



Cultural Services:

The cultural services are non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences, that include ecotourism, education and research, religious pilgrimage and aesthetic beauty.

Recently Panchase has received government attention to develop tourism in the area. Tourism being a non consumptive economic activity in the nature based area will contribute to biodiversity conservation and uplifting the economy of the local population. Panchase has become an easily accessible destination reachable by dirt roads linking all the VDC's and to the Bhanjyang – the core of the area. There is a good network of trekking trails criss-crossing the Panchase forest.

Panchase is very close to one of the major tourist hubs of Nepal – Pokhara, where hundreds and thousands of tourists and trekkers arrive every year. The spill over effect of this number will have a positive impact in Panchase provided a sound eco-tourism management plan is implemented. The home stay program in the area is in a preliminary stage, although their services somehow meet the basic conditions required by the government policies.

The Balachatardashi (the no-moon fortnight in December) is a major festival in the area. Some 25-50 thousand pilgrims every year through the area for about three days during the festival. They include all ethnic groups from various parts of the country and also from India.

Panchase has turned to be an educational and inspirational centre for many visitors from outside. The students, teachers and researchers have started frequenting the area for study tour and excursions in large groups. Several research work on flora and fauna, forestry, soil conservation, agriculture etc are conducted by students of forestry and other fields in the Panchase area. To attract the visitors for educational and recreational purposes many historical ruins and other landmarks need to be labelled on the basis of scientific research.

Supporting services:

Some part of the Panchase area is nearly undisturbed due to highly inaccessibility terrain such as steep slope. The Panchase has established two forest sample plots in Arthar and Bhadaure on the northern slopes of the core zone to study natural regeneration, bio-mass production and other aspects focusing on rhododendron and orchid species. The area is home to 589 species of flowering plants (107 medicinal herbs, 94 orchids, and five rhododendrons), 56 fungi and 98 ferns. Similarly, the area provides natural habitats to 24 species of mammals (including 8 species of bats) and 262 species of birds.

The surface runoffs originating from the forest lying in the ridges of the area bring fertility in the agricultural lands in the fringes. Farmers collect leaf litters from the forests to enrich soil fertility in the farmland.

The Great Himalayan Range helps to trap the moisture laden air that emerges from Bay of Bengal during monsoon. This is a blessing for this part of the world for vegetation and crops. Annapurna Range lies in the middle of the 2500 km Himalayan Arc. Probably because of its position, the area falls in the country's highest rainfall location, with 5496.8 mm annual rainfall in Lumle of Kaski district. Whereas, the southern part of Panchase receives lower than the northern part that is around 1930 mm in Walling of Syangja district. Although rain fed, most of the major streams and rivers originating from the area are perennial.



Ecosystem Services

For Further Information, Please Contact

Project Management Unit

Forestry Complex. P.O.Box.24417
Babarmahal, Kathmandu, Nepal
Tel: 01-4218458, Fax. 01-4225553
Email: info@eba.org.np, Web: www.dof.gov.np/eba

Field Office

Pame, Pokhara, Kaski, Nepal
Tel: 061621553

Implementing Partners



Supported by



Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Ecosystem Services

Ecosystem services are benefits human populations directly or indirectly derive from ecosystem functions (Costanza et al., 1997). These include provisioning services such as food and water, regulating services such as flood and disease control, cultural services such as spiritual and recreational benefits, and supporting services, such as nutrient cycling that maintains the conditions for life on Earth. There are strong linkage between the services provided by ecosystem and human well-being. For example, freshwater provided by the ecosystem will directly impact the health of humans. The supply of pure and clean water will enhance the health condition whereas the impure and polluted water will cause different types of water borne diseases like cholera, dysentery, diarrhoea, typhoid, etc. Besides ecosystem services, other environmental as well as economic, social, technological, and cultural factors also influence human well-being.

Ecosystem Services Trade-off

Trade-offs between ecosystem services arising from management choices made by humans can change the type, magnitude and relative mix of services provided by an ecosystem. Trade-offs occurs when the provision of one ecosystem service is reduced as a consequence of increased use of the other ecosystem. In some cases, trade-offs may be an explicit choice; in others, trade-offs arise without premeditation or even awareness that they are taking place (Swallow et al. 2009).

In nature, each and every component is inter-dependent. The different services that are obtained from ecosystem are also inter-linked and dependent with each other. As a result, the use of any specific services can enhance or deteriorate the other services whereas it also creates synergistic conditions of both services. These all conditions are dependent on the application of management practices of certain ecosystem. Therefore, the use of specific services leading to increase or decrease of other services is known as ecosystem services tradeoffs.

