one of the three areas. Understanding the context of each study and the interplay between different concepts required the reviewers to return to the full report of each study, as well as the text extracted for each code, and distil the key study characteristics and findings.

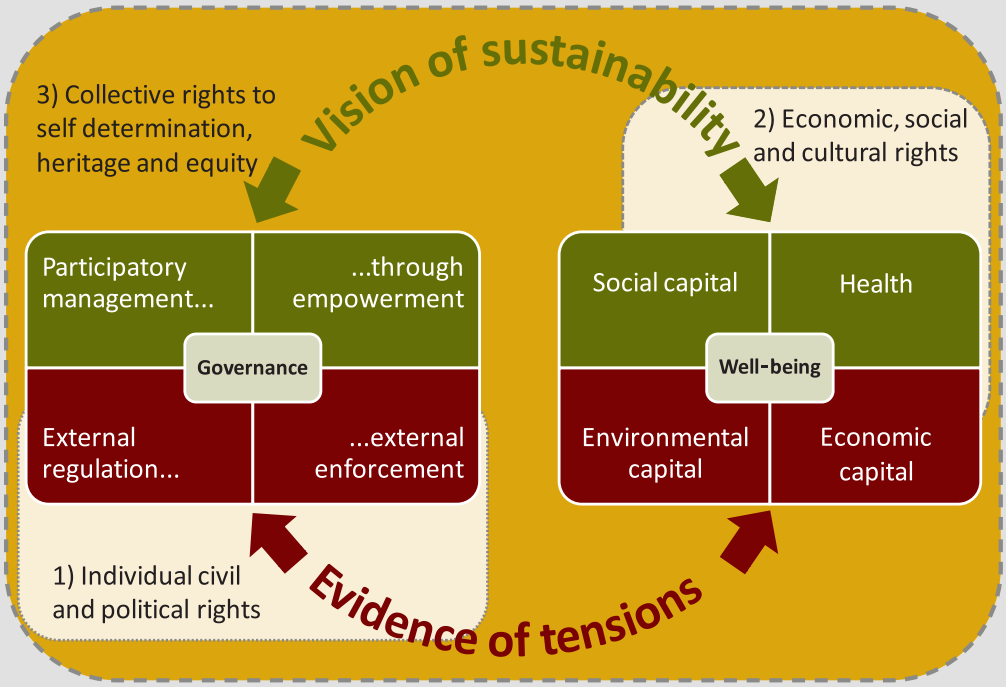
The resulting coherent text was placed within the emerging framework as appropriate. Where studies contributed substantial findings to different elements of the framework, these findings were distributed across the framework to allow each element to draw on all relevant studies. As the framework became more coherent with growing understanding of the relationships between its different elements, the elements were reordered to present governance issues first and then well-being issues.

Study findings were summarised for each element of the framework, taking into account the governance and time contexts of the studies. The contexts of the studies contributing to the synthesis were recorded, with the following being noted:

- location (name and country of the protected area);
- IUCN category (present category, years assigned and changed);
- governance (national or local government, private or community);
- timing of the study (year data were collected and year current IUCN category was assigned).

Finally, all studies were revisited for additional qualitative evidence of impacts that appeared significant in light of emerging findings.

FIGURE 1. CONCEPTUAL FRAMEWORK FOR STRUCTURING THE QUALITATIVE SYNTHESIS OF EVIDENCE OF IMPACTS



3.5. Review of quantitative evidence of impacts

3.5.1 Data extraction strategy

A preliminary data extraction phase was carried out during full text screening. Each reported study was categorised in terms of the outcome types represented in the quantitative data. These outcomes were then categorised according to the coding framework (described in detail in **Appendix 5**). Details about the following were ascertained:

- the broad study methodology (i.e. self-reported data from close-ended questioning in interviews and questionnaires;
- direct data collection;
- evaluations or data taken from other sources (e.g. national census documents);
- whether there was a valid comparator.

Comparator categories (i.e. no comparator, before-after, inside-outside, before-after-control-impacts, econometric) were used to group the studies for a second stage of detailed data extraction. Only studies that possessed an appropriate comparator were taken to this second stage of data extraction, where details of the study methodology, potential effect modifiers, or reasons for heterogeneity and relevant outcome data were obtained.

For all outcomes, averages (means/medians) and variability measures (standard deviation, standard error and confidence intervals) were obtained where possible, along with statistical test results and sums of counts (i.e. percentages of respondents in agreement).

3.5.2 Study quality assessment

Details relating to study quality were extracted for each study to allow critical appraisal of relevance (external validity) with respect to the review question and reliability (internal validity). Critical appraisal was conducted in two stages.

Initially, there was an assessment of whether a study could be described in terms of one or more of the following: confounding variables; within-study contradictory results; inappropriate implicit comparator; inappropriate population; inappropriate spatial comparator; inappropriate statistics; inappropriate temporal comparator; inappropriate time frame; insufficient detail in methods; data linked with marine ecosystem protection; non-standardised (incomparable) data; protected area establishment too recent/not yet established; data collection prior to 1992; extremely small sample size (e.g. in one study wood extraction was quantified in only nine households, with one intervention and one control village); superseded by more recent study; unbalanced questioning/questioning bias; or unmatched methods (see **Appendix 6** for further details). Studies with one or more of these characteristics were excluded from the review.

Studies accepted following this first critical appraisal stage were then scored for reliability with respect to the question, using the concept of susceptibility to bias (the extent to which a study is able to yield an unbiased estimate of effect; Borenstein et al. 2009). Susceptibility to bias in study design and reporting can affect both internal validity (study quality) and external validity (study generalisability).

Susceptibility to bias scores were assigned using a repeatable, but partially subjective, set of four criteria each assessed on a scale of 0 to 2, and thus ranging from a minimum possible value of 0 to a maximum of 8 (**Table 2**). The four criteria were:

- clarity of methods – extent of detail provided in the study's methodology regarding questionnaire design, survey implementation, replicate number and selection, and data analysis;
- study design – rigour of study design in terms of replicate number and sampling, location and choice of replicates and controls, questionnaire design, and survey implementation;
- appropriateness of analysis – suitability of analytical techniques, such as the implementation and choice of statistics and comprehensiveness of analysis;
- implementation bias – presence of one of the following biases in measurement and analysis: Neyman bias (the intervention in question causes systematic drop-out within the population, e.g. the most affected families move away), questioning bias (unbalanced/leading questions), potentially influential variables, recall bias (response affected by memory).

Susceptibility to bias scores were then combined with objective weighting by basic study design to provide a categorical assessment (high, medium or low) of susceptibility to bias (**Table 3**).

3.5.3 Potential effect modifiers and reasons for heterogeneity

Data on potential effect modifiers that were extracted from articles included the following variables: protected area studied; country; IUCN category; protected area size; date of establishment; history of protection prior to formal establishment; and residence history and ethnicity of the study population.

Where sufficient information about the IUCN category, protected area size and year of establishment was not presented in the article itself, data were supplemented from the World Database on Protected Areas (WDPA) (Protected Planet 2014, WDPA 2014).

3.5.4 Data synthesis and presentation

Extracted data were presented in narrative synthesis tables that summarised the studies' aims, methodology, study population, and results (see **Appendix 7**).

No further quantitative synthesis of data on outcomes was possible with the available data.

TABLE 2. QUANTITATIVE EVIDENCE OF IMPACTS: SCORING CRITERIA FOR SUBJECTIVE ASSESSMENT OF SUSCEPTIBILITY TO BIAS

Assessment criteria	0	1	2
Clarity of methods	All sample sizes provided, selection method described, questionnaire design fully disclosed	Some information regarding sample size, selection method, or questionnaire design provided	Sample size not provided in full, sample selection not stated, questionnaire design not discussed
Experimental design	Good sample size, appropriate sampling regime, control and intervention well matched, survey appropriately implemented	Low effective sample size, poorly randomised design, control and intervention choice not ideal	Very small sample size, pseudoreplication, non-random sample selection, control and intervention poorly matched/low consistency in sampling over time
Appropriateness of analysis	Confounding variables accounted for, appropriate metrics reported	Confounding variables only partly accounted for/only some low-risk confounding variables ignored	Significant confounding variables unaccounted for, inappropriate metrics reported, incorrect statistical analysis
Implementation bias	No identifiable bias reported/evident	Low-level bias present but ignored/strong bias accounted for	Strong bias present and unaccounted for

TABLE 3. QUANTITATIVE EVIDENCE OF IMPACTS: CATEGORISATION OF SUSCEPTIBILITY TO BIAS

	Susceptibility to bias score		
Comparator	**0-2**	**3-5**	**6-8**
RCT* (randomised control trials)	Low	Low	Medium
BACI (before-after-control-intervention)	Low	Medium	High
Control-intervention/ Before-after/ Econometric	Medium	High	High

*There were no RCT studies. This line is only provided for a theoretical perspective.

Photo: Paul VanDerWerf

4. RESULTS OF THE TWO REVIEW PROCESSES

4.1 Descriptive statistics

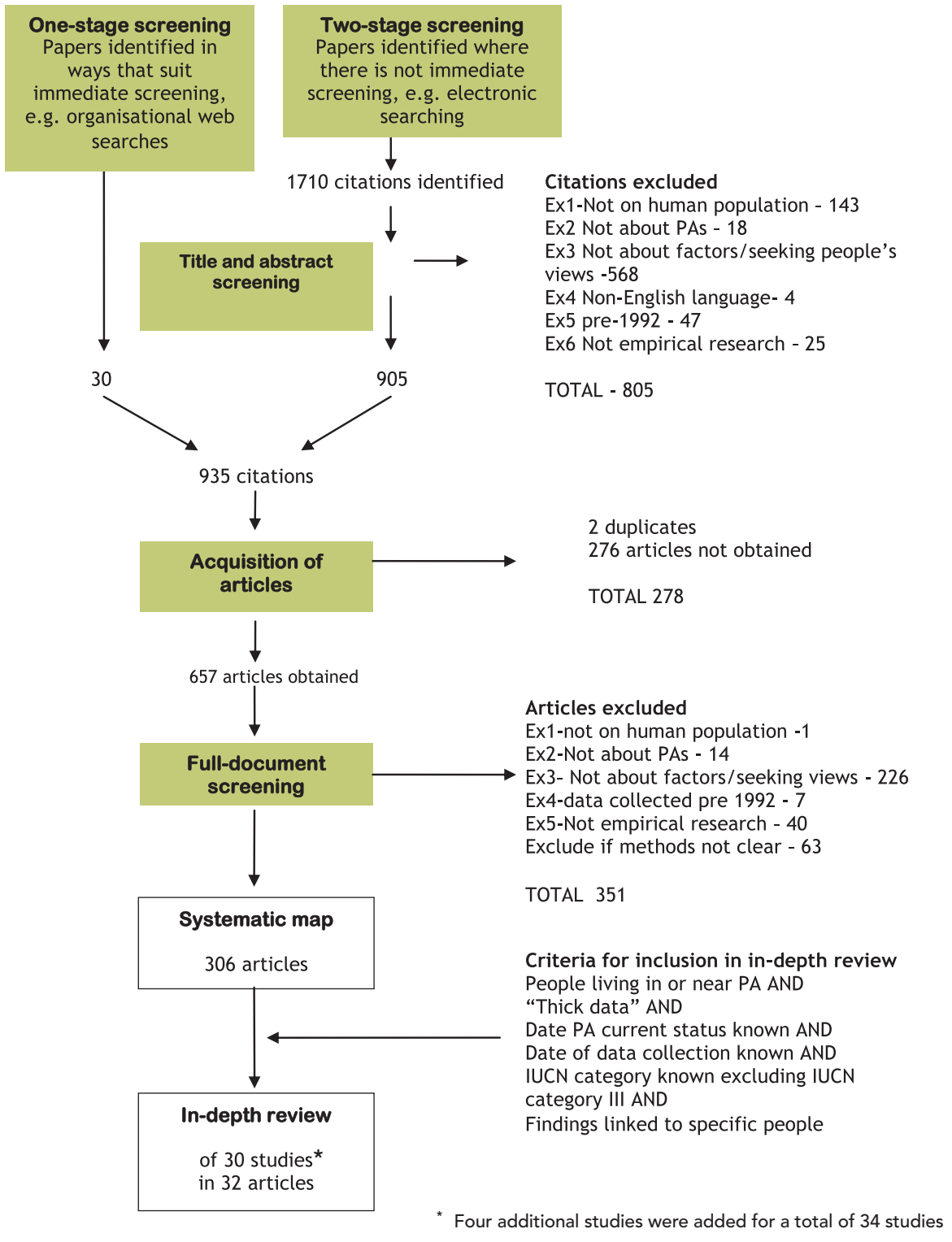
The main literature search was conducted in October/November 2011. An update was carried out in May 2013 (**Section 3.2.5**).

Overall, a total of 18,895 articles from all sources were identified through web searches and calls for information. Following title screening, 3370 articles remained. After abstract and full text screening, the qualitative evidence review mapped 306 relevant articles and synthesised in detail 34 that were scored as high quality. The quantitative evidence review critically appraised 79 studies from 70 articles at full text and included 14 studies of low/medium susceptibility to bias.

4.1.1 Qualitative synthesis of explanations and meanings of impacts,

Abstract screening for the qualitative synthesis resulted in the final inclusion of 30 studies, as shown in **Figure 2**. Four additional studies were included in an identical process following the search update in May 2013, for a total of 34 studies.

FIGURE 2. QUALITATIVE REVIEW SYNTHESIS: NUMBER OF PAPERS OR ARTICLES AND STUDIES AT PROGRESSIVE STAGES OF INCLUSION



4.1.2 Quantitative evidence of impacts

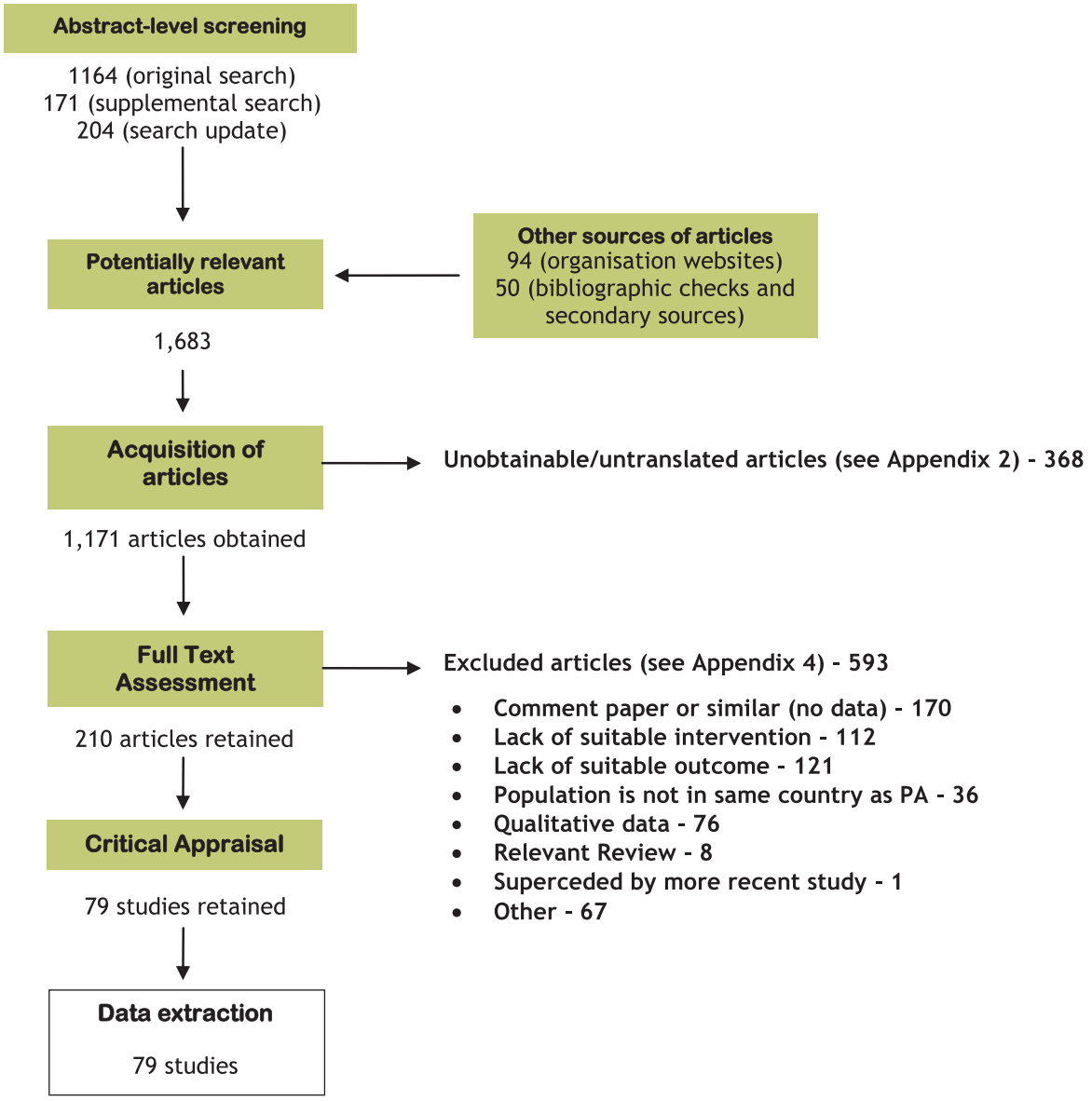
Abstract-level screening for the review of quantitative evidence resulted in the final inclusion of 79 studies (Figure 3).

In addition to the above searches, 2345 articles were identified by the supplemental search: 535 remained following title-level screening, and 171 following abstract-level screening. After critical appraisal, 12 articles from this supplemental search were included.

Searches of relevant organisations' websites in March 2012 yielded 94 relevant articles for the quantitative review. In addition to these searches, 50 relevant articles were identified through bibliographic checks and secondary sources, yielding a total of 1164 potentially relevant articles. Of these articles, 76% were retrievable for full text assessment while 275 were unobtainable within the time frame and resource limitations of the review. The numbers are shown in **Figure 3**. A total of 157 of the articles identified in the May 2013 search update were obtainable, although five were in Chinese and could not be assessed (see **Appendix 2**).

Following full text assessment, 177 articles from the original search, 16 from the supplemental search, and 17 from the update met the inclusion criteria and were subsequently critically appraised. Following critical appraisal, articles were rejected at full text level for a wide range of reasons (see **Section 3.5.2**). (A list of these articles with the reasons they were rejected is provided in **Appendix 6**.) A final set of 70 articles was included, reporting on 79 studies (these articles are listed in **Appendix 7**).

