

A rapid approach for measuring ecosystem services at the site-scale

This study investigated how ecosystem services provided by Shivapuri-Nagarjun National Park in Nepal would be altered if the area was subject to land-use change. Surveys were conducted focusing on carbon storage, water provision, tourism/recreation and cultivated goods using a quick and efficient assessment approach. The results demonstrate the value of this site for both biodiversity and human well-being, and therefore the importance of investment in and management of this protected area.



Providing site-based evidence of the ecosystem services provision of protected areas is a critical component in arguing for maintaining protection status and conserving biodiversity. However, empirical data are limited. This study is piloting the use of a new 'toolkit' to assess ecosystem services at the site-level. The approach incorporates accessible, state-of-the-art methods with participatory, inexpensive ones that result in acceptably robust values. An important aspect of the methods is to compare values for the current site versus those for a plausible alternative land-use.

The results of this work will be presented in a way that can be easily used by site managers, community forest user-groups, regional and national decision-makers to inform conservation and land-use decision-making in Nepal.

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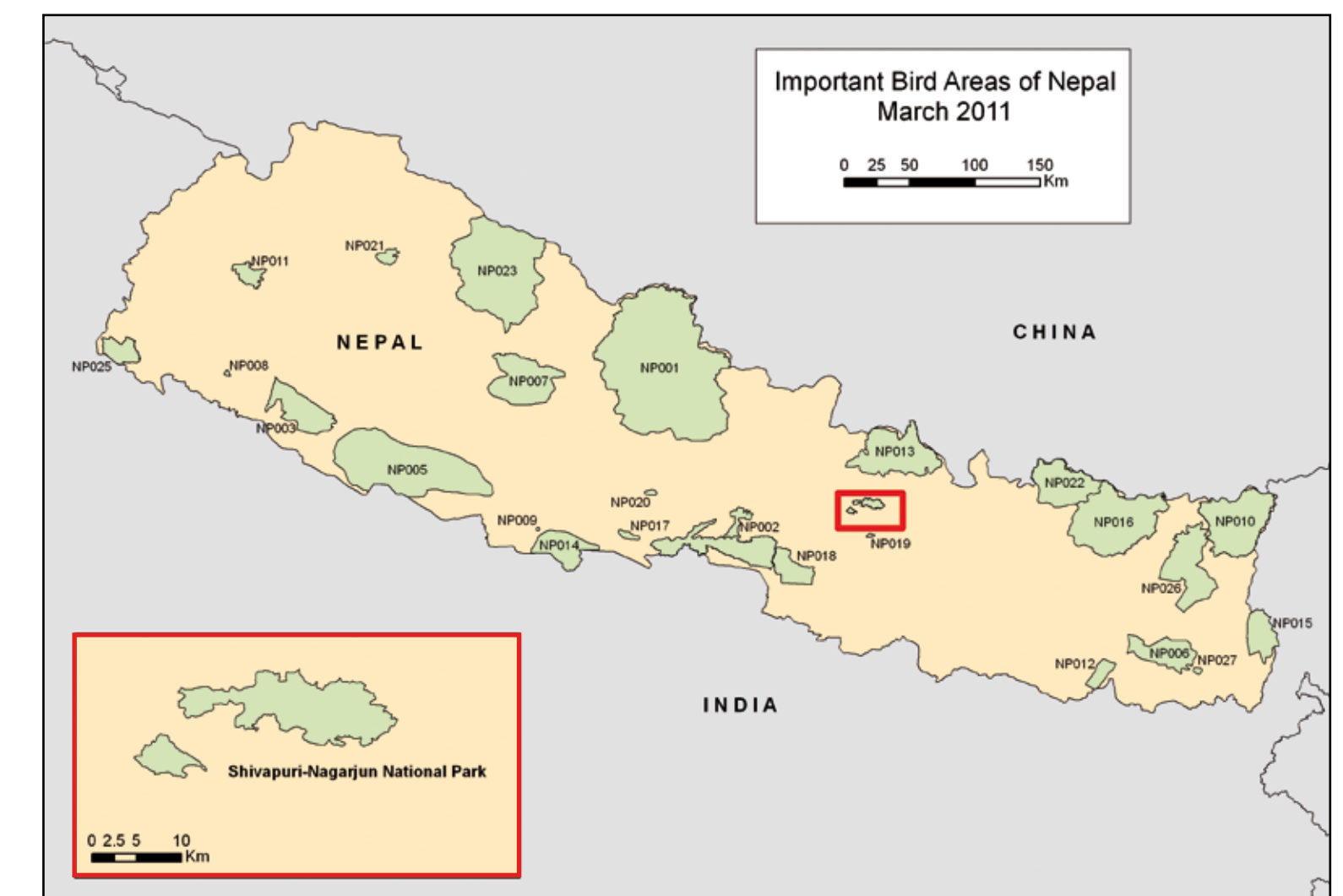


