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DECLARATION

I, Jeewan pandey, hereby declare this thesis "**Payment for Ecosystem Services (PES) Schemes in Shivapuri Nagarjun National Park"** is my own original work and all other sources of information used are duly acknowledged .I have not submitted it or any of its part any other university for any academic award.

……..

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ACRONYMS

ADB	Asian Development Bank
ANSAB	Asia Network for scientific Agriculture and Bio-Resources
AR	Afforestation and Reforestation
BOD	Biological Oxygen Demand
BS	BikramSambat
CDM	Clean Development Mechanism
CF	Community Forest
CFM	Community Forest Management
CFUG	Community Forest User Group
CFUG	Community Forest User Group
COD	Chemical Oxygen Demand
CVM	Contingent Valuation Methods
DDC	District Development committee
DFCC	District Forest Coordination Committee
DFO	District Forest Officer
DFO	District Forest Office
DFSCC	District Forest Sector Coordination Committee
DoF	Department of Forest
DWIDP	Department of Water Induced Disaster Prevention
ES	Ecosystem Services
FAO	Food and Agriculture Organization
FCPF	Forest Carbon Partnership Facility

FECOFUN	Federation of Community Forest Users Nepal
GHGs	Green House Gases
GIS	Geographical Information System
Ha	Hectare
HH	Household
HP	Horse Power
INGO	International non-governmental organization
ICIMOD	International Centre for Integrated Mountain Development
IFO	Illake Forest Officer
IPCC	Intergovernmental Panel for Climate Change
IRR	Internal Rate of Return
IUCN	International Union for Conservation of Nature
KP	Kyoto Protocol
LDO	Local Development Officer
LSGA	Local Self Governance Act
MEA	Millennium Ecosystem Assessment
MPFS	Master Plan for Forestry Sector
NEA	Nepal Electricity Authority
NGO	Non-Governmental Organization
NPV	Net Present Value
PES	Payments for Ecosystem Services
Ph	Percentage of Hydrogen Ion
PES	Payments for Ecosystem Services
RD	Regional Directorate

REDD	Reducing Emission from Deforestation and Degradation
RP	Range Post
R-PIN	Readiness Plan Idea Note
R-PP	Readiness Preparation Proposal
SP	Stated Preferences
SNNP	Shivapuri Nagarjun National Park
ToR	Term of References
UNEP	United Nation Ecosystem Program
UNFCCC	United Nations Framework Convention on Climate Change
VDC	Village Development Committee
VDC	Village Development Committee
WB	World Bank
WHO	World Health Organization
WTA	Willingness to Accept

ABSTRACT

Payment for Ecosystem Services (PES) is a mechanism to improve the provision of indirect Ecosystem services in which ecosystem services providers receive direct payments from the users of the services. Being a mid-mountain representing protected area, Shivapuri Nagarjun National Park (SNNP) has secured rich biodiversity and potential of ecosystem services. The SNNP is providing regulation fresh air and recreational services, aesthetic values and research opportunities. Drinking water potential is the key issue to assess and build mechanism for the payment of its values to the conservation entities. Ecotourism too have the very high Economic potential.

So, the study aimed to explore the economic potentiality of ecosystem services. It assessed the visitor's willingness to pay for ecosystem services, trend of income and expenditure of last 7 years, future potentiality of PES schemes implementation, and different maps demonstrating economic potentiality. It explored the organizational and institutions strategies to implement the plan. The study was conducted in Kakani area, Nagarjun area, Sundarijal area, Budhanilakantha area of SNNP. For primary data 100 visitors were interviewed using questionnaire. In addition, the secondary data were collected from different year annual reports of SNNP and DNPWC also from management plans and drinking water records. Collected data were analyzed economically, statistically, temporally and spatially.

It was found that both Nepali and foreign visitors have high willingness to pay for ecosystem services including different wildlife. The trend of income seems to be increasing from NRs 19.9 million in 2008/2009 to 49.96 million in 2014/2015. There is high potentiality of PES schemes was determined by calculation of NPV, B/C ratio and profitability index (PI). Similarly, maps demonstrate the physical condition of site and things to be considered during the PES schemes implementation. .

Key words: Ecosystem services, Economic valuation, visitor's willingness, Income trend, Ecotourism, Economic potentiality

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CHAPTER I INTRODUCTION

1.1 Background

Payment for Ecosystem Services (PES) is a mechanism to improve the provision of indirect Ecosystem services in which providers of Ecosystem services receive direct payments from the users of these services. The basic principles of PES are: beneficiaries of Ecosystem services pay for their provision; and providers of Ecosystem services get paid to provide them. PES scheme includes five basic components: well-defined Ecosystem services, at least one buyer, at least one Ecosystem service in the transaction, at least one service provider, and conditionality (Wunder, 2005).

Ecosystem services are hydrological services, carbon sequestration, biodiversity services, recreational services, landscape or scenic beauty. Ecosystem valuation is largely based on the assumption that individuals are willing to pay for Ecosystem gains and conversely, are willing to accept compensation for some Ecosystem losses(Sander, 2006). The PES approach establishes an institutional mechanism through which the provision of traditionally non market goods and services like those generated from conservation and effective natural resource management are incentivized. This ensures that those who benefit from the Ecosystem services pay those who provide the services (ERI, 2010) .

Globally PES consists different Projects under implementation such as "Eco markets Project" ($33 million WB + $8 million GEF) in Costa Rica, "Regional Silvipastoral Management Project'' ($4.5 millionGEF) in Colombia/Costa Rica/Nicaragua, "Western Altiplano Natural Resources'' in Guatemala. In same way different Projects of PES are under preparation such as "Technical support to national PES program" in Mexico, "Canaima National Park Project" in Venezuela, and "Cape Action Plan for the Environment" in South Africa (CAPE). Similarly Dominican Republic, Ecuador, El Salvador lunched Pilot PES projects like Developing carbon markets, Prototype Carbon Fund(PCF),Bio Carbon Fund (BioCF).In Philippines Many PES arrangements in local watersheds are made. Mindanao Geothermal plant success in improving water quality by supporting upstream forest management practices. Internationally the trading of carbon sequestration services generated by newly afforested land through the Kyoto Protocol's Clean Development Mechanism (CDM) is best way for PES (Taylor et al., 2014).

In neighboring countries of Nepal, there are a number of examples of PES-type schemes which redistribute financial resources to local communities. These are not purely market supply and demand based schemes (Wunder et al. 2005) incentivize local communities to conserve natural capital through established institutional mechanisms and through cash or another forms of incentives such as development projects. Examples of these include Markhor (Capra falconeri) hunting in Pakistan, hydropower revenue in Bhutan, and paying for landscape beauty in Sikkim, India (Landell-Mills, 2002). Similarly, according to CIFOR (2002), regeneration of dry secondary forests in central India, could double carbon sequestration from 27.3 to 55.2 t/ha in ten years at very modest cost. Also in china PES mechanism was adopted as not a cure-all, but could help improve water conditions in Western China and may reduce some treatment costs. Examples: Shanghai and Chongqing.

In Nepal, PES-like scheme is being put into practice in Kulekhani Hydropower project area in Makwanpur district. Likewise, a study was jointly undertaken by IUCN Nepal and International Center for Integrated Mountain Development (ICIMOD) in the Shivapuri Watershed for drinking water services. Similarly, another initiative was jointly initiated by IUCN Nepal and Local Initiatives for Biodiversity, Research and Development (LI-BIRD) to integrate wetland management model into the Rupa Lake wetland. In yet another specimen of PES pilot, Dhulikhel Municipality developed a PES-like scheme by formulating a linkage between drinking water users in Dhulikhel Municipality as service buyers and upstream communities as service providers. Such applications of PES in watershed services for drinking water, hydropower and recreational services are the key opportunities in the country. The other possible areas of intervention in a broader context include carbon sequestration, ecotourism and biodiversity conservation, however, the researches on these sectors are very limited in Nepal. (Sander, 2006) .

Buffer zone program and conservation area management are others examples of Payment of environment services of biodiversity conservation and management. Aesthetic and scenic beauty helps to develop eco-tourism in these areas and earning from the tourism development sharing with local communities for the sake of socio-economic development and livelihoods support. Basic and required policies and institutional arrangement for PES schemes are also already in place. The National Parks and Wildlife Conservation Act 1973, the Local Self Governance Act 1999, the Electricity Act 1992, the Forest Act 1993, among few others, contain the concept of benefit sharing (Karna, 2008). In the buffer zone management programs 50% revenue generated by respective park and reserve directly goes

to local communities for their socio- economic development and biodiversity conservation in Buffer zone. PES being a new concept and it is a burning issue for Nepal, many stakeholders, service providers and beneficiaries are not aware of it. Capacity building of concerned organizations and policy makers is inevitable. Moreover, awareness creation among local communities is also important.(Tech, 2007)

Being a mid-mountain representing protected areas, SNNP has secured high value of rich biodiversity and potential of ecosystem services. For the food provisions to surrounding rural people, it has high storage of wild fruits, vegetables and inland fisheries. Drinking Water potential is the key issue to assess and build mechanism for the payment of its values to the conservation entities. Roughly SNNP contributes water to over 4000 ha of agricultural land (Kunwar, 2008), and fulfils more than 60 percent water demand of the Kathmandu valley. The southern aspect of SNNP discharges 226.7 million liters of water per day, which is higher than the water demand per day for the valley (Kunwar 2008). However, unsustainable marketing of water resources by external business companies without the involvement of local people is a major concern of local communities in SNNP.

So, there's a need of well interactive regulatory mechanism to pay a value of watershed conservation and pricing of natural water treatment. Firewood supply to BZ communities is another important factor that has been raised as severe issues among PA authority and surrounding people. When hundreds of families inside the PAs core area have been collecting firewood for making liquor, it is providing key sources of livelihood to the people of Sundarijal, Manichud, Kakani, Gagalfedi and others. Being an urban-centered PA, it is providing regulation of air pollution services, recreational services and aesthetic values and research opportunities.

1.2 Problem Statement

Shivapuri Nagarjun National Park (SNNP) is lonely park to represent mid hill ecosystem of Nepal with huge problems to be tackled. The existing practice of unmanaged cultivation, deforestation, improper use of agro chemicals, unmanaged and unscientific construction of roads, buildings, and excessive sand and stone quarrying are some of the anthropogenic activities leading to soil erosion and landslides. However, the ultimate concerns of watershed degradation are related to overpopulation, poverty, limited income and lack of off-farm employment opportunities in the area. The Drinking Water Department has neither taken any initiative to protect the watersheds nor provided incentives to communities

involved in their protection. Therefore payment for the ecosystem services is required for Economic Valuation of watersheds and forested areas, ecotourism and carbon sequestration of SNNP forests. These are the major areas of further research in Shivapuri Nagarjun National Park.

Visitors are attracted with certain avenues, contexts and conditions. Some visitors enjoy visiting animals some enjoy looking plants and some enjoy to see landscape and go for trekking. They get satisfaction viewing the expected scenes and sceneries, however, the level of pleasures may be differed, so the people may be more excited to pay according to their level of their satisfaction. In this situation, the questions may raise how much payment for what purposes? In fact this is the visitors was and it varies according to persons to persons and event to event. In reality in no any such researches are done here on willingness to pay before. Thus this research is rational.

There are different sources of income in the national parks. Some examples are royalty from sale of products and others. The incomes are diffed in different years and different sites too. The incomes depend up on the seasons, situation of the weathers and political circumstances and other many factors. Thus, the income of 5 years ago is not same from now. Then, the obvious questions raise how much differences are there in annual incomes. Such types of researches are not done yet here, In addition, the pictorial representation or spatial analysis using GIS can be the useful tool for future planning and policy preparation showing the trend of income. Thus, this research is essential.

The past records are the base line of income trend. Indeed, the past trend can provide the way to forecast the future income and their sources. This needs the economic analysis and such analysis can show the roadmap of future PES scheme. However different situation and scenario may affect the future projection and potentiality of the PES scheme. Such researches are not done here yet. Therefore, this research is significant.

The pictorial information is an essential part of the research work. Maps are the one of the important element of pictorial information. The status of Shivapuri Nagarjun showing map can add the value to understand the location and condition of the national park. The several maps of this national park are available but the maps showing the mostly visiting location and potential PES area are unavailable. Map demonstration help to plan any project in Shivapuri Nagarjun National park. Proper planning leads to sustainability of PES schemes. Thus, this research has important.

1.3 Research Questions

- What is the maximum willingness of visitors to pay for the different ecosystem services of Shivapuri Nagarjun National park including actual travel cost paid and their willingness to pay for travel?
- How the Trend of income varies in different year due to different ecosystem services provided by Shivapuri Nagarjun National park (SNNP)?
- What is economic potentiality from ecosystem services in SNNP and its map Visualized sustainability?

1.4 Objectives

General Objectives

The general objective of the study is-

- To show the economic potentiality from the ecosystem services of the Shivapuri Nagarjun National Park (SNNP)

Specific Objectives

The specific objectives of the study is to quantify

- To assess the economic value of ecosystem services that visitors will to pay to visit Shivapuri Nagarjun National Park.
- To find out trend of income sources due to different ecosystem services and expenditures trend of Shivapuri Nagarjun National park.
- To explore the economic potentiality from ecosystem services of Shivapuri Nagarjun National park and spatially visualize potentiality of PES schemes.

1.5 Rationale of study

Payment for ecosystem services (PESs) is part of a new and more direct conservation and management paradigm explicitly recognizing: (1) the need to bridge the interests of communities connected by ecosystems, (2) the costs of securing and maintaining the provision of different ecosystem services and (3) that those who benefit from these services need to pay for these costs. While discussions on the potential of PES are becoming more

frequent, Nepal lacks concrete policies and an umbrella legislative framework at the national, sub-national, and institutional levels to operationalize PES. A lack of vertical and horizontal coordination among government departments and agencies often creates problems at the implementation level.

So, I argue that there is a need for a systematic analysis of present PES practices to inform a wider policy debate in Shivapuri Nagarjun National park. The main aim of this report is therefore to explore economic potentiality of Shivapuri Nagarjun National Park and spatially visualize if any of the PES mechanisms can be adopted as part of a long-term and sustainable strategy that will minimize impacts on ecosystems. Specific aims is to assess the maximum economic value of ecosystem services that visitors will to pay in Shivapuri Nagarjun National park including travel costs and find out trend of income sources due to different ecosystem services of Shivapuri Nagarjun National park which will help to explore the economic potentiality from ecosystem services of Shivapuri Nagarjun National park and spatially demonstrate sustainability of PES schemes. A study on the potential for a PES scheme in Shivapuri-Nagarjun National Park reveals that such a scheme would provide economic incentives to local communities to support conservation efforts and reduce park-people conflicts (ICIMOD 2011). The policy provision to provide 30 to 50% of the park revenue to buffer zones is considered useful to mitigate human wildlife conflict and conserve biodiversity.

This report discusses PES as a possible instrument to finance ecosystem management in Shivapuri Nagarjun National park, based on lessons learned from various ongoing PES-type schemes. I review a number of such schemes based on the available literature. I argue that PES experience in Shivapuri Nagarjun National park remains limited and is as yet insufficient as basis for mainstreaming. I recommend that (1) existing schemes need to be monitored to analyze challenges and effectiveness, and (2) such analyses should be carried out simultaneously with informing the national policy dialog to support the debate on implementing PES for sustainable ecosystem management.

This study of PES schemes in Shivapuri Nagarjun National Park indicates a demand and potential for PES schemes and the need to systematically address the value of ES. Furthermore the payment is not based on actual valuation of ES but rather on an understanding between users and buyers. Such a potential valuation of ES may help to incentivize communities to sustainably manage and conserve these ES and ensure long-term

supply. Besides valuation, there are a number of issues that need to be addressed and made coherent before PES can successfully and systematically be implemented in Shivapuri Nagarjun National Park. Thus this study is very important.

1.6 Limitations of Study

The study area is confined to only in specific sample plots of the Shivapuri Nagarjun National Park (SNNP).The PES concept is just in initial phase of execution. SNNP was taken under study because of time and budget constraint. There were no studies regarding PES schemes in SNNP except some journal articles published. E.g. "PES in Shivapuri Nagarjun National park" was published by Kamal Jung Kumar in year 2008 in initiation journal published by Kathmandu forestry college (KAFCOL). People around park were not aware about PES concept. Although SNNP has large possibility of ecotourism and has economy friendly ecological activities huge workout is required for PES enactment. In near future in case of proper application of PES concept was enormously uplift socioeconomic condition of people around park. The massive public action deriving interest is required for PES implementation in SNNP. Therefore, the study was carried out on SNNP; literatures on PES were reviewed and the results were compared with results of Global PES System.

