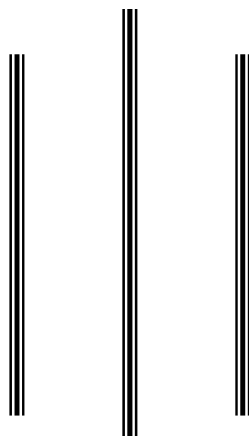
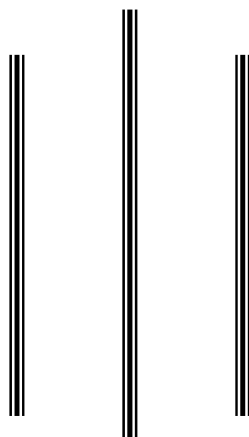


**ECONOMIC VALUATION OF ENVIRONMENTAL RESOURCES:
A CASE STUDY OF THE CENTRAL ZOO OF NEPAL**



A THESIS SUBMITTED FOR THE PARTIAL FULFILLMENT OF THE
REQUIREMENT FOR THE MASTER'S DEGREE OF SCIENCE IN
ENVIRONMENTAL SCIENCE



BY

TEK JUNG MAHAT

Exam Roll no. 1566, TU Regd. No. 5-2-37-299-98

CENTRAL DEPARTMENT OF ENVIRONMENTAL SCIENCE

TRIBHUVAN UNIVERSITY

KATHMANDU, NEPAL

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Letter of Recommendation

This is to certify that **Mr. Tek Jung Mahat** has completed the Thesis work entitled “**Economic Valuation of Environmental Resources: A Case Study of the Central Zoo of Nepal.**” under my guidance and supervision.

The entire work is based on the original research and contains useful outcome in recent environmental research and development. Therefore I recommend this Thesis for final approval and acceptance for the partial fulfillment of the requirements for the Degree of Masters of Science in Environmental Science.

Dr. Madan Koirala
Associate Professor
(Advisor)

Date: December 20, 2004

Letter of Approval

The Thesis paper submitted by **Mr. Tek Jung Mahat** entitled “**Economic Valuation of Environmental Resources: A Case Study of the Central Zoo of Nepal.**” towards partial fulfillment of Degree of Master of Science in Environmental Science has been approved for the final selection.

Dr. S. B. Karmacharya

*Professor
(Head of Department, CDES, TU)*

Dr. Madan Koirala

*Associate Professor
(Advisor)*

Dr. Devendra P. Chapagain

*Former Hon'ble Member, National Planning Commission
(External Examiner)*

Mr. Kedar Rijal

*Lecturer, CDES, TU
(Internal Examiner)*

Date of Examination: 4 January 2005 (BS 2061 Poush 20)

Certificate of Acceptance

The Thesis paper submitted by **Mr. Tek Jung Mahat** entitled “**Economic Valuation of Environmental Resources: A Case Study of the Central Zoo of Nepal.**” towards partial fulfillment of Degree of Master of Science in Environmental Science is hereby accepted. It is based on the original research and study under the guidance of Dr. Madan Koirala. The thesis in part or full is the property of the **Central Department of Environmental Science (TU)** and thereof should not be used for the purpose of awarding any academic degree in any other institution.

Dr. S. B. Karmacharya
Professor
(Head of Department, CDES, TU)

Date:

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Abstract

Economic valuation is a frequently applied measure of resource conservation in the developed world and its use is growing in the developing countries. It mainly aims to identify the role and importance of particular resources and to estimate their quantities. This is a very recent issue in Nepal, and has been used for the study of the Central Zoo, which is a major attraction for local and international tourists with the net annual visit of about 800,000. Some indicators show that the zoo needs further improvement and prompt action to improve its services. Less is known about how and where to start. There is an urgent need to assess the satisfaction level of the visitors and identify possible fund raising sources. The major objectives of the study include identification of the economic value of the zoo and the degree of relationship in between travel cost and the zoo visit. It further aims to investigate the management and financial status of the zoo, which could suggest sustainable measures to strengthen zoo facilities. To identify the economic value of the zoo the travel cost method was adopted and several other methods were applied to collect information on zoo management and the nature of the visitors. These methods include questionnaire survey, key informant interview, direct observation, direct count and focus group discussion.

The study shows that a higher proportion of school children, college students and adults visit the zoo in comparison to visitors of other age groups and professions. Brahmin, Chhetri and Newar are the dominant visiting castes. The zoo has an excellent public transportation access and it has achieved success in attracting a high proportion of visitors with relatively poor incomes. Public buses, tempos and microbuses are the widely used transportation facilities. There are limited numbers of visitors from SAARC countries and from the rest of the world. Visitor's level of education and their direct association with environment related organizations is not a significant determinant of the number and nature of visits. It is concluded that there is an inverse relationship between the travel cost and the number of zoo visits. The per capita economic value of the zoo is estimated to be NRs. 226.286 (US \$ 3.15). It would be better to improve environmental hygiene inside the zoo premises and expand facilities provided by the zoo. The existing entry fee for the college students could be increased by NRs 5 to 10 to raise funds for the zoo. It can strengthen economic strength of the zoo to improve its services. The zoo is found to be congested and needs expansion in its area. Greenery, peace, addition of animals, and availability of sufficient resting places are other major sectors for improvement.