The value of Shivapuri-Nagarjun National Park, Nepal, for biodiversity and people

Biodiversity importance

Shivapuri-Nagarjun National Park (SNNP) is located 12 km from Kathmandu, Nepal, covering an area of 159 km² with an elevation ranging from 1,000 m to 2,732 m asl. Over 1,250 plant species and 311 bird species have been recorded. The protected area is classified as an Important Bird Area (a site of international importance for bird conservation—one of 27 in Nepal) and has good populations of Spiny Babbler *Turdoides nipalensis* and Hoary-throated Barwing *Saxicola insignis*, two restricted-range species.

The forested land comprises several vegetation types. Mature oak-dominated *Quercus semecarpifolia* patches occur on steep slopes at altitudes greater 2,000 m. At the lower elevation, *Schima-Castanopsis*-dominated fragments are successional forests, recovering from heavy logging that occurred before the establishment of the area as a watershed reserve in 1976. Pine forests consist mainly of Chir pines *Pinus roxburghii* that were introduced for afforestation purposes.



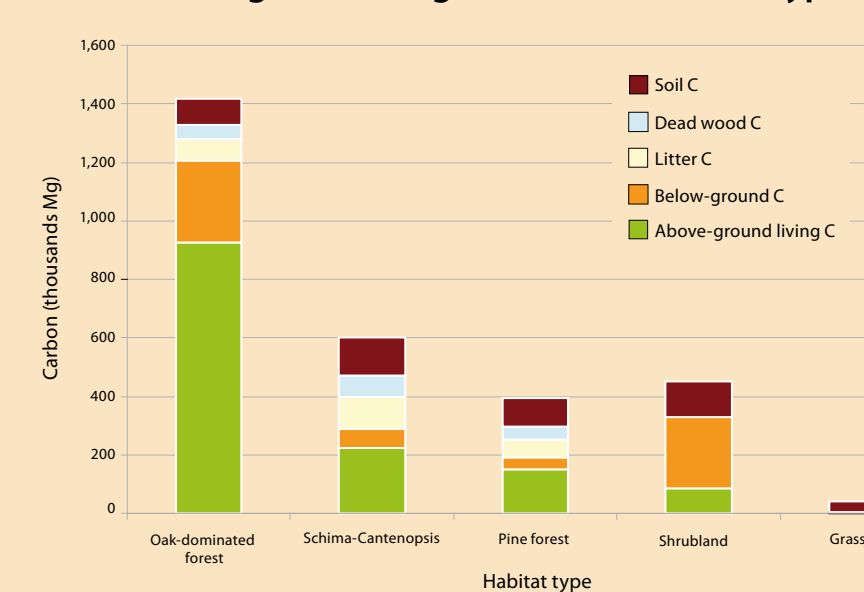
Benefits to people

Carbon storage

Carbon plots to measure all trees ≥10 cm DBH were carried out to estimate carbon storage in forested areas. Other habitats types were given carbon values sourced from the published literature.

Total carbon storage in the Park is 2.9 million tonnes, compared with 1.4 million tonnes in the alternative state of agricultural, urban and degraded forest land. Economic value of the Park based on social costs is estimated at USD 74.2 million more than in the alternative state.