For example:

- Promotion of tourism in the forests area results in decreased supply of timber, fuel wood, litter. Further, it may also have negative impacts on the water resources and air.
- The development activities like hydropower, road, mining etc can also reduce the supply of different types of ecosystem services such as timber, fuel wood, air regulation, fresh water, etc.
- Promotion of any cultural or religious site within the forest will also increase other services such as carbon sequestration, control of soil erosion, etc.

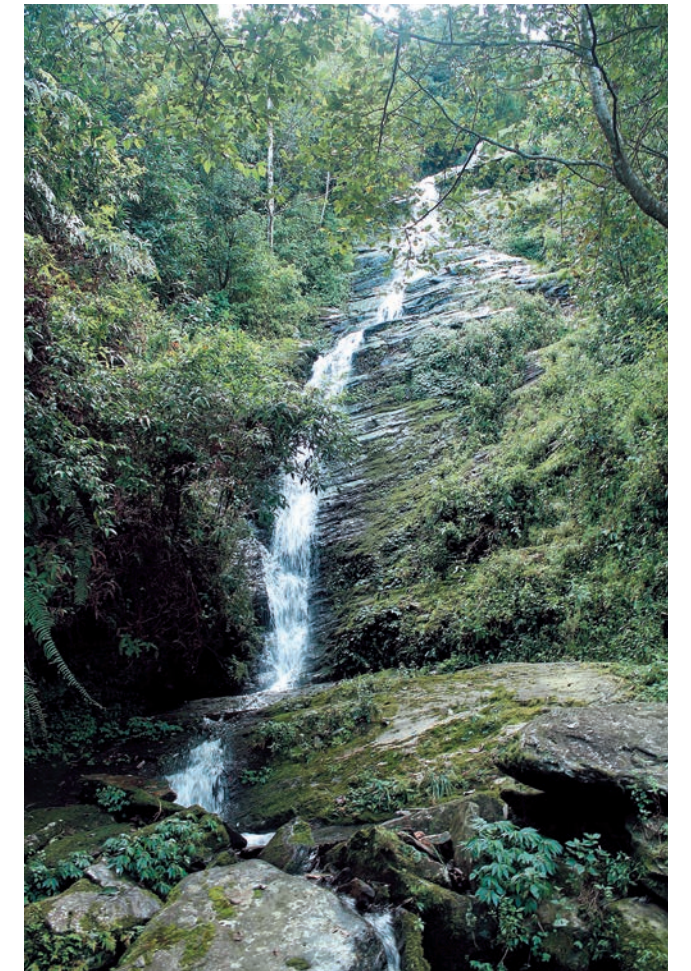
The similar type of examples of ecosystem services trade-off must be thoroughly analysed. The priority must be given to those services which will cause minimal negative impacts on other services. Similarly, the decision must be taken to the use or promotion of those services which have synergistic impacts on other services. For this, the rigorous scrutiny of the trade-off in the Panchase watershed must be carried out for prioritizing the important and useful ecosystem services.

slopes are generating huge amounts of silts and debris, and it is necessary to address road management and soil conservation issues.

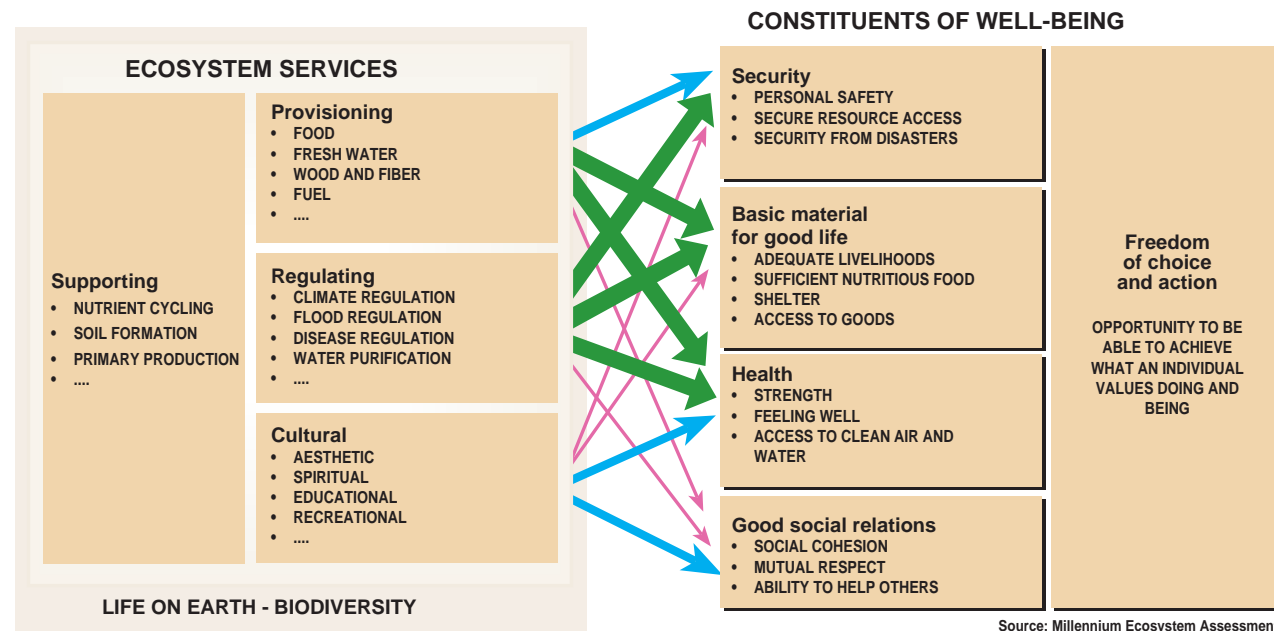
Forests ecosystems help prevent impurities—mostly from nonpoint source pollution—from entering streams, lakes, and groundwater in a number of ways. Root systems of trees and other plants keep soil porous and allow water to filter through various layers of soil before entering groundwater. Through this process, toxins, nutrients, sediment, and other substances can be filtered from the water. The core zone of the protected forest area (68 per cent) and buffer zone of community forest area (31 per cent) have played an important role in water purification and waste treatment before entering it into adjoining streams and water bodies.