FIGURE 3. QUANTITATIVE REVIEW SYNTHESIS: NUMBER OF PAPERS OR ARTICLES AND STUDIES AT PROGRESSIVE STAGES OF INCLUSION



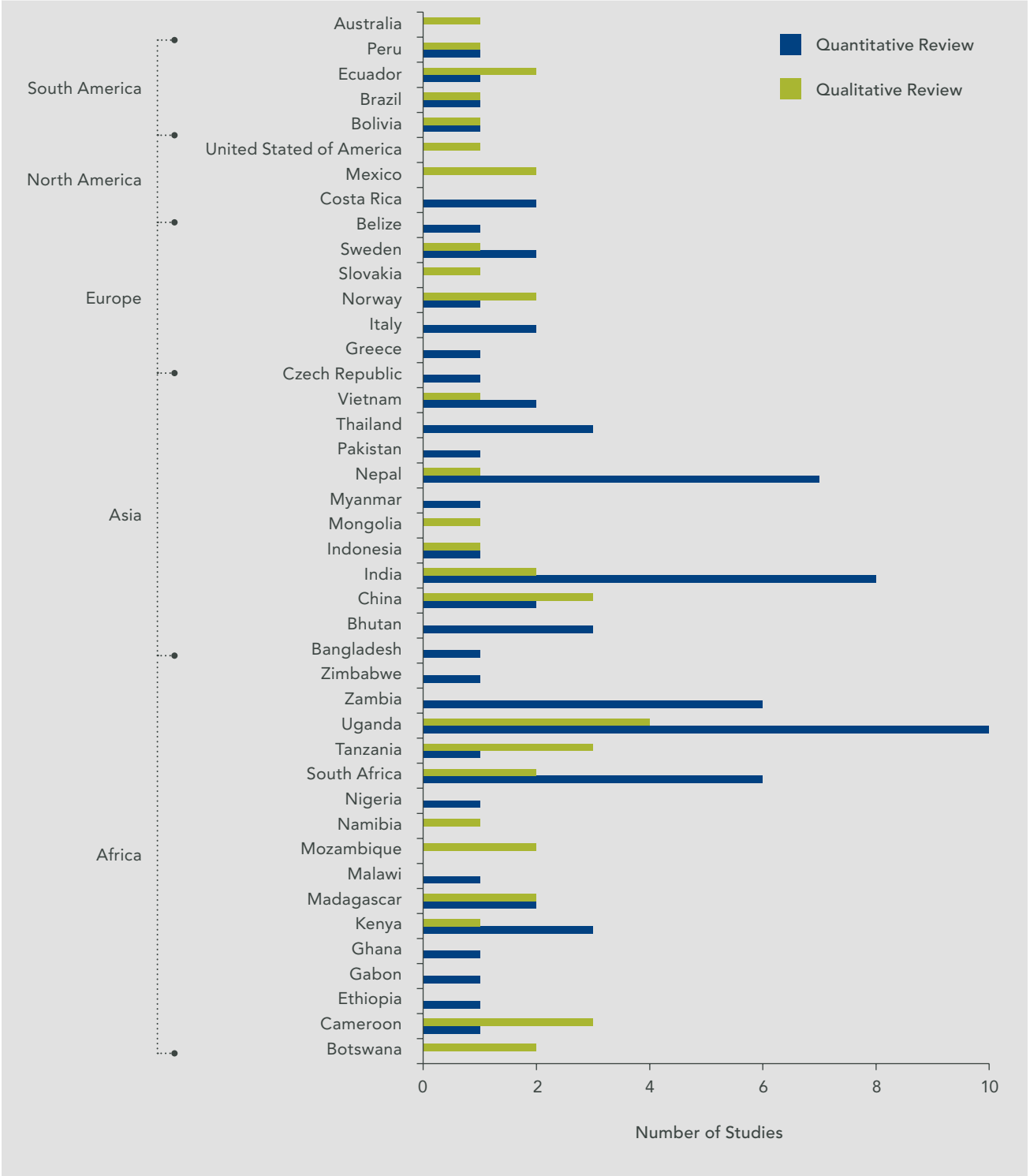
4.1.3 Comparison of studies included as a result of the two review processes

The 34 studies on qualitative evidence of impacts and 79 studies on quantitative evidence, included as a result of the two review processes, are described below.

Study locations

Figure 4 shows the countries from which data were collected for the included studies. Frequently studied countries include Cameroon, China, India and Uganda for the qualitative review; and India, Nepal, South Africa and Uganda for the quantitative review.

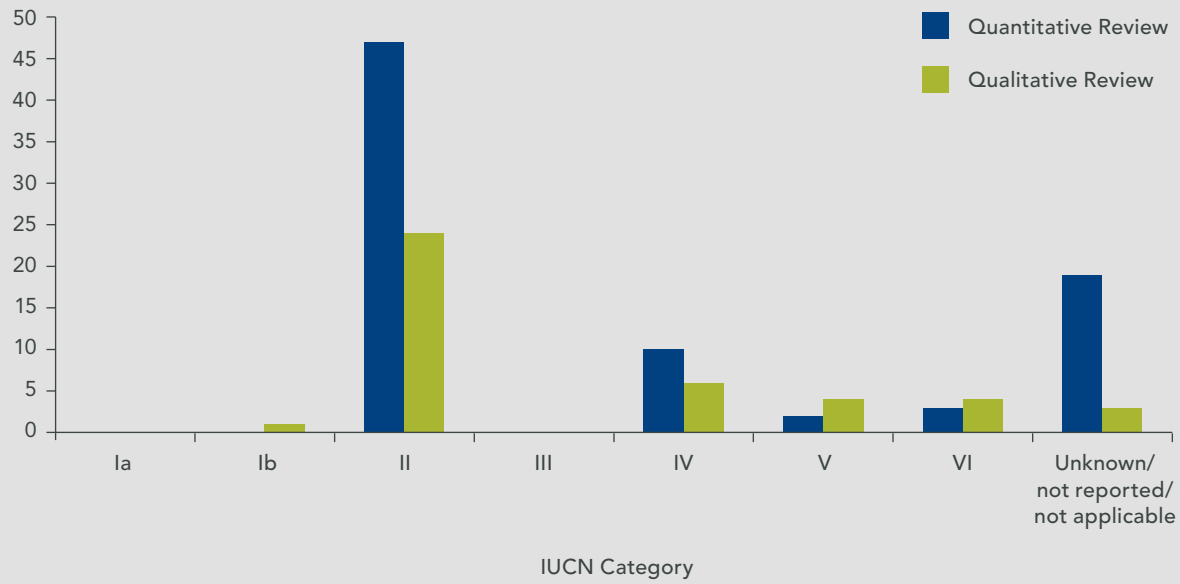
FIGURE 4. QUALITATIVE AND QUANTITATIVE EVIDENCE OF IMPACTS: COUNTRIES HOSTING PAS INCLUDED IN STUDIES



IUCN categories of PAs

The IUCN categories (see **Box 1**) of the PAs examined in the studies that were included are shown in **Figure 5**. These PAs were predominantly in category II for both the qualitative synthesis and the quantitative review, with 17% either unreported by WDPA or not present in the database for the quantitative review. (Note that this group includes 'not applicable' only for the qualitative synthesis, as studies were not included in the quantitative review unless the protected area IUCN category was stated.) A *post-hoc* decision was made to exclude category III PAs, as they were small in number and atypical of the set of categories (specifically protecting natural monuments). Similar patterns were observed in both review processes.

FIGURE 5. PROTECTED AREAS BY IUCN CATEGORY INCLUDED IN THE REVIEW



BOX 1: THE IUCN PROTECTED AREAS CATEGORIES SYSTEM[3]

IUCN protected area management categories classify protected areas according to their management objectives. These categories are recognized by international bodies, including the United Nations, and by many national governments as the global standard for defining and recording protected areas and they are increasingly being incorporated into governments' legislation.

Ia Strict nature reserve

Category Ia areas are strictly protected areas set aside to protect biodiversity, and also possibly geological/geomorphical features, where human visitation, use and impacts are strictly controlled and limited in order to ensure the protection of conservation values. Such protected areas can serve as indispensable reference areas for scientific research and monitoring.

Ib Wilderness area

Category Ib protected areas are usually large unmodified or slightly modified areas, retaining their natural character and influence without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.

[3] See: http://www.iucn.org/about/work/programmes/gpap_home/gpap_quality/gpap_pacategories/

II National park

Category II protected areas are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area. They also provide a foundation for environmentally and culturally compatible, spiritual, scientific, educational, recreational and visitor opportunities.

III Natural monument or feature

Category III protected areas are set aside to protect a specific natural monument, which can be a landform, sea mount, submarine cavern, geological feature such as a cave, or even a living feature such as an ancient grove. They are generally quite small protected areas and often have high visitor value.

IV Habitat/species management area

Category IV protected areas aim to protect particular species or habitats and management reflects this priority. Many Category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category.

V Protected landscape/seascape

These are landscapes and seascapes where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural and scenic value; and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.

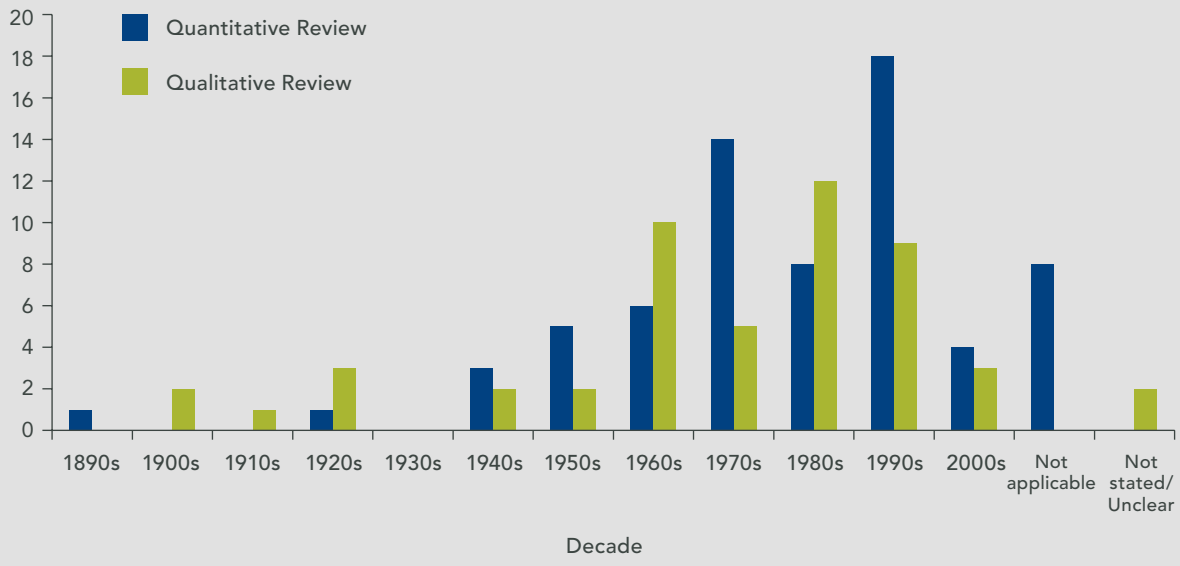
VI Protected area with sustainable use of natural resources

Category VI protected areas conserve ecosystems and habitats, together with associated cultural values and traditional natural resource management systems. They are generally large, with most of the area in a natural condition, where a proportion is under sustainable natural resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area.

Studies presented data on a total of 43 different named PAs in the qualitative review and 80 in the quantitative review. Seven PAs were studied twice or more, with Kibale National Park appearing in nine studies.

The years PAs were established are shown in **Figure 6**. The majority of PAs were established after 1950, with a peak in PA establishment for the qualitative review in the 1980s and for the quantitative review in the 1990s.

FIGURE 6. PROTECTED AREA YEAR OF ESTABLISHMENT OF STUDIES INCLUDED IN THE REVIEW



Study time scales

Figure 7 shows the survey years for the studies that were included for both reviews. A significant number of studies failed to report the survey year (applicable only to the quantitative impacts review, since this was an exclusion criterion for the qualitative synthesis). The fall in the number of surveys for both reviews from 2005-2006 likely relates to publishing delays.

FIGURE 7. YEARS OF PA SURVEY FOR THE STUDIES INCLUDED IN THE REVIEW: SURVEYS BEGAN IN THE YEAR SHOWN AND ARE CLASSIFIED AS A 'LONGITUDINAL STUDY' IF THE SURVEY SPANNED MORE THAN TWO YEARS

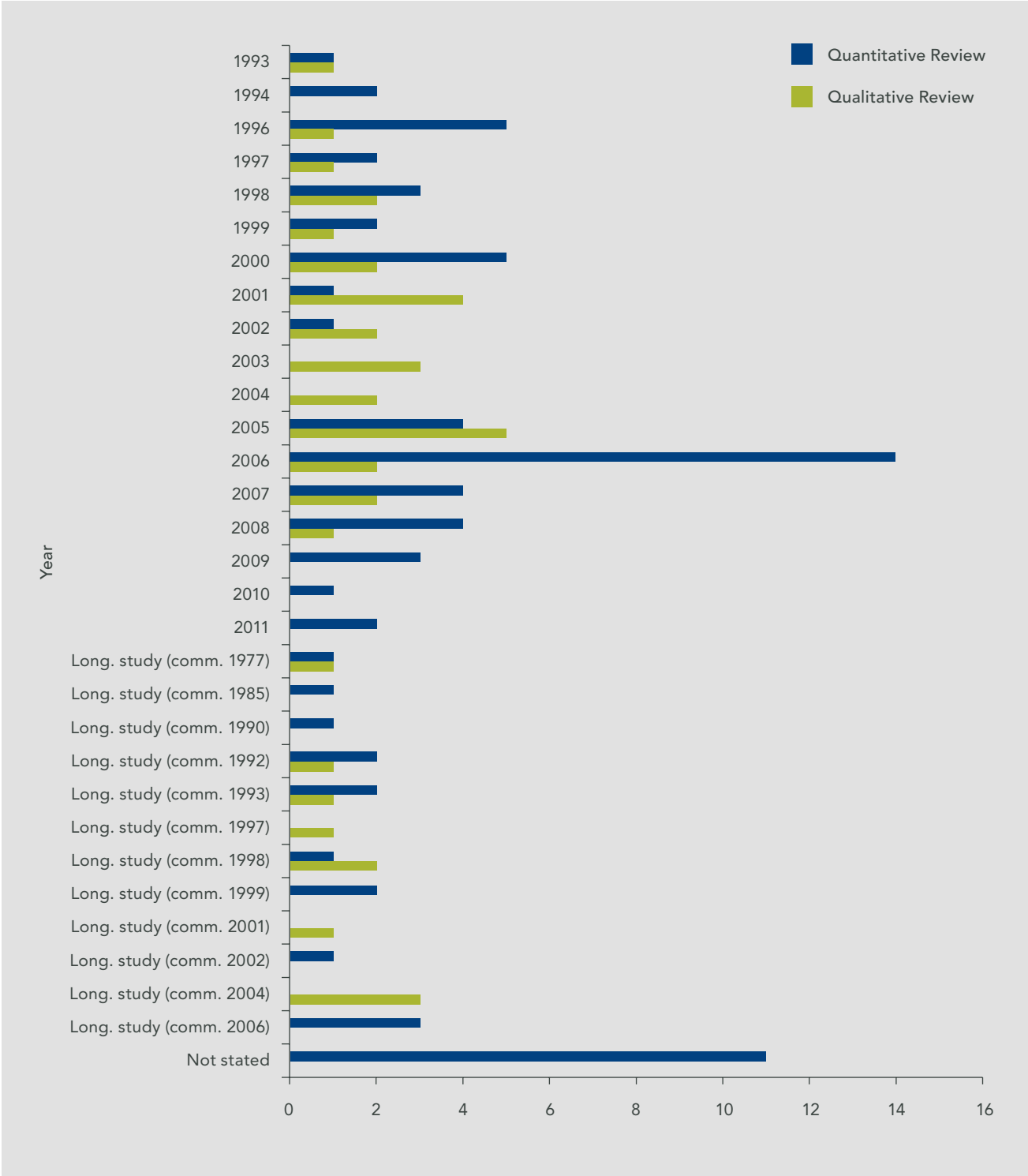


Photo: Carsten.nebel

4.1.4 Further descriptive statistics for the review of quantitative evidence of impacts

Study comparators

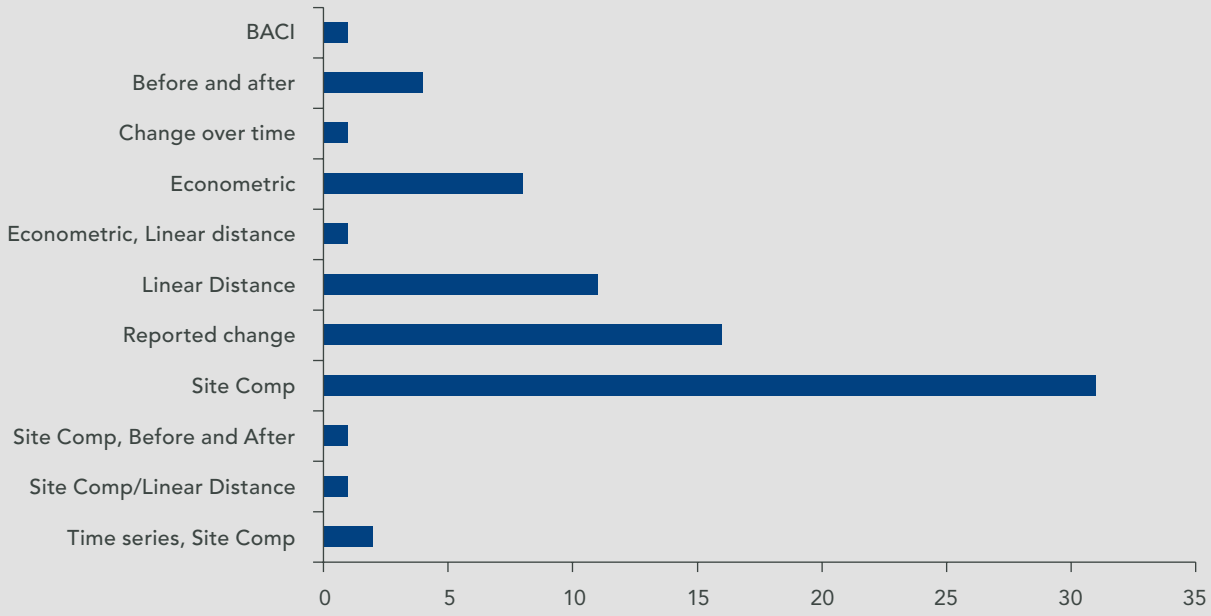
Figure 8 shows the range and frequency of comparators used in the studies that were included. Spatial comparators (site comparators and linear distance) were common, along with reported change over time. Before-after-control-intervention (BACI) studies were very rare. There was only one instance of a full BACI study.