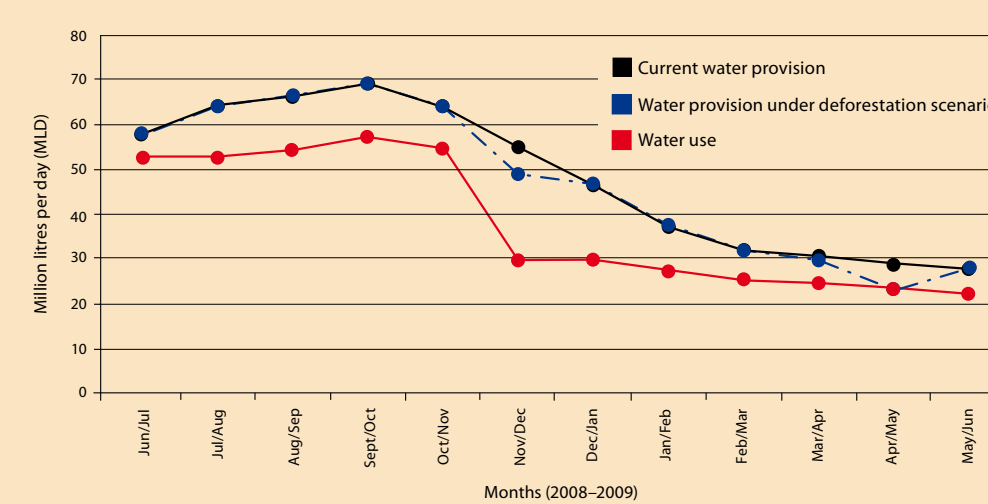
Carbon storage according to different habitat types



Hydrological services

Data were collected from a regional water agency, Kathmandu Upatyaka Khanepani Limited. Change in water provision is being analysed using the online policy support tool AguaAndes.

Provision and use of water under current and alternative state

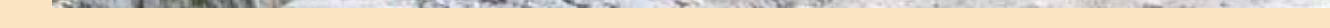


Water produced from the Park averaged 53.73 million litres per day, making up an average of 58.9% of the total water production for Kathmandu Valley which serves a population of 3.2 million people. Initial analysis suggests that land cover change within the Park will not impact greatly on the provision of water from the catchment. However, in some months there is a significant reduction in supply which combined with other factors (such as population increase) may result in shortages at certain times of year.

Nature-based tourism and recreation

Data on annual visits were gathered from the Department of National Parks and Wildlife Conservation. Visitor surveys were conducted at the Park entrance to establish visitor spend (including travel-cost) and reasons for visiting the site. Estimating the value of tourism in the alternative state will be analysed from results of asking visitors whether they would still visit if the forest was converted.

In 2009–2010 annual visits numbered 167,830. Income from tourism is more than USD 6 million per year and the fraction that can be attributed to appreciation of nature is significant. We predict that this tourism value would be greatly reduced in the alternative state, based on visitors' survey responses.



Cultivated goods

From discussion with key stakeholders, a mosaic of cropland, housing and degraded forest would form the most plausible alternative land-use of the Park if protection were removed. Household surveys were conducted in two representative areas outside of the Park to establish the most economically important cultivated goods.

Surveys identified three main crops of economic importance: wheat, rice and buckwheat. Livestock also had some economic value. Valuation of this service is still underway but provisional analysis suggests that the net economic value to communities is low due to the high investment costs in family/hired labour for harvesting and processing.



Overall importance of the Park for ecosystem services

The results of this study illustrate that the long-term value of Shivapuri-Nagarjun National Park in its intact state is much greater than the value of conversion.

- Carbon storage and sequestration within the Park contributes a significant contribution to Nepal's climate mitigation strategy.
- Local recreation and international tourism are important sources of income, and provide wider intangible services such as spiritual experience and aesthetic appreciation, which would be lost with conversion.
- Water provision and regulation is of great importance to the region.
- The likely economic benefit of conversion to small-scale agriculture suggests that this value is relatively low.

| Service | Current service assessment | Expected trend |
|------------------|--|----------------|
| Carbon | High – Park provides significant carbon storage and sequestration | ↓ |
| Tourism | High – local recreation high (close to capital). Foreign tourism significant | ↓ |
| Water | High – 3.2 million people rely on catchment for 59% of water supply. | → |
| Cultivated goods | Low – very little cultivation inside the Park | ↑ |

However, as with many protected areas, issues over inequitable distribution of benefits and alleviating poverty needs to be addressed. For example, establishing a buffer zone around the Park could deliver 30–50% of the Park's income to local communities and may provide an economic incentive to support greater protection of this National Park.