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List of Acronyms

ADB	Asian Development Bank
BUP	Bangladesh Unnayan Parishad
CDES	Central Department of Environmental Science
CZ	Central Zoo
EEU	Environmental Economics Unit
ENS	Environment News Centre
ESDO	Environment and Sustainable Development Organization
ESEE	European Society of Ecological Economics
FOZ	Friends of the Zoo
IPR	Intellectual Property Right
ISEE	International Society of Ecological Economics
IUCN	World Conservation Union
KMTNC	King Mahendra Trust for Nature Conservation
MFSC	Ministry of Forest and Soil Conservation
MoPE	Ministry of Population and Environment
NEFEJ	Nepal Forum of Environmental Journalists
NPC	National Planning Commission
NRs	Nepalese Rupees (Nepalese Currency)
SAARC	South Asian Association for Regional Cooperation
SANDEE	South Asian Network for Development and Environmental Economics
TCM	Travel Cost Method
TRIPS	Trade Related Intellectual Property Right
TU	Tribhuvan University
WB	World Bank
WWF	Worldwide Fund for Nature
HMG/N	His Majesty's Government of Nepal

I. Introduction

Human beings, the superior species on the planet earth, have existed over a period of at least 5 million years. Since the Vedic and Pre-Vedic period, nature is the source for meeting human demands including drinking water, breathing air, habitat to live, clothes to wear and food to eat. Not only to human beings, the earth ageing about 4.5 billion years has nourished and continues nourishing millions of species of flora and fauna. With climatic adversities and gradual ecological and geological degradation many of them have vanished. The present generation could hardly estimate the ecological, medical and economic values of extinct species. Extinction of such species was mainly forced due to natural causes, for example extinction of dinosaurs due to environmental changes linked to the gradual withdrawal of shallow seas from the continents at the end of the dinosaurian era.

Many people look at natural resources as a source of direct benefits in a growing economy and undermine the roles played by the earth to maintain warm hospitality and earthly living. Abrupt ecological changes occurred with the shift of agricultural society to industrial society and afterwards inducing a great threat to nature through excessive pollution, adverse land use change, widening gap between “the haves and have nots”, exploitation of energy resources, and of course, extinction of biodiversity.

With the establishment of the Yellowstone National park in 1872, mankind has shown its desire to preserve nature, but degradation of nature continues while attempts to reverse the trend are inadequate. During the early years of the 20th century people generated idea to harvest aesthetic and educational value of nature with the establishment of highly facilitated captivity, gradually changing it to *ex-situ* conservation practice. Animals and plants with higher threat of extinction were placed in it to reshape, and it started a conservation revolution.

But this effort of human beings has not achieved the expected goal, which is indicated by thickening of the IUCN Red data book. To fill the information gap for such conservation measures, economic valuation, a judgment tool to identify the value of natural resources, is growing mainly after 1960s. It is a universal fact that “higher the value of an object, higher will be

the investment to save it”. The present work is an attempt to apply this concept in the Nepalese territory.

1.1. Background

Nepal is a landlocked country roughly rectangular in shape. It borders India to the East, West and South and China to the North with a total land area of 147181 km², ranging in altitude from less than 100 meters in the south to over 8,848 meters in the north. It extends from east to west with an average length of 885 km with non-uniform north-south width of 193 km. For administrative purpose the country is divided into 75 districts with 16 districts in the north (Mountain Region), 39 districts in the middle (Hills), and 20 districts in the south (Terai) (MoPE, 2001).

With the altitudinal and climatic variation Nepal is rich in biodiversity. Though it has only 0.09% of the total landmass of the world, yet about 2.6% of the flowering plants, 3.2% of Pteridophytes, 6% of Bryophytes, 8.57% of birds, 4.3% of mammals, and 1.5% of reptiles of the world's flora and fauna have been recorded in Nepal so far (MoPE, 2000). About 500 species of plants are endemic to Nepal. Over 1,000 species are described from Nepalese flora. Of the total species recorded, 20 plant species are included in the CITES appendices and 13 species are legally protected. HMG has also given legal protection to 26 species of mammals, 9 species of birds and 3 species of reptiles (MoPE, 2000). These species are conserved in 9 National Parks, 3 Wildlife Reserves, 3 Conservation Areas and 1 Hunting Reserves as well as other national and community forest areas. However species outside the protected areas are facing threat due to habitat loss and degradation, unregulated collection of forest products, poaching and hunting of wild animals.

1.2. Resource Conservation

Lekhak et al (2003), has described natural resources as “goods and services supplied by our living or non-living environment to meet human needs and wants”. These are of two types, **Material or tangible resources** (measurable in quantities). Some material resources such as fresh air, clean surface water, fertile soil, and useful plants are directly available for use. Most material resources such a petroleum, iron, groundwater and modern crops are not directly available and their supplies are limited. They become resources with some efforts and technological endeavor. Material resources are often classified as nonrenewable, potentially renewable and perpetual. **Nonmaterial**

or intangible resources (that can't be measured, but only felt by human sense) include solitude, tranquility, joy, security, beauty, love, skill and knowledge..

Literally, conservation means preservation and prevention of loss, waste, damage etc. (The Pocket Oxford Dictionary, 2001). Thus nature conservation is preservation of any natural wealth such as water, vegetation, soil, minerals etc. through their reasonable use to improve the quality of living of present human population as well as of the future generations. Unfortunately, conservation is understood as hoarding or rationing of supplies of goods from nature so that something is left for future use. Every day about 260,000 humans are added to the world population, 470 Km² of forests are cleared, 170 Km² of new deserts are created, 66 million metric tons of top soil are eroded, 10-100 species of living beings are eliminated and 71 million metric tons of heat trapping CO₂ and 1600 metric tons of ozone depleting chlorofluorocarbons are added to the atmosphere. Beyond any doubt, the critical environmental resources are now under stress (Lekhak et al 2003).

