Chapter 9. Conclusions and recommendations

In the present study I assessed the value of the provisioning (biomass and water) and cultural (both recreational and religious) services provided by the forested ecosystem of Nanda Devi Biosphere Reserve (NDBR) and their contribution to human wellbeing. Biomass, provisioned by natural forests of NDBR and its use by local communities, has been quantified using questionnaire survey and entry point method. Provision of freshwater by natural forests and their quantity used by nearby local communities was quantified using timed volume method and questionnaire survey. Both the provisioning services were valued using market price method.

It was found that contribution of oak and moist temperate deciduous forests to the NTFP (kg/hh/year) was higher and hence these two forests contributed more to the direct household income (Chapter 3 and 4). The availability of forest resources and their contribution to local economy varied with the condition and type of forest, and distance between user household and of the source forest. It was observed that the dependence on resources was decreased with the increased household income. The high dependence on natural resources and high visitation rate to forests, often lead to the incidences of human-wildlife conflict in the area. The extent of human-wildlife conflict was found to be reducing with the increased in household income and level of education. As the NDBR hosts a large number of religious and recreational tourists, eco-tourism can be developed to generate alternative livelihood for local communities i.e. economically and educationally well-off households were found to be more tolerant towards the loss caused by wildlife. This will help in reducing the direct dependence on forest resources hence leading to restoration of degraded and restoration of less degraded forests.

To value recreational services, I used zonal travel cost method approach. Limited number of studies have linked forest conditions to human wellbeing, which has been addressed in the present study. It was found that the religious tourism create more livelihood opportunities than the nature based tourism as the religious tourism activity does not require much economic inputs and specific skills. The consumer surplus was lower for the religious tourism, although, it attracts more tourists and provides more opportunities to the local people, its less elastic nature affect the consumer surplus. It was also found that religious tourism was dominated by the affluent outsiders (especially large hotel owners and travel agents) and a larger part of
the benefit of tourism goes outside of the area. Recreational and nature-based tourism, although, provide opportunities to few people but contribute more to average household income, by creating markets for local agricultural and livestock products.

Both types of tourism were found to be limited to the specific valleys and pockets of the areas hence generating only niche jobs for the local people. Channelizing the tourists flow to less known religious sites and nature-based attractions, will provide livelihood opportunities to the deprived villagers by involving them in tourism related activities and will ensure equitable benefit sharing. New attraction for nature-based and culture based tourism can be develop to involve more people. This will not only reduce the direct dependence but also will reduce the concentrated pressure of tourists and local people on natural resources.

It was found that people who are being benefitted more from the natural resources are supportive and willing to participate in conservation and management practices, but are unaware about the indirect contributions of natural resources. The attitude of people is found to be associated with their education which is shaping the attitudes positively. People were also found to be aware about the changes occurring in the environment of their area. They mainly attribute these changes to the unplanned and rapid developmental programs and were found to be affected by the consequences. It was observed that the environmental, health and social wellbeing depletes with degradation of the natural resources in the vicinity. Degradation affects the social relation in a village as people have to compete for the limited resources. It was found that, although, resources like *Cordyceps sinensis*, which have high market price and contribute significantly to the income of dependent household, often is a root cause of clashes between villagers and leads to economic discrepancy in the area.