CHAPTER II LITERATURE REVIEW

2.1 Ecosystem Services (ES)

Ecosystem Services, also used interchangeably as Environmental Services, are 'the benefits that people obtain from the ecosystems' (MEA, 2005). Natural ecosystems generate a range of services besides commodities for human consumption. These services include water regulation, sequestration of carbon, maintaining biological diversity and maintaining natural beauty (MEA, 2005; Patterson and Coelho, 2009).Similarly, Ecosystem services are hydrological services, carbon sequestration, biodiversity services, recreational services, landscape or scenic beauty. Ecosystem valuation is largely based on the assumption that individuals are willing to pay for Ecosystem gains and conversely, are willing to accept compensation for some Ecosystem losses.

According to the Millennium Ecosystem Assessment (MEA), ecosystem services can be understood as those benefits obtained from nature that satisfy human needs and simultaneously fulfil other species requirements (Daily, 1997; Costanza et al., 1997; MEA, 2005). The flow of these services, derived from stocks of natural resources, is recognized as 'important elements in overall wealth along physical, financial, human, and social capital' (Vira and Adams, 2008). The MEA classifies ecosystem services in four categories, namely provisioning services, which include food, water, timber and genetic resources; regulating services, such as the regulation of climate, floods and waste treatment; cultural services, such as recreation and aesthetic enjoyment; and supporting services such as soil formation, pollination and nutrient cycling. Nevertheless, discussions on how to classify ecosystem services to inform natural resource management and policy decisions continue (Carpenter et al., 2006; Boyd and Banzhaf, 2007; Wallace, 2007; Fisher et al., 2009). This is a consequence of the application of the 'ecosystem service concept' to several policy contexts and in many initiatives worldwide (Fisher and Turner, 2008; Muradian et al., 2010-this issue).

Ecosystems provide human society with various services that include provisioning of environmental goods (e.g., food, fiber and fuel), regulating (e.g., climate, flood, erosion), supporting (e.g., nutrient cycling), and cultural with aesthetic and recreational values. Potential of these services in PAs are enhanced because of their protection and management status. Generally, regulation of climate, purification of air and water, protection from soil

erosion and nutrient cycling are among the services that are available in PAs (Defra, 2007). MPAs of Nepal are also the sources of food, fiber and fuel because buffer zone communities are very poor with food deficit. They often go to PAs and extract the resources they require. In addition, most of the MPAs are significant sources of water, store of cold-water fisheries, timber, firewood and fodder. (Tech, 2007)

2.2 Elements of Ecosystem services

PES scheme includes five basic elements: 1.Well-defined Ecosystem services, 2.At least one buyer, 3.At least one Ecosystem service in the transaction, 4. At least one service provider, and 5.conditionality (Wunder, 2005).First, PES is a voluntary, negotiated framework, which distinguishes it from command-and control measures. This presupposes that potential ES providers have real land-use choices, something which in Vietnam, for instance, typically was not the case: payments here were more to be seen as in integral part of the predominating command-and-control system (Wunder, The, and Ibarra 2005).

Secondly, what is bought needs to be well-defined— it can be a directly measurable service (e.g. additional tons of carbon stored) or land-use caps that are likely to help providing that service (e.g. "forest conservation provides clean water"). In fact, here the word "likely" hides important scientific insecurities and popular perceptions. Especially hydrological services are often based on beliefs rather than scientific c proof (e.g. "forest cover always increases water availability") (Kaimowitz, 2004). Also, external factors can interfere; Nature is not always 'well-behaved'. For instance, even if forest conservation indeed increases the likelihood of clean local water provision, this increase may be subordinate if the general frequency of tropical storms and flooding is high, thus dominating water-quality outcomes. Payments that build on scientifically unlikely relationships, on likely relationship being unlikely to affect significantly the desired

Outcome, or on what has outright been proven to be a myth, might persist over a long time. In many cases, we lack the knowledge base to classify objectively which ES provision cases are real and which ones are 'imaginary'. However, we assume that a poor underpinning of ES will tend to decrease PES robustness and sustainability: the less realistic the scientific basis of a PES scheme, the more exposed it is to the risk of buyers questioning.(Tamang,2009)

In any PES, there should be resources going from at least one ES buyer (criterion 3) to at least one provider (criterion 4), though the transfer often occurs through an intermediary.

Last but not least, in a PES scheme user payments need to be truly contingent upon the service being continuously provided (criterion 5). ES buyers thus normally monitor compliance, e.g. has hunting, deforestation or slash-and-burn agriculture really been contained in the manner stipulated in a given contract? In developed countries, supporting legal and enforcement apparatus can create the conditions for once off payments to provide future ES flows, for\ instance in permanent easements (e.g. Bayon 2004; Sokolow and Zurbrugg 2003). But in developing countries, this option is usually lacking — more so in agricultural frontier areas with weak governance. This feature implies that in the tropics PES normally need to be *periodic* (often with an infinite horizon) and tied to *monitored compliance*. Service buyers thus need to be able to withdraw from a PES contract if they do not get what they paid for. Conversely, service providers may also have an interest in flexible contracts, so they can pull out (or alter the terms) of a PES scheme if changing context conditions induce them to do so.(Engel & Palmer, 2007)\

2.3 Payments for Ecosystem Services (PES)

Payments for Ecosystem Services (PES) economically reward resource managers for the provision of ecosystem services and are thus characterized by (i) an ecological function subject to trade; (ii) the establishment of a standard unit of exchange; (iii) and supply, demand and intermediation flows between those who sell and buy ecosystem services. (Environmental Resources Institute (ERI), 2010)

The most precise – and, some would argue, restrictive – definition of PES is that offered by Sven Wunder and his colleagues. They define PES as a "voluntary, conditional transaction with at least one seller, one buyer, and a well-defined Ecosystem service" (Wunder, 2005). Payment for Ecosystem service (PES) is an economic tool in which the beneficiaries of ecosystem services pay back to the providers or promoters of those services. The PES concept can be thought as the complement to the "Polluter Pays Principle". Services that are mainly provided thanks to the wellbeing of ecosystem come under ecosystem services. PES can provide economic resource to managing authorities that creates an arrangement of rewards and incentives for upstream villagers developing a well-managed natural environment as well as securing vital downstream water benefits (Danish Institute for International Studies, 2007).Wunder (2005) has identified four types of PES that currently stand out: (i) carbon sequestration and storage (electricity companies are paying farmers for planting and maintaining additional trees), (ii) biodiversity protection (conservation donors are paying local people for setting aside or naturally restoring areas to create a biological

corridor), (iii) watershed protection (downstream water users are paying upstream farmers for adopting land uses that limit deforestation, erosion, and flooding risks, and (iv) landscape beauty (a tourism operator is paying a local community not to hunt in a forest being used for tourists' wildlife viewing).

Payment for Ecosystem Services (PES) is an incentive based conservation policy paradigm for conservation of natural resources. This paradigm has been applied to a wide variety of resources, especially watersheds. Wunder (2005) defines PES as a voluntary, conditional transaction with at least one seller, one buyer and a well-defined Ecosystem service. In the most fundamental form, it recognizes the necessity of bridging the interests of resources managers/owners and beneficiaries of such management. The PES approach establishes an institutional mechanism through which the provision of traditionally non market goods and services like those generated from conservation and effective natural resource management are incentivized. This ensures that those who benefit from the Ecosystem services pay those who provide the services.((Sapkota,2009)

The justification to recognize these ecosystem services in general and forest ecosystem in particular is based on two major arguments. First, free enjoyment of these services by the traditional beneficiaries has promoted resources degradation at an alarming rate that needs to be urgently stopped. Second, developing incentive based conservation mechanism of resources is expected to create liabilities and responsibilities in service producers and service users for constructive contribution in resource management system. PES schemes also have the potential to benefit poor landowners who manage these Ecosystem services. Long term sustainable conservation efforts could be made effective through local financial mechanisms that recognize externalities and provide incentives to service providers accordingly.(Acharya, Baral, Malla, & Basnyat, n.d.)

Internationally PES in New York Supported by 9% user fee on NYC water users, several conservation programs: easements, reduced development rights, and other eco-friendly practices. It Avoided infrastructure costs would have doubled the cost of water for NYC users and $4-6 Billion in infrastructure and $300-500 Million in ongoing expenses. In same way in Philippines there is many PES arrangements in local watersheds. Mindanao Geothermal plant success in improving water quality by supporting upstream forest management practices. Payments through government to local watershed management boards results in some inefficiencies. Large watershed boards slows process(Langton, n.d.).

Also Asian development bank (ADB) has an early and still emerging portfolio of projects that are experimenting with market systems for provision of ecosystem services. Recent initiatives include the Indonesia pilot and demonstration activities using compensation mechanism for watershed protection services in the Citarum River Basin5 with grant funding under the ADB Water Financing Partnership Facility, as well as the TA on Carbon Sequestration through the Clean Development Mechanism in Indonesia. The proposed TA was broaden opportunities for knowledge sharing among these types of projects and expand the numbers of complementary pilot activities.(U. Schäfer-Preuss, R.J. Dobias, X. Yao, 2009)

2.4 Approaches for Measuring Ecosystem Services

There are numerous approaches used in Ecosystem valuation studies. These include measuring the direct costs of Ecosystem services in explicit markets (such as the revenue from selling a ton of carbon); the productivity method (such as measuring the contribution that pollination makes to total farm-gate output); hedonic pricing estimates (using for instance changes in real estate or other market process as a proxy for the value of the Ecosystem services derived from the Ecosystem service); the travel cost method (which measures how much people was spend to visit protected parks such as in Costa Rica); contingent valuation (including – as noted above – undertaking different kinds of willingness-to-pay surveys or questionnaires); and damage cost avoided methods (measuring how much people would spend to avoid Ecosystem damages); and benefits transfers.(Jose & Rica, 2005). However before understanding and implementing PES, some crucial and pertinent questions need to be answered such as:

- What is the willingness-to-pay of the beneficiaries of Ecosystem services to help finance conservation (Contingent Valuation)?
- How can their willingness-to-pay be translated into real resource flows?
- How should the collected funds be used to structure payments to those who are doing conservation activities?
- How do these questions differ when global and local PES are taken into consideration?(BANKO & JANAKARI, 2008).

So, in overall total ecosystem values (TEV) can be expressed as:

TEV = Direct use value (DUV) +Indirect use value (IUV) +Option value+ Existence value

Direct Use Values are direct benefits that arise from the use/extraction of an Ecosystem service. In the case of tropical forests, this would include the revenue derived from selling logs illegally or legally, the use of residue for fuel or building purposes, and the direct genetic benefits that can be extracted and sold to genetic-resource buyers. Indirect Use Values are the indirect benefits of different kinds of ecological functions, taken in isolation or jointly, but are rarely exchanged in the market. To use forestry again as an example, these include the contribution of tropical forests to top-soil quality, species habitats such as wetlands and tree canopies, and the storage of carbon.

Option and Existence Values involves measuring an individual's wasingness to- pay to converse the option of making use of a tropical forest or biological resource in the future, even if the current value of that resource is unknown, undervalued or imperfectly understood. Related to this is the notion of existence value, whereby an individual expresses willingness-to-pay for an Ecosystem service, even if no plans are presented to "use" the components of the forest now or in the future.

The main assumption of Ecosystem economics is that, for most activities, direct use values are less than the combined values of indirect value uses and option and existence values. The question is whether this assumption has affected policy choices or behavioral choices. Currently, there are hundreds of studies which point to different values of Ecosystem services. For example, studies for the past decade have shown that the indirect use values and other values derived from the sustainable use of tropical forests is greater than the direct use values (revenues) to loggers derived from clearing forests, as well as benefits of cleared lands for cattle-ranchers and growers of soybeans and other produce. However, making use of the case that TEV is greater than DUV has largely failed to influence on-the-ground activities. To name one case, in 2004, rates of deforestation in tropical countries – fueled in large part by illegal logging – in such countries as Brazil, Honduras, Guatemala, St. Lucia, Haiti and other countries has increased.(Coull, Commission, & Valatin, 2008)

2.5 Payment for Ecosystem services with REDD and REDD+

Mexico, Costa Rica, and Ecuador have substantial experience with implementing payments for ecosystem services (PES) and conservation incentive programs. Yet, many aspects of their experiences remain poorly understood and would require special attention in any new or expanded use of these types of incentives. As these countries, along with many others, get ready to implement integrated approaches to Reduced Emissions from Deforestation and

Forest Degradation (REDD or REDD+ with conservation, sustainable management of forests, and enhancement of forest carbon stocks), they seek to understand how the lessons and challenges from their past experiences, as well as the wider lessons from similar initiatives around the world, can inform their emerging REDD+ strategies, policies, institutional frameworks, and tools.(From & Rica, n.d.)

One key requirement for PES and REDD+ is that payments must be conditional upon performance—that is, participants achieving certain outcomes or doing (or refraining from) certain activities. Performance-based payments, in turn, require supportive legal and policy frameworks, as well as effective monitoring, verification, and reporting. Moreover, they must be carefully targeted to achieve desired Ecosystem and social outcomes, taking into account the particular goals of the program as well as synergies and trade-offs with other goals, programs and sectors. Performance payments such as PES, whether market- or fund-based, was be an important element of national and subnational REDD+ mechanisms. Learning from past experience was therefore allow national and subnational governments to avoid past mistakes while adapting successful approaches to the REDD+ context. The central question is whether, and how, PES and conservation incentives can be effective instruments for REDD+.(Ina Porras, n.d.)

2.6 Payments for Ecosystem services in watershed

The economic logic of PES schemes dealing with the promotion of particular land use changes in watersheds is simple: by means of establishing market transactions between downstream and upstream economic agents, the downstream effects are taken into account when upstream holders make decisions about their own land use. This should lead to a larger social economic efficiency. Besides, direct payments are expected to be more cost-effective in meeting the Ecosystem and local development goals, as compared to indirect ways of financing a better stewardship of natural resources (Ferraro and Kiss, 2002). PES schemes are derived from the Coase's theorem. That is, in a free market with no transaction cost, the gains in efficiency due to the internalization of Ecosystem externalities are independent from the direction of the payment, and the initial endowment of property rights. Hence, the adoption of the polluter-pay principle is not a condition for achieving a Pareto better situation when applying this kind of instruments. (Nicolas Kosoy, Martinez-tuna, Muradian, & Martinez-alier, 2005)

In fact, most payments schemes addressing hydrological services in watersheds do not hold the polluter-pay principle, since upstream landholders are in general compensated for avoiding/reducing negative Ecosystem externalities (Seymour, 2008). However, the payments schemes for Ecosystem services should fulfill the following two conditions in order to be efficient: i) the compensation of upstream landholders should be at least equal to the opportunity cost of land use. Namely, the forgone benefits for adopting or keeping the land uses or practices promoted by the scheme; and ii) the amount of the payment should be lower than the economic value of the Ecosystem externality (for example, the abatement cost of improving water quality to the desired level). In the case of PES schemes compensating upstream landholders for maintaining forest cover, the amount offered to providers should be equal to the potential profits derived from alternative land uses to forest cover, in order to be efficient.(Paro, Boquim, Brazil, & Nilsson, 2000)

The payments for Ecosystem services have been proposed as promissory tools, alternative to command-and-control instruments, for forest protection (Nathan and Kelkar, 2001), biodiversity conservation (Pagiola et al., 2004) and watershed management (FAO, 2004). They fit well into the current trend towards decentralized and self-organized systems for water and forest management. Typically, command and- control institutions and policy may be effective in controlling pollution from well-defined point sources, such as factories or sewage treatment plants. However, they are less effective in regulating non-point sources of pollution, such as those occurring when numerous upstream landholders dedicate their land to intensive agricultural or cattle-ranching activities. In those cases, downstream water pollution (or scarcity) is the result of the combination of individual actions carried out by geographically spread and heterogeneous upstream users (Lubell et al., 2002).

In watersheds, rights on forest direct use are often restricted to upstream landholders. Nonetheless, forests provide a variety of Ecosystem services to diverse stakeholders, at different geographical scales, are there is rivalry in the consumption of forest goods and services; that is, the consumption by one individual of forest goods might reduce the extent forest services are available for others. For example, upstream deforestation related to extraction of firewood may induce a deterioration of water quality downstream. Thus, as in the case of common property resources (Gibson et al., 2000; Ostrom et al., 2002), the resolution of conflicts between different beneficiaries of Ecosystem goods and services from forests typically involves collectively beneficial but individually costly actions. Economic incentives (for compensating those undertaking individually costly actions) are supposed to

be particularly effective in such cases (Sea bright, 1993). Equally, the institutional arrangement of PES schemes may contribute to lower transaction and monitoring costs, which are normally assumed to be critical features for solving collective action problems (Taylor and Singleton, 1993).