Measured outcomes

Within the five key themes described in Chapter 1 (livelihood strategies, social capital, empowerment, human rights, and access to ecosystem goods and services and natural resources), 24 individual outcome types were identified in an iterative process during screening. The reported outcome types were separated in order to facilitate the description and analysis of similar, comparable data. The frequency of these broad outcome types is shown in Figure 9. Wildlife conflict, attitude and income outcomes were most common.

The exclusion of studies following critical appraisal resulted in the outcome types 'empowerment' and 'religion and spirituality', identified during full title

FIGURE 8. RANGE AND FREQUENCY OF COMPARATORS USED IN THE STUDIES



assessment, being unrepresented by data. 'Other outcome types were represented in two studies or fewer: 'gender equity', 'interactions with PA authorities', 'livelihood diversity', 'medicinal plants/animals', 'protect for future' and 'resettlement and displacement'.

Methodology of data collection

Figure 10 shows the frequency of different data sources in included studies. Self-reported measures (in 63 of the 79 included studies) made up the majority of the data reported.

FIGURE 9. BROAD OUTCOME TYPES IN THE STUDIES INCLUDED IN THE REVIEW

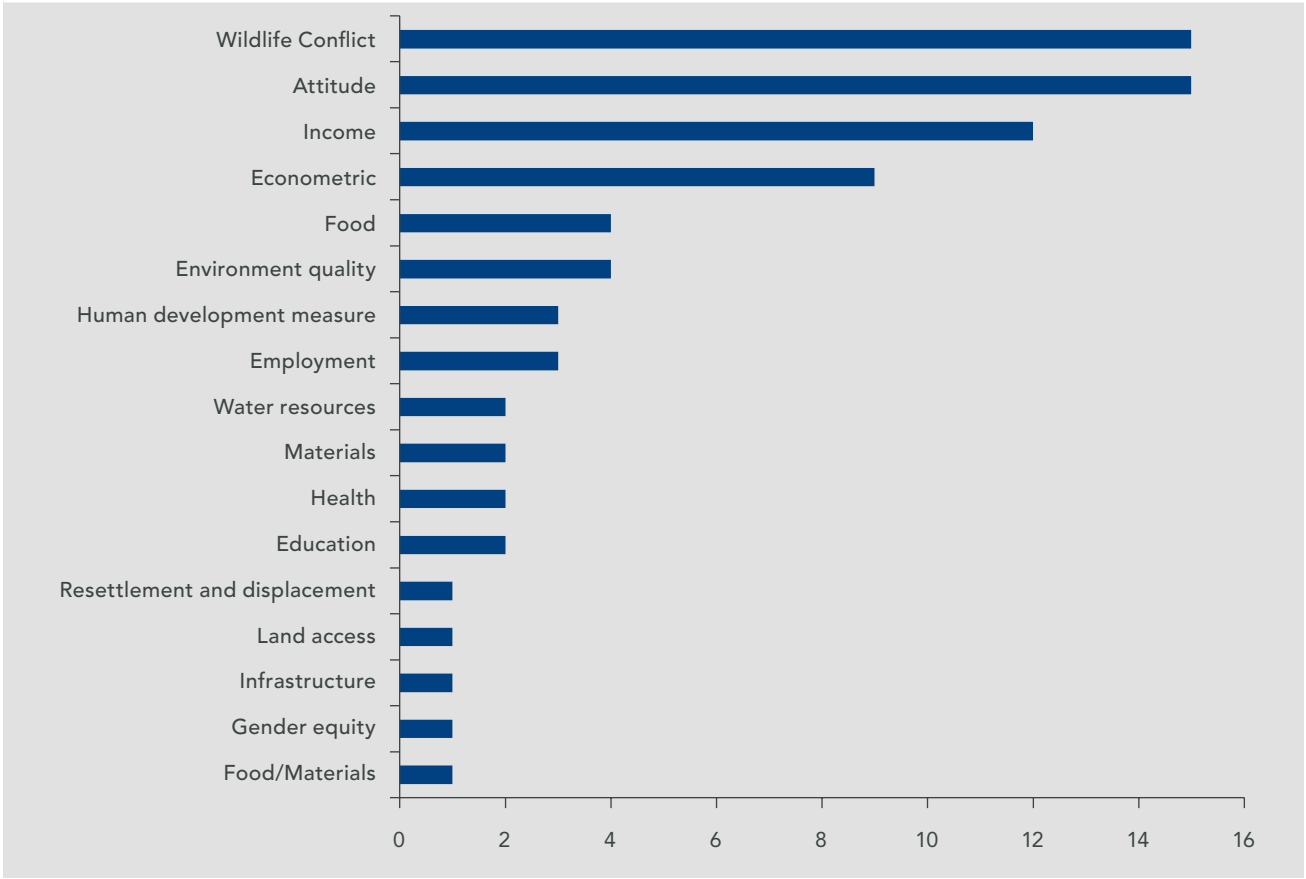
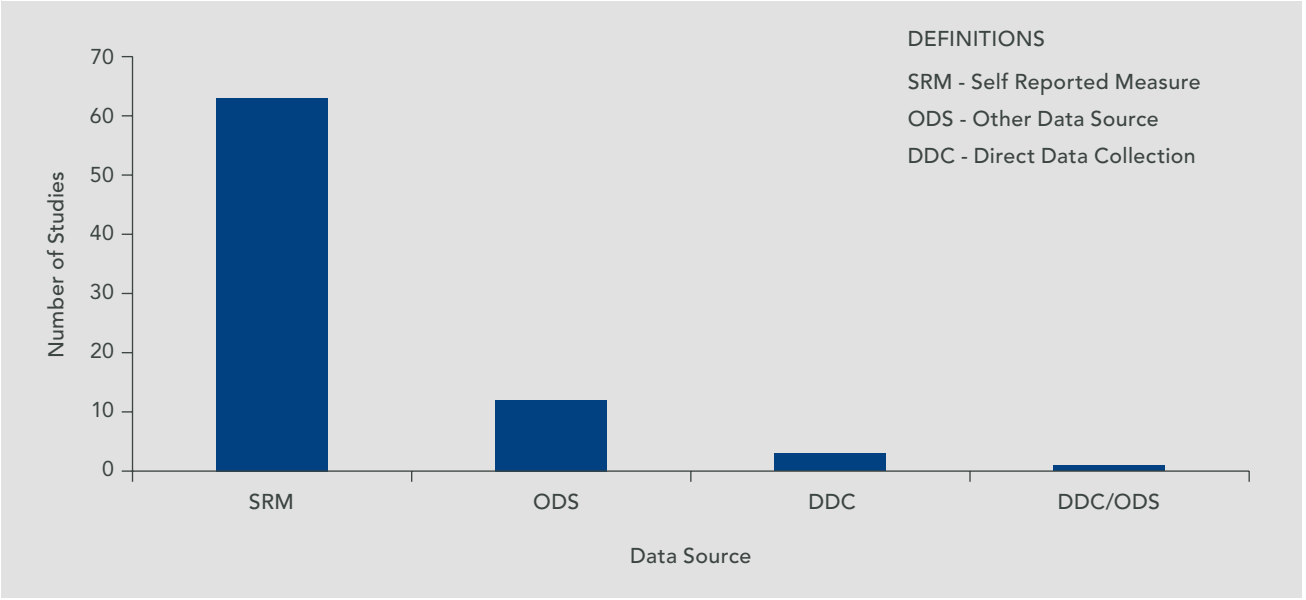


FIGURE 10. DATA SOURCES FOR STUDIES INCLUDED IN THE REVIEW



4.2 Qualitative synthesis of explanations and meanings of impacts

4.2.1 Studies included in the qualitative synthesis

The criteria for selecting studies to include in the in-depth qualitative synthesis are described in **Section 3.3.3**. Studies with 'thick' data were chosen for their ability to provide explanations and meanings of impacts obtained from people living in or near the PA, although they were not statistically representative of the 306 studies of people's views that were identified. These studies also spanned the range of the broader literature, in terms of countries frequently studied, as described in the map (see **Section 3.3.3**). Because of poor reporting, however, it was difficult to make further comparisons between the studies reviewed in-depth and the wider map in terms of IUCN categories and key dates.

The vast majority of the studies included were by academic authors. A small minority came from NGOs, commercial organisations and protected area authorities. These different perspectives are likely to shape the focus of studies and, consequently, their findings.

People's views were most often sought in the case of IUCN category II, where there are strict restrictions on settlements, but rarely in the case of category VI, where the aim is to balance the aims of conservation and the needs of the local population. Leaders' views were most often sought concerning category I, where human settlements are not allowed. There was also a notable absence of studies presenting the views of protected area authorities or employees in category IV (similarly to the map).

Other stakeholders not well represented in studies presenting 'thick' findings were visitors to PAs. Studies seeking visitors' views have often done so using highly structured questionnaires that provide little understanding of what protected areas mean to them. The one study of visitors included in the synthesis was set in a category IV protected area. It was not typical of visitor surveys, which, in the map, were most often used in category II.

This literature is thus a likely source for understanding people's views – and setting those views in context – across the IUCN categories, although less so in the case of category IV.

4.2.2 Summary findings of the qualitative synthesis of explanations and meanings of impacts

This section presents a summary of a full synthesis of findings from studies that provide the explanations or explore the meanings of the impacts of PAs for people living in or near them. The full synthesis can be found in **Appendix 9**. This section also draws on the perspectives of other stakeholders relevant to those experiences and pertinent policy and historical documents. The synthesis is presented within a conceptual framework that was informed by conservation policies and refined by the emerging research literature (**Figure 1**).

The synthesis process identified the implementation issues and characteristics of well-being that were associated by research participants with either: (a) tensions arising from governance models imposed and enforced by external authorities; or (b) a vision of sustainability sought through participatory management and empowerment, commonly referred to as community-based natural resource management (CBNRM).

The latter developed in response to tensions that resulted from restrictions and resettlement having had deleterious impacts on economic and environmental (natural) capital and social capital. Participatory approaches, within a regulatory framework, seek a vision of sustainability through building on social capital and good health. That vision of sustainability may be on a small scale, as in the case of IUCN category VI areas, where the aim is sustainability within their boundaries. Alternatively, it may be on a larger scale, across IUCN categories I or II and wider areas.

Participatory approaches have developed against a backdrop of an evolving consensus on human rights (**Section 3.4.2**). One purpose of the synthesis was to assess the degree to which these approaches and their anticipated impacts were supported by the perceptions of people who live in or near protected areas and others who work alongside them.

The characteristics of the studies included in the qualitative synthesis are summarised in **Table 4**. Findings were synthesised in sections corresponding to the conceptual framework (see **Figure 1**) to present a coherent narrative that explores key themes within governance (source of authority and nature of implementation) and then considers impacts on health and well-being in terms of environmental (natural), economic and social capital.

TABLE 4. SUMMARY TABLE OF STUDIES INCLUDED IN THE QUALITATIVE SYNTHESIS

Citation	Protected area (PA)	IUCN category	Date PA established	Date of current IUCN category	Years since IUCN category change/ establishment	Year of data collection	Governance model	Country
Allendorf et al. (2007)	Royal Bardia National Park	II	1969	1976	14	1990	Government: federal/ national	Nepal
Almudi and Berkes (2010)	Peixe Lagoon National Park	V	1986	2001-2010	3	2005 and 2007	Cooperatively managed: collaboratively	Brazil
Bedunah and Schmidt (2004)	Gobi Gurvansaikhan	II	1993	1993	5-7	1998-2000	Information not found	Mongolia
Bizikova et al. (2012)	Slovensky Raj Park	II	1998	1998	8	2006	Government: federal/ national	Slovakia
Bolaane (2004)	Moremi Game Reserve	IV	1965	1965	32	1997-2001	Private	Botswana
Bruyere et al. (2009)	Buffalo Springs Samburu	II	1985	1985	20	2005	Government: local	Kenya
Castillo et al. (2005)	El Vizcaíno Sian Ka'an Monarch Butterfly	IV	1988 2006 2008	1988 2008	16 3 < 1	2004 – 2007	Government: federal/ national	Mexico
Davis (2011)	Tarangire National Park	II	1970	1970	35	2005-2007	Government: local	Tanzania
Diaw (2010)	Korup National Park	II	1961	1985	18	2003	Government: federal/ national	Cameroon
First Peoples (2006)	Mgahinga National Park Bwindi National Park Awa Forest Reserve Zone	II VI	1930 1991 1988	1930 1991 1988	Not stated 14 10-20	 2005 1998-2008	Government: federal/ national Government: federal/ national Community: indigenous	Uganda Uganda Ecuador
Gerritsen (2002)	Sierra De Manantlan Biosphere Reserve	VI	1987	1987	6-11	1993-1998	Government: federal/ national	Mexico
Hartter (2009)	Kibale National Park	II	1932	1993	16			Uganda
Haukeland (2011)	Rondane National Park Jotunheimen National Park	II II	1962 1980	1962 1980	47 18	2009	Government: national	Norway

Table 4 continued

Citation	Protected area (PA)	IUCN category	Date PA established	Date of current IUCN category	Years since IUCN category change/ establishment	Year of data collection	Governance model	Country
Herr-old-Menzies (2011)	Caohai Nature Reserve	V Protected land-scape/ Seascape	1985	1985	13-16	1998-1999, 2000, 2000-2001	Government managed: local	China
Hoole and Berkes (2010)	Etosha National Park	II	1975	1975	31	2006-2007	Government	Namibia
Keskitalo and Lund-mark (2010)	Sarek National Park; Stora Sjöfallet National Park; Abisko National Park; Pieljekaise National Park; Vadvetjåkka National Park; Padjelanta National Park; Haparan-da-Sandskär Nature Reserve	Ib II	1909 1909 1920 1962	1909 1909 1920 1982	95 95 83 22	2001	Government: federal/ national	Sweden
Lunstrum (2008)	Limpopo National Park	II	1979	1979	25	2004-2005	Cooperative: transboundary/ collaborative	Mozam-bique
Mbaiwa (2005)	Moremi Game Reserve	IV	1965	1965	38	1998, 2001, 2003	Private: for profit	Botswana
Mehring et al. (2011)	Lore Lindu National Park	II	1982	1982	24	2006-2008	Government: federal/ national	Indonesia
Milgroom and Sperien-burg (2008)	Limpopo National Park	II	2001	2001	6-7	2007-2008	Cooperative: transboundary/ collaborative	Mozam-bique
Nguiffo (2001)	Dja Wildlife Reserve	IV	1950	1950	51	2001	Government: federal/ national	Cameroon
Ogra (2008)	Rajaji National Park	II	1983	1983	20	2003-2004	Information not found	India
Ormsby and Kaplan (2005)	Masoala National park	II	1997	1997	4	2001	Private/ non-profit	Madagas-car
Petrzelka and Marquart-Pyatt (2013)	Grand Stair-case Escalante National Monument	V	1996	1996	0 10	1996 2006	Government: federal/ national	United States of America
Slater (2002)	Qwaqwa National Park	IV	1992	1992	6-7	1998-1999	Government: local	South Africa
Sletten et al. (2008)	Mount Elgon National Park	II	1951	1951	47	2002	Government: federal/ national + collaborative	Uganda
Songorwa (1999)	Selous Game Reserve	IV	1905	1905	91	1996	Community: local	Tanzania
Spenceley and Good-win (2005)	Kruger National Park	II	1926	1930	74-75	2000-2001	Information not found	South Africa

Table 4 continued

Citation	Protected area (PA)	IUCN category	Date PA established	Date of current IUCN category	Years since IUCN category change/ establishment	Year of data collection	Governance model	Country
Stone and Wall (2004)	Jianfengling National Forest Park and Diaoluoshan National Forest Park in Hainan Province	V	1986	1986	16 years	2001	Government: local	China
Strick-land-Munro and Moore (2012)	Purnululu National Park	II	2003	2003	5	2008	Government: federal/ national +collaborative	Australia
Stronza and Gordillo (2008)	Kapawi Reserve; Madidi National Park; Bahuaja Sonene National Park	II	Kapawi Reserve: not stated; Madidi National Park: 1995; Bahuaja Sonene National Park: 2000	1991-2000	Bolivia: 5 years; Ecuador: unable to ascertain; Peru: 8 years	2003	Cooperatively managed Collaborative management (various forms of pluralist influence)	Bolivia Ecuador Peru
Torri (2011)	Sariska Tiger Reserve	IV	1955	1955	46	2001 (pilot) 2007	Government: federal/ national	India
Yasuda (2011)	Benoue National Park	II	1968	1968	40	2004, 2009	Private: for profit	Cameroon

4.2.3 Governance

Matching study findings to the conceptual framework facilitated the comparison and interpretation of these findings, in order to reveal problems and potential solutions during implementation as well as instances of both benefits and harm (**Box 2**).

BOX 2: PROBLEMS WITH AND LESSONS LEARNED FROM DIFFERENT APPROACHES TO THE GOVERNANCE OF PAS

Types of implementation problems

1. Long-time inhabitants may be portrayed as posing environmental risks to protected areas.
2. Lack of clarity is a source of tension. PA regulations may be ineffective as a result of inaccurate maps or poorly drafted legislation. Further confusion may arise from discrepancies between State rules and those of local institutions.
3. Poor communication is a major problem at many levels.
4. Memories of forced or induced migration may negatively influence community responses to authorities.
5. Inadequate or non-existent compensation is a widely held concern.
6. Externally imposed rules and regulations are incompatible with traditional ones and often do not take into account cultural and social diversity; respect for rules and regulations is greater where they have been locally adapted and allow income-generating possibilities.
7. Failing to distinguish between local people's environmentally sustainable subsistence activities and activities on a larger scale.

Lessons Learned

Successful implementation can be achieved when staff of protected areas have prior experience working with locals; clear guidelines; and extensive training in community development, gender issues and a variety of participatory approaches. It is essential for them to meet with local inhabitants informally and to make use of existing kinship networks.

Types of implementation problems

1. Environmental risks allegedly posed by long-time inhabitants

Studies in Australia (Strickland-Munro and Moore 2013), Indonesia (Mehring et al. 2011), Mexico (Castillo et al. 2005, Gerritson 2002), Nepal (Allendorf et al. 2007), Norway (Haukeland 2011) and the United States (Petrzelka and Marquart-Pyatt 2013) demonstrated that the inhabitants had long appreciated the areas in question for their aesthetic and spiritual values, as well as for environmental benefits and economic and leisure opportunities.

Mexican farmers in one study valued their land because it provided food, water, wood and other products. They had developed farming techniques along a spectrum of reciprocal relationships between man and nature, in areas that were between wilderness and urbanisation (Gerritsen 2002).