Environmentalists express doubt about sustainability of resources and human lives if present human population growth rate and present resource consumption rate remain unchanged. Mankind as an intellect creature of god is responsible for depletion and degradation of the environment and resources. Man has learnt to fly in the air like a bird, and swim in the water like a fish, but he has forgotten to live in harmony with nature. He harbors the wrong belief, that “he is the master of nature”. Hence all the results of his misunderstanding of nature has created loss of “Golden moments and spiritually peaceful healthy yesterday and the days before that” (Mahat 2003).

Hence learning from the past, our society should turn to sustainable society to harmonize in between economy, environment and physical development. Our present demand is development with environmental considerations i.e. Sustainable Development.

1.3. Concept of a Zoo

The aim of conservation is to bring biodiversity to use for society by making the people and communities knowledgeable about, capable of, and responsible for its management (Chaudhary 1998). There are two types of conservation measures, ***in-situ* conservation**, for conservation of ecosystems and their natural habitats and maintenance and recovery of viable population of species in their natural habitats (National parks, conservation areas, Nature reserves, protected areas are

suitable examples), and ***ex-situ* conservation**, meaning conservation of components of biodiversity outside their natural habitats. Examples include gene and seed banks, botanical gardens, in-vitro storage Cryopreservation, DNA bank-net, zoos etc. These are essential for the preservation of wild lives when natural habitat is unfavorable or undesirable for such species due to change in various components.

The Convention on Biological Diversity (1992), in Article 9, has made provision for the establishment and management of *ex-situ* conservation. It says that each Contracting Party shall, as far as possible and as appropriate, and predominantly for the purpose of complementing *in-situ* measures:

- (a) Adopt measures for the *ex-situ* conservation of components of biological diversity, preferably in the country of origin of such components;
- (b) Establish and maintain facilities for *ex-situ* conservation of and research on plants, animals and micro- organisms, preferably in the country of origin of genetic resources;
- (c) Adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions;
- (d) Regulate and manage collection of biological resources from natural habitats for *ex-situ* conservation purposes so as not to threaten ecosystems and *in-situ* populations of species, except where special temporary *ex-situ* measures are required under subparagraph (c) above; and
- (e) Cooperate in providing financial and other support for *ex-situ* conservation outlined in subparagraphs (a) to (d) above and in the establishment and maintenance of *ex-situ* conservation facilities in developing countries.

The zoo is a unique place, which holds collection of live, and in most cases endangered animals. It has significantly contributed to safeguarding the long-term survival of animals, as well provided services as a place of research, recreation and education to visitors (Chaudhary, 1998)). It is estimated that collectively more than 600 million people visit zoos all around the world. Zoos are accepted globally as open schools for biological and social information. The changing roles of zoos nowadays have taken the form of centres of conservation and education.

1.4. Tourism, Ecotourism and Protected Areas

Tourism is an important source of foreign exchange for many developing countries. Development of tourism in and around protected areas is seen as one of the best ways of delivering economic benefits to remote areas by providing local employment, stimulating local markets, and improving transportation and communication infrastructure (MoPE, 2004). Since ecotourism is related with nature travel in rural, remote and protected areas, tourism in Nepal is often viewed from an ecotourism perspective (SNV, 2003). The term ‘**ecotourism**’ is defined as traveling to relatively undisturbed or uncontaminated natural areas with specific objectives such as studying, admiring, and enjoying the scenery with its flora and fauna, as well as any existing cultural manifestations (both past and present) found in these areas. By this definition, nature-oriented tourism implies a scientific, aesthetic or philosophical approach to travel, although the ecologically motivated tourist need not be a professional scientist, artist or philosopher. The main feature of such tourism is that the person who practices ecotourism has the opportunity of immersing himself/herself in nature in a manner generally not available in the urban environment (MoPE, 2004). Ecotourism differs from other forms of tourism particularly due to the opportunity for observation and learning. It contributes to cultural conservation and long-term sustainability of communities and natural resources. Therefore, it is a form of sustainable tourism that benefits the community, environment and local economy. This may be achieved through various means such as employment for local people or programs where tourists contribute money or labor to community activities such as tree planting or conservation of local monuments or sites (SNV, 2003).

The growth in tourism was accompanied by a growth in undesirable socio-cultural and environmental problems in the destination areas. This situation called for special efforts to protect the environmental integrity and ensure development of the host areas. As a result, several protected areas including environmental projects came into existence with a strong tourism development component (MoPE, 2004). In Nepal such areas includes various national parks, conservation areas, religious sites and Himalayan regions, rivers (rafting) and the only national zoo which has experienced large pressure from local visitors.

1.5. Status of Biodiversity in Nepal

As already mentioned Nepal comprises only 0.09% of the land area on a global scale, but it possesses a disproportionately rich diversity of flora and fauna at genetic, species and ecosystem levels. These species are found in the dense tropical monsoon forests of the Terai, in the deciduous and coniferous forests of the subtropical and temperate regions, and in the sub-alpine and alpine pastures and snow-covered Himalayan peaks. Nepal falls within two bio-geographical realms, the Indo-Malayan and the Palaearctic realm, which add to the high biodiversity level. A comprehensive summary of biodiversity is given in table 1.1.