In tropical watersheds (in developing countries), the most economically vulnerable groups tend to be located in upstream areas, where land is usually less productive and more prone to suffer erosion. Nevertheless, these rural communities are often providers of Ecosystem services benefiting other groups with a better socioeconomic situation (normally located in downstream urban areas). Hence PES are also expected to contribute to poverty alleviation and to reduce the overall cost of improving the condition of natural resources, by means of creating rural/urban economic linkages and economic incentives for good land stewardship (Pagiola et al., 2002b; Pagiola et al., 2005). These instruments might also play a critical role in raising awareness about the economic benefits natural ecosystems provide. Hence, PES may work as (win-win) multipurpose instruments, contributing to improve the conditions of different types of natural resources at the same time (e.g. forests and water), raising awareness about the economic role of ecosystems and contributing to the redistribution of wealth between different regions or social groups (Landell-Mills, 2002).

2.7 Payment for ecosystem services in community forestry

The success of community forests in regenerating barren hills of Nepal is well recognized. Community forests have been able to meet local community's needs for forest products such as timber, fuel wood, and fodder to some extent. Community forests have helped to empower local communities and to develop their leadership skills by conducting various activities. Some community forests have also made important contributions to the development of women and other disadvantaged groups in society. Community forests have the potential to help in poverty alleviation and the achievement of the Millennium Development Goals (MDGs).

In addition to these, community forests supply valuable Ecosystem services. So far, the contribution of community forests to Ecosystem services has not been recognized adequately. Consequently, the suppliers of Ecosystem services have not been able to get any benefits for supplying Ecosystem services which leads to undersupply of such services (Upadhyaya, 2005)

Community forests in a watershed supply four main types of Ecosystem services. First, forests sequester and store carbon and reduce the amount of carbon in the atmosphere which, in turn, helps to slow down the process of global warming. Second, forest conservation provide valuable hydrological services such as control of soil erosion and landslides, reduction of sedimentation, improved water sources, regulation of water flow, enhanced water quality, etc. Third, forests help to increase biodiversity. Fourth, forests enhance the natural beauty of a watershed and attract tourists which, in turn, increase income and employment of local people and help to improve their livelihood.(World Bank, 2004)

2.8 Payments for ecosystem services and commodity fetishism

The term commodity fetishism, broadly understood as the masking of the social relationships underlying the process of production, to illuminate three invisibilities in the commodification of ecosystem services. Firstly, we argue that narrowing down the complexity of ecosystems to a single service has serious technical difficulties and ethical implications on the way we relate to and perceive nature. Secondly, the commodification of ecosystem services denies the multiplicity of values which can be attributed to these services, since it requires that a single exchange-value is adopted for trading. Finally, the process of production, exchange and consumption of ecosystem services is characterized by power asymmetries which may contribute to reproducing rather than addressing existing inequalities in the access to natural resources and services.(Nicolás Kosoy & Corbera, 2010)

The analysis of emerging markets for nature's services is considered one of the most important themes in critical geography and Ecosystem research. There is therefore a need to identify and address their pitfalls, and challenge their logic by looking at whose interests pricing and marketing serve, and why money and monetary valuation are considered as useful and persuasive as a sign of ultimate worth (Nelson, 2001; Liverman, 2004; O'Neill, 2007). In this regard, McAfee (1999) argues that the idea of 'selling nature to save it' legitimizes the behavior of those who frame policy for their own direct benefit and advocate for markets as the best strategy to strike a balance between nature conservation and the expansion of capitalism Vatn (2000) suggests that treating the environment as a commodity can create, on the one hand, technical problems derived from the process of defining boundaries in ecological systems and addressing the complementary of goods and services and, on the other, ethical dilemmas as a result of using a purely economic logic to pursue or discard Ecosystem conservation.

In this Sense, there have been calls against the commodification of nature's services and for their conservation based on aesthetic and ethical arguments (McCauley, 2006), as we further elaborate below. Corbera et al. (2007) also suggest that an excessive focus on economic efficiency can make PES 'blunt instruments with respect to issues such as procedural fairness and equitable distribution of project outcomes' (Corbera et al. (2007),), thereby undermining Ecosystem stewardship (Pascual et al., 2010-this issue). This follows Martinez- Alier's (2002) view that changing the logic of resource use and conservation from multiple non-monetary to monetary values can be counterproductive for conservation.

A commodity is therefore a mysterious thing, simply because in it the social character of men's labor appears to them as an objective character stamped upon the product of that labor; because the relation of the producers to the sum total of their own labor is presented to them as a social relation, existing not between themselves, but between the products of their labor… There, the existence of the things quality commodities, and the value relation between the products of labor which stamps them as commodities, have absolutely no connation with their physical properties and with the material relations arising therefrom. There it is a definite social relation between men that assumes, in their eyes, the fantastic form of a relation between things… This I call the Fetishism which attaches itself to the products of labor, as soon as they are produced as commodities, and which is therefore inseparable from the production of commodities' (Marx, 1867,).

2.9 Economic potentiality of payments for ecosystem services (PES)

Much debate has emerged around the need for new conservation paradigms. The concept of payments for environmental services (PES) is at the center of calls for more direct conservation approaches (Hardener and Rice 2002; Niesten and Rice 2004; Scherr, White, and Khare 2004; Ferraro and Kiss 2002). As wilderness and natural habitats shrink, environmental services (ES) previously provided free by Mother Nature are becoming increasingly threatened. This emerging scarcity makes them potentially subject to trade. The core idea of PES is that external ES beneficiaries make direct, contractual and conditional payments to local landholders and users in return for adopting practices that secure ecosystem conservation and restoration(Pagiola, 2003).

This contingent method differs fundamentally from other conservation approaches. Instead of presupposing win-win solutions, this approach explicitly recognizes hard trade-offs in landscapes with mounting land-use pressures, and seeks to reconcile conflicting interests

through compensation. Compelling conceptual arguments have been made that PES schemes are more cost-effective than integrated conservation and development project (ICDPs) (Ferraro and Simpson 2002; Simpson and Sedjo 1996). While PES schemes exist in some developed economies, they remain poorly tested in developing countries. There are many incipient PES initiatives (Landell-Mills and Porras 2002; Pagiola, Bishop, and Landell-Mills 2002), but for implemented PES schemes with money really changing hands in a conditional way, one is typically referred only to Costa Rica and a dozen other pioneer experiences, mostly in Latin America.

CHAPTER III RESEARCH METHODOLOGY AND MATERIALS

3.1 Research Design and Flow charts

The flow includes the information and procedure of the research. It represents overall framework of research at giving the information about procedure of research conducted to meet the objective.

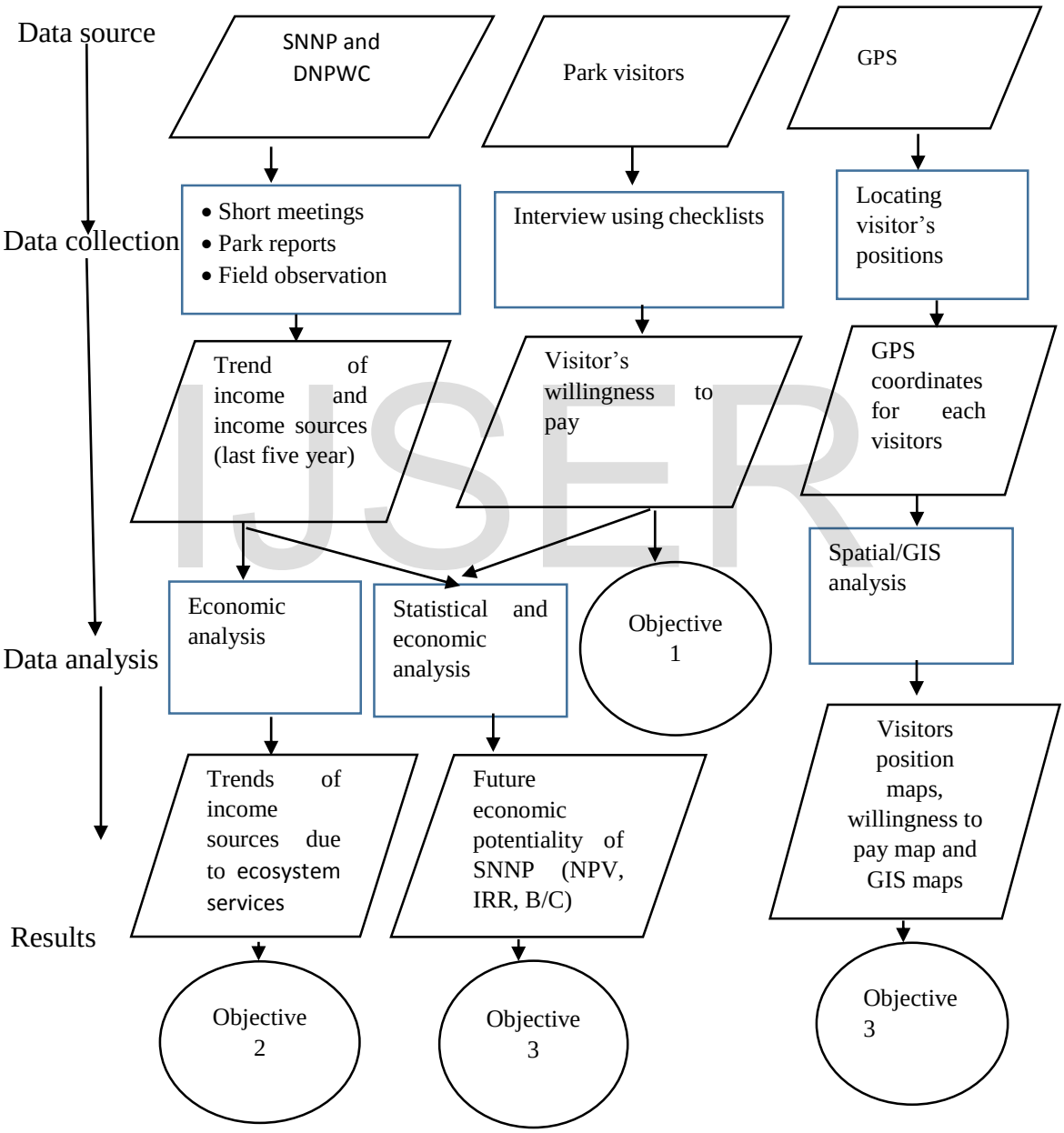


Figure 1 Flow chart and material

3.2 Materials

Necessary materials and software's was used to carry out and accomplish the research work. Material and software's were used for data source, data collection, data analysis and results. Data source (materials) mainly included the selected sites in SNNP, tourists, NGOs and INGOs, field staff, supervisor of research, various published and unpublished literatures, letters, journals, previous reports and various tools and techniques that provided the data's related to research. In same way data collection includes all the data's that were acquired during research process and the processes used to collect the data. Data were collected by interview, general meetings, surveys, literatures reviews, park visit, and formal and informal meetings with the park staffs. Checklists and questionnaire was be pre prepared.

Analyzed data was obtained in forms of Maps, tables, numbers and descriptions. The Statistical, economic and spatial analysis was be carried out to analyze the collected data. GIS mapping of income of different years was be done .Trend analysis was be carried out to show the income sources. In addition, the Net present value (NPV), internal rate of return (IRR), B/C ratio was be calculated using economic analysis to project the potentiality of PES for next 5 years.

Table 1 Material and software used in research work

Materials and software	**Purposes**	**Remarks**
Park reports , brochures, hardcopy and softcopy data	Generate the data	Secondary information's
GPS receiver	Locating visitors position	Visitors location maps and willingness to pay map
Microsoft office word	To prepare overall report	Final report is outcome
MS Excel	To analyze the collected data	Synthesis of raw data's
EBM SPSS 20	Statistical analysis	Compare the data set
Arc GIS 10.3	Mapping the data's	Map outcome

Published and unpublished literatures	Collect necessary information	Report writing
Tally sheet	Data collection	Compare data
Questionnaires	Key informant Interview	Collect data
Check list	Data collection	

3.3 General description of the site

3.3.1 Location

The Shivapuri Nagarjun National Park (SNNP), initially gazetted as Shivapuri National Park (SNP) in 2002, covers an area of 159 km^2 and elevation range of 1000-2732 m, is located in Kathmandu, Nuwakot, Dhading, and Sindhupalchowk districts of the Central development region of Nepal. Shivapuri Nagarjun National Park (SNNP) is located between $27^0$45' and 27^0 52' North latitude and 85^0 15' and 85^0 30' East longitudes. It was renamed as SNNP after the addition of Nagarjun forest patch (15 km^2) in 2009. It is located on the north-western fringe of the Kathmandu valley, and represents true mid hill ecosystem in the protected area (PA) system of Nepal. The name of the park is derived from the Shivapuri and Nagarjun hills (DNPWC, 2013).

3.3.2 Salient features

The salient features of SNNP include **a**) a region of rich biodiversity of the mid hill region, **b**) an important biological corridor that links north-south corridors **c**) an important bird area (IBA), **d**) a major source of fresh water for Kathmandu valley, fulfilling about 40% surface water demand, **e**) one of the major tourist destination nearby capital city, **f**) a potential area for research and exploration, **g**) a site for conservation education for students and researchers and **h**) a sink for air pollution generated by Kathmandu Valley. However the poor institutional mechanism of the Park, inadequate coordination between stakeholders, and subsistence agriculture practice as experienced in all other mountain protected areas of Nepal pose threat on management of SNNP. Similarly, developmental interventions on communities are lagging behind due to delay on declaration of buffer zone area.

3.3.3 Floral and faunal diversity

The SNNP comprises four types of forests, which supports rich floral and faunal diversity with a number of protected, threatened and endemic wildlife species. The SNNP is estimated to possess 1250 species of flowering plants, of which 1120 species have been documented so far. SNNP is home to diverse epiphytic and terrestrial orchids, nearly one third species of orchids of Nepal (123 species) have been recorded from here. Similarly, 102 species of pteridophytes, and equal number of medicinal plants have been documented from SNNP.

Nepal is characterized by 35 types of forests (Satinton, 1972), of which SNNP comprises of following types of forests, such as: 1) Lower mixed hardwood (*Schima-Castanopsis*) forest (1,000 m - 1,500 m), ii) Chir pine forest (1,000 m – 1600 m), iii) Upper mixed hardwood forest (1,500 m - 2,300 m), and iv) Oak forest (2,300 m -2,700 m). Four types of forests namely, Schima forest, Pine forest, Mixed braod-leaved forest, and Dry Oak forest weredecribed from Nagarjun forest (HMG, 1973). These forest are later renamed as *Schima-Castanopsis*forest, Chir Pine and Broadleaved forest, East Himalayan Oak-Laurel forest, and Temperate Mountain Oak forest (Bhuju*et al.* 2007).

The *Schima-Castanopsis* forest comprises of *Schimawallichii*, *Castanopsisindica*, *C. tribuloides*, *Juglansregia*, *Myrsinesemiserrata*, *Sarcococcacoriacea*, *Machilusduthie*, and *Arundinariafalcata*, etc. The Pine forest comprises mainly of *Pinusroxburghii*, associating with *Myricaesculenta*, *Schimawallichii*, *Sarcococcacoriacea*, *Berberisasiatica*, *Colebrookeaoppositifolia*, and *Rubusellipticus*, etc. The mixed broad-leaved forest consists of *Machilusduthie*, *Micheliakisopa*, *Acer oblongum*, *Quercusglauca*, *Camellia kissi*, and *Linderapulcherrima*, etc. Similarly the Oak forest comprises *Quercuslanuginosa*, *Rhododendron arboreum*, *Lyoniaovalifolia*, associated with *Berberisasiatica*, *Gaultheria fragrantissima*, *Rubusellipticus*, *Inulacappa*, etc.

Considering the faunal diversity there are 24 species of Mammals, of which nine are threatened (Annex 8, Shrestha and Basnet 2006, BPP 1995). They include Pangolin (*Manis*spp), Leopard cat(*Prionailurusbengalensis*), Clouded leopard (*Neofelisnebulosa),* Common leopard(*Pantherapardus*),Langur (*Semnopithecus entellus*), Rhesus monkey (*Macacamulatta*), Jungle cat (*Felischaus*), Goral(*Naemorhedus goral*), and Himalayan black bear (*Ursusthibetanus*).