A resettlement policy associated with the establishment of a IUCN II park in Cameroon in 1961 was reportedly driven by ideas about a pristine forest whose protection was incompatible with the lives of the indigenous inhabitants, despite historical analysis showing that the current forest structure was the result of sustained use over centuries (Diaw 2010). The economic arguments favouring resettlement were flawed, with excessively strong assumptions being about tourism benefits, flood control, forest use, research discoveries, soil fertility and agricultural productivity.

In Norway residents pointed to a lack of convincing scientific evidence supporting the need for certain protective measures (Haukeland 2011). Residents of the state of Utah in the United States claimed the land had benefitted from the way they cared for it before it was declared a protected area (Grand Staircase Escalante National Monument, IUCN II) (Petrzelka and Marquart-Pyatt 2013).

Local tourist firms in Norway were frustrated by lack of opportunities to play a part in a protected area's management (IUCN II) (Haukeland 2010). They believed that local expertise, based on generations of experience in managing the area before it was given its official status, should play an important role.

2. Lack of clarity

One source of tension can be inaccurate maps and lack of clarity in imposed rules and regulations. Mehring et al. (2011) investigated regulatory institutions in two villages in an Indonesian park established in 1982. In one village, new regulations on forest land and products drawn up by the mayor and the customary organisation were neither written down nor completely implemented. While there was support for State zoning of the park to allow traditional access to the forest by local people, there was disagreement about the zone boundaries. Effective village sanctions were considered important. However, confusion about appropriate application of these sanctions arose from discrepancies between State rules and those of local institutions.

In Cameroon 'traditional hunting' was still allowed in 2001 in territories outside protected areas (IUCN IV) so long as this was for personal consumption (Nguiffo 2001). Whether traditional hunting referred to the people involved, weapons employed or some other characteristic was unclear. Allowing only 'traditional' weapons (depending on the definition) might outlaw common traditional practices such as use of snares (metal wire), arrows (steel tipped) or rifles. The ban, and uncertainty surrounding poorly defined traditional hunting, led to tension and mistrust between local people and conservation agents.

In Uganda the legal agreement protecting Mount Elgon National Park (IUCN II), established in 1951, was flawed as it failed to refer accurately to maps or related by-laws, statutes or other documents (Sletten et al. 2008).

3. Poor communication

Poor communication between communities and authorities has been typical. For example, people living in the Dja wildlife reserve in Cameroon (IUCN IV, established 1951) reported being 'neither informed … nor invited to participate' when their village became part of a protected area (Nguiffo 2001). They were told later of the existence of a conservation initiative by the authorities, but were unable to give a precise date.

Such problems are not restricted to developing countries. In Norway several people living near an IUCN category II area found the process one-sided and undemocratic because national interests took precedence over local knowledge (Haukeland 2010).

Petrzelka and Marquart-Pyatt (2013) describe the growing anger of residents and their diminishing trust in agencies to make good decisions on land management after the Grand Staircase Escalante National Monument was established in Utah, in the United States, in 1996 with no prior consultation or publicity. Trust diminished further over the next ten years as roads were closed and cattlemen's leases were rescinded, despite prior assurance that this would not occur. Restrictions on visiting the park stoked anger among residents who reported that they felt 'locked out of our backyard' and that 'law enforcement is gun-toting like we're a bunch of criminals'.

Even when management of Kenyan national reserves was delegated to local level, with rangers and wardens taking responsibility for initiating and maintaining dialogue, inhabitants were disappointed with the communication processes (Bruyere et al. 2009). Most of the protected area staff considered their informal, word-of-mouth network sufficient for communicating with local communities about important management decisions.

> *"Of course we cannot conserve this wildlife without the help of these communities. There must be that, a good relationship between the park and the community. So we normally go to the [homes and villages], we have meetings with them, tell them that these resources are also theirs, these are their resources.'*
> *(Park ranger in Bruyere et al. 2009, p. 55)*

In contrast, most community members considered that communication between the reserves and communities was limited or non-existent, and that decisions were made without opportunities for them to provide input or ask questions.

In addition to poor communication between authorities and inhabitants, difficulties were encountered with respect to communication among inhabitants. Qwaqwa National Park (IUCN IV) in South Africa was established for eco-tourism (Slater 2002). This did not correspond to the livelihoods of stockholding families, however, while others would have preferred the land to be subdivided for agriculture. Some inhabitants were better than others at making their voices heard. Family conflicts escalated as housing became more crowded and building new homes within the park was forbidden.

At Lore Lindu National Park in Indonesia, the weak point for communication was between villagers and their leaders (Mehring et al. 2011). Although the village leadership was active in negotiations on park regulations, many ordinary villagers had not heard of any agreements.

At Purnululu National Park (IUCN II) in Australia, relationships among different indigenous groups were so acrimonious that one group withdrew from management of the park (Strickland-Munro and Moore 2012).

In Slovakia, local authorities near Slovensky Raj Park (IUCN II) tried to make park management a focus for building relationships and developing mutual trust between different groups (Bizikova et al. 2013).

Communication problems could be compounded by new regulatory arrangements being incompatible with traditions. For instance, very few Mexican farmers applied for resource use permits since the rules of a formal biosphere reserve (IUCN VI) competed with customary rules (Gerritsen 2002). The formal rules were generic and did not take into account local variations in natural resource management. These inconsistencies created frustration.

> *"The reserve is like a beautiful woman whom you cannot touch. It does not do you any good. The hills are rich, but a poor man stays poor.'*
> *(Gerritsen 2002, p. 205)*

4. Memories of forced or induced migration

Where regulations prohibit people from living in an area, resettlement may be forced or induced. In Cameroon forced migration and a violent confrontation prompted villagers to accept resettlement outside familiar territories, against the recommendations of earlier research (Diaw 2010). Enacting laws to drive resettlement resulted in an integrated conservation and development plan that failed, leaving

villagers bitter and sceptical. Expulsions to make way for the privately managed Moremi Game Reserve in Botswana included huts being burned as the inhabitants were loaded into trucks for relocation outside the reserve (Bolaane 2004). People were forced to relocate a second time by the suspension of all services such as water supply, health facilities, shops, schools and communications.

Although labelled as 'voluntary' since the term 'involuntary' is politically problematic nationally and among international donors, resettlement from Limpopo National Park in Mozambique was widely recognised as having been 'induced' by planning blight and economic decline (Milgroom and Spierenburg 2008). Although people living there were consulted about resettlement, their views were disregarded.

> *"Since the park was made we were supposed to leave. Since they said that, people don't construct houses, we don't plant trees. This house was built in 2000 but it was never really finished because the park came. There were [papaya] trees but we stopped planting and the old ones died. No one is investing, not to do things for nothing. Even now that we have accepted to leave, the park does nothing.'*
> *(Milgroom and Spierenburg 2008, p. 443)*

5. Concern about lack of compensation

Concern about inadequate or non-existent compensation was expressed in many studies. This included compensation for: loss of property or land in Botswana in the 1960s (Mbaiwa 2005); access or use restrictions in India in 2007 (Torri 2011); environmental protection of privately owned Swedish forests (IUCN Ib and II) in 2001 (Keskitalo and Lundmark 2010); resettlement in 2001 and loss of crops or livestock in Mozambique in 2007/2008 (IUCN II) (Milgroom and Spierenburg 2008); personal injury or property damage from wildlife in South Africa (IUCN II) in 2001 (Spenceley and Goodwin 2007) and in Tanzania (IUCN IV), where there was no compensation policy at the time of the study in 1996 (Songorwa 1999); and loss of jobs or land in China (IUCN V, established 1986) (Stone and Wall 2004). In the last case, there was some compensation in the form of new homes, crop seeds, lump sum payments and subsidised education, electricity, and water fees, but views differed on the nature and adequacy of this compensation (Stone and Wall 2004).

People living in the Sariska Tiger Reserve (IUCN IV) in India were generally discouraged by staff from claiming compensation for restricted access to or use of forest products (Torri 2011). Some villagers were never told they had a right to compensation. One villager, on asking for compensation, was told by a forest officer: 'If you the villagers insist in living in the forest, then be ready to accept as well all the consequences deriving from your choice. You could live elsewhere.'

Opposition to the Selous Game Reserve in Tanzania grew among those losing crops and livestock to wildlife without compensation (Songorwa 1999).

Contrary to tradition, only people living on the borders of Mount Elgon National Park (IUCN II) in Uganda were given rights of access (Sletten et al. 2008). The new outsiders were required to pay the 'insiders' for access, although half the insiders thought outsiders should have equal rights of access.

Even where access was allowed, as at Permululu National Park in Australia, the costs of transportation across long distances over rough ground could be prohibitive (Strickland-Munro and Moore 2013).

6. Externally imposed rules and regulations

In Indonesia, Mehring et al. (2011) attributed some of the difficulties associated with incompatibility to the government's indifference to cultural and social diversity when managing Lore Lindu National Park (IUCN II). Indigenous people respected their own traditional informal rules (traditional use rights and sanctions at the village level). Elsewhere, more prosperous and ethnically diverse villagers, growing more cash crops, did not take account of traditional institutions but rather economic power structures, where there was a widely spread *laissez-faire* attitude to resource use. With forest resources and agricultural land in short supply, the villagers had no alternative to using the park to extend their land. The State's formal rules interacted with traditional informal rules, leading to confusion and conflict. Migrants struggled to implement traditional informal rules, and indigenous people failed to obey State-induced laws.

Near Purnululu National Park (IUCN II) in Australia, traditional land ownership rights for indigenous populations were contested both between local people and protected area management, and among local

people who belonged to different groups (Strickland-Munro and Moore 2012).

Implementing regulations that have disadvantages for local communities is challenging. For example, the relationship between inhabitants and park officials in Masoala National Park officials in Madagascar (IUCN II) was further damaged by absenteeism among staff who, unlike many locals, had the privilege of employment but lacked training and clear job expectations and had little interaction with the inhabitants (Ormsby and Kaplin 2005).

7. Failing to distinguish between subsistence activities and those on a larger scale

Distinguishing environmentally sustainable subsistence activities from those on a larger scale is a major challenge with respect to the development and implementation of regulations for protected areas. As mentioned above, this challenge was experienced in Cameroon where regulations failed to distinguish clearly 'traditional' hunting methods (for personal consumption) from commercial hunting (Nguiffo 2001). In Masoala National Park (IUCN II) in Madagascar, inhabitants acknowledged that some members of the community benefitted from illegal lemur hunting and timber harvesting (Ormsby and Kaplin 2005).

> "… people wanted easy money, especially the youth, so they went into the park to cut rosewood …'
> (Ormsby and Kaplin 2005, p. 160)

However, much greater damage was done by industrial scale rosewood logging for international markets. Park agents have limited legal powers over loggers.

> "… people from all over come to this area to cut rosewood, there is no other way to get money than from valuable wood …'
> (park inhabitant, Ormsby and Kaplin 2005, p. 160)

> "… [international] demand is driving the outside buyers of rosewood, and this is a much bigger issue than lemur hunting.'
> (park manager, Ormsby and Kaplin 2005, p. 162)

In Cameroon the impacts of inhabitants hunting in Dja Wildlife Reserve (IUCN IV) to ensure a diet that includes animal protein are minor compared with those of intensive industrial scale logging, which opened up forest tracks and thereby provided access for well organised commercial poachers who used the tracks to transport their game to city markets (Nguiffo 2001, p. 208).[4]

Lessons learned

Regulations imposed by external authorities have often been widely disregarded, so that protected areas have continued to be exploited on domestic and industrial scales. Studies have focused on efforts to improve communication, draw on indigenous knowledge, and share decisions to combine community development with environmental conservation. These efforts have had mixed success.

The Lore Lindu area in Indonesia was established as a UNESCO Biosphere Reserve in 1977 and a national park (IUCN II) in 1993. Since then, participatory approaches have been advocated for managing biospheres (UNESCO 1996) and protected areas more widely (WPC 2003). Initial efforts to impose external regulations failed, and in the late 1990s the park authority, NGOs and village representatives began to negotiate Community Conservation Agreements (Mehring et al. 2011). Within designated zones, village conservation councils were the bridge between the park authority and the community for planning, implementing, evaluating and reporting the results of the agreements.

Although the village leadership was active in the negotiations, communication between park authorities and the whole community was poor, so that many ordinary villagers had never heard of the agreements, which covered use of forest products and land. The village conservation councils were responsible for monitoring activities. The council could employ punishments or sanctions, which were usually based on the village's traditional rules. Insights into this system came from NGO interviewees. A collaborative management approach aimed to minimise the gap between park management and the people through

[4] Ironically, a combined forestry management and community development project in Ecuador made indigenous people more aware of the potential benefits of logging. When profits were not what they had hoped, they began to make deals outside the community with industrial loggers [First Peoples Peoples Worldwide of the First Nations Development Institution Worldwide of the First Nations Development Institution (First Peoples) 2006].

participation by local inhabitants and integration of local rules. Respect for rules was greater where they were 'more practical', having been locally adapted, and allowed income-generating possibilities.

In Mount Elgon National Park, Uganda (IUCN II), as in other African countries, a similar 'fortress management' or 'fence and fine policy', based on systematic evictions, exclusions and prohibition of using natural resources, met increasing resistance (Sletten et al. 2008). Lack of success with 'fence and fine' policies prompted approaches with greater participation of local people in management and changes in regulations to legitimise sustainable use. Establishing agreements was difficult even in the case of guidelines and training for park staff. Converting staff from law enforcers to community collaborative workers was also difficult. Nevertheless, meeting local people and getting to know them improved relations. Some of the local people acknowledged that their initial reluctance lessened as they met staff and learned more about the resource base, while a third of respondents had not participated at all.

An agreement, once established, provided greater clarity concerning rights and duties, as well as opportunities for long-term planning about livelihood strategies. However, as a legal document the agreement was flawed as it failed to refer accurately to maps or related by-laws, statutes or other documents (Sletten et al. 2008). Subsequently, people were more positive towards the park, its resources and staff. However, as the focus was on the park rather than the community, they were sometimes organised according to what resources they collected rather than other, socially relevant criteria such as ethnicity, kinship, location, or wealth.

Contrary to tradition, only people living on the park borders were given rights of access. The new 'outsiders' were required to pay the 'insiders' for access, although half the insiders thought outsiders should have equal rights of access. Conflicts arose from this situation and threatened the agreement's endurance. In such sensitive situations, staff need the socio-cultural skills to understand, interpret and interact with local people in appropriate ways about livelihoods, conflicts and challenges. Reports of misuse and corruption remained common. Nevertheless, collaborative arrangements improved relations and benefited biodiversity and livelihoods.

The findings of Sletten et al. (2008) in Mount Elgon Park (IUCN II) are supported by other studies. Elsewhere in Uganda, a supporting community's transition from a hunter gatherer to a settled farming community in a culturally sensitive way was more likely to result in community satisfaction and personal efficacy (First Peoples 2006). Training and capacity building by charities and NGOs led to an increase in skills and knowledge and new income-generating activities. Two NGOs working with local people helped to organise efforts around existing kinship networks, and that community reported higher levels of economic development than other communities. At the other end of the scale, these communities were willing to sacrifice their land claims in order to join relatives in other areas and access charitable projects there, leaving the settlements struggling to maintain a viable community.

In Masoala National Park (IUCN II), Madagascar, inhabitants who were more familiar with park staff viewed the staff as well as the park more favourably than those who were unaware of staff or had had negative interactions with them (Ormsby and Kaplin 2005). People were confused by the responsibilities and changing priorities of different NGOs. A park manager and a local town official both considered community development as essential for maintaining a protected area. There was local support for protecting the park by providing community benefits through alternative livelihoods. However, it is unclear whether the benefits essential for behaviour change were the intangible empowerment benefits of community development, or material benefits.

In the Selous Conservation Programme (IUCN IV), Tanzania, support from communities was greatest in areas where education and mobilisation campaigns had been conducted and benefits were beginning to be derived. Findings suggest that the majority of villagers supported the project. The evidence showed that they were motivated to join the conservation programme by promises of socio-economic benefits (Songorwa 1999).

The arrival of western donors and NGOs in Caohai Nature Reserve (IUCN V), China, in 1993 changed the focus from enforcement of resource regulations towards small-scale community development and outreach programmes (Herrold-Menzies 2011). These included small grants and a micro-credit programme

Photo: United Nations Development Programme in Europe and CIS

for farmers to start up microenterprises in the hope that they would be less reliant on the reserve's natural resources, as well as infrastructure development, environmental education, a community-based natural resource management programme, and school fees for girls from poor families.

This initiative involved two employees who had extensive prior experience working with farmers, and required extensive training in community development, gender issues and a variety of participatory methodologies. The result was many fewer hostile confrontations between local people and nature reserve managers, participation by local people in conservation activities, and farmers contrasting the nature reserve's concern for local people with the indifference or corruption of government agencies. Farmers now work cooperatively with the reserve to seek solutions to their own problems, sometimes bringing up issues about road construction, sanitation improvements and agro-forestry projects. The transformation from conflict to cooperation has been dependent on funds from NGOs and donors, which raises questions about the project's sustainability.

There was another successful example of cooperative management on the margins of a category II park in Mozambique, where land values increased exponentially. With the support of an NGO, inhabitants thrived, benefitting materially and empowered by the process of acquiring land titles and setting boundaries (Lunstrum 2008).

Participatory approaches to governance have not always been successful. Almudi and Berkes (2010) investigated the relationship between a local fishing community and officials responsible for the creation and maintenance of Brazil's Peixe Lagoon National Park. They took a particular interest in factors that could empower local fishers to 'defend their rights to remain physically within the park and politically in the conservation policy process'. The authors also found that fisher communities struggled to participate in discussions essential to securing their 'long-term access to the resources for their livelihoods or to trigger the development of a PA co-management arrangement'. They summarised two of the main barriers contributing to lack of empowerment as weak assistance for developing community organisational capacity and leadership, and lack of basic knowledge on laws and fisher rights.

Overall, establishing informal relationships between local community members and regulatory agents and clearly communicating guidelines and rationale will increase the likelihood that a PA will be implemented successfully and deliver both environmental and socio-economic benefits. However, barriers to implementation are extremely dependent on geographic, cultural, and socio-economic contexts. Therefore, it is essential that management strategies are both participatory and adaptive, so that barriers can be addressed on a case-by-case basis as they arise. The difficulties associated with implementing PAs should not be underestimated, and it is important that the staff involved have prior experience working with locals and extensive training in community development, gender issues, and a variety of participatory approaches.

4.2.4 Well-being

Well-being is a broad concept that both encompasses and is influenced by access to land and resources, health, inequality, and environmental, social, and economic capital. The following section outlines the effects that PAs can have on these variables.