The first legislation to protect Nepal's wildlife was introduced more than a hundred and fifty years ago in the 1840s, during the regime of Jung Bahadur Rana, when restrictions were placed on the hunting of certain animals. The Central Zoo was also established during this period. The importance of conserving wild species of fauna and flora was first recognized by HMGN in Nepal's first Five-Year Development Plan (1956-1961). The Rhino Patrol, established in 1961 as a result of this first Plan, was fairly successful in controlling the poaching of large mammals. It was only after the 1970s that an effective conservation program allowed for the establishment of protected areas. So far, nine national parks, three wildlife reserves, three conservation areas, and one hunting reserve have been established in the three different ecological zones of Nepal: the terai, mid-hills and high mountains (MFSC 2002).

Table 1.1: An overview of species richness in Nepal (MFSC 2002)

Group of Organisms	Number of Species		Reference	Nepal Representation (%)
	Globally ¹	Nepal		
Bacteria	3,000-4,000	?		
Lichens	20,000	465	Sharma 1995	2.3
Fungi	69,000	1,822	Adhikari 1999	2.4
Algae	26,000	687	Baral 1995	2.6
Bryophytes	16,600	853	Compiled from Kattel and Adhikari 1992; Mizutani <i>et al.</i> 1995; Furuki & Higuchi 1995	5.1
Pteridophytes	11,300	380	Iwatsuki 1988	3.4
Gymnosperms	529	28	Koba <i>et al.</i> 1994; Akiyama <i>et al.</i> 1998	5.1
Angiosperms	220,000	5,856	Koba <i>et al.</i> 1994; Akiyama <i>et al.</i> 1998 ²	2.7
Platyhelminthes	12,200	168	Gupta 1997	1.4
Spiders	73,400	144	Thapa 1995	0.2
Butterflies and Moths	112,000	640 2,253	Smith 1994, 1997 Smith 1997 (pers. com.)	2.6
Other Insects	751,000	5,052	Thapa 1997	0.7
Fishes	18,150	182	Shrestha 2001	1.0
Amphibians	4,184	43	Shah 1995	1.0
Reptiles	6,300	100	Shah 1995	1.6
Birds	9,040	852	Grimmet <i>et al.</i> 2000	9.3
Mammals	4,000	181	Suwal & Verheugt 1995	4.5

¹Wilson (1988; 1992), ²Akiyama *et al.* added 50 new species of Nepalese flowering plants to the list of Koba *et al.*, NA = Not Available

Table 1.2: Number of flowering plants and endemic species in protected areas (after MFSC 2002)

	Protected Area	Number of Species ¹	Number of Endemic Species ²
Lowlands	Koshi Tappu WR	237	1
	Parsa WR	919	0
	Royal Chitwan NP	919	0
	Royal Bardia NP	839	0
	Royal Suklaphanta WR	700	0
Mid-hills	Shivapuri NP	2,122	16
	Dhorpatan HR	1,150	36
	Khaptad NP	567	4
High Mountain	Kanchenjunga CA	>3,000	11-23
	Makalu Barun NP	3,073	7
	Sagarmatha NP	1,074	11
	Langtang NP	3,689	15
	Manaslu CA	>2,500	NA
	Annapurna CA	3,430	56
	Shey Phoksundo NP	1,579	30
	Rara NP	1,070	16

Source: ¹Shakya *et al.* (1997); ²Shrestha & Joshi (1996), NA=Not available

Table 1.3: Protected areas in Nepal

Category (Year of Establishment)		Area (km ²)	Altitude (m)
National Park (NP)	Royal Chitwan NP (1973)	932	150-815
	Royal Bardia NP (1976/1988)	968	152-1,494
	Shivapuri NP (2002)	144	1,366-2,732
	Khaptad NP (1984)	225	1,000-3,276
	Makalu Barun NP (1991) 1	1,500	435-8,463
	Sagarmatha NP (1976)	1,148	2,800-8,850
	Langtang NP (1976)	1,710	792-7,245
	Shey Phoksundo NP (1984)	3,555	2,000-6,885
	Rara NP (1976)	106	1,800-4,048
	<i>Total</i>	<i>10,288</i>	
Wildlife Reserve (WR)	Koshi Tappu WR (1976)	175	90
	Parsa WR (1984)	499	150-815
	Royal Suklaphanta WR (1976)	305	90-270
	<i>Total</i>	<i>979</i>	
Hunting Reserve (HR)	Dhorpatan HR (1987)	1,325	2,850-7,000
	<i>Total</i>	<i>1,325</i>	
Conservation Area (CA)	Kanchenjunga CA (1997)	2,035	1,200-8,598
	Manaslu CA (1998)	1,663	1,360-8,163
	Annapurna CA (1986, 1992)	7,629	1,000-8,092
	<i>Total</i>	<i>11,327</i>	
Buffer Zone	Royal Chitwan NP	750	
	Royal Bardia NP	328	
	Makalu Barun NP	830	
	Langtang NP	420	
	Shey Phoksundo NP	449	
	Sagarmatha NP	275	
	<i>Total</i>	<i>3,051</i>	
<i>Total Area Protected (% of Nepal Territory)</i>		<i>26,970 (18.32)</i>	

Source: MoFSC 2002

Protected areas in the country generate revenue from different sources such as issuing filming license, entrance fees, royalty from hotels in and around protected areas, elephant ride, issuing hunting license in a regulated way, fines, and issuing license to export materials made from bones of domestic animal (DNPWC website 2004). Table 1.4 presents the revenue generated by different protected areas in the fiscal year.