Nature-based recreation and tourism is touted as a sustainable means to preserve natural resources while providing a diversity of economic benefits to local communities and national economies (Gossling, 1999; Wunder, 2000; Wood, 2002). Recreation is one of numerous services provided by ecosystems. The value that users attach to nature recreation can be substantial although it is not reflected by market prices and is provided as a quasi-public good. On a practical level, taking these values into account can make a significant difference in the management, conservation and planning options for nature recreation. On a research level, gaining knowledge on the range of values attributed to ecosystems, dependent on population characteristics, quality and quantity of the natural resource as well as specification of demand models,
are essential when assessing general trends and impacts on the use of forests for recreation. Tourism is emerging as the second largest foreign exchange earner for the country even though the mainstay of the tourism industry in India continues to be domestic travelers (Government of India, 2002). The barriers to improved performance of the tourism industry in India include its distance from affluent tourist markets, lack of facilities, relatively limited professionalism in the industry and the ‘image’ of the country (e.g. it is not a holiday location, it poses safety concerns and it has inadequate services) (Government of India, 2002). As well, the emphasis of the central government on other development issues has left many regions to plan for tourism with little central help or coordination. Cultural heritage sites typically possess public goods characteristics, and thus nonmarket valuation methods must be employed to measure the benefits that they provide to visitors (Poor and Smith, 2004). Nature-based tourism, particularly in protected areas, can create uneasy interfaces between the business models of the tourism industry and the “business models” of natural resource managers (Fennell and Smale, 1992; Shultis and Way, 2006). As a direct result of these interfaces, formal and informal relationships are created between tourists, tour operators and natural resource managers. These relationships sometimes described in the literature as public–private partnerships, form frameworks around which tourism is often organized, formally and informally, in protected areas (Buckley, 2002).

The continuous provision and quality of the ecosystem services is determined by the ecological health of the source ecosystem (Fig. 9.1). The ecosystem’s health is governed by bio-physical processes and affected by land use policies, affecting the economy and development. Ecosystem, economy and societal structures are three main components that form the mainstay of the sustainability debate. Of these, economics – the study of how humanity provides for itself (Heilbörner, 1968), is the most critical factor undermining the sustainability of the natural resources, since humanity provides for itself by standing on the shoulders of natural systems (Fisher et al., 2008). Thus, integration of economic and ecological sciences into operational decision support system is fundamental for global conservation and sustainability (MEA, 2005a). Ecosystem degradation is argued to be linked with combination of information, market and policy failures, since these failures results in under pricing of scarce resources and environmental assets. The provisioning services provided by the ecosystems have been central to economic and financial decisions and transactions
whereas the services, which cannot be translated into direct tradable goods have largely been ignored by the policy planners, till recently. As ecosystem services are neither fully captured by the markets nor adequately valued in monetary terms, they do not receive due importance in policy decisions (Costanza et al., 1997; Costanza et al., 1998; Bernard et al., 2009; TEEB, 2008, 2009, 2010). Provision of assigning market value for ecosystem services proves to be useful while measuring trade-offs between society and the nature when natural resources can enhance human welfare in a sustainable manner (Pagiola et al., 2004; Dasgupta, 2009, 2010; DEFRA, 2010; United Kingdom National Ecosystem Assessment, 2010). Existing markets have ‘failed’ to conserve ecosystem services because they lack mechanisms to compensate resource users and thus do not send signals that encourage participants to use and manage natural resources sustainably (Whitten and Shelton, 2005; Arifin and Hudoyo, 1998). There are many other proximate factors such as, demand on existing services, the opportunity costs of conserving services and unclear property rights, which add to the complexities of understanding of the value of ecosystem resources and results in over use of the common property resources (Gunningham and Young, 1997; Collins and Whitten, 2007; Bromley, 1990; de Groot et al., 2009). As a result, there is suboptimal investment in conservation and management leading to ecosystem deterioration (MEA, 2005a).

Ecosystem services valuation thus has become a crucial tool to tackle information failure, with the aim to influence policy makers and managers at all spatial scales, in their decision for wisely placing natural resources under various management options. Ecosystem service valuation has gained major recognition since Millennium Ecosystem Assessment (2005). Now The Economics of Ecosystems and Biodiversity initiative by United Nations Environment Programme and European Commission, and the set-up of the Inter-Governmental Platform on Biodiversity and Ecosystem Services testify the importance of ecosystems, by placing monetary value on the ecosystems (Ninan and Inoue, 2013).
9.1. Failure towards valuation and conservation of ecosystem services provided by NDBR

9.1.1. Market failure: is it the case with NDBR?

The markets for goods and services are present for provisioning and cultural services but the values assigned to them are not actual value and have not been revised recently (Table 9.1). Due to absence of market for these services from the NDBR, these do not receive due importance in policy decisions (Costanza et al. 1997; Costanza et al. 1998; Bernard et al. 2009; TEEB 2008, 2009, 2010). Existing markets fail to conserve ecosystem services because they lack mechanisms to compensate resource users and thus do not send signals that encourage participants to use and manage natural resources sustainably (Whitten and Shelton 2005; Arifin and Hudoyo 1998) (Table 9.1).