Environmental (natural) capital

Evidence of attitudes towards the environmental capital of protected areas is summarised in **Box 3**. Even where inhabitants have recognised that conserving a park (IUCN II) and its wildlife is valuable on an individual, local, national and global scale for economic, educational, recreational, aesthetic and environmental reasons and for future generations, they still regret the economic limitations imposed by restrictions on access, extracting resources and grazing, and the dangers of wild animals (Allendorf et al. 2007). Indeed, some communities refuted the need for resettlement, having managed the land (IUCN II) for centuries; this was confirmed by the authors' historical analysis and portrayal of a pristine forest whose protection was incompatible with indigenous people living there as a scientific myth (Diaw 2010).

BOX 3: APPRECIATION OF THE ENVIRONMENT BY LOCAL COMMUNITIES

- Appreciation of protected areas other than for economic benefit was found in IUCN categories II, IV and VI both before and after the Durban Accord;
- Communities expressed a tension between appreciating the environment and wanting to protect it, as well as needing to make immediate use of land or natural products;
- Communities could be encouraged to participate in further conservation measures, so that they could anticipate socio-economic benefits.

Evidence synthesised from Allendorf et al. 2007, Castillo et al. 2005, Diaw 2010, Gerritsen 2002, Mehring et al. 2011, Ormsby and Kaplin 2005 and Songorwa 1999.

Farmers who were studied in Mexico, despite appreciating protected areas for their aesthetic, environmental products, economic opportunities and spiritual values (Gerritsen 2002, Castillo et al. 2005), became less positive in their attitudes when conservation regulations (IUCN IV) competed with productive activities such as cattle ranching or growing imported varieties of fruit, or with their personal safety (Castillo et al. 2005).

Responses to plans for balancing conservation and economic development appear to vary depending on where the benefits might be felt. For some affected people, it was not an interest in conserving wildlife that motivated participation in a Community-based Wildlife Management Programme (IUCN IV) but promises of socio-economic benefits for themselves (Songorwa 1999). Other respondents were critical of a programme promoting economic activities alongside maintaining ecosystems; in that case tourism was expected to benefit entrepreneurs and rich families who owned coastal land with tourism potential (Castillo 2005).

Access to land

Evidence of attitudes to accessing PAs is summarised in **Box 4**. Restrictions on access to protected areas (IUCN II) had implications for grazing cattle, hunting, and the collection of natural products (Milgroom and Sperienburg 2008, Bruyere et al. 2009, Hoole and Berkes 2010). Local people would often like grazing rights in a park (IUCN II), especially during droughts, as well as the opportunity to visit traditional areas including burial sites (Hoole and Berkes 2010). Where staff are mostly concerned about illegal grazing, they commonly impound livestock and fine owners or refer them to a local judicial body. In contrast, community members may feel that a harsh environment justified grazing cattle in protected areas (Bruyere et al. 2009).

BOX 4. ACCESS TO LAND

- Protected areas are important to communities for grazing, agriculture, hunting, foraging and spiritual homes;
- Relocation and loss of control over land and resources can result in resentment, poaching and antagonism;
- Participating in the process of setting boundaries and securing land rights can be empowering.

Evidence synthesised from Bruyere et al. 2009, Davis 2011, First Peoples 2006, Hoole and Berkes 2010, Lunstrum 2008, Mbaiwa 2005, Milgroom and Spierenburg 2008, Nguiffo 2001 and Slater 2002 – from IUCN V and IV before the Durban Accord from IUCN II afterword.

Communities may consider that threats to their environmental capital outweigh any potential economic benefits of living near a national park (Davis 2011). Outside the park, people may feel that they would not have access to access to agricultural land, forest resources and grazing land (Milgroom and Sperienburg 2008). Cattle owners are likely not to want to move since their cattle would need to compete for food and water with host villages, and cattle theft may be common outside of the park (Milgroom and Sperienburg 2008).

Access restrictions pose similar problems for communities in or near PAs in category IUCN IV. Accessing the forest is important for local people, in order to obtain resources and because of feelings about the forest being 'theirs' (Nguiffo 2001). Authors of studies described cases of relocation and loss of control over land and resources resulting in resentment, poaching and antagonism (Mbaiwa 2005) and in overcrowding due to restrictions on building new homes (Slater 2002).

More positive views were expressed where land values increased substantially on a park's margins (IUCN II). In that case, inhabitants might thrive, benefitting materially from land titles and revenues and feeling empowered by acquiring land titles and setting boundaries (Lunstrum 2008).

Resource use

Evidence of attitudes to resource use is summarised in **Box 5**. Local people viewed protected areas as rich sources of food and other products (Nguiffo 2001, Gerritsen 2002, Stone and Wall 2004, Ormsby and Kaplin 2005, First Peoples 2006, Hartter 2009). They acknowledged that illegal use of resources continued despite bans (Stone and Wall 2004, Ormsby and Kaplin 2005, Hartter 2009). Some people living in the park could not conceive of a balanced diet without animal protein, and protected areas were still perceived as the ideal place to hunt throughout the year (Nguiffo 2001). Where dependence on access to products was high, collection of these products continued despite a ban since compensation was not always considered adequate (Stone and Wall 2004).

BOX 5. RESOURCE USE

- Inhabitants appreciated protected areas for their rich products;
- Resource use was common even where it was illegal.

Evidence synthesised from First Peoples 2006, Gerritsen 2002, Hartter 2009, Nguiffo 2001, Ormsby and Kaplin 2005, Stone and Wall 2004, Torri 2011. (Studies were mostly conducted before the Durban Accord and span IUCN categories II, V and VI.)

Economic capital

Evidence of perceived impacts of PAs on economic capital is summarised in **Box 6**. Studies showed that before the Durban Accord, the impacts of IUCN II parks on the wealth of whole areas was seen in Asia, South America and Europe (Scandinavia). Forest workers in Sweden associated environmental protection with lower levels of employment and production in commercial forestry (Keskitalo and Lundmark 2010). Politicians anticipated that conservation policies would lead to lower tax revenue and greater emigration (Stronza and Gordillo 2008). In Nepal communities were developing a dependence on foreign aid, with some people considering this an expected source of income and not necessarily associating its benefits with conservation efforts (Allendorf et al. 2007).

BOX 6. ECONOMIC CAPITAL

- Before the Durban Accord (IUCN Ib and II), concerns focused on reduced employment and tax revenues; reliance on foreign aid (without understanding its link with conservation); and unrealistic expectations of the economic benefits of tourism.
- After the Durban Accord (IUCN II), concerns focused on the meager benefits of tourism; benefits not being shared equitably, with indigenous groups or those less amenable to conforming to new regulations missing out.
- Concerns about lack of compensation were expressed before about IUCN V before the Durban Accord, and about categories II and IV before and after the Durban Accord. However, in developed countries there welfare dependency was increasing.

Evidence synthesised from Allendorf et al. 2007, Bedunah and Schmidt 2004, Bruyere et al. 2009, Diaw 2010, Keskitalo and Lundmark 2010, Mbaiwa 2005, Ogra 2008, Slater 2002, Songorwa 1999, Spenceley and Goodwin 2007, Stone and Wall 2004, Stronza and Gordillo 2008 and Yasuda 2011.

Some people living in or near national parks (IUCN II) were concerned about neighbours having unrealistic expectations concerning the economic benefits to be derived from tourism and eco-lodges (Stronza and Gordillo 2008). Others were unaware that community development was one of a park's primary objectives only initially (Ormsby and Kaplin 2005).

The benefits of tourism to national parks (IUCN II) were seen as meagre, and distribution of revenues from protected areas was considered inequitable or of little benefit to indigenous communities (Bruyere et al. 2009). Park and eco-lodge staff tend to be wealthier than those living in the community (Ormsby and Kaplin 2005, Stronza and Gordillo 2008), and local people felt overlooked with respect to employment, with opportunities favouring neighbouring communities and those deemed amenable to new regulations (Diaw 2010).

Similar concerns about few or unevenly shared benefits and opportunities were expressed in other (IUCN IV) protected areas (Mbaiwa 2005, Slater 2002). Communities across IUCN categories, before and after the Durban Accord, often considered as inadequate the monetary or in-kind compensation available for: constraints on forestry; resettlement; loss of land, crops, livestock or jobs; and personal injury or property damage (Songorwa 1999, Stone and Wall 2004, Mbaiwa 2005, Spenceley and Goodwin 2007, Milgroom and Spierenburg 2008, Keskitalo and Lundmark 2010, Torri 2011).

Environmental protection is associated with economic decline in high-income countries. In the state of Utah, in the United States, there was more tourism but no economic growth as a result of establishing a protected area (Petrzelka and Marquart-Pyatt 2013). In Slovakia, although people living near Slovensky Raj National Park (IUCN II) anticipated multifunctional forest management as a source of employment and income generation, in practice the socio-economic situation worsened, particularly for minority ethnic communities, with reduced employment and changes in welfare support (Bizikova et al. 2013). Minority ethnic groups, lacking both experience and of opportunities for involvement in small businesses and local or regional planning, saw no viable economic options.

The most positive findings about social and material benefits came from an NGO-funded study, with one academic author and one author employed by an eco-lodge, although they shared the concerns described above (Stronza and Gordillo 2008).

Social capital

Evidence for perceived impacts of PAs on social capital is summarised in **Box 7**. Slater (2002) noted that households configured themselves in such a way as to maximise livelihood diversification, sometimes to the detriment of family relationships. Households could be separated geographically by livelihoods, or could be overcrowded because sharing dwellings allowed younger adults to rely on the support of older ones claiming pensions.

Inhabitants perceived a direct link between livelihood diversification and changes in cultural traditions and in traditional relationships among local people (both positive and negative) as a result of the establishment of a PA (First Peoples 2006, Stronza and Gordillo 2008). For some, making the transition to a settled agrarian life meant a decrease in the

BOX 7. SOCIAL CAPITAL

- Changes in livelihood strategies have influenced the shape of households and the strength of social ties, and introduced new inequalities within communities;
- PAs have been established in areas inhabited by various ethnic groups. The pressures resulting from regulatory and economic changes have introduced tensions or exacerbated historical tensions between these groups.

Evidence synthesised from First Peoples 2006 [two studies within one article], Nguiffo 2001, Slater 2002, Songorwa 1999, Stone and Wall 2004, Stronza and Gordillo 2008 and Torri 2011.

traditional communal work ethic and less frequent use of their native language (First Peoples 2006). Stronza and Gordillo (2008) saw changes in social ties within communities when some people began working in the tourism.

Local people who secured employment in eco-lodges (IUCN II) talked about their work limiting participation in gatherings traditionally used to complete community tasks, and how communities tended to charge eco-lodge employees more because they were richer – in effect, buying them out of their community responsibilities. Working in eco-lodges made villagers aware of new opportunities and a wider social circle, but this was at the cost of leaving their families and communities.

More direct commitment to conservation in a national park (IUCN II) also caused family pressures where the Village Scout scheme took young men away from family and farming responsibilities (Songorwa 1999). Elsewhere (IUCN V), investment in communities was mentioned by park staff and by inhabitants; this included the aim of establishing a special university training programme to prepare students to fill key park management positions (Stone and Wall 2004).

Villagers emphasised the importance of social relations as part of their survival strategy, and expressed apprehension about the weakening and possible disappearance of these relations as a result of displacement. Social relations were particular important in times of struggle such as periods of drought (Torri 2011). Stronza and Gordillo (2008) considered not only that communities rich in social capital may be better able to manage changes associated with eco-tourism, but that such changes in social capital could collectively sustain local institutions, which subsequently may be critical of conservation efforts. In contrast, community-managed forests in Ecuador created new business relationships and improved the community's social standing with other indigenous groups in the area (First People 2006).

Although ethnic identities may strengthen social capital within groups, they have more often created tensions between groups. Some ethnic groups have been resentful, as they have perceived others receiving community development preferentially – although the authors considered these community development efforts to be culturally inappropriate (First Peoples 2006). As noted above, migrants may struggle to implement traditional informal rules, and indigenous people may fail to obey laws introduced by the State. Some of these difficulties were attributed to government indifference to cultural and social diversities when managing a park (Mehring et al. 2011). At the level of implementing regulations, local people objected to the leniency of guards towards those who were wealthier or ethnically related to them (Allendorf et al. 2007).

Health

Evidence on perceived impacts of PAs on health is summarised in **Box 8**. In one study, community members evicted from a forest unanimously spoke about their exposure to new disease when integration with other groups began. The authors confirmed that the community (particularly children) was seriously affected by malaria, which did not exist in the forest, and that HIV/AIDS was also appearing (First Peoples 2006). Forced transition to an agrarian society had cut these people off from access to and knowledge of traditional medicinal plants they previously used to stay healthy. Elsewhere, villagers reported lack of access to basic health services. Torri (2011) confirmed that child mortality was high in isolated forest villages, where common illnesses – easily treatable where there were basic medical facilities – could lead to death.

BOX 8. HEALTH

- New diseases associated with changes in way of life were attributed to forest evictions or to changing from a nomadic to a sedentary existence;
- Accidents and injuries resulted from conflicts between guards and those living in protected areas; animal conflicts resulted in increased workloads and exhaustion, as well as injuries;
- Sexual aggression was more common when women were less protected following changes in working patterns or kinship ties.

Evidence synthesised from First Peoples 2006, Ogra 2008, Slater 2002, Songorwa 1999, Torri 2011.

Affected people described how crop raiding by elephants led to food shortages and greater workloads, especially among women, who suffered more from insect-borne diseases and heat exhaustion. When elephants damaged water pipes, women risked drowning when collecting water from unsafe sources (Ogra 2008). First Peoples (2006) reported that women's safety was compromised as men worked further afield, and as the women were drawn from their homes to assume new roles, entailing the erosion of kinship ties and possibly reducing protection from male sexual aggression.

Inequalities

Evidence of the perceived impacts of PAs on health and social inequalities is summarised in **Box 9**. People living in or near PAs differ in a number of ways. Some indigenous people who live near one other come from different ethnic groups; some PAs include indigenous communities, new immigrant communities, and inhabitants who are long established following historical migrations. Individuals differ in terms of their occupations (e.g. subsistence farmers, day labourers, tourism employees), wealth, tenure (landowners or not), gender and education.

Differences in wealth accruing from the ownership of land or livestock have been influenced by wildlife conflict (Songorwa 1999, Ogra 2008) and by PA regulations on land access or livestock numbers, including consideration of whether people have complied

BOX 9. INEQUALITIES

- PAs and local people's responses to them have exacerbated existing local ethnic tensions;
- Participation in PA governance has favoured people already advantaged by their socio-economic positions;
- PAs have unequal impacts, depending on socio-economic position (e.g. the size of a business), legal land tenure or gender;
- New tourism enterprises have tended to employ outsiders rather than locals.

Evidence synthesised from Allendorf et al. 2007, Bolaane 2004, Davis 2011, First Peoples 2006, Hoole and Berkes 2010, Keskitalo and Lundmark 2010, Mehring et al. 2011, Milgroom and Sperienburg 2008, Ogra 2008, Slater 2002, Sletten et al. 2008, Songorwa 1999, Stronza and Gordillo 2008, Torri 2011 and Yasuda 2011.

(Slater 2002). Smaller businesses and entrepreneurs may bear the brunt of restrictions on forest products (Keskitalo and Lundmark 2010).

Some differences have arisen at least in part from inequalities between ethnic groups or from discrimination involving indigenous groups. For instance, some indigenous people have discouraged immigration and excluded immigrants from community governance procedures (Mehring et al. 2011). Within and between ethnic groups, people have taken advantage of those who earn more due to the presence of the PA (Stronza and Gordillo 2008) or those struggling to make a living who sell land legitimately owned, only to claim protected land illegally (Mehring et al. 2011).

Misunderstandings or prejudices concerning the histories or abilities of communities have led authorities to make decisions which the communities considered damaging (Bolaane 2004, Milgroom and Sperienburg 2008). Authorities have also discriminated within communities through policies that protected landowners but not other long-standing inhabitants (Slater 2002), or through involving people chosen for their age, wealth, education and position rather than relevant practical knowledge (Sletten et al. 2008).

Ethnic discrimination has been introduced by PA legislation forbidding resource use by non-white indigenous people but allowing resource use by predominantly white landowners (Hoole and Berkes 2010). Where ethnic discrimination predates the establishment of PAs, historic practices of favouritism have been strengthened as land has become more valuable and rare because much of it has been set aside for conservation (Davis 2011). Prejudice and nepotism have been a source of favouritism or corruption among PA employees (Allendorf et al. 2007).

Some differences have arisen from commercial or conservation enterprises providing more earning power in the case of some, but not all, positions (Yasuda 2011). Some eco-tourism enterprises have a history of being poor employers of local casual labour (Bolaane 2004). Financial inequalities have been introduced when spent funds resulted in financial support for some people but not others, and bank loans have been refused on the grounds of people having an address in a protected area (First Peoples 2006).

Women have been vulnerable to attack and injury from men or wildlife (First Peoples 2006, Ogra 2008, Songorwa 1999). Female heads of households have been vulnerable financially as they tried to balance working for pay and subsistence farming (Slater 2002). More might have been learned through the studies if some women had not been reluctant to express their opinions to researchers (Torri 2011).

4.3 Narrative synthesis of quantitative evidence

This section provides a narrative overview of all the included studies that provided quantitative data on impacts. The studies are divided into six subsections, determined iteratively based on the outcomes reported in the accepted literature (see typology in **Figure 11**). The reviewers do not claim that these divisions are definitive or optimal, but they provide a pragmatic breakdown of a complex body of evidence. A summary of data presented in the included studies is provided as **Appendix 7**. A more detailed set of data extraction tables is available as supplementary material.

Of the 79 studies included in this synthesis, 63 were categorized as having 'high', 11 as 'medium' and three as 'low' susceptibility to bias. **Table 5** shows the 14 studies and 33 outcome measures categorised as having low and medium susceptibility to bias. **Appendix 10** provides details of critical appraisals and the basis for assigning susceptibility to bias for all 79 studies.

Below, there is a concentration on the results reported in these 14 studies. Where 'susceptibility to bias' is discussed, it is the categorisation of studies that resulted from the critical appraisal that is referred to. In some instances, reference is also made to specific types of bias (defined in **Box 10**); in others, reference is made to shortcomings of study design and implementation that implicitly increase the studies' susceptibility to bias.