SNNP is one of the most popular areas for watching birds and butterflies in Nepal. It harbors 318 species of birds (BCN 2006), and 14 of them are threatened including Spiny babbler

(*Turdoidesnepalensis*), which is an endemic species . Some of the threatened bird species of SNNP include Oriental hobby, Grey-sided Laughing Thrush (*Garrulaxcaerulatus*), and Cinerous Vulture (*Aegplusmonachus*). About 117 species of birds recorded in SNNP are of migratory nature.Herpetofauna of SNNP has not been explored in detail. However recent finding suggests 18 species of Herpetofauna in Nagarjun forest, including seven species recorded earlier (Aryal*et al. undated*).

3.3.4 Ecotourism

Tourism management is mainly fretful to enhance eco-friendly tourism in SNNP and proposed BZ, with three outputs. The outputs are: i) to preserve cultural heritages, ii) to diversify tourism products, and ii) to increase employment and income opportunities. The main attraction of the Park is scenic view, biodiversity, forest environment, wilderness, avifauna, spiritual fitness, religious site, and trekking, hiking and soft adventure. Besides, the park has high potential to promote an ecotourism center, which may generate financial resources, needed for Park management and income generating opportunities to the locals. Scenic beauty, historical and religious sites, outdoor adventures like nature-walk, hiking, trekking and mountain biking, and wildlife tourism are some of the potential attractions of SNNP. Currently, domestic tourism is developed in the periphery of the important religious sites like Budhanilkantha, NagiGumba, Sundarijal, Jamacho etc. and the scenic-spots like Kakani and Chisapani.

The Kathmandu based tour/trek operators conduct regular tourism activities like a day-hike to Shivapuri Peak, viewing a snow pear panorama of other Himalaya and back through visiting NagiGumba. This has become the most popular activity which is taken by 85% of the international visitors, followed by bird watching, Jungle walk and cycling the surroundings; endemic tours like watching butterfly, dragonflies, as well as transition to the long trek packaged to Helambu and Langtang. For Nepali visitors, picnicking, educational visits, meditation and religious ceremony are the major activities. An average duration of the tourism activities is of one day. Thus, SNNP deserves immense tourism Potential.

3.4 Map of Shivapuri Nagarjun National Park (SNNP)

The location of Shivapuri Nagarjun National Park in Nepal is shown in figure

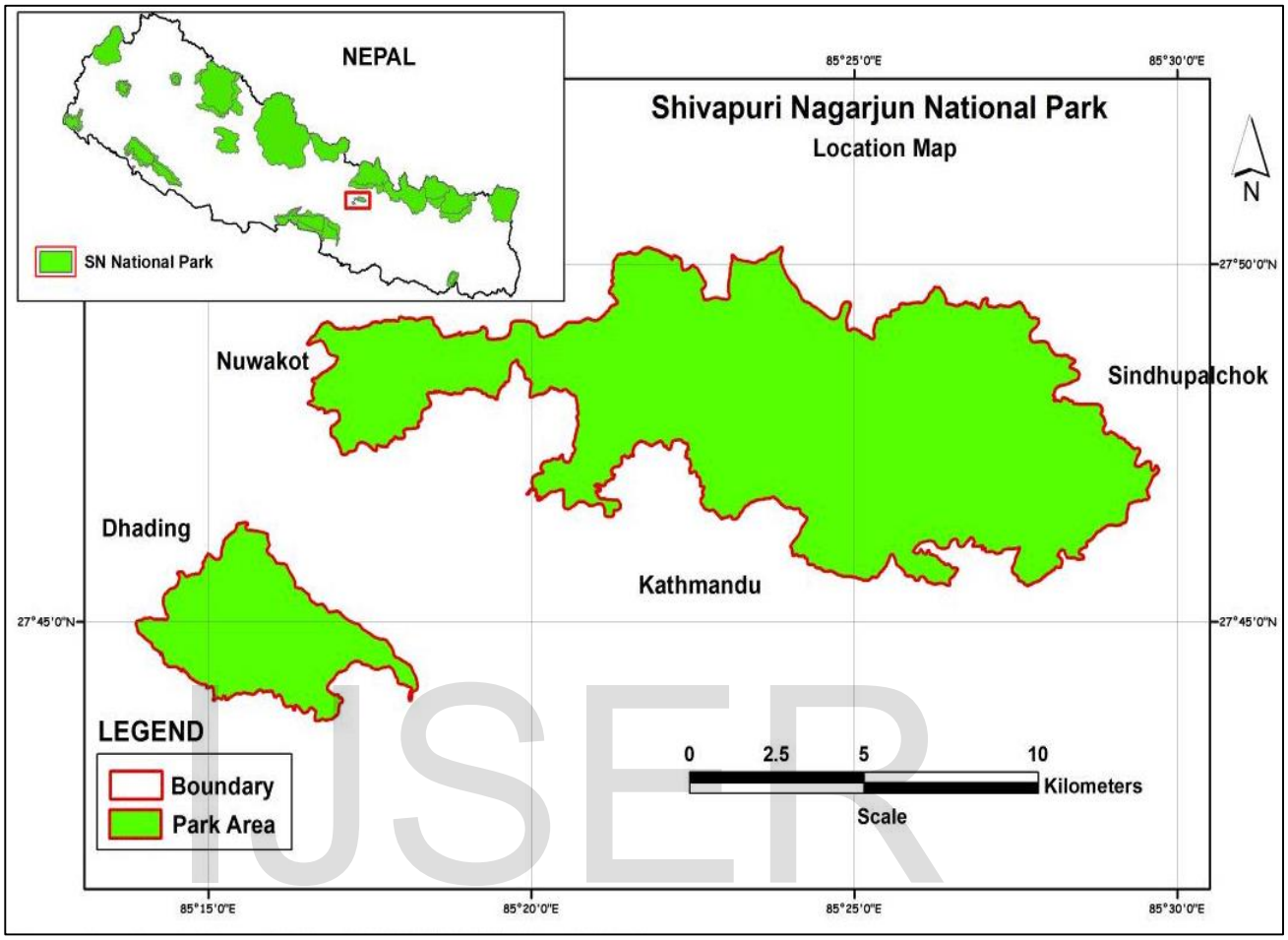


Figure 2: Location of Shivapuri Nagarjun National Park (SNNP)

3.5 Sampling procedure

Shivapuri Nagarjun National Park (SNNP) was divided into four Areas based on the richness of the visitors at the particular site of SNNP and infrastructural management of the site with the vision of tourist augmentation. Major areas in Shivapuri Nagarjun National Park (SNNP) fulfilling these two criteria were selected. The selected areas were as follows:

- Sundarijal area
- Kakani area
- Nagarjun area

- Budhanilakantha area

Similarly each of above strata's was randomly observed based on number of type of the visitors visiting the selected site and really enjoying the ecosystem services. These visitors were categorized into two types:

- Nepali visitor
- Foreign visitor

Since the Ecotourism in Shivapuri Nagarjun National Park (SNNP) was heterogeneous with respect to the characteristics under study i.e. the prevalence of the Nepali and foreign visitors in different sites were different and they too intend to pay different prices for the ecosystem services on the basis of their acquired satisfaction from the ecosystem services they enjoyed at the particular site. Moreover the infrastructural management of the site with the vision of tourist augmentation were different at each sites .Thus in order to minimize the variances in number of different types of tourists at different selected Areas and Visitors at the site were interviewed.

3.6 Data collection

Primary and secondary data were collected including field data was collected as follows:

3.6.1 Primary data collection

Primary information was generated through various Rapid Appraisal tools; such as informal discussion with park officials, semi-structured interview with key informants, field observation, discussion with people of local organizations, interviewing with local people, and short meeting with different management committees of given research sites etc. Checklists was prepared and was used to find visitor's willingness to pay for ecosystem services of SNNP.GPS was used to locate position of each visitor and attractive avenues of the park

3.6.2 Secondary Data collection

Technical and policy documents was extensively reviewed to derive existing information. Secondary information was obtained through published and unpublished literatures and office records of SNNP and DNPWC (department of national park and wildlife

conservation).Annual protected area plan from fiscal year 2065/2066 to 2071/2072 and Annual plan of Shivapuri Nagarjun national park was reviewed extensively. . Collection of the view of PES experts and expert's officers was done.

3.6.3 Field Data Collection

For data collection visit to the Park study area was continuous process. Area was visited to observe the visitors prevalence at the area. Questionnaire survey was conducted with visitors using checklists. PS location of visitors were tracked and visit to parks office was thoroughly done to acquire secondary information

3.7 Data Analysis

The Statistical, economic and spatial analysis was carried out to analyze the collected data. Collected information was compiled and organized systematically. The data was analyzed using SPSS IBM 21 with frequency, mean, standard deviation and bar diagrams. Trend analysis was carried out to show the income sources. In addition, the Net present value (NPV), internal rate of return (IRR), B/C ratio was calculated using economic analysis to project the potentiality of PES for future. GIS mapping of visitors location was performed. Economic analysis was done by travel cost including contingent valuation.

Formulas used for Data analysis

Net Present Value (NPV): NPV is the present value of benefits minus the present value of its costs. Present value of benefits and costs is computed by discounting a set of benefits and costs that occur through time back to the beginning of the base year (t = 0).

Internal Rate of Return (IRR): IRR is defined as that discount rate at which the present value of benefits equals the present value of costs, i.e. the net present value is zero. It is usually found by trial and error method.

c) **Benefit Cost Ratio (B/C ratio)**: B/C ratio is the present value of benefits divided by the present value of costs.

Table 2 Formulas of data analysis

SNO	Calculation	Formula	Conditions	
			Accepting	Rejecting
1	Net Present Value (NPV)	$NPV=\sum_{t=0}^{n}\frac{B_t}{(1+i)^t} - \sum_{t=0}^{n}\frac{C_t}{(1+i)^t}$ $NPV = \sum_{t=0}^{n}\frac{(B_t - C_t)}{(1+i)^t}$	zero or greater	Negative
2	Profitability index	PI = Total present value – Net cash outlay.	Greater than zero	Negative or Zero
3	Benefit Cost Ratio (B/C ratio)	$B/C \text{ ratio}= \sum_{t=0}^{n}\frac{B_t}{(1+i)^t} \div \sum_{t=0}^{n}\frac{C_t}{(1+i)^t}$	B/C ratio is 1 or greater than 1	unacceptable if B/C ratio is lesser than 1

CHAPTER IV RESULTS AND DISCUSSION

4.1 visitors willingness of Visitors to pay for different ecosystem services

Visitors visiting at SNNP to enjoy different Ecosystem services at study sites (Budhanilakantha area, Kakani area, Sundarijal area and Nagarjun area) were interviewed using Questionnaire shows that they have different willingness to pay for different ecosystem services and their willingness to pay obviously differs from the average value they are paying for their visit. Visitor's abundance at different place shows their interest towards the ecosystem services of SNNP. It shows that ecosystem services can be accounted to monetary basis. This symbolize that Shivapuri Nagarjun National park has great potentiality of PES schemes implementation.

4.1.1 Visitors distribution at the study sites and their willingness to pay for different ecosystem services

Among the total visitors who were interviewed using questionnaire visiting the Shivapuri Nagarjun National park at four study sites (Budhanilakantha area, Kakani area, Sundarijal area and Nagarjun area) 18% were found to be foreign visitors and 82% were found to be Nepali visitors. This shows Nepali visitors has greater willingness to pay for ecosystem services of SNNP .Furthermore Nepali visitors are more interested to enjoy the ecosystem services of SNNP and they are contributing much to convert environmental service in financial mechanism.

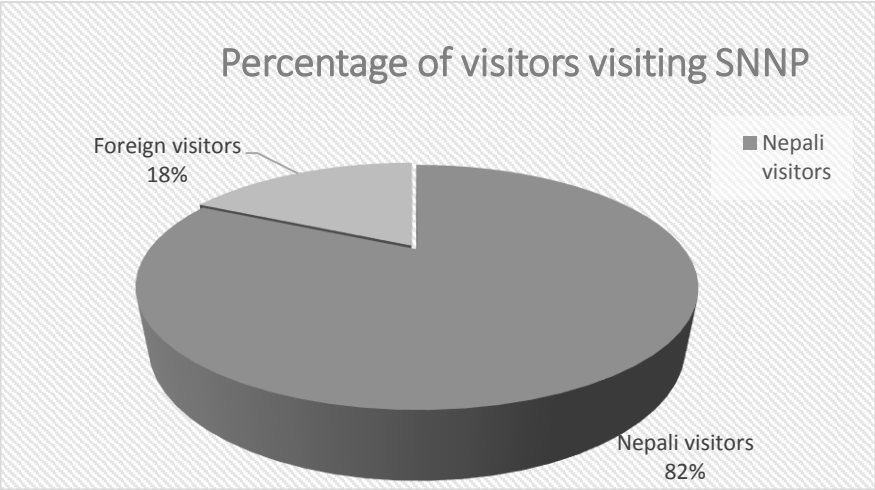
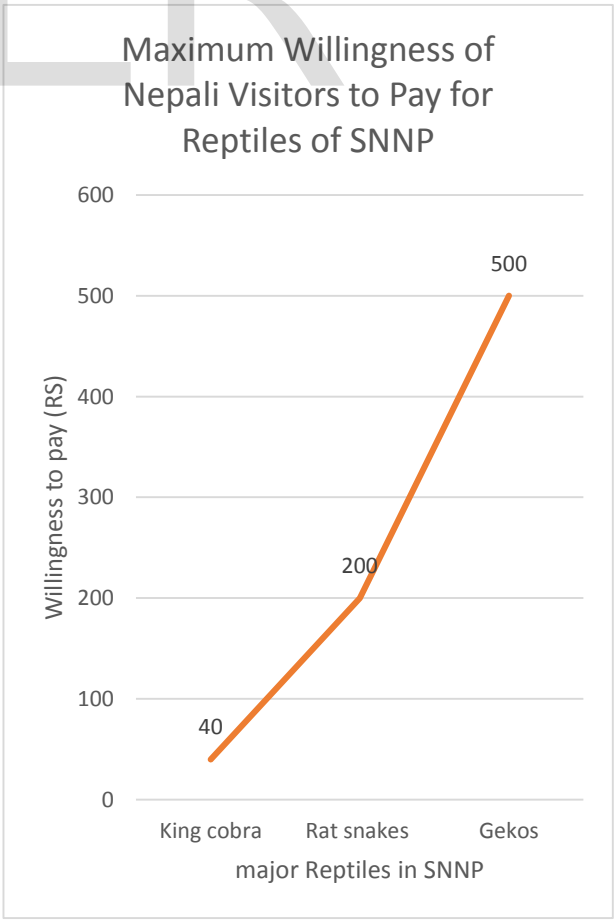