9.1.2. Information failure – is it the case with NDBR?

The state and national government recognizes NDBR as a biodiversity rich area with unique cultural and natural heritage, which are interlinked and complex. This has lead
to the designation of the area as UNESCO’s world heritage site. Also, the services (especially regulating services) obtained from this region and their linkages with human welfare are being recognized by national and international level legislative measures, such as National Mission on Himalayan Ecosystem (2009), Green India Mission, Green Bonus and the Japan International Cooperation Agency. Also, at local level people are highly aware of the direct services (fuel wood and fodder) provided by the NDBR ecosystem. But majority of the tourists visiting the pilgrimage sites in the NDBR were not aware of the protection status and objectives of protection for the region. One third of the visitors did not know how the conservation status of the area will improve the condition of natural ecosystems.

9.1.3. Intervention failures
Policies for ecosystem services valuation are influenced by different sectors as implemented through different government agencies, which often work in isolation. Often the objectives of these sectoral developmental plans are in contradiction to the forest conservation objectives. The National Biodiversity Action Plan 2008 and National Mission for Sustaining Himalayan Ecosystems 2009, provide measures for reducing the environmental impacts of production and use of ecosystem goods and services. These legislative measures emphasize the need for incorporating the costs of depletion of natural resources into the decisions of economic actors to reverse the tendency to treat these resources as “free goods” and to pass the costs of degradation, thus integrating environmental concerns in economic and social development.

9.1.4. Drivers of degradation of ecosystem services
The changes in ecosystems have led to substantial net gains in human well-being and economic development, but these gains have been traded off against increasing degradation of many ecosystem services. Population growth, economic activity, cultural factors, technological development and revolutionized social-political-cultural dynamics (especially change of most of the rural to urban lifestyle) are the most important factors that have contributed to direct ecosystem degradation reducing the provision of ecosystem services (MEA, 2005b; Bullock et al., 2011). Discrepancy in the economic condition of people and communities and socio-political setup of the
area affects the environment and changes the flow of ecosystem services at the local and regional level (Chazdon, 2008). Land use classes change (from natural ecosystem to human modified land use classes), expansion of agricultural land, industrial use of natural resources (McNeely, 2010), introduction of alien species (Pimentel et al., 2000; Vilà et al., 2009), rapid growth in human population, industrializations and urbanization (UNEP, 2006) has reduced ability of natural ecosystems reducing to provide ecosystem services continuously (Peters and Lovejoy, 1992; Schneider and Root, 2002).

In the NDBR the main drivers of change were found to be developmental activities including hydroelectric project, road construction, change from locally sufficient economy to market based economy. The developmental programs have not only put extra pressure on the local biological diversity and loss of agricultural and natural ecosystems affecting the provision of services provided by these land use classes. New development projects have provided new livelihood opportunity to the local people and have empowered them to avail the services of different sectors which have changed the societal setup of the area and lead to the social discrepancy.

9.2. Recommendations for reducing the vulnerability of local communities

9.2.1. Market Based Instruments

Presently the market for services provided by NDBR are nascent as demand on existing services, the opportunity costs of conserving services and unclear property rights, add to the complexities of understanding of the value of ecosystem resources and results in over use of the common property resources (Gunningham and Young 1997; Collins and Whitten 2007; Bromley 1990; de Groot et al. 2009). However, yet we have given estimate of the ecosystem service value of NDBR, which can be used for measuring trade-offs between society and the nature when natural resources can enhance human welfare in a sustainable manner. Regulation and clarification of property rights (ownership and use rights) is considered crucial while dealing with the issue of market failure arising due to notation of ‘free goods’ and ‘easy access’. Market based instruments (MBI), which aim at behavioral change by changing prices in existing markets can be applied in case of NDBR. MBI can be price based or quantity based market instruments, such as environmental taxes, charges, fees and
penalties that would internalize negative externalities, payment for ecosystem services and rewards for conservation friendly behavior to address positive externalities. Other MBI aims at making existing markets work better through information and transaction costs (Collins and Whitten, 2007). Some of the MIB, such as taxes, tolls, fees, permits, administrative charges can be levied.