BOX 10. DEFINITIONS OF BIAS MENTIONED IN THE NARRATIVE SYNTHESIS

Recall bias
Imperfect recollection of past events by respondents. Generally worsened by longer periods of recall

Social desirability bias
Tendency to respond to questioning in such as way as to be viewed favourably by others

Questioning bias
Questioner leading respondents to reply to questioning in a certain direction

Neyman bias
Arises from a time lag between exposure and sampling, such that undetected dropout of participants may occur before the study begins

Attrition bias
A skew in results where participants are lost between measurements at two time points (potentially as a result of the exposure) during the study

Optimism bias
Belief by respondents that they are less likely to experience a negative event relative to other respondents, or over-optimism on the part of analysts or interviewers about the effects of a project

Hypothetical bias
Failure of respondents to consider the true budget constraints in responding to financial questioning

Strategic bias
Tendency for respondents to alter their answers in an attempt to influence an event

FIGURE 11. TYPOLOGY FOR STRUCTURING THE QUANTITATIVE REVIEW OF IMPACTS OF PROTECTED AREAS

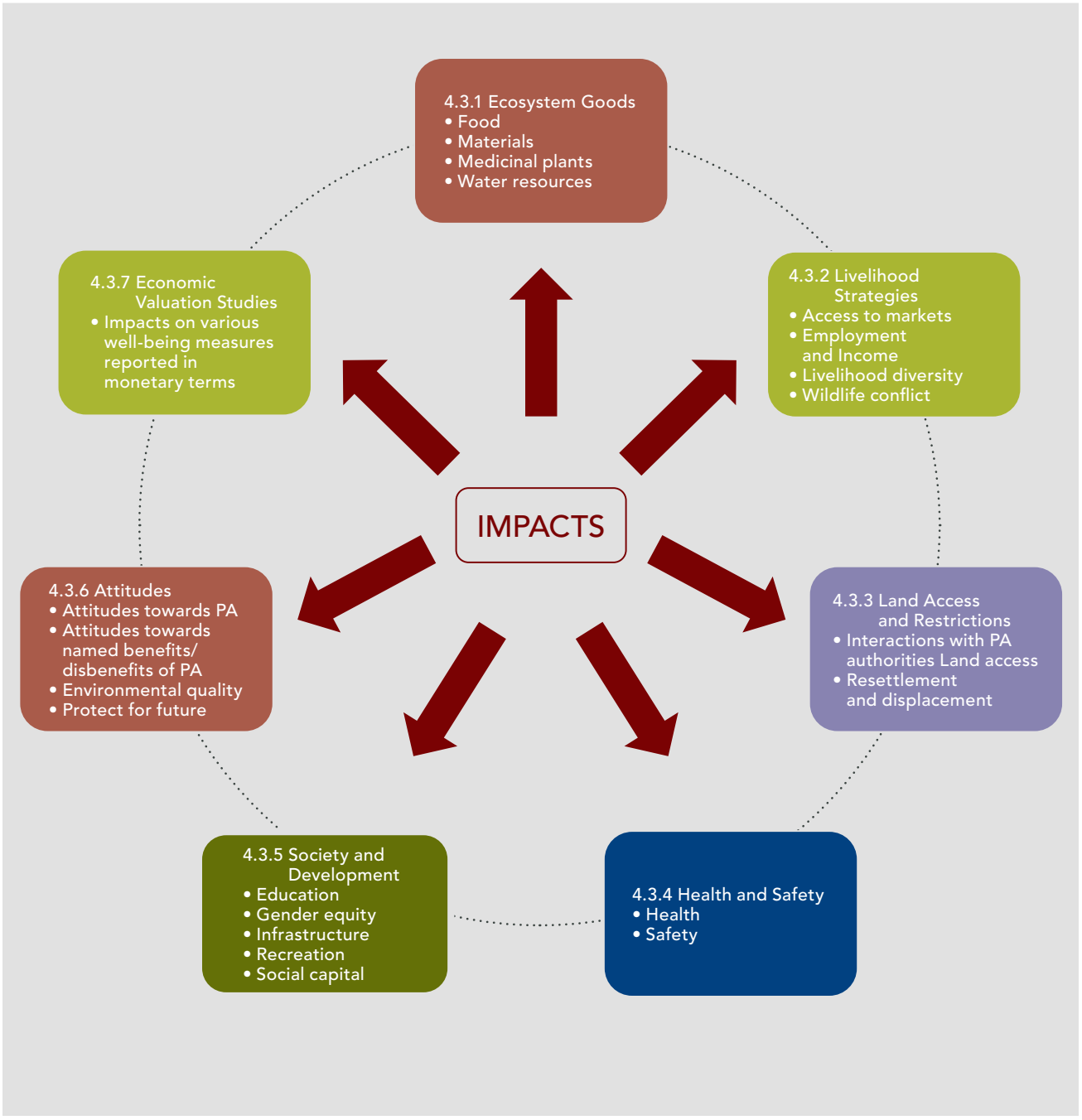


TABLE 5. SUMMARY TABLE OF STUDIES INCLUDED IN THE QUANTITATIVE REVIEW AND THEIR MEASURED OUTCOMES (SCORED AS HAVING 'LOW' OR 'MEDIUM' SUSCEPTIBILITY TO BIAS)

Citation	PA (IUCN Category)	Broad outcome	Outcome measure	Study design	Description of exposed population	Impacts: summary	Impact: results	Susc. to Bias
Andam et al. (2010), Ferraro et al. (2011), Ferraro and Hanauer (2011)	Multiple PAs, Costa Rica (n/a), est. various	Human development measure	Poverty index	ODS (national census data), comparator; n/a	Less than 1% of area protected (matching)	Lower effect size in protected segments (Andam et al. 2010). Poorer areas at baseline have greatest level of poverty reduction (Ferraro et al. 2011). Poverty alleviation higher where protection assigned to land unsuitable for agriculture, near major cities and infrastructure, and where agricultural employment is low (Ferraro and Hanauer 2011).	Effect size (poverty index) = -0.2. T-test: $p<0.05$	Low
Andam et al. (2010), Ferraro et al. (2011), Ferraro and Hanauer (2011)	Multiple PAs, Thailand (n/a), est. various	Human development measure	Poverty headcount	ODS (national census data), comparator; n/a	Less than 1% of area protected (matching)	Lower effect size in protected segments (Andam et al. 2010). Poorer areas at baseline have greatest level of poverty reduction (Ferraro et al. 2011). Poverty alleviation higher where protection assigned to land unsuitable for agriculture, near major cities and infrastructure, and where agricultural employment is low (Ferraro and Hanauer 2011).	Effect size (poverty head count) = -0.43. T-test: $p<0.01$	Low
Canavire-Bacarreza and Hanauer (2013)	Nationwide survey, Bolivia (various), est. various	Human development measure	Poverty index	ODS (Bolivian National Statistics Office [census data]), comparator; site comp	Segment tracts (municipalities) with protection >10% land area	Improved poverty index in protected segments relative to unprotected	Poverty index effect size (intervention - control) = -0.525 +/- 0.142 (SE)	Medium
Gubbi (2012)	Nagarhole National Park, India (II), est. 1974	Wildlife conflict	Frequency of human-elephant conflict	ODS (applications for compensation by inhabitants (State Wildlife Department), comparator; site comp	Outside PA	Greater level of conflict where villages have higher PA frontage	Mulitple linear regression model: regression coefficient = 6.310 (1.430SE) beta = 0.52 t = 4.407 p = 0.001	Medium
Hartter (2009)	Kibale National Park, Uganda (II), est. 1993	Wildlife conflict	Reporting of problems with wildlife	SRM (questionnaire), comparator; linear distance	Outside PA	No discernable impact	Logistic regression: non-significance in logistic regression (not significant)	Medium

Table 5 continued

Citation	PA (IUCN Category)	Broad outcome	Outcome measure	Study design	Description of exposed population	Impacts: summary	Impact: results	Susc. to Bias
Korhonen et al. (2004)	Ranomafana National Park, Madagascar (II), est. 1991	Gender equity	Percentage of girls in primary schools	ODS (school enrolment statistics), comparator; BACI	Inside PA	No discernable difference	Comparator: % = 1990 (49), 1991 (51), 1992 (53), 1993 (52), 1994 (55), 1995 (47), 1996 (49), 1997 (48), 1998 (48), 1999 (48), 2000 (51), Exposure: % = 1990 (60), 1991 (49), 1992 (56), 1993 (49), 1994 (54), 1995 (49), 1996 (49), 1997 (50), 1998 (49), 1999 (49), 2000 (50)	Medium
Korhonen et al. (2004)	Ranomafana National Park, Madagascar (II), est. 1991	Gender equity	Percentage of girls in third grade	ODS (school enrolment statistics), comparator; BACI	Inside PA	Increase over time inside but not outside PA	Comparator: % = 1990 (60), 1991 (70), 1992 (58), 1993 (25), 1994 (59), 1995 (43), 1996 (39), 1997 (46), 1998 (55), 1999 (58), 2000 (51), Exposure: % = 1990 (34), 1991 (32), 1992 (47), 1993 (56), 1994 (34), 1995 (26), 1996 (38), 1997 (49), 1998 (36), 1999 (55), 2000 (97)	Medium
Korhonen et al. (2004)	Ranomafana National Park, Madagascar (II), est. 1991	Health	Infant mortality rates (population based) – means deaths per 1000 live births (infants <1 year old)	ODS (mayor's census records), comparator; BACI	Inside PA	Variable over time, higher outside PA	Comparator: infant mortality rate = 1990 (57), 1993 (31), 1994 (72), 1996 (54), 1998 (45), [1999-2001 (60) health centres only], Exposure: Infant mortality rate = 1990 (34), 1993 (40), 1994 (29), 1996 (48), 1998 (34), [1999-2001 (74) health centres only]	Medium
Lundgren (2009)	No specific park (national level comparison), Sweden (n/a), est. various	Income	Income growth	ODS (Swedish National Census), comparator; time series, site comp	Not stated	n/a	Generalised Method of Moments model: estimate = -0.003 SD = 0.011 t = -0.285 p=0.776 (not significant)	Low
Lundgren (2009)	No specific park (national level comparison), Sweden (n/a), est. various	Employment	Employment in the forestry sector	ODS (Swedish National Census), comparator; time series, site comp	Not stated	n/a	Generalised Method of Moments model: estimate = -0.003 SD = 0.008 t = -0.411 p = 0.681 (not significant)	Low
Lundgren (2009)	No specific park (national level comparison), Sweden (n/a), est. various	Employment	Employment in the tourism sector	ODS (Swedish National Census), comparator; time series, site comp	Not stated	n/a	Generalised Method of Moments model: estimate = -0.010 SD=0.006 t=-1.728 p=0.084 (not significant)	Low
MacKenzie and Ahabyona (2012)	Kibale National Park, Uganda (II), est. 1993	Wildlife conflict	Area damaged by wild animals	DDC (observation), comparator; site comp	Outside PA	Greater level of crop raiding near PA	Spearman's Rank Correlation: r = -0.282 p = 0.001 n = 143	Medium

Table 5 continued

Citation	PA (IUCN Category)	Broad outcome	Outcome measure	Study design	Description of exposed population	Impacts: summary	Impact: results	Susc. to Bias
Naughton-Treves (1997)	Kibale National Park, Uganda (II), est. 1993	Wildlife conflict	Number of raids by wildlife	DDC (observation), comparator; linear distance	Outside PA	Initial increase to 60 metres from PA, then continual exponential decrease with increasing distance from PA	Distance from PA (metres) = 10,20,30,40,50,60,70,80,90,100,110,120,130,140,150,160,170,180,190,200,210,220,230,240,250,260,270,280,290,300,310,320,330,340,350,360,370,380,390,400,410,420,430,440,450 +/- 120, 147,149,162,179,180,154,124,87,58,61,69,71,50,54,26,30,19,19,22,12,19,5,10,14,3,4,6,4,3,2,2,2,3,2,2,2,1,0,3,0,1,0,0,0 (number of raids)	Medium
Nyahongo et al. (2009)	Serengeti National Park and Grumeti Game Reserve, Tanzania (II), est. 1951	Food	Number of meat meals consumed	SRM (questionnaire), comparator; linear distance	Outside PA (buffer zone to outside)	More meals nearer park	Regression coefficient; intercept (27.919), livestock (0.052), distance to PA (-0.218). SE; intercept (2.029), livestock (0.016), distance to PA (0.052). t; intercept (13.759), livestock (3.206), distance to PA (-4.168). p; intercept (<0.001), livestock (0.002), distance to PA (0.025). Kruskal-Wallis: H = 85.2 p = 0.0001	Medium
Nyahongo et al. (2009)	Serengeti National Park and Grumeti Game Reserve, Tanzania (II), est. 1951	Food	Number of fish meals consumed	SRM (questionnaire), comparator; linear distance	Outside PA (buffer zone to outside)	More meals nearer park	Regression coefficient; intercept (87.03), distance to Lake Victoria (-0.742), distance to PA (-0.931). SE; intercept (3.34), distance to Lake Victoria (0.155), distance to PA (0.205). t; intercept (26.06), distance to Lake Victoria (-4.787), distance to PA (-4.549). p; intercept (<0.001), distance to Lake Victoria (0.041), distance to PA (0.045). Kruskall Wallis test not significant.	Medium
Richardson et al. (2012)	Various GMAs across Zambia, Zambia (Various), est. various	Income	Total household income	SRM (questionnaire), comparator; site comp	Inside PA	Greater income in GMA than in non-GMA households	Ordinary Least Squares Regression: coefficient=0.170 SE=0.069 p<0.01	Medium
Sarker and Røskaft (2011)	4 PAs across Bangladesh: Teknaf Game Reserve, Chunati Wildlife Sanctuary, South-eastern Forest Reserve, Northern Forest Reserve	Materials	Perceived benefits from PA in terms of timber and fuelwood extraction	SRM (questionnaire), comparator; site comp	Outside PA	Inversely correlated with distance from PA	% = 59.4. Logistic regression: timber and firewood; B = -6.92 SE = 1.19 Wald = 34.02 df = 1 p = 0.0001 dds ratio = 0.001 (Significant)	Medium

Table 5 continued

Citation	PA (IUCN Category)	Broad outcome	Outcome measure	Study design	Description of exposed population	Impacts: summary	Impact: results	Susc. to Bias
Sarker and Røskaft (2011)	4 PAs across Bangladesh: Teknaf Game Reserve, Chunati Wildlife Sanctuary, South-eastern Forest Reserve, Northern Forest Reserve	Wildlife conflict	Perceived disbenefits from PA in terms of crop raiding	SRM (questionnaire), comparator; site comp	Outside PA	Inversely correlated with distance from PA	% = 85.5. Logistic regression: B=-10.49 SE=1.74 Wald=36.29 df=1 p=0.0001 odds ratio = 0.0001 (significant)	Medium
Sarker and Røskaft (2011)	4 PAs across Bangladesh: Teknaf Game Reserve, Chunati Wildlife Sanctuary, South-eastern Forest Reserve, Northern Forest Reserve	Wildlife conflict	Perceived disbenefits from PA in terms of destruction of homes	SRM (questionnaire), comparator; site comp	Outside PA	Inversely correlated with distance from PA	% = 33.3. Logistic regression: B=-2.92 SE=0.43 Wald=45.11 df=1 p=0.0001 Odds ratio=0.054 (Significant)	Medium
Sarker and Røskaft (2011)	4 PAs across Bangladesh: Teknaf Game Reserve, Chunati Wildlife Sanctuary, South-eastern Forest Reserve, Northern Forest Reserve	Wildlife conflict	Perceived disbenefits from PA in terms of fear of elephant attacks	SRM (questionnaire), comparator; site comp	Outside PA	Inversely correlated with distance from PA	% = 33.3. Logistic regression: B = -2.64 SE = 0.39 Wald = 43.89 df = 1 p = 0.001 Odds ratio = 0.071 (significant)	Medium
Sarker and Røskaft (2011)	4 PAs across Bangladesh: Teknaf Game Reserve, Chunati Wildlife Sanctuary, South-eastern Forest Reserve, Northern Forest Reserve	Attitude	Positive vs. negative attitude (post-hoc categories)	SRM (questionnaire), comparator; linear distance	Outside PA	Positively correlated with distance from PA	% = disfavour (91.3), favour (8.7). Logistic regression: B = 5.78 SE = 1.09 Wald = 28.34 df = 1 p = 0.0001 Odds ratio =3 22.35 (significant)	Medium
Sheppard et al. (2010)	Wechiau Community Hippo Sanctuary, Ghana, est. 1998	Infrastructure	Infrastructure developments per community	ODS (local council records), comparator; time series, site comp	Inside PA	Higher increase in infrastructure developments over time inside PA	Mean (in/out) = small communities (<1000 inhab.); 1999 (0.5/0.1), 2000 (0.65/0.2), 2001 (0.65/0.3), 2002 (0.65/0.3), 2003 (0.7/0.5), 2004 (1.1/0.5), 2005 (1.3/0.6), 2006 (1.5/0.7). Large communities (>1000 inhab.); 1999 (1.7/0.2), 2000 (1.7/0.2), 2001 (2.7/0.4), 2002 (2.7/0.5), 2003 (2.7/0.5), 2004 (3.5/0.5), 2005 (4.5/0.5), 2006 (5.7/0.7).	Low

Table 5 continued

Citation	PA (IUCN Category)	Broad outcome	Outcome measure	Study design	Description of exposed population	Impacts: summary	Impact: results	Susc. to Bias
Sims (2010)	Multiple PAs, Thailand (n/a), est. various	Income	Log consumption – estimated mean monthly household consumption (Baht)	ODS (year 2000 poverty mapping analysis (Healy and Jutsuchon [2007]), comparator; site comp	Inside and around PA	Positively correlated with protection	Coefficient for log consumption in OLS model = 0.135 +/- 0.033 (SE). Ordinary least squares regression: R-sq = 0.593 p<0.01 (significant)	Medium
Sims (2010)	Multiple PAs, Thailand (n/a), est. various	Human development measure	Poverty headcount – share of population with consumption below poverty line	ODS (year 2000 poverty mapping analysis (Healy and Jutsuchon [2007]), Comparator; Site Comp	Inside and around PA	Negatively correlated with protection	Coefficient for poverty headcount ratio = -0.066 +/- 0.017 (SE). Ordinary least squares regression: R-sq = 0.702 p<0.01 (significant)	Medium
Shrestha et al. (2007)	Koshi Tappu Wildlife Reserve, Nepal (IV), est. 1976	Economic valuation	Willingness to accept compensation for foregone access to resources and perpetual protection of the PA	SRM (questionnaire), comparator; modelled/ hypothetical	Outside PA	Mean WTA = 11776.7 per household (Rs. year = US currency exchange rate quoted for 1994/1995 (49.4 Rs: 1 USD))		Medium

various = multiple protected areas
est. = year established
GMA = game management area
ODS = other data source
SRM = self-reported measure
WTA = Willingness to accept
? = protected area(s) missing from the World Database on Protected Areas (WDPA)
n/a = IUCN category not applicable
unknown = protected area(s) with IUCN category not reported in the WDPA

It is important to note that since the majority of studies were identified as being highly susceptible to bias, the results of these studies are not considered further, either individually or in general. These studies are unreliable both alone and combined. Because this group of potentially biased studies is unreliable, their findings cannot be summarised any more than individual results can be discussed. However, for completeness the diversity of outcomes reported by all studies is considered.