Forest vegetation cover plays an important role in soil retention, adds organic matter in the soil through organic carbon decomposition, add nutrient in the soil through nutrient cycling and biological nitrogen fixation and minimize nutrient loss through soil erosion. These biogeochemical activities in the Panchase forest through soil and plant interactions improve and regulate soil quality. Additionally, the forests of the area produce nutrients in the forms of humus and leaf litters that are transferred to the cultivated lands during rainy season. The forests floor produces rich nutrients that flow with surface run off, and later some amounts are trapped in the cultivated fields. Many of the native trees root absorbs the nitrogen from the atmosphere and turn it into the nutrients.

The surrounding nine VDCs of the Panchase Protected Forest area are heavily dependent upon agriculture. Growing vegetables like cabbage, mustard and radish, fruits like orange, peach and pear and cereal crops like maize, paddy, millet, wheat and buckwheat are the major farming activities of the area. The good habitat of the different insects and birds in the Panchase area possibly help in pollination and increased crop production. Among the bird species yuhinas, leaf birds, sibia,



myna, sunbirds and flower peckers are chief pollinators of the flowering/fruited trees found in the Panchase area. The wild and domestic honeybee contributes to the pollination of the mustard flowers, buckwheat flowers and fruited trees. The Forest ecosystem changes affect the distribution, abundance and effectiveness of pollinators such as bees, birds, and different insects.



ARROW'S COLOR: Potential for mediation by socioeconomic factor

ARROW'S WIDTH: Intensity of linkages between ecosystem services and human well being



Regulating services:

One of the benefits obtained from the regulating services of ecosystem is air quality maintenance. The forest ecosystems contribute to the improvement of the local and regional air quality. The Panchase forest area is close to Pokhara, Putalibazar and Baglung cities and towns and nine VDCs of Kaski, Parbat and Syangja districts. The forest and grassland coverage in protected forest area can significantly contribute to improve air quality of those towns and villages.

The climate regulation is another important aspect of ecosystem service. Ecosystems influence climate both locally and globally. At the global scale, ecosystems play an important role in climate by either sequestering carbon or emitting green house gases. At local scale, changes in land cover can affect both temperature and precipitation. Considering the comparatively small land mass of the Panchase area, local level forests can provide shade, reduce air temperatures and create cooler microclimates in land and water bodies.

The water regulation function of ecosystem services controls the timing and magnitude of runoff, flooding, and aquifer recharge. All this can be strongly influenced by changes in land cover, including the water storage potential of the system. The Panchase forests affect the timing and magnitude of water runoff and water flows in the major streams of this area such as Aandhikhola, Modikhola and Harpankhola.