9.2.2. Information measures

Though at the scale of governance, the officials in the policy making, scientific community are well informed of the services provided by the NDBR ecosystem, but at grass root level the visitors (non-locals) did not know the significance of protecting the region as National Park and Biosphere reserve. It is important to target this sector at grass root level, as demand of expanding the tourists’ related infrastructure from this sector could become one of the main reasons for degradation of this ecosystem and thereby reducing the capacity of this ecosystem to provide the services. Through the use of suasive instruments, such as education, extension, outreach, research, and monitoring people should be informed about the links between ecosystem goods and services to climate change and human welfare.

9.2.3. Governance structure for maximizing benefits to local people

Nature based tourism in and around PAs has potential to augment equitable livelihood opportunities for forest dependent communities, thereby eliciting local participation in biodiversity conservation around PAs (Wunder, 2000; Karanth and Nepal, 2011; Nepal and Spiteri 2011). Tourism can create local constituency for conservation by compensating local communities for the cost incurred by them (Sekhar, 2003; Sebele, 2010). Tourism also helps in diversification of livelihoods by creating alternatives for local communities, reducing pressures on the natural resources (Neto, 2003). In case of NDBR, prominent pilgrimage site in the proximity of the PA has negatively affected the ecosystem leading to commercialization, where outsiders accrue the monetary benefits of tourism, as they have resources to make preliminary investments. Because of the large number of tourists; 10-12, 00,000 tourists within a four month period, there is a concomitant increase in the number of tourism staff (mostly outsiders) which also has an adverse impact on the habitat. However, tourism
has also help reduce dependence of local communities on forest resources by providing alternative livelihoods but the involvement of local communities in tourism is indirect and limited to insignificant monetary gains. The local communities have little control on the management of tourism and the monetary flow from therein. In case of religious tourism in Badrinath and Hemkunt, the non-locals viz., Hemkunt Sahib Trust, the tour operators, the infrastructure owners control the monetary flow. The locals are involved in petty activities with little monetary gains. Local and other institutions i.e. forest department, NGOs, religious trust work nearly independent of each other. Also linkages between tourists and the local communities are minimal, resulting in reduced opportunities for the local community to derive monetary gains. Regulated and controlled tourism in core areas has helped in generating income for the local community, yet the benefits here are skewed in favour of the village elite, because mechanisms to ensure equity are absent. However, the benefits of mass tourism from the religious sites accrue mainly to the outsiders and have negative impacts on social relationships.

The efficacy of vertically integrated governance structure has been advocated to be the ideal model for public participation (Pierre and Peters, 2000), and only recently studies have started focusing on hierarchical governance in tourism. A layered and complex institutional arrangement, created with the participation of multiple agencies working in close coordination is able to channel the benefits of tourism to local people. Such institutions are capable of adapting and responding to the challenges of a globalized economy, but the government institutions need to evolve more effective and stricter mechanisms to deal with unforeseen challenges (UNDP, 2010) (Table 9.1).
Table 9.1. Ecosystem services provided by NDBR landscape and their markets

<table>
<thead>
<tr>
<th>Services and values</th>
<th>Market existing</th>
<th>Market Possible</th>
<th>Level of difficulties in establishing market</th>
<th>Spatial scale of Benefits</th>
<th>Spatial scale of Market</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Provisioning</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh water</td>
<td>Present</td>
<td>Yes</td>
<td>Easy</td>
<td>Regional, National (water for domestic and agricultural use, hydroelectric production)</td>
<td>Regional, National</td>
</tr>
<tr>
<td>Biomass</td>
<td>Present</td>
<td>Yes</td>
<td>Easy</td>
<td>Local</td>
<td>Local</td>
</tr>
<tr>
<td><strong>Cultural</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreation</td>
<td>Present</td>
<td>Yes</td>
<td>Easy</td>
<td>Regional, National</td>
<td>Regional, National, International</td>
</tr>
</tbody>
</table>
9.3. Specific recommendations

On the basis of the results of the present study following specific recommendations are made:

1. Forest resources have significant contribution to the local economy of the NDBR landscape. This is almost comparable to the contribution of the agricultural output. Policy and management sector have to recognize this.