Furthermore, vote-counting is avoided where the sum of all negative, positive and neutral study results is calculated. Vote-counting is unreliable because it assumes that a significant finding is evidence that an effect is present, and that a non-significant finding is evidence that an effect is absent. The former statement is true, but the latter is not.[5]

Sections 4.3.1 to 4.3.7 correspond to the boxes in **Figure 11** and summarise results related to each category as part of the quantitative review.

4.3.1 Ecosystem goods

Summary

- Seventeen studies were identified;
- Only two studies were not highly susceptible to bias ('medium' susceptibility to bias);
- Nyahongo et al. (2009) found that meat and fish consumption increased with proximity to Serengeti National Park;
- Sarker and Røskaft (2011) found that people's perceptions of timber and fuelwood benefits from four PAs in Bangladesh decreased with the distance they lived from the PA boundary;
- There was high susceptibility to bias in the remaining studies, related to low methodological detail, confounding variables and weak experimental design.

Of the 17 studies reporting results on ecosystem goods, only two had designs that were not highly susceptible to bias (i.e. medium). Nyahongo et al. (2009) reported that the number of meat and fish meals consumed by survey respondents was significantly negatively correlated with their distance from the Serengeti National Park boundary. The authors' statistics account for a range of other potentially influential variables, contributing to the study's favourable susceptibility to bias rating (medium). The study results indicate that meat consumption increased with proximity to the park at a rate of 0.218 (±0.052) meals per week per km, while fish consumption increased at a rate of 0.931 (±0.205) meals per week per km (assuming units in analyses are identical to units described in the methodology).

Sarker and Røskaft (2011) found that people inhabiting areas surrounding four protected areas in Bangladesh identified more benefits from the protected area in the form of timber and fuelwood extraction closer to the park boundaries than further away, with an associated odds ratio of 1000 ('The odds that respondents living closer to the protected area boundary reported a higher level of benefit from timber and firewood because of the conservation programme were 1000 times greater than those for respondents living further away.')

Thirteen studies used questionnaires and semi-structured interviews for data collection, resulting in higher susceptibility to bias since reporting by respondents can be subject to recall or social desirability bias. Fourteen studies reported 39 different (but not all independent) outcomes related to food and materials, comprising a mixture of foods obtained by hunting and gathering, through agriculture and purchased, as well as other indicators such as land area under cultivation or grazing, availability of fodder, support for agricultural development, dietary diversity, gathered fuelwood and other plant products including timber, and change in ownership of goods.

Five studies reported seven different (but not all independent) outcomes related to water resources: three studies were related predominantly to water quality (e.g. households relying on least safe water resources) and two to water availability and supply. Only one study reported one outcome related to medicinal plants/animals.

Studies reporting data on common themes differed significantly in the precise outcomes measured. For example, while Bajracharya et al. (2006), Rinzin et al. (2009), Naughton-Treves et al. (2011) and Okello et al.

[5] See Borenstein et al. (2009) for further details of vote counting.

(2011) measured the accessibility and quality of water resources, there was insufficient conformity to allow meaningful synthesis.

Other studies could not be used to infer with reliability any effect of a protected area for a range of reasons, including:

- They recorded change over time, with no spatial comparison and no adequate basis for determining whether the changes observed were attributable to the effect of the protected area;
- They made a spatial comparison, but location relative to the protected area was clearly confounded with a range of other important site variables;
- The scale of the spatial comparison was too small for it to be used to infer effects of the protected area on the specific outcomes recorded in the study;
- The time elapsed between the creation of the protected area and the study was too short to infer any effect of the protected area.

4.3.2 Livelihood strategies

Summary

- Forty-three studies were identified;
- Eight studies were not highly susceptible to bias (one 'low' and seven 'medium' susceptibility to bias);
- Four studies reported poverty-related outcomes, with beneficial impacts of land protection found in all cases;
- Wildlife conflict was relatively well studied (18 studies and 47 outcomes; five studies with seven outcomes that had 'medium' susceptibility to bias). The majority reported significantly more problems when there was proximity to protected areas than further away;
- Lundgren (2009) found no significant differences in income growth or forestry/tourism sector employment as a result of the existence of protected areas in Sweden;
- Household income (Richardson et al. 2012) and consumption (Sims 2010) were found to increase with proximity to/within protected areas.

Studies in this group report on access to markets, employment, income, livelihood diversity, human development measures and wildlife conflict (see **Appendix 7**). Wildlife conflict was the most frequently reported outcome measure in the group, contributing 18 of the 43 studies and 47 of the 101 outcomes. Only five of the 18 studies were not highly susceptible to bias, with all but one (Hartter 2009) showing significantly greater crop and livestock losses closer to protected areas. Two of the five studies employed questionnaires to elicit perceived disbenefits; three used observations of conflict.

Lundgren (2009) found no significant correlation between the existence of protected areas and income growth or employment in either the tourism or forestry sectors in Sweden. Sims (2010) reported higher consumption in regions with a high 'share' of PAs compared to a low 'share' in Thailand. Richardson et al. (2012) found that households within game management areas (GMAs) had greater income across a number of Zambian PAs than households outside GMAs.

Four studies reported poverty-related measures (human development measure outcomes) as either poverty index or poverty headcount. They found that there were significant beneficial impacts of protected areas on poverty alleviation in Bolivia (Canavire-Bacarreza and Hanauer 2013), Costa Rica (Andam et al. 2010) and Thailand (Andam et al. 2010, Sims 2010). The study by Andam et al. (2010) involved subsequent in-depth reanalysis in two later publications (Ferraro et al. 2011, Ferraro and Hanauer 2011). These later analyses showed that along with protection alleviating poverty, poorer areas (measured at baseline) were found to have a higher level of poverty reduction than those that were less poor (Ferraro et al. 2011), and that poverty alleviation was also associated with characteristics that reduced the efficacy of deforestation prevention (i.e. where protection had been assigned to land that was unsuitable for agriculture, near major cities and infrastructure, and where agricultural employment is low) (Ferraro and Hanauer 2011).

The remaining studies were judged to have high susceptibility to bias. (The following examples are only illustrative of the diversity.) Foerster et al. (2011) reported that purchasing power was lower in villages closer to PAs in Gabon. Cardozo (2011) conducted a

questionnaire-based site comparison of communities inside and outside Allpahuayo-Mishara National Reserve, Peru and reported changes in income and livelihood diversity. Annual income from agriculture was lower inside the PA, whereas income from domestic animals and palm products was higher.

Kayser et al. (2011) reported greater annual transfer of money to small and medium-sized enterprises (SMEs) through contracts financed by Addo Elephant National Park, South Africa. Saayman and Saayman (2010) provided data on self-reported changes in the business environment around South African PAs. These studies provide weak evidence that opportunities for and turnover of business has increased as a result of the PA.

4.3.3 Land access and restrictions

Summary

- Six studies were identified;
- All studies were highly susceptible to bias due to lack of methodological detail, non-random sample selection, spillover, questioning bias and uncontrolled confounding variables;
- The majority of outcomes were related to restrictions on access or extraction;
- Two outcomes were related to perceptions of relationships with park employees

The six studies in this group report on 11 different (but not all independent) outcomes related to land and resource access, interactions with protected area authorities, displacement and resettlement (**Appendix 7**). All had a high risk of bias in their study design because of a lack of detailed description of their methodologies. In cases where the description was detailed, specific risks of bias were identified; replicates were non-randomly selected (Bajracharya et al. 2006, Ninan 2009) and spillover, questioning bias, and confounding variables were not accounted for (Gonzalez 2003, Bajracharya et al. 2006, Phamtrong and Swan 2009).

4.3.4 Health and safety

Summary

- Nine studies were identified;
- Only one study was identified as not highly susceptible to bias ('medium' susceptibility to bias);
- Korhonen et al. (2004) found highly variable infant mortality rates in and around Ramonafana National Park in Madagascar, with slightly higher levels outside than inside the PA, although the pattern was not clear.

Studies in this group looked at health in the population and access to health services (**Appendix 7**). The studies reported a limited range of outcomes relating to health and safety, but the reliability of findings was generally compromised due to various aspects of study design which make them highly susceptible to bias, such as a lack of comparator or non-random selection of study sites or participants, or incomplete reporting, with no details about selection of study populations, validity of survey instruments or survey response rate (Mishra 2000, Saayman and Saayman 2010).

The only study in this group with 'medium' susceptibility to bias, Korhonen et al. (2004), reported a case study on reproductive health from a ten-year-old Integrated Conservation and Development Project (ICDP). The study was of BACI design, comparing villages and municipalities (chosen for their representativeness) within a 3 km belt around Ranomafana National Park (the 'peripheral zone') (seven villages, six municipalities) with those outside that zone (six villages, four municipalities).

Data on modern contraceptives suggested an increase in use over time, a decrease with increasing distance from the park, and variability in use within 'park' villages – attributed by the authors to varying access to ICDP activity, but also to the educational status of women and to local culture and religious beliefs. Fertility levels were estimates rather than direct measures and did not indicate any change over time or differences between park and 'outside' villages. Visits to the health centre for pre-natal care increased over time in line with national trends and did not differ between park and 'outside' village inhabitants.

Data presented for infant mortality were drawn from pre-1999 census data. They showed year-on-year variation and no clear differences between 'park' and 'outside' inhabitants, although there was a slightly

higher mean over an eight-year period outside than inside the PA. Post-1999 data were health centre data and only related to health centre births. Thus, they could be subject to bias if a higher percentage of more problematic births occurred at the health centre as opposed to in villages.

4.3.5 Society and development

Summary

- 13 studies were identified;
- Two studies were not highly susceptible to bias (one 'low' and one 'medium' susceptibility to bias);
- Sheppard et al. (2010) found a greater number of infrastructure developments inside the Wechiau Community Hippo Sanctuary in Ghana than outside it;
- Korhonen et al. (2004) found no difference in the percentage of girls in primary schools either over time, or inside relative to outside Ramonafana National Park in Madagascar, but there was a possible slight increase in the percentage of girls in the third grade over time inside the PA.

Studies in this group include measures of education, empowerment, infrastructure, recreation and social capital. Thirteen studies reported data on 54 development-related outcome measures. Apart from the two studies mentioned above, all remaining studies were judged to be of 'high' susceptibility to bias. There is weak evidence for improvement in educational provision following PA establishment in terms of an increased number of schools or perceptions of improvement (Mishra 2000, Rinzin et al. 2009, Kayser et al. 2011).

A questionnaire based on reported change used by Saayman and Saayman (2010) in multiple South African PAs produced variable responses to statements such as 'participation in community activities has increased', 'the pride that the residents have in their town has improved' and 'the opportunities to meet new people has increased'. In most but not all cases, the majority agreed. Other studies reported perceived improvements in infrastructure in and around PAs compared to elsewhere or before the PAs were established (Mishra 2000, Bajracharya et al. 2006) but this was not always the case (Rinzin et al. 2009).

4.3.6 Attitudes towards protected areas and the benefits (or otherwise) they provide

Summary

- 24 studies were identified;
- Only one study was identified as having 'medium' susceptibility to bias, with all the remaining studies highly susceptible to bias due to lack of methodological detail, confounding variables unaccounted for, and spillover from protected areas into controls;
- Sarker and Røskaft (2011) found attitudes to PAs to be negatively associated with PA proximity;
- Four studies failed to identify the location of 'inside' populations, two studies failed to report the distance of controls from PAs, and controls were generally very close to PA boundaries (e.g. <1 km and 2.5 km);
- Studies reported attitudes towards PAs, attitudes towards identified benefits/disbenefits from the PAs, and perceptions of environmental change.

Studies reporting attitudes were separated into two distinct categories: attitudes towards the protected area or conservation, and those concerning benefits or disbenefits resulting from the protected area. All but one of the 24 studies reporting attitudes fell into the category of 'high susceptibility to bias'.

The main issues identified in the critical appraisal were lack of detail in the methods, failure to account for important confounding variables, and (where spatial comparators were used) potential spillover effects due to the intervention and 'comparator' sites being close together. The latter was a particular problem for studies looking at the effect on attitudes of 'distance from the PA boundary'.

Thirteen studies examined spatial differences in attitudes with respect to distance from the protected area. However, four studies failed to report the location of the intervention population inside the protected area. Two studies (Shrestha and Alavalapati 2006, Sarker and Røskaft 2011) regressed attitude scores against distance from the protected area, but the distances involved were not stated. Control populations in 'inside-outside' studies were generally very close to the protected area boundary, for example

2.5 km (Sekhar 1998) and <1 km (Cardozo 2011), although the population was 50 km from the boundary in the study by Bonaiuto et al. (2002).

Attitudes towards the protected area

Fourteen articles reported a wide range of general attitudes towards protected areas in question. Thirteen of them provided respondents' statements (usually a mix of positive and negative statements) and presented data on the percentage agreeing or disagreeing with each statement. One study (Bonaiuto et al. 2002) presented composite attitudinal scores made up of responses to a series of questions which were not presented in the article.

In the only study judged not to be highly susceptible to bias, Sarker and Røskaft (2011) found that respondents from around four parks in Bangladesh had negative attitudes towards the protected areas, and that negative attitudes decreased with distance from each protected area. The remaining studies were of 'high' susceptibility to bias. Bonaiuto et al. (2002) reported that regional identity and place attachment were higher inside the Tuscan Archipelago National Park in Italy, but that specific and general attitude scores towards the protected area were lower relative to a control group of respondents 50 km away. Jim and Wu (2002) reported that a higher proportion of people living on the boundary of Shimentai Nature Reserve in China 'disliked' the park than those living 4 km from its boundary. Finally, Shrestha and Alavalapati (2006) observed a positive correlation between positive attitudes and distance from Koshi Tappu Wildlife Reserve in Nepal.

In contrast to the above studies, which found a positive relationship between distance from the park and attitudes, Infield and and Sekhar (1998), Namara (2001), Gubbi et al. (2008) and Cardozo (2011) reported higher positive and lower negative attitudes inside protected areas than outside. Other studies found no statistically significant or observable difference in attitudes inside and outside protected areas (Fiallo and Jacobson 1995, Ite 1996, Harada 2003, Hartter and Goldman 2009) or over time (Cihar and Stankova 2006).

Attitudes towards named benefits/disbenefits resulting from the park

Thirteen studies reported data concerning respondents' attitudes towards named benefits or disbenefits resulting from the protected area. All of these studies were considered highly susceptible to bias. Ite (1996) found that fewer respondents close to Cross River National Park in Nigeria believed that they had benefited from the protected area than those 5 km away, although a third group of respondents 7.5 km from the protected area revealed an intermediate perception of benefits. Jim and Wu (2002) reported no significant difference in perceptions of benefits from Shimentai Nature Reserve, China, between respondents inside and those 4 km from the protected area, while significantly more respondents inside than outside claimed to have experienced losses as a result of the reserve.

Other studies found no evidence that respondents felt that either negative or positive impacts had resulted from the protected area (Fiallo and Jacobson 1995, Alexander 2000, Gonzalez 2003, Rugendyke and Son 2005, Hartter and Goldman 2009).

A smaller category of studies reported respondents' perceptions of environmental change as a result of a protected area. Respondents in one study predominantly did not perceive a change (Cihar and Stankova 2006), and two studies reported that the majority perceived an increase in environmental 'appearance' (Saayman et al. 2009, Saayman and Saayman 2010). However, these studies were of low quality, predominantly due to a lack of detailed methodology and shortcomings in the experimental design. For example, Cihar and Stankova (2006) lacked a true before-and-after comparison and generated 'before data' by asking informants to recall the past. This is clearly open to recall bias.

4.3.7 Economic valuation studies

Summary

- Ten studies were identified;
- One study was considered not highly susceptible to bias ('medium');
- In four groups of studies cost-benefit analyses, stated preference studies, stated preference combined with a distance comparator, and reported direct financial losses from a PA (e.g. fines/foregone income) were found;
- These studies did not have real comparators (with the exception of the distance comparator): instead they were hypothetical and therefore highly susceptible to bias (e.g. optimism bias);

- Studies were too heterogeneous and open to bias to permit meaningful quantitative synthesis of valuations.

Studies in this group reported welfare impacts in monetary terms. Economists usually maintain that individual well-being is not directly and cardinally measurable, or comparable between individuals or time periods (e.g. Just et al. 2004). However, changes in an individual's well-being as a result of a PA's existence can be expressed in terms of the amount of money needed to render that individual indifferent to the existence of the PA (the aggregation of such monetary amounts across individuals is common in applied economics, but deeply problematic).

Ten studies estimated the well-being impacts of protected areas in monetary terms. Nine of these were categorised as having high susceptibility to bias, and one as having medium susceptibility.

Shrestha et al. (2007) used a contingent valuation survey with a stratified random sample of 160 households within around 6 km of Koshi Tappu Wildlife Reserve in Nepal to estimate these households' willingness to accept the PA in terms of foregone resources. They found substantial local one-time costs of 11,776.70 Nepali Rupees per household (1994/1995).

A major reason for excluding economic studies (see **Appendix 6**) was that they measured the well-being impacts of ecosystems within PAs, but did not isolate the impacts of the PA itself. One study (Hayatudin et al. 2008) carried out a contingent valuation survey of willingness to accept compensation for the costs of the PA's presence on traditional pastureland, with respondents within the protected area and further away. The remaining studies included only hypothetical or 'modelled' comparators. In all cases this was done more or less explicitly by the analysts themselves, but many studies also required respondents to mentally construct hypothetical comparators in order to answer stated preference surveys.

Such constructed comparators can be useful and indeed essential when 'real' comparators (RCTs, BACI, etc.) are unavailable (they may also be used in conjunction with such research designs). However, they are vulnerable to a number of potential biases, such as optimism bias, strategic bias, and hypothetical bias (see **Box 10** for definitions).

Without real comparators, direct evidence is lacking on the effects of the PA on individuals. Instead, these must be predicted using whatever information and opinions are available to the analyst or respondent. Numerous assumptions must necessarily be made, but will not always be explicitly stated. This leaves the studies open to well-recognised biases. For example, cost-benefit analyses are known to suffer from optimism bias, especially when conducted by groups with an interest in the project. In the case of PAs, this may be the government or conservationists more generally. For example, the results of Kremen et al. (2000) are heavily dependent on optimistic assumptions made about the efficacy of development interventions planned to accompany the PA; no evidence is presented on whether these interventions had the effects assumed by the authors, as the analysis was conducted ex ante.