Table 1.4: Revenue Generation in Protected Areas (DNPWC website dated November 2004)¹

S.N.	Name of Protected Area	057/058	058/059	059/60
1.	Department of National Parks & Wildlife Conservation	2,09,53,326.20	7054414.59	7254831.16
2.	Royal Chitwan National Park	7,43,02,801.36	38887119.06	30831199.47
3.	Royal Bardia National Park	98,21,783.51	4376585.83	2777654.94
4.	Sagarmatha National Park	1,54,39,746.19	11355101.00	10819019.00
5.	Langtang National Park	85,50,227.00	4490787.21	4866446.21
6.	Rara National Park	1,00,372.00	74065.00	59000.00
7.	Shey phoksundo National Park	1,93,790.00	481216.00	159460.00
8.	Khaptad National Park	94,302.46	34789.00	22276.00
9.	Makalu Barun National Park	3,13,927.60	44059.00	131872.00
10.	Shivpuri NP		1800084.00	1986025.00
11.	Royal Suklaphanta Wildlife Reserve	24,19,214.53	1552950.25	631871.07
12.	Parsa Wildlife Reserve	3,54,153.00	258500.90	421860.00
13.	Koshi Tappu Wildlife Reserve	12,08,770.00	642591.00	596281.00
14.	Dhorpatan Hunting Reserve	1,51,081.68	87387.00	1200.00
15.	Kanchanjunga Conservation Area	1,95,000.00	44059.25	254800.00
	Total	13,40,98,495.53	7,11,83,709.09	6,08,13,795.85

Recent studies in Nepal have shown that 342 plant species and 160 animal species are endemic to its territory.

Table 1.5: Endemic species in Nepal

Group	No. of Species	Reference
Lichens	39	Sharma, 1995
Fungi	16	Joshi & Joshi, 1991
Algae	3	Joshi & Joshi, 1991
Bryophytes	30	Joshi & Joshi, 1991
Pteridophytes	8	Joshi & Joshi, 1991
Angiosperms	246	Shrestha and Joshi, 1996
Total	342	
Spiders	108	Thapa, 1995
Butterflies & Moths	*30	Smith, 1997 (pers. com.)
Fishes	8	Shrestha 1995
Amphibians & Reptiles	11	Shah, 1995
Birds	2	Shah, 1995
Mammals	1	Suwal & Verheugt, 1995
Total	160	

(*Possible endemic taxa), *Oberonia nepalensis* is a recently reported endemic species of angiosperm (Shakya & Chaudhary 1999), and *Tomoptera maskeyi* is an endemic amphibian species.

Source: MoFSC 2002

¹ Revenue generation from the zoo is not mentioned.

1.6. Statement of the Problem

The economic wellbeing of Nepal is very closely connected with its natural resources, scenic beauty, topography, agricultural land, wetlands, forests, and protected areas. Economic development and livelihood improvement are urgent needs and the rapid population increase, unplanned urbanization, deforestation, various forms of pollution, social conflicts, civil war etc are highly pronounced environmental problems. The natural resource base is undergoing more and more pressure and the demand is crossing the ecological limit (carrying capacity). Such unsustainable anthropogenic activities are creating environmental panics and if these trends remain unchanged, the day is not so far in which concrete jungles will replace the forest. As we know, some decades ago Nepal was proud of its forest wealth, which was even an enchanting national slogan. The changes in quality of the land, air and water as well as the loss of flora and fauna have raised concern about such costs of development. In this context, especially after the Rio Summit in 1992 the global community has raised a strong voice to cut off or reduce such unsustainable resource use patterns. Delayed awareness (mainly after the 1990s) has witnessed loss of thousands of species of flora and fauna. Further delay may lead to irrecoverable loss of diversity at ecosystem level.

Nepal is a signatory of many biodiversity conservation related treaties most of which are ratified by the parliament as well. But due to poor institutional framework, increasing human pressure and natural calamities, the environment is degrading day by day (Bhattarai, 2003). In this regard, fragile ecosystems with higher pressures should be designated as conservation areas and protected for future use without compromising the livelihood of the present settlers. If such effort is not enough to conserve the natural resource base, such species should be translocated to *ex-situ* conservation areas. *Ex-situ* conservation is a tool to protect animals and plants from being extinct. In addition to this it helps to provide information related to natural resources, strengthen the economy by generating revenues, and acts as an entertaining site as well. Valuation of such resources suggests us to assess its effectiveness and the gap between people's willingness to pay and services provided by a resource.

1.7. Study Area

The Central Zoo (CZ) of Nepal extended in an area of 6 hectares and located in Jawalakhel (Southern part of the Kathmandu Valley) provides facilities for viewing, studying, and preserving wildlife in captivity. Records have shown that about 1 million people visit it annually (Chaudhary 1998). The Zoo holds a collection of fauna, mainly threatened animals from different ecological zones of the country and gifted by other institutions of the world. Notable collections include the rhino, tiger, panther, crocodile, black bear, and hippopotamus etc. Few years ago the King Mahendra Trust for Nature Conservation (KMTNC), a national NGO supported by HMG Nepal had introduced a management plan of the zoo to support the goal of conservation of natural heritage of the country. The same management is continuing till to date.