2. Most of the ecosystem services generated from the forested ecosystem of the NDBR, due to their off-site nature, do not benefit the local communities. To capture ecosystem services such as freshwater, site specific strategies for instance storing and distribution channel should be developed to channelize the functional output of the streams to the villages which are not able to use the services due to terrain and distance from the water resources. Micro-hydel projects can be developed as they help and support local communities more than bigger hydro-electric projects.

3. Almost 100% of the households surveyed were found to be dependent on the forests; this is impacting the quality of forest and also hampering their ability to provide other ecosystem services. Direct dependence on natural resources can be reduced through providing alternative non-forest based livelihoods such as nature and culture based tourism and ensuring equity in benefits.

4. The social and economic vulnerabilities were found to result from lack of better education. Educational facilities, especially vocational training, should be provided to diversify livelihoods.

5. Tourism is clumped at few valleys and pockets in the areas hence, providing niche based jobs such as tourist trekking guide and porters, benefiting only small number of residents. The benefits can be shared by introducing and developing tourist attractions like farm tourism, cultural tourism, homestays.

6. Onsite tourism related leakages occurring due to economic capitalization should be channelized to local communities based business sectors e.g. homestays, market for local handicrafts.
7. Local varieties of crops should be promoted and subsidized (MBIs) for its popularity in nature-based tourism. This will help in maintaining the agro-biological diversity and food security particularly for women and children.

8. Traditional crops production will help in reducing exploitation of natural resources for cash crop based agriculture.

9. Most of the cases of crop depredation reported by respondents were for cash crops, promotion of local varieties can help to reduce the loss caused by such conflict cases.

10. Payment for ecosystem services strategies like, Grain for Green Programme (also known as Grain for Tree policy), REDD+, can be adopted and developed to ecological protection and poverty alleviation of the dependent community.

11. Institutions should be identified to develop integrated plan to ensure the conservation of natural resources and continuous flow of ecosystem services, and for the equitable benefit sharing from conservation of natural resources among different stakeholders.

9.4. Conclusions

Notwithstanding the limitations cited earlier, findings of this study establish that the ecosystem service contribute significantly to the human well-being in the region. Governments and societies faced with the development versus conservation dilemma need to factor in such benefits while taking decisions that impact on natural resources and ecosystems. Realization about these significant intangible benefits will help in more informed decisions and policies that will help conserve forest ecosystems and the services they provide as well as promote human well-being and sustainable development. Most conservation plans focus on biodiversity and ignore the importance of ecosystem services (Singh, 2002). Using biodiversity approach may neglect areas that are degradation prone and crucial for human welfare. Thus, valuation of ecosystems and the assessment of the distribution of costs and benefits of conservation are essential for sustaining ecosystem services. There are few studies dealing with ecosystem service valuation in mountain regions leading to a lack of information of opportunity costs of putting land under different uses viz. conservation, agriculture, development, tourism.
The informatory, regulatory and market instruments do not function in isolation. For sustainable environmental governance, they need to have positive synergistic interactions. To manage or regulate a resource’s use, it is important to have information about the resources’ quantity, quality and their economic worth. Resource uses create markets and vice-versa, which are regulated by pricing and incentive mechanisms. Natural resources are further impacted by developments in the other sectors. Hence, presence of all three instruments is important for policy or legislative measures to achieve sustainability in managing natural ecosystems. A policy portfolio approach combining several measures promises to prove the best choice for biodiversity protection (Ring and Schroter-Schlaak, 2011). Sustainability of the ecosystem resources across states of the Indian Himalayan region calls for proactive management that blends anticipation, adaptation and preparation for future environmental challenges such as escalating population, climate change, shrinking natural resource base and natural disasters. An adaptive and integrated policy approach, both at national and local levels, that is able to address ecological and economical well-being of the communities inhabiting the IHKH and develops their stakes in conservation of these vulnerable and fragile ecosystems is called for.