Stated preference studies are known to suffer from both hypothetical bias and strategic bias on the part of respondents. Hypothetical bias may lead respondents to overstate their willingness to pay (WTP) for goods or services provided by a PA because they fail to consider their true budget constraints. Respondents may also behave strategically: beneficiaries may overstate their willingness to pay for a PA in order to increase the likelihood of its establishment if they suspect they will not be required to contribute to it, or to understate their WTP if they suspect this will result in lower user fees. Those who expect to lose from PA establishment may overstate the amount they would require to receive in compensation for the establishment of the PA – i.e. their willingness to accept (WTA) the PA – to reduce the likelihood of its establishment, or increase compensation payments. Alternatively, surveys may underestimate opportunity costs if the activities concerned are considered sensitive or of dubious legality, and are likely to be underreported. The results of stated preference studies are also known to be sensitive to the information provided by surveyors and the precise formulation of the questions. This renders them vulnerable to the same optimism bias noted above.

Methodologically, the included studies fell into three groups: cost-benefit analyses, stated preference studies, and reported direct financial losses from a PA. One study, Kremen et al. (2000), carried out an ex ante cost-benefit analysis of the establishment of Masoala National Park in Madagascar, disaggregating

costs and benefits by local, national and international groups. Both the effects of the PA and the counterfactual (no PA) were modelled, although little detail was presented and the evidence upon which the modelling was based was often rather weak. The study estimated that local populations would suffer losses due to the establishment of the park, but that there would be a net gain if development projects associated with the park succeeded in raising local incomes. At the national level, the study estimated that there would be a net loss due to the protected area.

Seven of the studies used stated preference techniques for eliciting estimates of welfare gains or losses. Four studies (Maharana et al. 2000, Adams et al. 2008, Han et al. 2011, Jones et al. 2012) used contingent valuation to estimate the willingness of regional or national populations to pay for existing protected areas in India, Brazil, China and Greece respectively. All four studies indicated generally positive welfare impacts of the PAs on these broad populations. A fifth study, Ascuito et al. (2005), similarly estimated local willingness to pay for a fire prevention programme in an existing protected area, again finding positive welfare impacts.

Two studies (Shrestha et al. 2007, Hayatudin et al. 2008) used contingent valuation to estimate local populations' willingness to accept restrictions on livelihoods imposed by existing protected areas in Ethiopia and Nepal, respectively, indicating negative welfare impacts of the PA. In Hayatudin (2008), surveys carried out with respondents inside and further away from the PA found that those within the PA were less willing to accept compensation than those further away, suggesting that negative welfare impacts increased with proximity to the PA. Finally, Abbot and Mace (1999) presented data on fines levied on local people for illegally harvesting fuelwood in Malawi's Lake Malawi National Park. These fines were levied by the PA, but no information was provided on areas outside the PA.

4.3.8 Inequalities

Assessing the impacts of PAs on health or social inequalities would require either individual sound studies with justifiable subgroup analyses, or a set of comparable studies which describe in detail the socio-economic position of the populations studied (Kavanagh et al. 2009, Petticrew et al. 2012). Neither was available from the extant literature.

4.4. Meta-synthesis of qualitative and quantitative evidence

In attempting to bring together the findings of the qualitative and quantitative reviews, it is important to reflect on the differences in their philosophies. The qualitative synthesis was essentially formative and attempted to provide a picture of how PAs are perceived to impact human well-being. It could therefore form a template for empirical investigation and hypothesis testing. The synthesis of quantitative evidence was more summative and attempted to test hypotheses of impacts. Consequently, the meta-synthesis should not be expected to be a simple matching of similar studies or outcomes.

In this section the findings of the qualitative synthesis are summarised. Consideration is given to whether the quantitative evidence of impacts can inform the questions raised by these findings, or whether it suggests something different.

4.4.1 Governance

The qualitative synthesis reveals a number of factors that can lead to negative views about and impacts of PA establishment, including lack of clarity in regulations and boundaries; discrepancies between state rules and local institutions; forced migration; inadequate or non-existent compensation; poor communication between communities and authorities; and government indifference to cultural and social diversity.

Negative views on the impacts of management can arise from poor relationships between inhabitants and park officials. Views on how to lessen negative impacts or achieve positive ones include: rules that are locally adapted or based on traditional rules; greater clarity about rights and duties; planning focused on community livelihoods as well as on the park; appropriate capacity building; and empowerment through the process of acquiring land titles and setting boundaries. The existence of these views enables hypotheses to be generated on how to achieve changes in impacts. The synthesis of quantitative measures of impacts shows that these hypotheses are yet to be tested. What is absent from the evidence base is a quantitative comparison of the costs and benefits for local people of different forms of PA governance.

4.4.2 Well-being

Environmental (natural) capital

Appreciation of the environment: The qualitative synthesis presents a range of positive and negative attitudes towards PAs among local populations. Alongside an appreciation of and desire to protect the environment were concerns about reliance on the same areas to maintain livelihoods. Although the qualitative literature provides evidence of different views, quantitative evidence with which to estimate the scale and reach of those views was not extractable since all but one study were highly susceptible to bias.

Access to land: The qualitative synthesis revealed two very different scenarios in terms of access to land: resentment at loss of access, and benefits from land acquisition and the value of land on the PA's margin. All quantitative studies of the impacts of PAs on land access and restrictions were highly susceptible to bias. Thus, the current evidence does not allow the magnitude of these scenarios to be assessed.

Resource use: There was a range of positive and negative views concerning PAs as a source of natural resources and ecosystem goods. In the synthesis of quantitative evidence of impacts, only two studies (showing that meat and fish consumption was greater in proximity to a PA, and that timber and fuelwood benefits were more frequently appreciated nearer another PA) were not highly susceptible to bias.

Economic capital: Views expressed concerning the impacts of PAs on economic capital were generally negative, with the exception of some views on the benefits of eco-tourism. In contrast, the quantitative evidence of impacts from three studies on livelihood strategies was neutral to positive in terms of poverty reduction. In particular, in Sweden there were concerns among foresters about sustaining employment and among politicians about sustaining tax revenue in the presence of regulations. However, these concerns were not upheld by a quantitative assessment of impacts in the same country. All but one of the economic valuation studies suffered from high susceptibility to bias, and therefore added only limited reliable quantitative evidence with respect to this issue.

Social capital: The qualitative synthesis suggests that development associated with PAs can exacerbate ethnic tensions through perceived preferential treatment of some communities. There may be a relationship between existing social capital and the ability to adapt to new circumstances. Quantitative evidence of impacts on social capital is mixed. There is some evidence that land protection has positive impacts on poverty alleviation and on housing and infrastructure, but there is also evidence of increasing incidence of wildlife conflict.

Health: Views expressed on the health of local populations were predominantly negative, including exposure to disease, wildlife conflict and women's safety. Quantitative studies of the impacts of PAs on health and safety were notable by their absence.

Photo: Victoria Imeson

5. DISCUSSION

Historical accounts of the establishment of protected areas provide evidence that substantial negative impacts on local populations have occurred. Forced displacement of communities is a recurring theme in the narrative of the negative impacts of PAs (e.g. Dowie 2009).

The study described here does not seek to question that historical narrative. However, community development and infrastructural improvements in close proximity to PAs have also been documented, suggesting that PA establishment can have positive impacts (i.e. win-win solutions for biodiversity and human well-being are possible).

The establishment of PAs will inevitably lead to effects on local (and possibly regional) populations. The challenge is to improve capacity to predict which factors will influence the balance of positive and negative impacts. This study provides an assessment and characterisation of the range of positive and negative impacts in the period following the 1992 Rio Earth Summit and the establishment of the Convention on Biological Diversity (CBD). It was not the objective of the study to revisit this history prior to 1992. The study also attempts to collate evidence concerning the factors that modify impacts, either in a positive or a negative direction.

5.1 Comparison of qualitative and quantitative evidence

The quantitative evidence is insufficient for conclusions to be drawn about the scale of either the positive or negative impacts of protected areas on human well-being. However, it was possible to synthesise information from qualitative studies about how positive and negative changes in well-being can arise from the establishment and implementation of regulations to protect the natural environment, with or without simultaneous investment in community development.

The qualitative synthesis identified a number of themes concerning the ways the governance of protected areas affects people's well-being and how PAs are viewed. Some themes, such as the impact of land protection on forestry sector employment in Sweden, are reflected in the impacts assessed in studies considered in the quantitative review. Others, however, have not been rigorously assessed in the quantitative literature. Examples are novel diseases resulting from changes in lifestyle; increased workload and heat exhaustion due to crop raiding; and safety risks felt by women as men worked further afield, and as women were drawn out of their homes to assume new roles.

5.2 Reasons for heterogeneity

Identifying variables that influence whether positive or negative impacts will occur would be desirable to support decision making on the process of establishment and subsequent management of PAs. Unfortunately, the nature of the evidence provides little opportunity to analyse differences in impacts among different PAs (see 'limitations of the evidence base' below).

Mode of governance is commonly viewed as a key variable determining the impacts of PAs. This is supported by the qualitative synthesis, in which many narratives are available on different aspects of governance. However, rigorous tests of governance as an effect modifier are absent. A similar lack of quantitative evidence is apparent with respect to the following questions:

- Which practices repeatedly lead to negative impacts, and which ones seem recurrently to improve people's well-being?
- Are some of these practices becoming more/less common with time?
- Are any costs or benefits associated with particular types of PAs (e.g. size or location)?

5.3 Strengths and limitations of the study

This is the first systematic study (of which the reviewers are aware) that attempts to identify and synthesise, in a transparent manner, findings from international studies of people's views about the impacts of protected areas on their lives. To reduce the likelihood of studies being missed during the review process, sensitive searches of bibliographic databases were supplemented by other methods to seek out less easily found literature such as unpublished reports from topic relevant websites.

Studies providing thick descriptive data spanning the different categories of IUCN protected areas, before and after the 2003 Durban Accord, offered an excellent source for synthesising understanding of how PAs impact people's lives.

The reviewers found that data presented in studies often encapsulated the complexity of living in or near PAs, touching on a multiplicity of inter-related themes. Within the limitations of time and resources available for the study, it was possible to present these themes only fairly superficially without fully exploring all their interconnections.

The disparate, fragmented nature of the literature limited the reviewers' ability to test the comprehensiveness of the search. In reviewing such a broad and interdisciplinary question, it was a significant challenge to test all the possible sources of relevant material; nor was it simple to measure what proportion of the relevant articles could be accessed in view of the time and resources available. Limiting the search to English-language articles and articles translated into English could also be significant.

The diversity of the literature limited any assessment of the extent of publication bias. While the reviewers attempted to minimise publication bias by employing a systematic search strategy, there was no way to test for publication bias in the literature obtained. The selective nature of many studies, in terms of the type of impacts investigated, was also a potential source of bias, as researchers may 'cherry-pick' (possibly inadvertently) those impacts most likely to show a particular effect.

5.4 Limitations of the evidence base

Although the quality of the studies was sufficient to draw out their findings in order to explain how different impacts may arise, many of them failed to report adequately their methods of data collection and analysis.

In any studies looking at the quantitative impact of PAs, there is the potential that respondents will bias their responses in an effort to influence protected area governance. Some questionnaire-based studies attempted to minimise this strategic bias by clearly stating that interview and questionnaire results would be used solely for research purposes. Other studies did not acknowledge this potential bias or attempt to reduce it.

Of the 305 outcome measures extracted from 79 included studies, 92 outcome measures (30%) involved 'reported changes'. For these data the comparator is implicit in the respondent's reply; they report a change over time due to the PA. While these results are relevant to the review in hand (externally valid), they can be susceptible to significant recall bias and questioning bias (elements of internal validity). Several studies attempted to elicit opinions and attitudes regarding protected area establishment retrospectively, many years after the event, which is similarly open to substantial sources of bias.

For these reasons, results in the form of reported changes that involve significant recall should be viewed with caution, and studies should be critiqued in-depth for potential sources of bias. The reviewers attempted to account for these sources of bias during critical appraisal using a 'susceptibility to bias' scoring system.

Of the 79 studies accepted following the critical appraisal, 66 had collected data in the form of self-reported measures. Fifty-six of these articles failed to provide details of the questionnaires given to respondents, and only two articles provided a copy of the survey instrument in full (Reid et al. 1995, Phamtrong and Swan 2009). Without details of the questioning involved in these surveys it is difficult to assess questioning bias.

Variation in all the question elements (PECO; population, exposure, comparator, outcome), and the high degree of specificity in outcome measures identified in this study, created problems for synthesis. In particular, in studies based on self-reported measures very specific questions were commonly asked that could not then be synthesised along with other similar outcomes. Similarly, a high degree of variability in the choice and design of comparators prevented synthesis. In some studies, the inside-outside comparison was open to many confounding factors that cloud the link between protected area presence and impacts. This highlights the difficulty of balancing the minimisation of spillover effects (whereby the comparator population is close enough to feel the effects of the exposure) and the control of non-target variables. While some studies accounted for this problem by including confounding variables in statistical models, many others did not. Furthermore, very few studies examined differences in environmental conditions between the comparator and exposure populations.

High susceptibility to bias in most studies limits the ability to attribute outcomes/impacts to the presence of PAs. Forty-five studies were excluded during critical appraisal due to flaws in experimental design and data analysis, or due to a lack of methodological detail. However, many studies included after the first stage of critical appraisal also failed to account for confounding variables, selected replicates in a non-random manner, and used opportunistic methodology.

The most frequently occurring factor that affected the susceptibility to bias score in included studies, however, was a failure to report their methodology appropriately. Significant details such as recall period, response rate, item pool balance and order, sample selection process, sample size and sample location were not disclosed in a large number of cases. Together these factors limit the ability to attribute the reported impacts to PAs.

There is a lack of primary studies estimating the impacts of PAs on human well-being using direct measurement techniques in a before-after-control-intervention (BACI) format. In addition to a generally high susceptibility to bias, very few studies employed robust comparators over appropriate time frames in order to maximise evidence linking PAs to observed human well-being impacts. Only one included study used a full BACI design to account for spatial and temporal confounding variables. Direct data collection was used by only three studies.

The reviewers found a surprisingly small number of studies on the health of populations. Only nine studies reported data on the human health impacts of PAs. This is surprising since the majority of articles in this study purport to measure human well-being. Difficulties regarding ethical approval for human study may account in part for the paucity of health studies.

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6. CONCLUSIONS

6.1 Implications for policy/management

The evidence base provides a range of possibilities to inform, but little evidence to support decision making on how to maximise positive impacts of PAs on human well-being. The diversity of studies and of outcomes measured, together with the diversity (or lack of a clear signal) in the data suggest that the impacts of PAs are highly context dependent. However, the reviewers found that the evidence base is insufficient to provide any power with which to predict impacts on well-being from a knowledge of these impacts' context. It logically follows that the evidence base is insufficient for circumstances/variables/effect modifiers that might lead to greater or lesser impacts to be identified. The available evidence base is currently failing to inform policy on the progress (or lack of it) being made, since 1992, towards lessening the negative and promoting the positive impacts of PAs on human well-being.

6.2 Implications for research

The nature of the research reported to date forms a diverse and fragmented evidence base that is insufficiently developed to reliably inform future policy decisions (recognising that many included studies did not set out to address the review question). Many studies appear to have been conducted opportunistically and lack baseline measures. There is no evidence of a strategic approach to (or strategic investment in) this field of research beyond the initiatives of individual research groups. If a sufficient evidence base is to be formed, there is a need for a concerted programme of research rather than an uncoordinated, short-term opportunistic approach.

The diversity of outcome measures and the consequent difficulty of synthesis suggests a need to use standard indicators of human well-being that allow comparison among studies and meaningful synthesis of evidence.

Comparative research needs to progress from 'PA/no PA' to 'PA type A/PA type B' comparisons.

Comparisons should be made between potential proximate causes of positive or negative impacts when the ultimate cause is PA establishment/management. This study suggests that comparisons could use, for example, governance models, existing social capital, cultural diversity, and poverty indices.

It would be helpful to devote research to efforts by funders to find consensus on minimum standards for methodologies (with respect to both qualitative and quantitative evidence) that provide improved quality and thus reliability of data. The large proportion of included studies with a high susceptibility to bias indicates such a need, and also indicates that scarce research resources are not being used effectively.

Recommended study design

In order to better assess the impacts of protected areas on human well-being, the reviewers made the following recommendations for future research study design and reporting:

Methodological detail

Studies should report sufficient details regarding the location of sample sites (particularly in relation to PA boundaries), the degree of replication, the data collection tool (e.g. questionnaires could be included), the method of sample selection (e.g. random or purposeful), and the times and duration of sampling. This is not an exhaustive list. Sufficient detail needs to be provided to allow the sampling to be repeated. Where information did not fit within published articles, these details should be provided in supplementary material.

Baseline assessment

Where changes following the establishment of or changes in protected area governance are investigated, adequate baselines need to be assessed. Although this is difficult and requires planning prior to the intervention, full BACI study design is vital to account for confounding temporal and spatial confounding factors. By assessing baselines, any differences between intervention and comparator populations can be compared relative to the starting conditions to strengthen the evidence towards causation.

Matched controls

'Control' or 'comparator' populations are vital to enable conclusions to be drawn about impacts in the absence of the intervention. A reliable comparison requires that other variables describing the environment are held constant or matched between comparator and intervention populations, allowing only the intervention to change in an ideal situation.

In practice, this is very difficult (and is the reason baseline assessment is important). There is often a payoff between maximising similarity and minimising spillover (i.e. the overflow of impacts from the intervention into the nearby comparator). Statistical tests can help confirm similarity across intervention and comparator populations, and descriptive variables can be included in models that test for the significance of the intervention in order to account for differences that might occur.

Replication

Care must be taken to ensure that there is an appropriate trade-off between a study's accuracy and its precision. When combining many studies in a synthesis, more accurate results are preferable to more precise ones. For example, a study that measures daily resource extraction over a year in ten households from one intervention and one comparator village is less likely to reflect the true impact of the intervention than a study that measures daily resource extraction over one month from 12 interventions and 12 comparator villages.

This spectrum is not clear-cut, however, and the allocation of resources to pseudoreplication (improving precision) and true replication (improving accuracy) must be considered carefully. Indeed, the scale at which conclusions will be drawn defines what is pseudoreplication, and what is true replication. This definition may be different for authors and systematic reviewers.

Statistics

Statistics, both in summarising results and in analysing patterns, must be used with great care. The reviewers recommend that a statistician be consulted during experimental design in order to optimise design for analysis. In addition, the use of models that account for changes in non-target variables across temporal and spatial scales is recommended. Tests for differences in confounders between intervention and comparator populations are also appropriate. Where information can be presented in summary statistics (e.g. mean/median and standard deviation/confidence intervals), this will aid future meta-analysis.

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