1.8. Rationale of the Study

Establishing conservation areas alone is not enough to realize full conservation. Promotion of conservation education is only a potential key to enable people toward sustainable resource consumption. The zoo has its own place to achieve this goal. But poor understanding of the people's demand and ecological issues are hindering progress in many places worldwide and the case of the zoo is no exception. Problems such as inadequate solid waste disposal, poor water supply and sanitation and low air quality often observed in the Central Zoo led this researcher to focus this study on it.

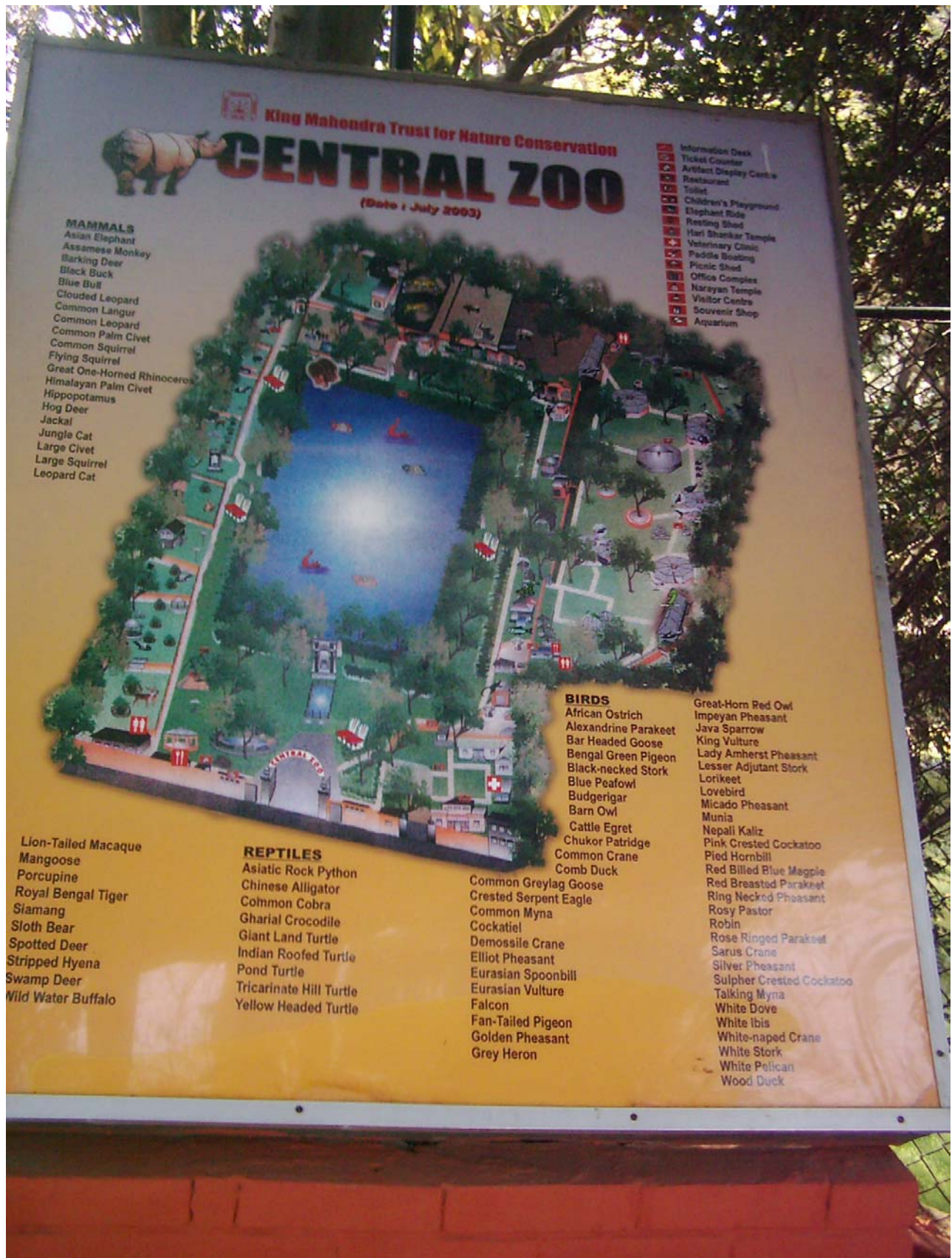


Figure 1.1: Location map of Central Zoo

II. Literature Review

2.1. Importance of Economic Tools for Environmental Resource Management

Valuation of natural resources is a relatively new area of research in South Asia and a very recent approach for Nepal. Few researches related to forests, parks and wetlands are available. Based on the published literature the present research is a second attempt in South Asia to know people's willingness to pay for the services provided by the zoo. A similar study was made in Bangladesh by Shammin in 1999. This is a pioneer research in Nepal, and it lacks related literature for comparative studies. In this section literatures related to other aspects and methods of resource valuation are also considered.