Figure 3: percentage of foreign and Nepali visitors

Service

4.1.3. Maximum willingness of visitors to pay for Ecosystem services of SNNP

From the study it has been known that there is no system of payments for seeing anything inside the park and enjoying some special movements out of their expectation due to ecosystem services in SNNP. As payment for satisfaction is obviously the part of PES mechanism Nepali and foreign visitors were interviewed to find their willingness to pay for the extra satisfaction that they gain from the ecosystem services inside SNNP. The study shows that Nepali visitors reasonably will to pay for the ecosystem services of SNNP. Following figures shows that maximum willingness of Nepali visitors to pay for the satisfaction they gain from different ecosystem services. The willingness payments ranges from Rs 50 to see the leopard cat to 1000 rupees they will to pay for enjoying Sundarijal watershed beauty and recreation of SNNP. They will to pay similar price to see reptiles and birds of Shivapuri Nagarjun National park. They will to pay Rs 500 for Geckos and spiny babbler to have just a glance of them. The



maximum willingness of Nepali visitors are given below

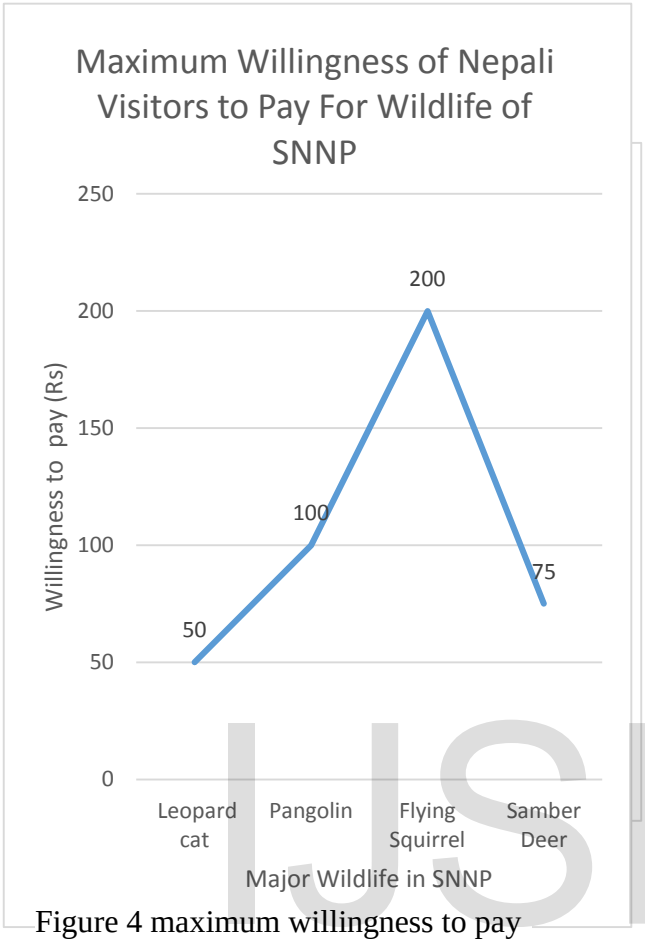


Figure 4 maximum willingness to pay for wildlife

Figure 5 maximum willingness to pay for reptiles

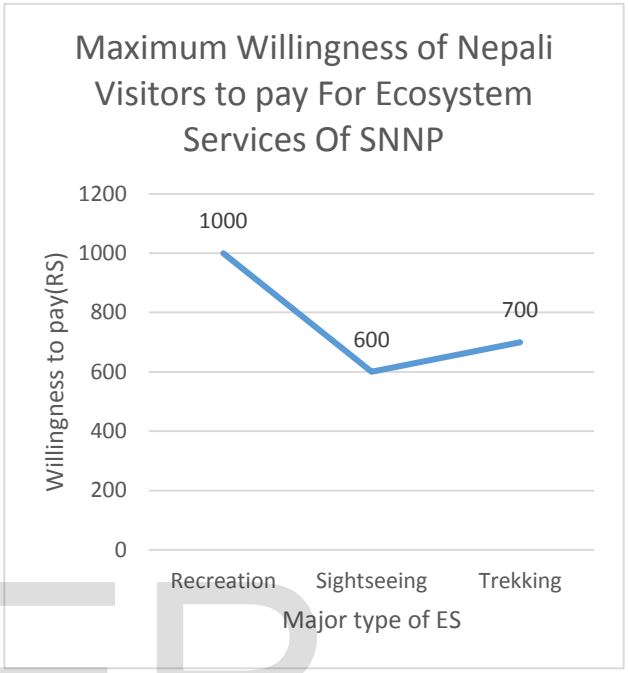


Figure 6: maximum willingness to pay For water services

Figure 7: maximum willingness to pay for other services

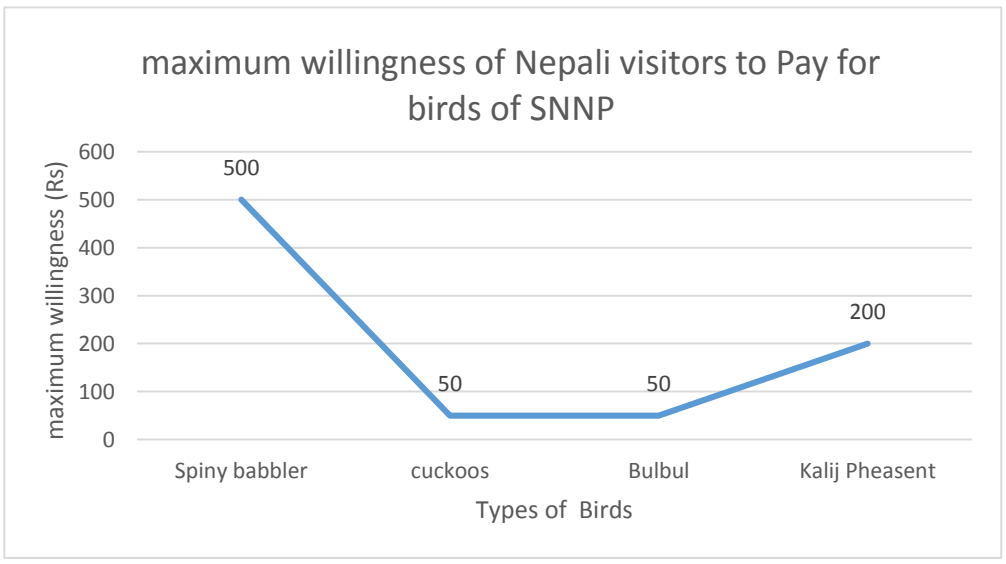


Figure 8 Maximum willingness of Nepali visitors to Pay for birds of SNNP

Similarly in the case of the foreign visitors who are found willing to pay from Rs 200 to leopard cat to Rs 5000 to see pangolin, enjoy Sundarijal water service and trekking through the Shivpuri Nagarjun National Park also Rs 3000 to see spiny babbler in SNNP. They will to pay Rs 4000 to see flying squirrel and Rs 1000 to see kalij pheasant, enjoy recreational service and to observe Bishnumati watershed in SNNP. Following figures gives detail knowledge about the maximum willingness of foreign visitors to pay for the ecosystem services of SNNP.

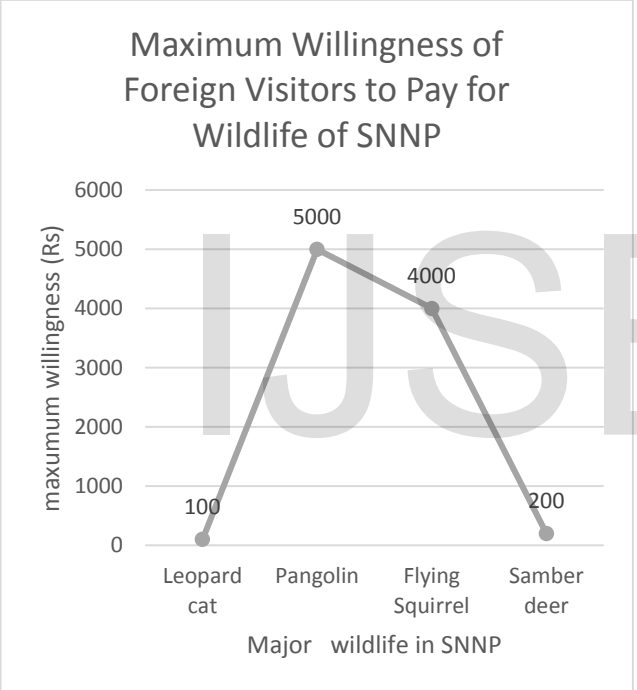


Figure 9: maximum foreign visitors Willingness to pay for wildlife

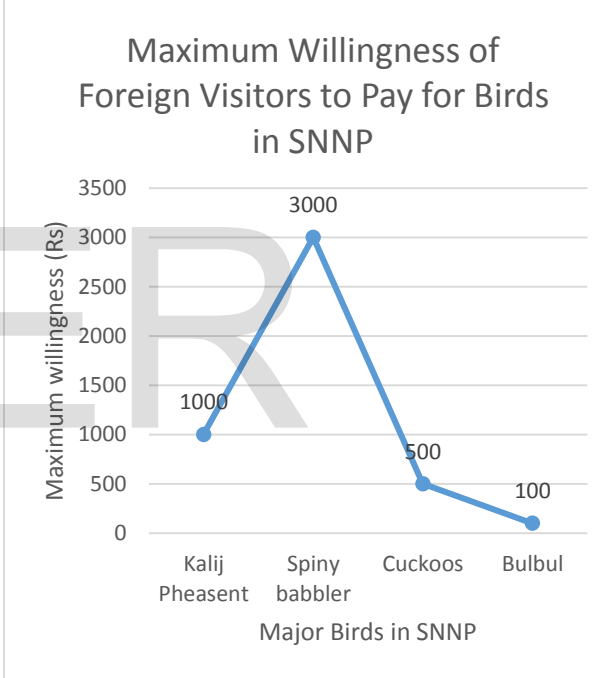


Figure 10: maximum foreign visitors willingness to pay for birds

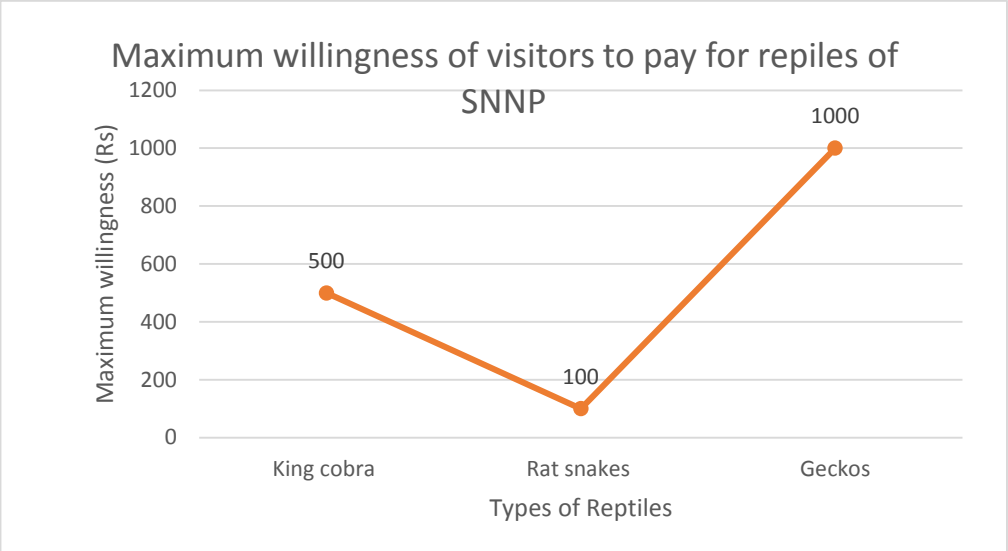


Figure 11 : Maximum willingness of foreign visitors to pay for reptiles of SNNP

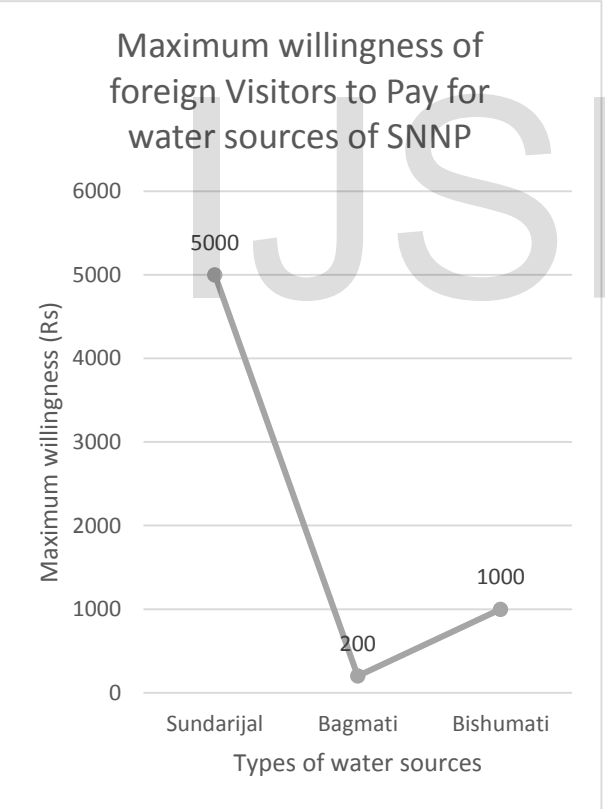


Figure 12: maximum foreign willingness For water sources

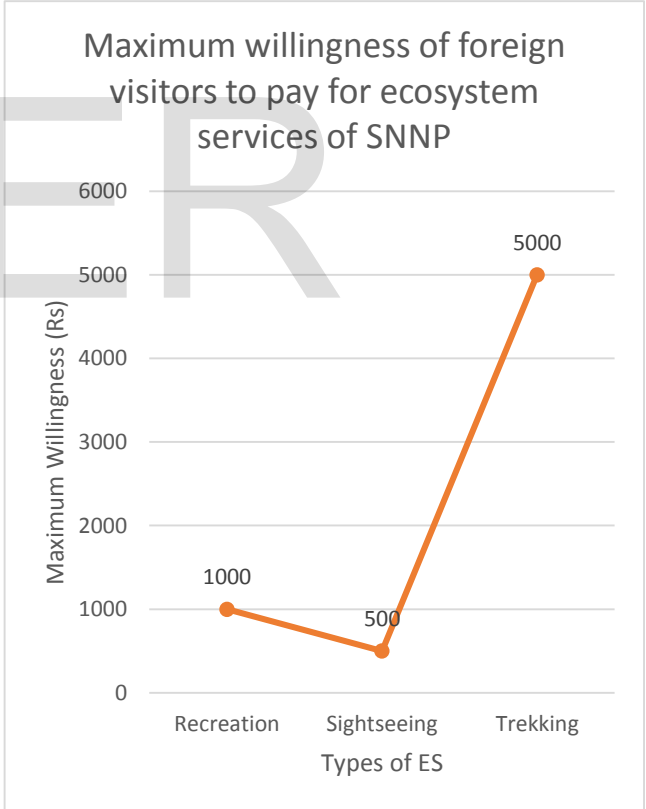


Figure 13: maximum foreign willingness for other services

Above findings indicates that the potentiality of payments for ecosystem services (PES) in SNNP is very high due to diversity of the ecosystem services. It have varieties of wildlife, birds, and reptiles inside attractive vegetation consisting various sources of watershed and glorious beauty and freshness. So the visitor's willingness to pay never ends if proper management of park is done. Moreover abundance of such birds, animals and reptiles should be amplified through the proper conservation mechanism. This shows PES schemes has huge potentiality in SNNP.

In same way the summary willingness of both Nepali and foreign visitors are shown below in the diagram. The diagram shows that 4 visitors wants to pay maximum 5000 rupees for the wild animals 7 visitors wants to pay maximum 3000 rupees for birds. Similarly,13 visitors wants to pay maximum 5000 rupees for the wild animals,2 visitors wants to pay maximum 1000 rupees for reptiles,11 visitors wants to pay maximum 1000 rupees for recreation and hence finally 6 visitors wants to pay more than 5000 rupees for Trekking. This shows that economic potentiality due to ecosystem services is very high in Shivapuri Nagarjun national park.