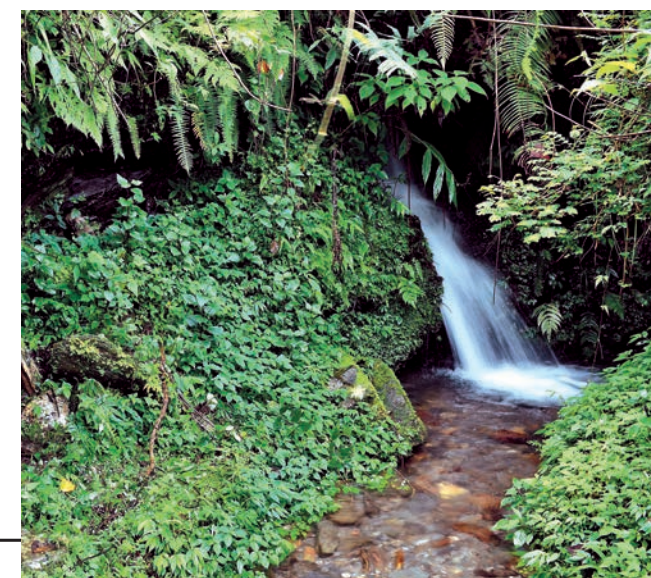
The forest ecosystems act as sponges, intercepting rainfall and absorbing water through root systems. Water is stored in porous forest soils and debris, and then slowly released into surface water and groundwater (Cappeilla et al, 2005). Through these processes, Panchase forests recharge groundwater supplies, maintain base flow stream levels, and lower peak flows during heavy rainfall or flood events. The Panchase area is highly significant for recharging the aquifers and springs resulting in continuous flow of the streams that eventually merge into the river Modi and the Harpankhola feeding Phewa Lake.

Panchase receives nearly 6000 mm rain in the monsoon season from June through September, and some snow in winter. During the spring season from March through April, the water flow in the streams is minimal. Although high rainfall occurs in this area during the monsoon period, the forest ecosystem possibly regulates lower peak flows during dry season.



Due to the effect of climate change the monsoon season in the past few years has been reduced arriving erratically and behaving unpredictably. When all these effects are taken together, the phenomenon of 'too much water, too little water' becomes more than just normal ecological occurrence and turn into a real and serious problem for the country and people.

Forests help keep soil intact and prevent it from eroding into nearby water bodies. By intercepting rain, a forest canopy reduces the impact of heavy rainfall on the forest floor reducing soil disturbance. Leaves and natural debris on the forest floor can slow the rate of water runoff and trap soil washed away from nearby fields. Tree roots can hold the soil in place and stabilize stream banks reducing soil erosion. With good coverage of land by forests, the upper part (core zone) of the Panchase area is well protected in terms of soil conservation. But the rough roads constructed by simply cutting the steep



Ecosystem Services of Panchase

Provisioning services

A vast range of food products are obtained from the ecosystem in Panchase. The major food crops cultivated in the area are maize, millet, potato, rice, wheat, vegetables and fruits. Similarly, animals provide milk, curd, ghee, etc. But the agricultural productions are in declining trend, mainly due to the unavailability of human resources.

The area is rich in wild foods, especially fruits, mushrooms, ferns, shoots, tubers, roots and medicinal and aromatic plants, but there is no specific information in terms of yields, and distribution and seasonality of these products. There is a huge potential and prospects for commercial production of honey as the entire area is rich in wild flowering plants, and the market of Pokhara city is very close. But except for a handful of farmers, majority of them produce honey in a traditional way, only for domestic consumption.

Local people gather wood, jute, hemp, silk, and many other products from the area. Panchase is rich in variety of raw materials for cottage industries of traditional papers, bamboo baskets and other products. NTFPs like mushroom, orchid are also found in the area. Further, the fuel like dung, charcoal, firewood and other biological materials serve as sources of energy. Currently most of the firewood and fodder requirements have been met with the supplies from community forests of the fringe area.

The upstream of Pame can be a potential area for mining sands and gravels brought by the monsoon rain. If a set of environment friendly guidelines of mining activities are developed it will reduce siltation in Phewa lake and thus contribute in its conservation.

The Panchase watershed is rich in perennial sources of drinking water. Most of those sources have been traditionally managed and maintained, and in several places the modern management also had been introduced. The local communities have identified their sources, built headwork and laid pipelines with the technical supports availed from the VDCs. They also have



formed drinking water management user's committees for regular inspection and maintenance.

The residents of the towns and villages beyond the watershed boundary of the Panchase are also depend on the local streams and other sources of Panchase for drinking water. But both upstream and downstream residents are not much aware of sharing benefits from each other. The concept of Payment for Ecological Services (PES) would support them in the future management.

The local communities have tapped several sources of water from the streams originated from the Panchase area for irrigating their farmland. But the number of households and area of land benefitted from irrigation services have been very low, nearly 2000 households and 550 hectares only. Irrigation in the farmland is mostly rain fed. Managing water for irrigation will help the subsistence farmers to have additional crop and better yield than usual.

Mountain water is a source of hydroelectricity power. But, except in one village, local people in other places are not aware of feasibility of generating micro-hydro electricity from the local streams.