Hecht (1999) has described that when the environmental movement began gaining strength in the 1960s, it was perceived to present a tradeoff between improved standards of living and a clean environment. Increasingly, however, both environmentalists and development advocates are recognizing that to maximize living standards in the long run, we must protect the environment. Improvements in the well being of much of the world's population depend on finding ways to use our resources without destroying them. The field of environmental economics and ecological economics are both responses to this challenge. They constitute an economist's strategy for ensuring that the decisions of individuals, firms, and governments reflect the economic importance of the environment and that the development paths we choose will be sustainable. The environment plays four critical roles in sustaining economic activity; life support, supply of raw materials, absorption of waste products, and supply of amenity services.

Environmental Accounting can also help detect which is an illusory growth, and which it is not, and it can even show that a transitory gain in income by depleting natural resources leads to a permanent loss in wealth (Ahmed et al 1999). Economic decisions, market prices and environmental regulation are the main forces driving the stock of natural capital. Accordingly, economic theory and, in particular, resource economics, faces the challenge of providing adequate solutions for the trade-offs between environmental protection and economical needs faced by today's generations. Within the broader interdisciplinary approach to sustainability, research in

resource economics has to be directed at finding and establishing the rules for a world society, which is intrinsically compatible with its natural environment (WIF).

Tiwari (1998) has explained the relationship between the economy and environment. The environment supplies resources to the economy and waste flows occur from the economy to the environment. The two laws of thermodynamics support the circular linkage: in each of the three stages of the process, namely resource collection, production and consumption. Since energy and matter cannot be destroyed (the first law of thermodynamics), it is clear that the utilized resources will generate an equal amount of waste (and energy) in any period of time. Recycling is only possible way to a certain extent, due to the second law of thermodynamics that states that mainly entropical processes take place. This circular flow is sometimes represented by the material balance model, which identifies three ways of environmental conservation: reducing the production output and therefore input requirements, reducing production residuals and increasing the recycling of production and consumption residuals. In order to sustain the economy, renewable resources should be used in such a way that their harvest rate is not greater than their natural regeneration rate, and waste flows should be kept at a level below the assimilative capacity of the environment. The use of resources should thus be as efficient as possible.

The concept of environmental protection has come to existence in connection with the economic quest of securing means for a better life. The ongoing depletion of exhaustive natural resources has been the issue of economic endeavor. Sustainable management of natural resources is connected to the concept of people's participation. The question of empowering the local community in the management of natural resources has been a part of economic programs. The process of development gradually leads to a gradual integration of local communities into a larger social and economic framework (WECD, 1987).

IUCN (1998) has given emphasis on the understanding of flow and distribution of economic benefits from tourism, which is one of the most critical elements in park economies. Policy makers, planners, and managers, can influence this flow and its distribution, and need to consider their options carefully. International bodies (such as the World Bank), all levels of the government, corporations/businesses of all kinds, and especially those involved in tourism, and local citizens and visitors to protected areas all make decisions on future investments of money and time which

affect protected areas. Economic benefit valuation can inform many of these decisions. Protected area managers and their supporters should therefore do all they can to provide such valuations and communicate the results widely.

The World Bank website (2004) has cited that developing "greener" national accounts holds the promise of placing environmental problems into a framework that key economic ministries in any government will understand. For too long now, ministries of finance and planning have paid scant attention to the exploitation of the natural resource base, or the damaging effects of environmental pollution. At the same time, countries have been developing national environmental action plans that read as if they were written by the environment ministry with no links to the finance ministry.

2.2. Valuation

Valuation is the system of expressing goods and services in economic terms. Economic value is one of many possible ways to define and measure the worth of a good or service. Although other types of value are often important, economic values are useful to consider when making economic choices, which involve tradeoffs in allocating resources. Measures of economic value are based on what people want (their preferences). Economists generally assume that individuals, not the government, are the best judges of what they want. Thus, the theory of economic valuation is based on individual preferences and choices. People express their preferences through choices and tradeoffs that they make, given certain constraints, such as those on income or available time (King et al 2004). Sustainable management of Natural resources requires sound knowledge in ecological and economic perspectives and values of such resources (Mahat 2001).

Characteristics of economic value:

- Products or services have value only if human beings want them for a price, directly or indirectly.
- Value is measured in terms of trade-offs, and is therefore relative.
- Typically, money is used as a unit of account.
- To determine values for society as a whole, values are aggregated from individual values.

In order to internalize the externalities (costs/benefits imposed by consumption and production decisions on third parties not directly participating in the decision) into the economic market prices, the value of environmental resources (and therefore environmental damages) should be

known. This will help in designing pollution charges, in carrying out cost-benefit analyses of projects including environmental impacts, and in constructing environmental accounts that could be integrated with the conventional System of National Accounts, annually presenting the national (macro-) economic situation. The total economic value of a resource consists of its 1) direct, indirect and option use values and 2) non-use values (for example: existence values). These values are difficult to estimate, even though several theoretical methods are available. Direct valuation methods include the contingent valuation, hedonic pricing and Travel Cost Method (TCM), while indirect valuation methods include estimating dose-response relationships (Tiwari 1998).

Miller (2002), explains that Conservation biologists and ecologists contend that wild species, natural ecosystems, and the earth's overall biodiversity have two types of values, **intrinsic** (species or ecosystem centered) and **instrumental** (human centered) values. Instrumental value is further classified as **Utilitarian** (goods, ecological services, information, option, and recreation) and **Non-utilitarian** (existence, aesthetic and bequest).