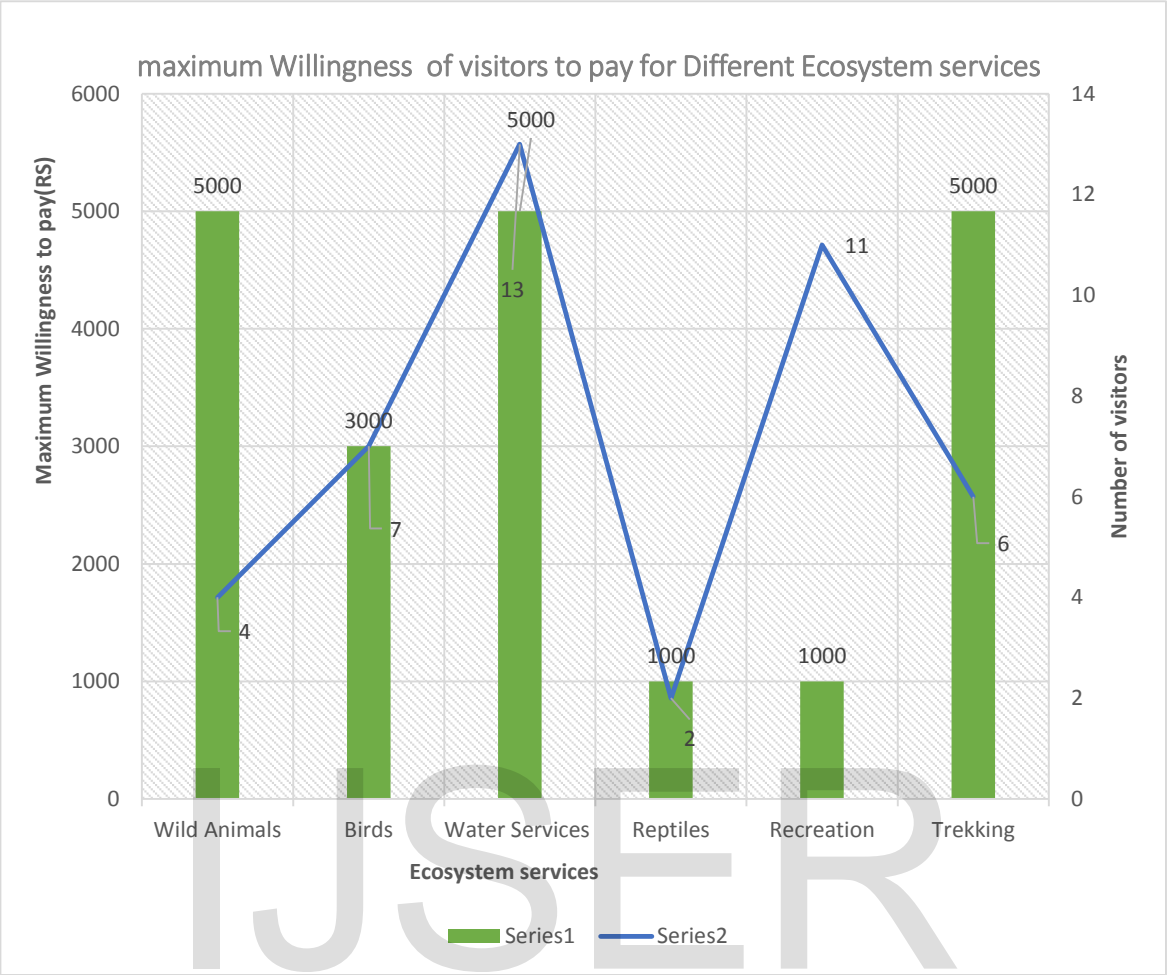


Figure 14: willingness of visitors to pay for the ecosystem services of SNNP

Thus, for the promotion of Ecosystem Services in SNNP conservator government should make the proper strategy related to conservation, management and utilization of ecosystem services of SNNP .At the same moment Government should be aware about the sustainability of ecosystem services. It means ecosystem should be able to yield similar service in future as consuming in present. This is only possible when people believes that the ecosystem service will provide same benefit to them on long term. For this there should be economic flow for ecosystem services promotion. There should be the system of direct payment for indirect goods or services provided by the ecosystem services. It means through implementation of PES schemes in SNNP ecosystem services can be made sustainable. The study shows that it is not difficult to apply polluter pay and conservator receive principle in SNNP.

4.2 Trends of income due to different ecosystem services of SNNP

Trends of revenue from different ecosystem services in different year is observed as given on table graph .Among the different types of ecosystem services the trend of revenue due to foreign and Nepali visitors entry fee shows significant improvements in different years. Out of total 210.25 million. Ecosystem services such as Trekking, Recreation, Jungle drive, mountain biking, Camping, Chhango game, Rock climbing and water services. The table describes the trends of income due to ecosystem services of different year.

Table 3: trends of income due to different ecosystem services

Source: Annual report of SNNP from 2008/2009 to 2014/2015

Types of Ecosystem services	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	Total
Trekking	4.8	6.07	8.58	9.06	10.25	12.63	13.8	**65.19**
Recreation	5.81	1.05	4.4	6.55	6.31	7.35	12.3	**43.77**
Jungle drive	0.8	2.48	1.31	0	0.38	3.19	5.45	**13.61**
Mountain biking	2.1	2.2	3.5	3.6	0.32	0.46	0.43	**12.61**
Camping	0.02	0.14	0.02	3.4	6.1	2.5	3.4	**15.58**
Chhango game	3.3	2.3	1.1	3.1	2.12	3.1	5.33	**20.35**
Rock climbing	1.2	1.5	1.4	2.3	1.14	2.17	5.15	**14.86**
water services	1.16	2.07	3.3	4.32	4.33	5	4.1	**24.28**
Total	**19.19**	**17.81**	**23.61**	**32.33**	**30.95**	**36.4**	**49.96**	**210.25**

Similarly the trends of income due to different ecosystem services is somehow increasing shows that the utilization of ecosystem services is increasing. The trends increase from19.9 million in 2008-2009 to 49.96 in 2014 -2015 due to different ecosystem services .Trekking seems to have incurred maximum income from the ecosystem services and mountain biking have incurred minimum income in these seven years. Since the table shows that all the ecosystem services have equal potentiality of ecosystem services the trend shows the great

potentiality from recreation and changgo game. And again rock climbing alone have income of Rs 14.86 million.

Following figure shows the income trends due to different ecosystem services in different years:

Source: Annual report of SNNP from 2008/2009 to 2014/2015

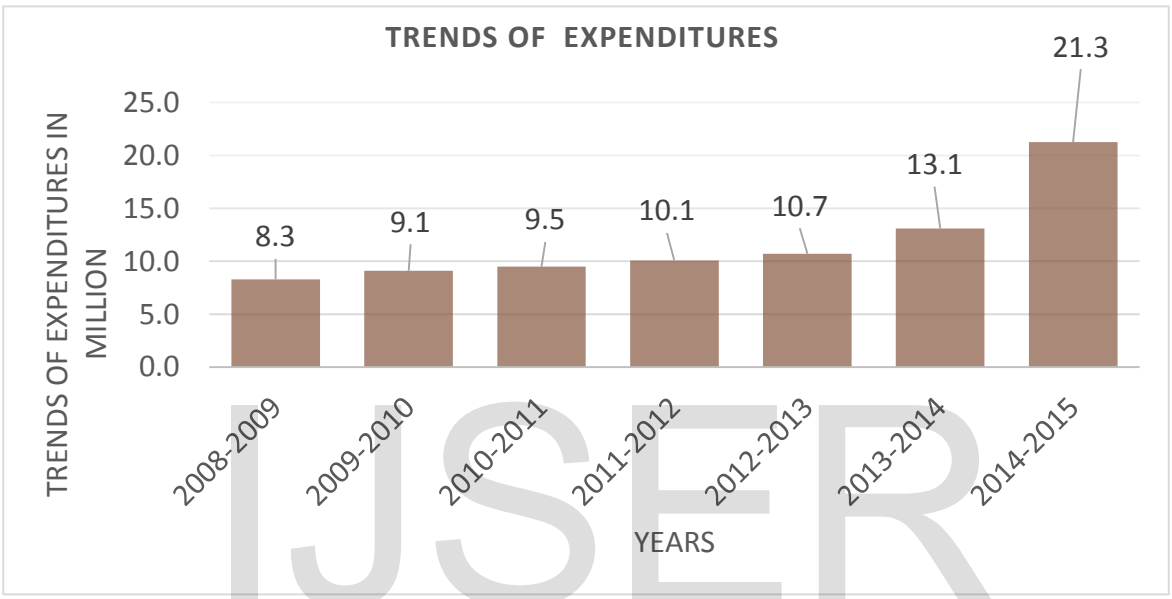
Figure 15: Trends of revenue of different ecosystem services in different years

4.3 Trends of expenditures of Shivapuri Nagarjun national Park (SNNP)

Expenditure trends shows that in the year 2008-2009 total expenditure made by park was 8.3 million rupees and total expenditure on 2014-2015 was 21.3 million rupees. Similarly on the 2009-2010 total expenditure of park was 9.1 million, in 2010-2011 total expenditure was 9.5 million, in year 2011-2012 total expenditure was 10.1 million, in 2012-2013 it was 10.7 million, in 2013-2014 total expenditure was 13.1 million rupees. This shows that trend

of expenditure is continuously in increasing. Both income and expenditure is in continuously increasing pattern.

This shows that more conservation efforts are made on park to improve the ecosystem services. The study made by Kamal Jung kuwar, 2008 shows that there is huge potentiality of PES schemes on watershed and similar trend of income showed the high potentiality of ecosystem services .



Source: Annual report of SNNP from 2008/2009 to 2014/2015

Figure 16: Expenditure trend of SNNP

4.4 Potentiality of payments for Ecosystem services In Shivapuri Nagarjun National park

The study shows that total income of the seven year has been found to be 210.3 million rupees and total expenditure found to be 82.1 million. Mean, Median and Standard deviation of income has been found to be 30, 31 and 11.2 and expenditure has been found to be 11.7, 10.1, 4.2.

Table 4: Income and Expenditures

Description	Income	Expenditure
Total	210.3	82.1
Mean	30.0	11.7
Median	31.0	10.1
Standard deviation	11.2	4.2
Minimum	17.8	9.9
Maximum	50.0	21.3

Considering total income as total income as total benefit and total expenditure as total cost B/C ratio was found to be 2.6,Net present value (NPV) has been found to be 75 and Percentile index(PI) is found to be 40.9. As they all are positive it indicates that SNNP ha s very high economic potentiality of ecosystem services.

Table 5: B/C ratio, NPV table and PI index table

Total benefit	210.3
present value of Benefit	123.0
Total cost	82.1
present value of cost	48.0
B/C ratio	2.6
NPV	75.0
PI	40.9

4.5 Visualizing the economic potentiality in map of SNNP

According to Buffer zone management plan (2015-2019) submitted by project Coordination unit National trust for nature conservation, Khumaltar, Lalitpur, maps ere important part for planning. Furthermore different maps showing the geographic status of the site were prepared. This proves that PES potentiality overall depends on proper mapping of the study site and preparing proper spatial framework of site. Supporting this vision different maps of the Shivapuri Nagarjun national park are demonstrated in this report. Moreover map

visualization is very important before launching the project. Planning can be comfortable made after the spatial visualization.

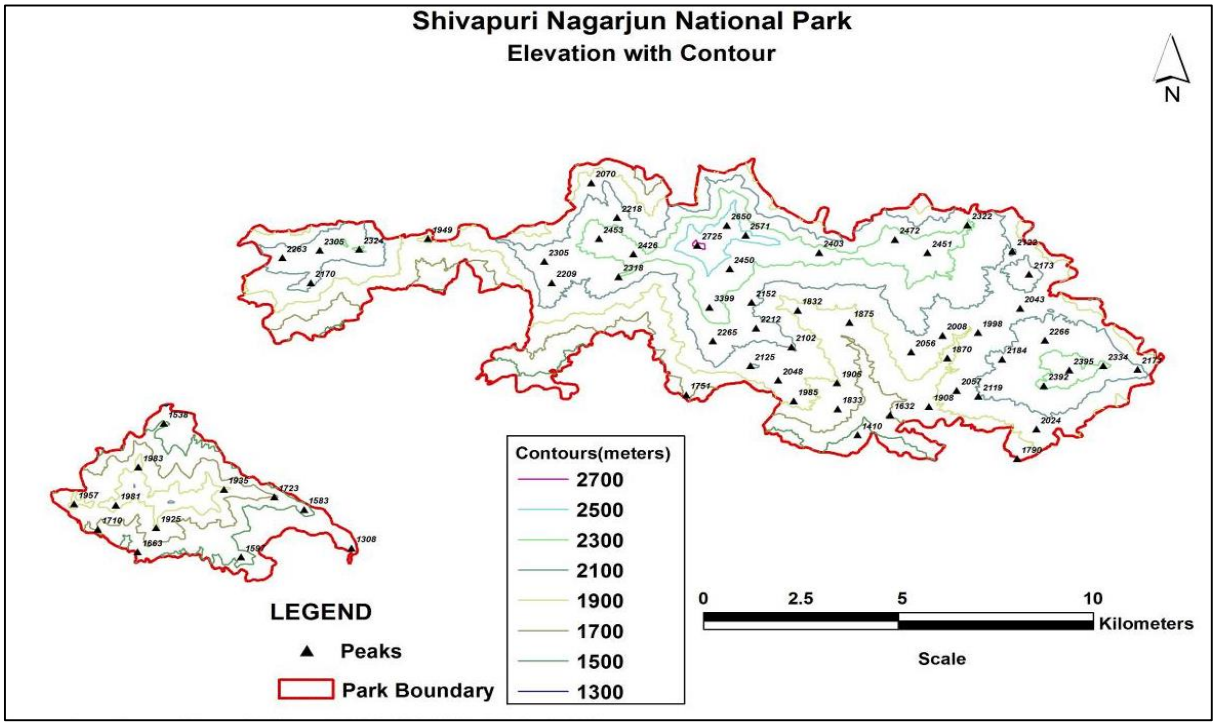
Given maps demonstrates elevation contour of SNNP, Trial networks of SNNP, River systems of SNNP, Post location of SNNP, Proposed buffer zone of SNNP, land cover map of SNNP and Visitors willingness map of SNNP. Table above the maps gives information about the map. They are presented below.

4.5.1 Elevation with contour map

The maps shows that elevation of Park ranges from 1000 to 2732 m. It mostly consists of mountainous and steep slopes which ranges from >30 % at least in 50% of the total area.so soil erosion at the site is very high.

Table 6: Elevation with contour of SNNP

Sno	Information's	Data's
1	Elevation of the Park	1000 m to 2732 m
2	Slopes	>30 % at least in 50% of the total area
3	Topography of SNNP	Mountainous with steep slopes
4	Soil erosion	Very high



Source: Department of National Park and wildlife conservation (DNPWC)

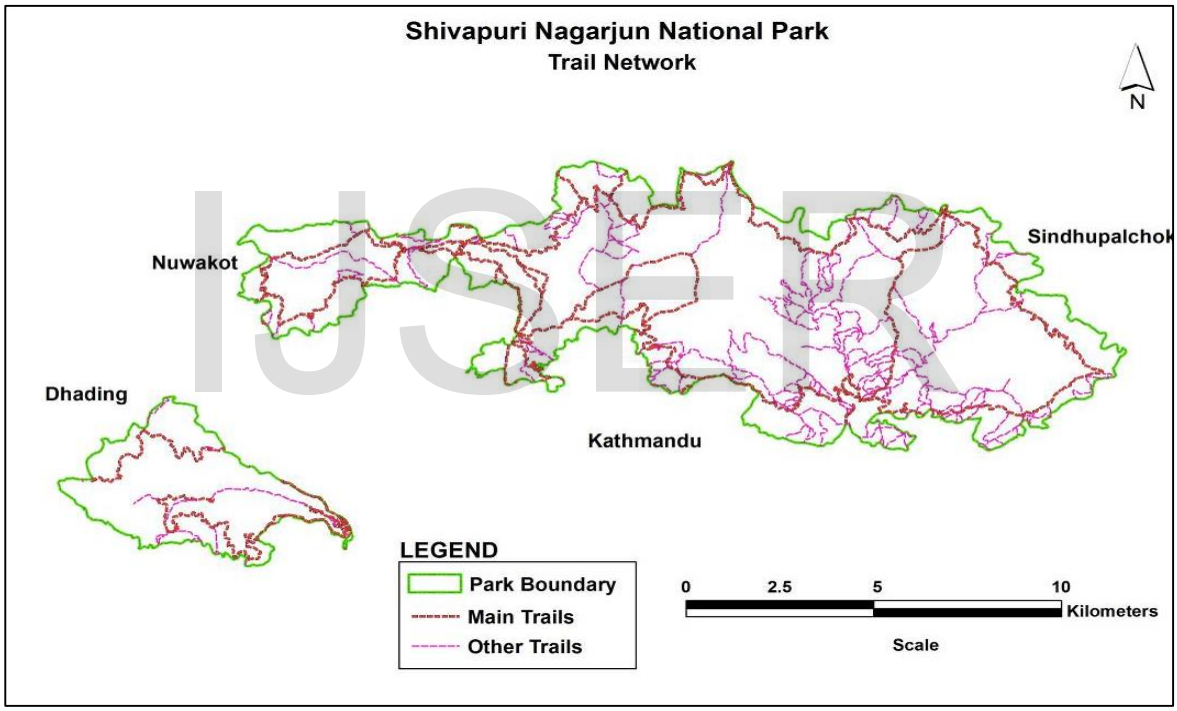
Figure 17 SNNP elevation with contour map

4.5.2. Trial Network map

From the map we can highlight different road networks through Shivapuri Nagarjun National park. We can mainly observe main trail and other trail seperated inside the park .trails are mainly used by the villagers and visitors.

Table 7: Trial Networks in SNNP

Sno.	Informations	Data's
1	SNNP road-networks from the Kathmandu	Panimuhan, Tokha, Kakani, Sundarijal and Nagarjun
2	Boundary wall	111 km long mud stone-wall in Shivapuri sector and 29 km in Nagarjun sector
3	Roads inside SNNP	95 km long graveled-road and 83 km foot trails constructed for trekking



Source: Department of National Park and wildlife conservation (DNPWC)

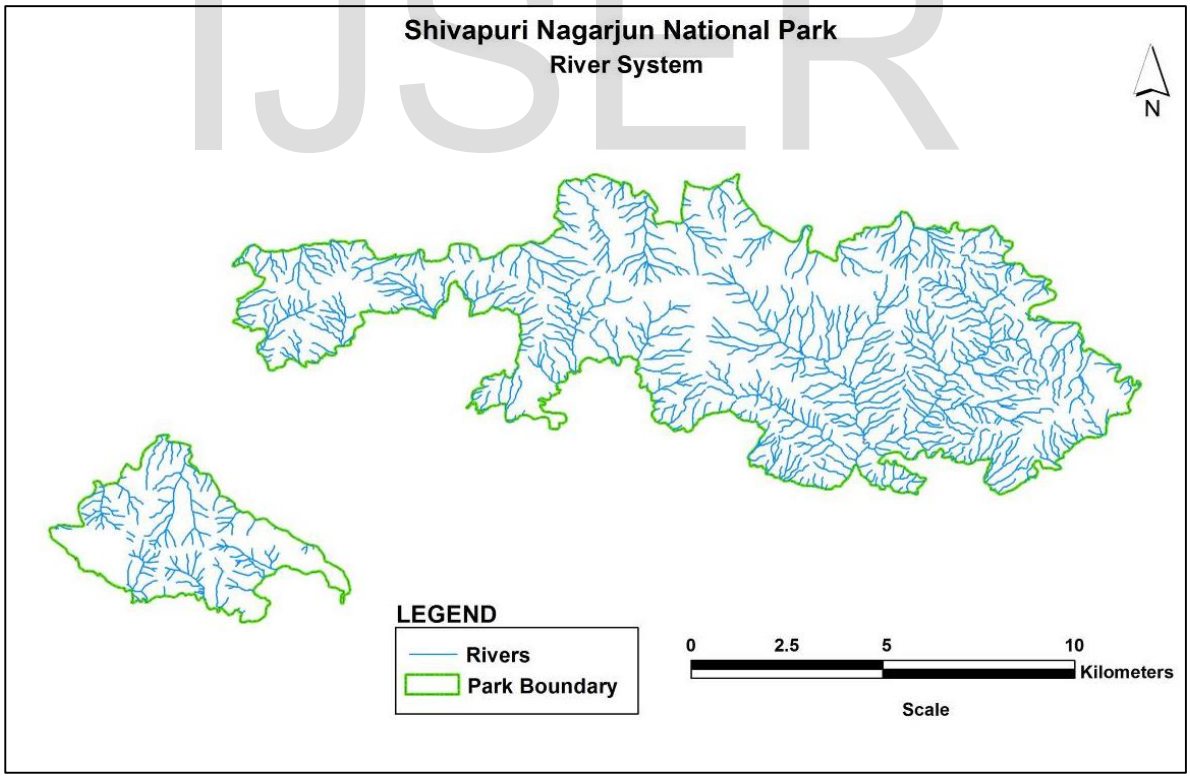
Figure 18 SNNP Trail Network map

4.5.3 River system map

From the river system map we can trace out the potentiality of water services in Shivapuri Nagarjun national park. The map shows that park is rich in water Sources. Different Rivers in park are shown below in table.

Table 8 River system of SNNP

Sno	Informations	Remarks
1	River systems	Bagmati, Bishnumati, Nagmati, Syalmati, Rudramati, and Yasomati.
2	sub-watersheds of small streams	RudramatiMahadev, Chahari, Yagmati, Sani and ThuliJhyalmati and Dhobi Kholas
3	Rivers draining to the Northern side	Likhu and SindhuKhola



Source: Department of National Park and wildlife conservation (DNPWC)

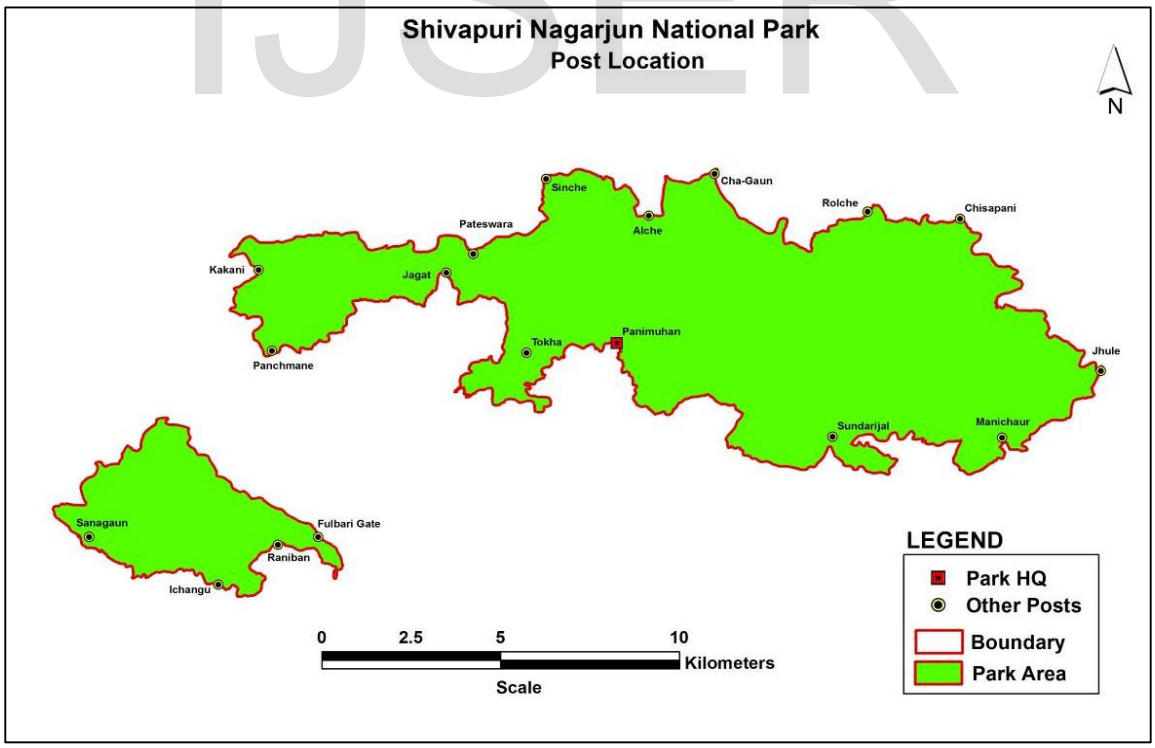
Figure 19 SNNP River system map

4.5.4 Security post location map

Post location map demonstrates the status and location of the security posts in Shivapuri Nagarjun national Park. The park in all four side is surrounded by security posts of Nepal army. However different police forces are also acting for the security of park.

Table 9 Security post location of SNNP

Sno	Informations	data's
1	Total Number of posts	22
2	Number of security post in Shivapuri	12
3	Number of security post in Nagarjun	9
4	Main headquater	1 in Tokha
5	Battalion shivapuri	Ranabambattalian
6	Battalian in Nagarjun	BhairabprasadBattalian



Source: Department of National Park and wildlife conservation (DNPWC)

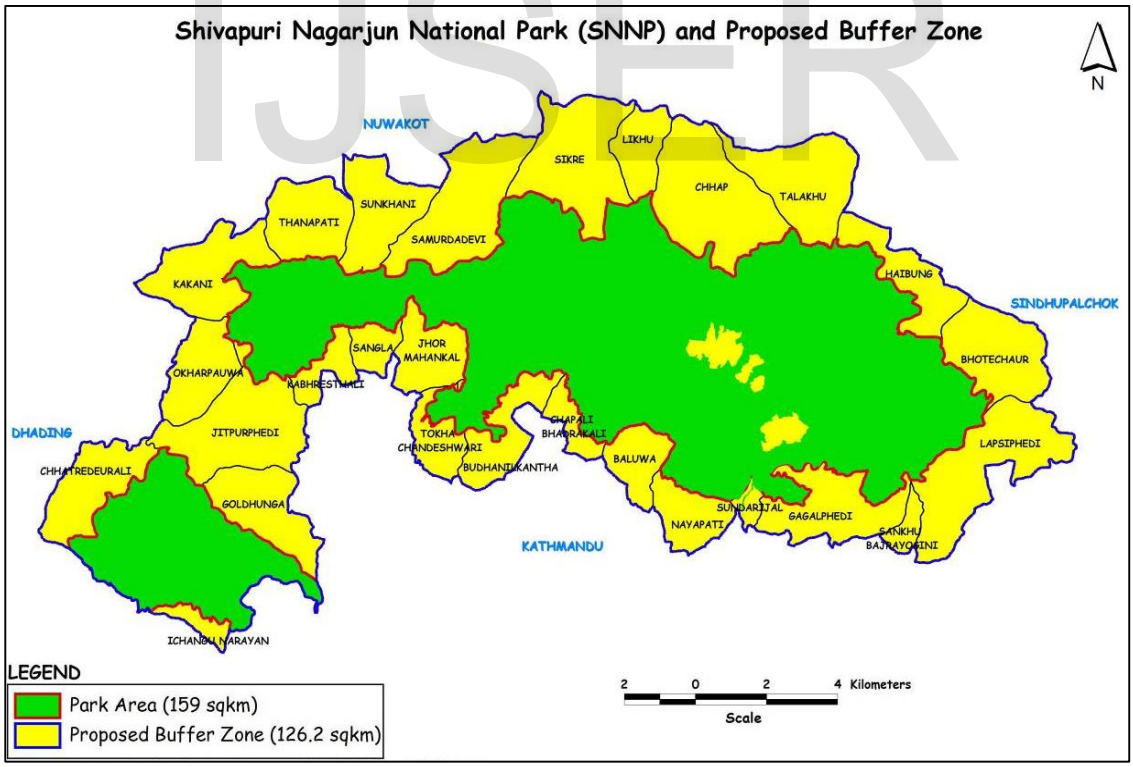
Figure 20 SNNP Security post location map

4.5.5 Proposed buffer zone map

The proposed buffer zone map shows the economic potentiality of Shivapuri Nagarjun National park. It demonstrates the all VDC of Nuwakot , Sindhupalchok, Kathmandu and Dhading district that are planned to develop as Buffer zone.

Table 10 purposed buffer zone of SNNP

SN	Information	Data
1	Proposed BZ covering	126.2 Km^2
2	Number of VDC included	28
3	Number of Wards Included in Buffer Zone	154
4	Number of population	79,969



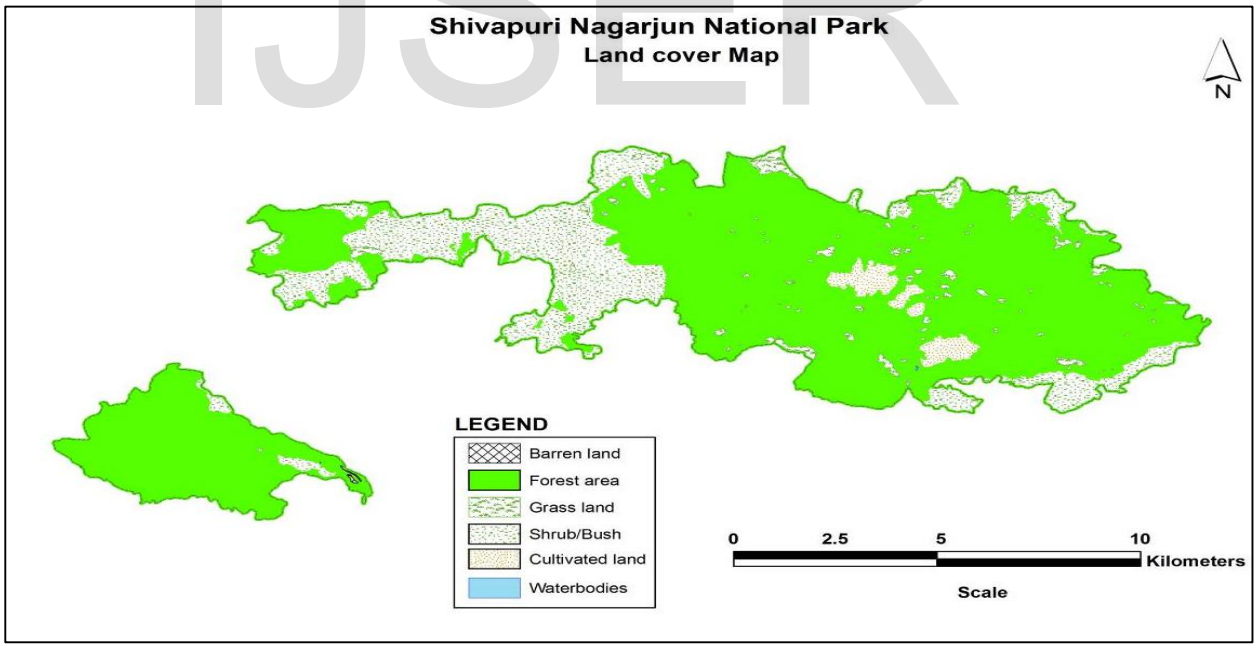
Source: Department of National Park and wildlife conservation (DNPWC)

Figure 21 SNNP Proposed buffer zone map

4.5.6 Land coverage map

Table 11 land coverage of SNNP

Sno	Information	Descriptions	
		Area in Km^2	% out of total area
1	overall decline in forest land	6.71 Km^2	0.91%
2	overall decline in Bare land	18.8 Km^2	0.53%
3	Raise of agricultural land	25.5 Km^2	0.72%
4	Adverse impact of land use mainly observed in Areas	water quantity, water quality, soil condition and forest resources, firewood and timber overharvesting, alcohol production, and population	



Source: Department of National Park and wildlife conservation (DNPWC)

Figure 22 SNNP land use map

4.5.7 Visitors Location map

Given maps shows the location of visitors in Shivapuri Nagarjun national park. Visitors are distributed through the Shivapuri Nagarjun National park. They enjoy all type of ecosystem services in park.so overall ecosystem services should be promoted to improve economic potentiality of ecosystem services.

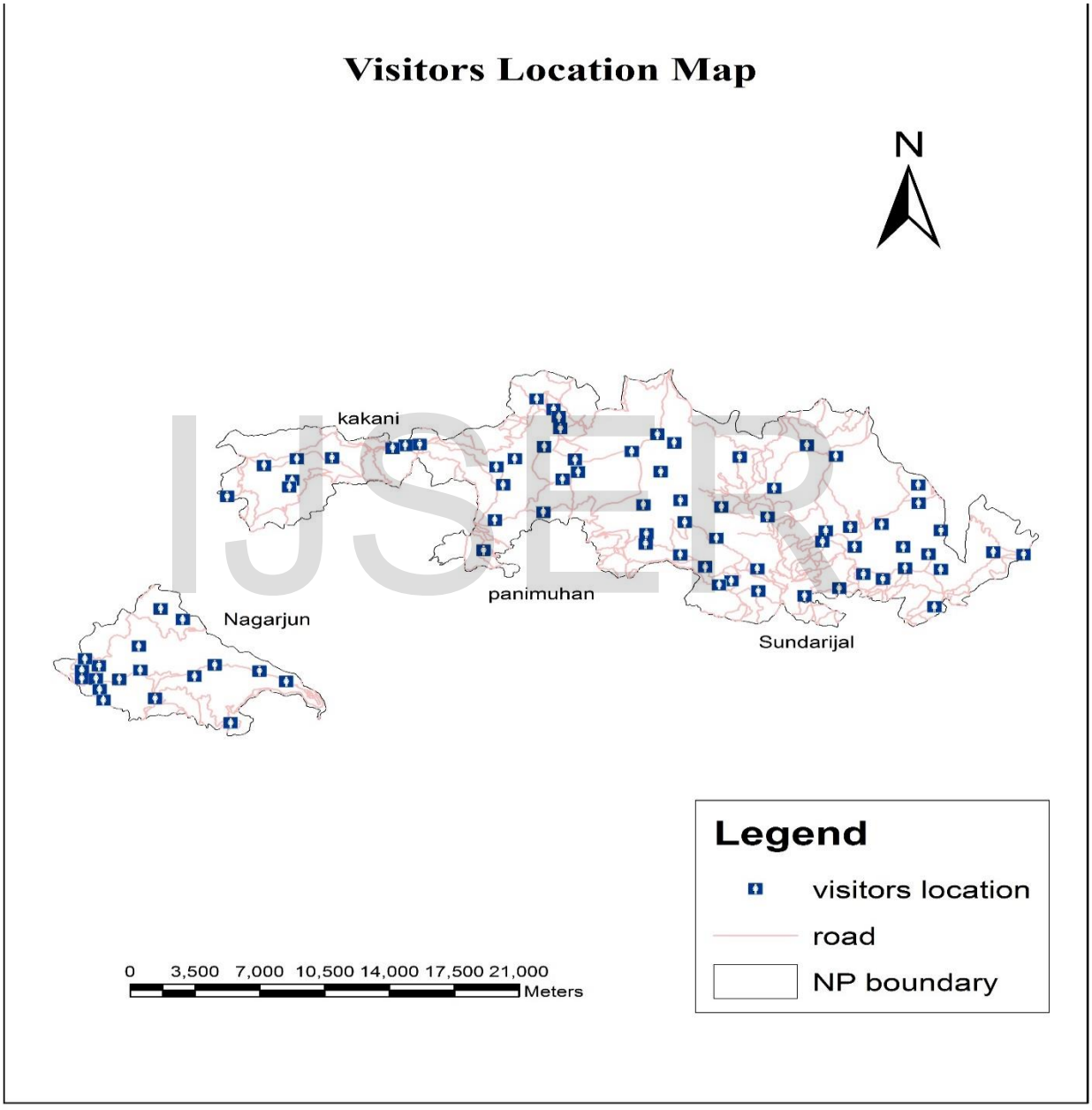


Figure 23 visitors location map

CHAPTER V CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The overall study shows that there is high potentiality of PES schemes in Shivapuri Nagarjun National park.

- Visitors have high willingness to pay for the ecosystem services of park. They will to pay the monetary value for ecosystem services of park.
- The trend of income and expenditures of park are both increasing shows that both utilization of ecosystem services as well as conservation effort to enhance ecosystem services are increasing.
- There is huge economic potentiality of ecosystem services. So it is required to be implemented in SNNP.

5.2. Recommendations

For Further improvement in the ecosystem potentiality of Shivapuri Nagarjun National park this study makes following recommendations:

- There should be clear provision in policy, acts, rules, regulations, and guidelines to address the issue of PES and benefit sharing. Appropriate environmental governance policies and institutional set up are required.
- There should be assurance of local level participation to conserve the ecosystem services.

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REFERENCES

- Acharya KP, Baral SK, Malla R, Basnyat B. 2010. Potentiality of payment for environmental services in community forests of Nepal [Internet]. [cited 2012 Jul 20]. Available from: http://www.forestrynepal.org
- Amatya, D. 1933. Study on Forest Vegetation Analysis. Field Document No. 7. SIWDP, HMG/FAO. Kathmandu, Nepal.
- Azam, M.A. &Borsha, F.H. 2013. Community practices towards ecosystem services in Mulkharka village, Shivapuri National Park, Nepal. International Journal of Scientific and Technology Research.
- Bajracharya, S. 2009. An assessment of crops damage by wild animals in the southern parts of Shivapuri National Park. Master's dissertation, Central Department of Zoology, Tribhuvan University, Kathmandu
- Baral H, Keenan RJ, Stork NE, Kasel S. 2014. Measuring and managing ecosystem goods and services in changing landscapes: a south-east Australian perspective. J Environ PlannManag.
- Bhandari, A. 1998. Fuelwood dependency of buffer zone people: a case study of Baluwa and Nayapati village in Shivapuri watershed and wildlife reserve, Nepal. Master's dissertation, International institute for Aerospace Survey and Earth Sciences.
- Bruce J, Wendland KJ, Naughton-Treves L. 2010. Whom to pay Key concepts and terms regarding tenure and property rights in payment-based forest ecosystem conservation. Madison
- CIFOR. 2007. Tropical forest and climate change adaptation [Internet].
- Corbera EK, Brown K, Adger WN. 2007. The equity and legitimacy of markets for ecosystem services. Dev Change.
- DEFRA. 2007. An Introductory Guide to Valuing Ecosystem Services. Department of Environment, Food and Rural Affairs, Crown, London.

- DNPWC 2012. Annual Report, Fiscal Year july 2008-july 2009 to July 2014-July 2015, Department of National Parks and Wildlife Conservation, Kathmandu, Nepal.
- Engel S, Palmer C. 2008. Payments for environmental services as an alternative to logging under weak property rights: the case of Indonesia. Ecol Econ.
- FAO/HMG. 1996. Shivapuri Management Plan.
- Garbacha K, Lubella M, DeClerck FAJ. 2012. Payment for Ecosystem Services: the roles of positive incentives and information sharing in stimulating adoption of silvopastoral conservation practices. AgricEcosyst Environ.
- GoN/MFSC. 2010. Nepal's readiness project proposal; REDD, Kathmandu: Government of Nepal, Ministry of Forests and Soil Conservation.
- Gutman P. 2007. Ecosystem Services: foundations for a New Rural-urban Compact.
- Hubermann D. 2009. A gateway to PES: using payments for ecosystem services for livelihoods and landscapes. Markets and incentives for livelihoods and landscapes series No. 1, forest conservation programme. Gland: International Union
- Kunwar, K.J. 2008. Payment for Environmental Services in Nepal (A case study of Shivapuri National Park, Kathmandu, Nepal. The Initiation, 2(**1**): 63-72. Available online: http://www.nepjol.info/index.php/INIT/article/view/2525
- NPC/MPE/HMG. 2003. Sustainable Development Agenda for Nepal. National Planning Commission, Ministry of Population and Environment, His Majesty's Government.
- SNNP, 2011. Annual Report, Fiscal Year July 2008-July 2009 to July 2014-July 2015. Shivapuri Nagarjun National Park, Kathmandu. www.forestrynepal.org
- Wunder S, Engel S, Pagiola S. 2008. Taking stock: a comparative analysis of payments for environmental services programs in developed and developing countries.

ANNEX 1

General Information of SNNP

Location	Central Development Region of Nepal
District (s)	Kathmandu, Nuwakot, Sindhupalchowk and Dhading
Coordinates	Latitude (27^0 43' - 27^0 52' N), Longitude (85^0 13' - 85^0 45' E)
Physiographic zone	Middle mountain
Major landscapes	Watershed/rivers (Bagmati, Bishnumati, Nagmati, Syalmati, Sani khola, ThuliKhola and AlleKhola; LikhuKhola
Total area	159 km^2 (Shivapuri :144 km^2 and Nagarjun: 15 km^2)
Elevation range	1000 m-2732 m
Climate and weather	Monsoonal climate
Bioclimatic zone	Mid hills
Average temperature	Maximum (22.7^0), Minimum (0.30^0 C)
Mean annual rainfall	2727 mm
Park headquarters	Panimuhan, Budhanilkantha, Kathmandu
Range posts	10 (in two sectors: Manichud, and Dhakalchaur)
Nepal Army protection unit	12 security posts in Shivapuri (Ranabam Battalion) and eight security posts in Nagarjun (Bhairab Prasad Battalion)
Biodiversity: Forests	Four types of forest: Lower mixed hardwoodforest, Chir pine forest, Upper mixed hardwood forest, and Oak forest
Flowering plants	1250 species
Economic plants	102 species of medicinal plants, 49 species of edible plants
Fauna	24 species of mammals, 311 species of birds

Livelihood: Proposed Buffer Zone Area	126.2 km^2, 28 VDCs (total and partial) and 154 wards adjoining the park area
Major ethnic groups	Tamang, Brahmin, Chhetri, and others
Population (in proposed BZ)	79969 (Male: 39619, Female: 40350) *use 2011 census data*
Economy	Agriculture, animal husbandry, daily wage labor
Tourism: Major attractions	*Shivapuri-Sundarijal*: Bagdwar, Bajrayogini, Bishnudwar, Budhanilkantha, Manichur, Nagigumba, PachaliBhairab, Sundarijal, Tarkeshowar, *Nagarjun*: BalajuBaisdhara, Inchangu Narayan, Jamacho

ANNEX 2

Questionnaire checklists

(For semi structured interview with hotels, lodge and resorts around parks**)**

Name of surveyor:

Date:

GPS coordinates:

X Coordinate:

Y Coordinate:

1. General information about hotel:

- Type of organization: Hotel /lodge/resorts
- Name of organization:
- Location of organization:

2. Type of tourist mostly visiting the organization:

- Domestic
- Foreign

3. What is the purpose of tourist visiting the park?

4. What is the number of tourist visiting the park?

- Yearly
- Monthly

5. Which is the peak month for the tourist visit?

6. Is the number of tourist increasing or decreasing compared to last year?

7. Is there any provision of royalty payment to park?

- Yes
- No

8. If yes how much do you pay to SNNP?

9. If no how much do you will to pay?

QUESTIONNAIRE CHECKLIST

(For semi structured interview with the visitors in SNNP)

Name of the surveyor

Date

GPS coordinates

1. General information about visitors

- Name of the visitors
- Gender
- Name of place of visit
- Ethnicity

2. What is your purpose of visit?

3. Type of visitors

- Domestic
- Foreign

4. How much did you paid for current visit including travel cost?

5. How much you really will to pay for this visit?

6. How much would you like to pay if you see following animal in park?

- Clouded leopard (Neofelisnebulosa)
- Pangolin (Manissps)
- Leopard cat (Felisbengalensis)
- Samber deer

- Flying squirrel
- Goral(naemorhedus goral)

7. How much would you really like to pay if you see following birds in park?

- Kalijphesant
- Spiny babbler
- Vulture
- Dark kite
- Bulbul

8. How much would you pay if you see following reptiles in park?

- King cobra
- Rat snake
- Geckos

9. How much would you like to pay for watershed beauty of park?

- Sundarijal watershed
- Bishumati watershed
- Baghmati watershed

10. How much would you like to pay?

- Recreation
- Camping
- Jungle drive
- Rock climbing
- Trekking

11. How much you really will to pay for your visit to the park including travel cost?

ANNEX 3

GPS coordinates

Visitors location at Panimuhan

Sno	X coordinates	Y coordinates	Elevation
1	339568	3075157	1661
2	339629	3075160	1669
3	339638	3075160	1670
4	339645	3075139	1673
5	339640	3075095	1679
6	339685	3075060	1685
7	339714	3075102	1704
8	339718	3075080	1701
9	339748	3075128	1709
10	339732	3075056	1699
11	339787	3075152	1721
12	339784	3075102	1726
13	339796	3075166	1717
14	339760	3075029	1693
15	339754	3075322	1753
16	339770	3075036	1695
17	339793	3075087	1728
18	339836	3075197	1724
19	339839	3075066	1733
20	339755	3075408	1755
21	339862	3075199	1726
22	339853	3075044	1735
23	339889	3075016	1740
24	339918	3075225	1732
25	339896	3074994	1742
26	339922	3075279	1737
27	339296	3075529	1841

Visitors Location at Kakani

Sno	X coordinates	Y coordinates	Elevation	Remarks
1	329253	3077449	1968	Near entry gate
2	329262	3077490	1983	Near tower View
3	329319	3077789	2030	hotel area
4	329441	3077868	2041	sahidsmarak park
5	329449	3077723	2051	View tower
6	330025	3077658	1998	scout kakani
7	330434	3077523	2038	national park
8	330329	3077451	2007	national park
9	330350	3077482	2025	national park
10	330381	3077492	2022	national park
11	330377	3077499	2023	national park
12	330394	3077520	2045	national park
13	330386	3077556	2070	national park
14	330422	3077584	2062	national park
15	330470	3077592	2065	national park
16	330499	3077620	2080	national park
17	330520	3077640	2025	national park
18	330531	3077690	2072	national park
19	330540	3077710	2066	national park
20	330789	3077720	2064	national park

Visitor's location at Nagarjun

Sno	X coordinates	Y coordinates	Elevation
1	332440	3069530	1329
2	332401	3069560	1331
3	332338	3069665	1336
4	332361	3069616	1334
5	332301	3069705	1338
6	332286	3069718	1338
7	332505	3069382	1323
8	332261	3069731	/1338
9	332476	3069391	1344
10	332234	3069743	1337
11	332474	3069363	1349
12	332574	3069221	1320
13	332213	3069760	1370
14	332188	3069761	1399
15	332688	3069792	1420

Visitors Location at Sundarijal

Sno	X coordinates	Y coordinates	Elevation
1	344654	3072457	1509
2	344671	3072566	1571
3	344782	3072646	1596
4	344978	3073022	1669
5	345305	3073049	1688
6	345458	3072949	1709
7	345655	3072983	1725
8	345664	3072985	1726
9	345644	3073037	1734
10	345606	3073086	1739
11	345554	3073057	1761
12	345677	3073143	1785
13	345674	3073150	1796
14	345745	3073201	1808
15	345779	3073208	1820
16	345890	3073269	1823
17	345945	3073269	1829
18	345986	3073305	1831
19	346044	3073325	1837
20	346115	3073405	1841
21	346178	3073491	1851
22	346251	3073549	1847
23	346256	3073523	2170
24	346251	3073547	2188

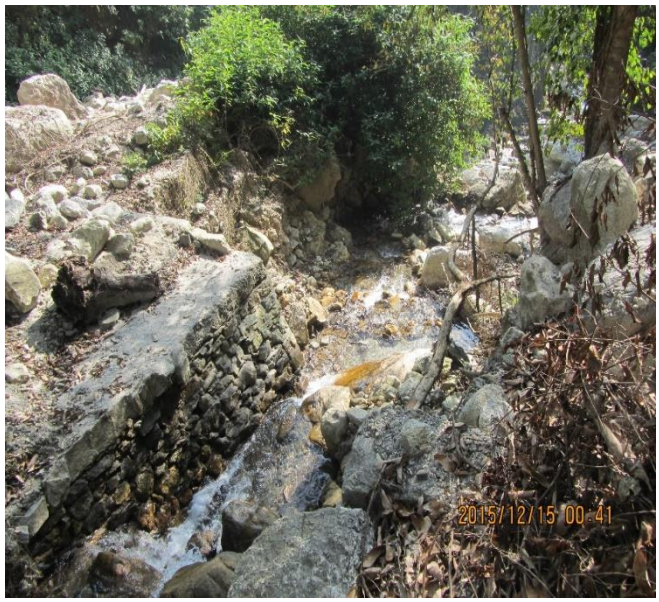
ANNEX 4

Photos

Picture 1: Entry gate to SNNP from panimuhan

Picture 2 Side View of SNNP from Panimuhan

Picture 3 SNNP office at Panimuhan



Picture 4 Mahadev River

*P*icture 5 Mountain View Side Kakani

Picture 6 SNNP view From Kakani

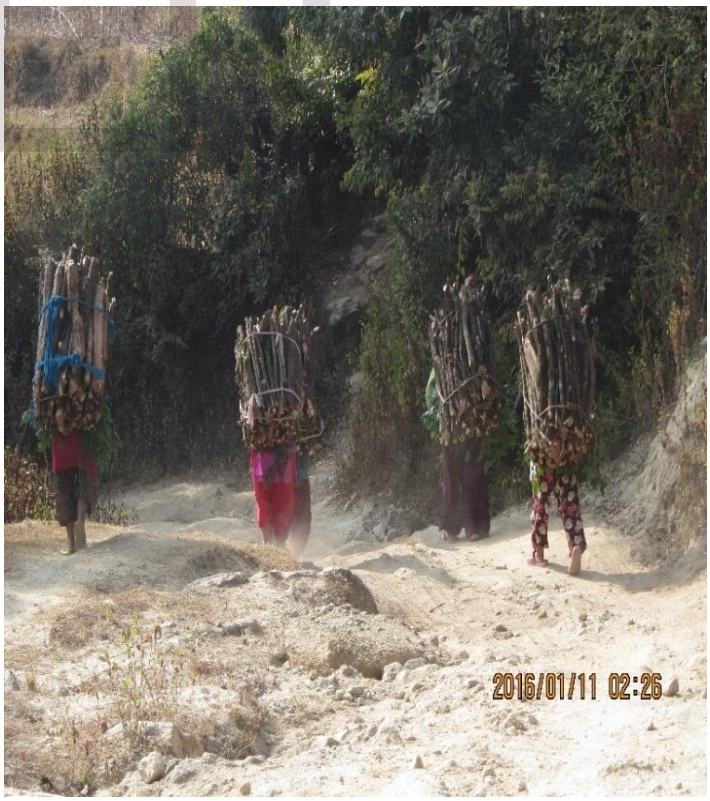
Picture 7 Chhango the Camping base camp

Picture 8 Kakani international scout center

Picture 9 Strawberry Farm in Kakani

Picture 10 Gate way to Sundarijal

Picture 11 Visitors in SNNP



Picture 12 Firewood collection from SNNP

Picture 13 Trekking Rout to Chisapane Picture 14 Visitor Responding to Questionnaire