Mahat (2004) has explained economic valuation, which includes cost of tangible as well as intangible benefits together, as an excellent idea for the investigation and realization of the true value of environmental resources. He has suggested that community efforts with optimum allocation of resources could solve the problem of "Tragedy of the commons" (a situation in which free access resources are degraded due to over exploitation) and it leads the way for sustainable resource management. He further adds moral, market and legal forces together can bind people to manage it.

2.3. Significance of Resource Valuation

To understand why resource valuation may be important for sustainability of zoo management and policy, it is necessary first to review the role of valuation in decisions that concern the use of environmental resources. By providing a means for measuring and comparing the various benefits of the zoo, economic valuation can be a powerful tool to aid and improve its wise use and management of Zoo. Although we know intuitively that such resources may be important, this may not be enough if we are to ensure their wise use. Many environmental resources are complex and multifunctional, and it is not obvious how the myriad goods and services provided by these resources affect human welfare. In some cases, it may be worthwhile to deplete or degrade

environmental resources; in others, it may be necessary to 'hold on' to these resources. Economic valuation provides us with a tool to assist with the difficult decisions involved. Valuation is only one element in the effort to improve management of environmental resources (such as zoo). At the same time, decision-makers must take account of many competing interests in deciding how best to use a resource. Economic valuation may help inform such management decisions, but only if decision-makers are aware of the overall objectives and limitations of valuation (Barbier et al 1997).

The World Bank's World Development Report (1992) addresses importance of valuation as "an essential step in determining what should be done about environmental damage is to value it and compare it with the costs of preventing the damage. Measurement is essential, since tradeoffs are unavoidable". There are many practical problems in deriving credible estimates of economic value. But four broad approaches can be used in setting priorities.

- I. Market prices
- II. Costs of replacement
- III. Surrogate markets (effect on other markets)
- IV. Surveys

Adhikary et al (1998) has given notes on "economic assessment of protected areas: guidelines for their assessment". He has emphasized on market-based instruments for environmental management and described on its application potential in Nepal.

Finally, economic valuation is concerned ultimately with the allocation of such resources to improve human welfare. Consequently, the various environmental benefits are measured in terms of their contribution to providing goods and services of value to humanity. However, some members of society may argue that certain systems and the living resources they contain may have an additional 'preeminent' value in themselves beyond what they can provide in terms of satisfying human preferences or needs. From this perspective, preserving resources is a matter of moral obligation rather than efficient or even fair allocation. There may be other motivations for managing resources in particular ways, such as political considerations. Thus, economic values represent just one input into decision-making, alongside other important considerations. The goal

of this text is to assist planners and decision-makers with increasing the input from economic valuation in decision-making (Adhikary et al, 1998).

Economic theory suggests that the amount that consumers are willing to pay (WTP) for a marginal increase in consumption should be about the same as the amount they are willing to accept (WTA) as compensation for an equivalent decline in consumption. Few researches have shown that WTA amounts exceed WTP by a wide margin. To date there is no satisfactory explanation for the divergence in WTP and WTA (Gunton 1991). Valuation of a zoo could explore the status of visitor's willingness to pay and the services provided by the zoo, which ultimately helps to harmonize the relationship between both these factors.

2.4. Resource Valuation Methods and Issues in Travel Cost Method

The economic value of a particular item, or good, for example a loaf of bread, is measured by the maximum amount of other things that a person is willing to give up to have that loaf of bread. If we simplify our example "economy" so that the person only has two goods to choose from, bread and pasta, the value of a loaf of bread would be measured by the most pasta that the person is willing to give up to have one more loaf of bread. Thus, economic value is measured by the most someone is willing to give up in other goods and services in order to obtain a good, service, or state of the world. In a market economy, dollars (or some other currency) are a universally accepted measure of economic value, because the number of dollars that a person is willing to pay for something tells how much of all other goods and services he/she is willing to give up to get that item. This is often referred to as "willingness to pay." It is often incorrectly assumed that a good's market price measures its economic value. However, the market price only tells us the minimum amount that people who buy the good are willing to pay for it. When people purchase a marketed good, they compare the amount they would be willing to pay for that good with its market price. They will only purchase the good if their willingness to pay is equal to or greater than the price. Many people are actually willing to pay more than the market price for a good, and thus their values exceed the market price (King et al 2004).

Resource values are measures of how important resource services are to people and what they are worth. Resource valuation can be a difficult and controversial task, and economists have often been criticized for trying to put a "price tag" on nature. However, agencies in charge of protecting

and managing natural resources must often make difficult spending decisions that involve tradeoffs in allocating resources (King et al 2004).

Decisions about ecosystem management are complicated by the fact that various types of market failure are associated with natural resources and the environment. Market failures occur when markets do not reflect the full social costs or benefits of a good. There are various forms, from monopoly to perfect competition, of market in the society though both are rarely found in the real economy due to presence of poverty, inequality in income and wealth, unemployment, dualistic nature of economic policy, fluctuation of agricultural production, improper utilization of natural resources, etc. (Bhattarai 2003). For example, the price of gasoline does not fully reflect the costs, in terms of pollution, that are imposed on society by burning gasoline. Market failures related to ecosystems include the facts that: (i) many resources provide services that are public goods (goods for which two or more individuals can consume the same unit at the same time and not reduce its availability to others); (ii) many resource services are affected by externalities; and (iii) resource related property rights (endemic resources and original creative works that have economic value are protected by law and have trademark and copyright law) and their services are often not clearly defined.

However, King et al. (2004) has described three widely accepted approaches to estimating dollar values of a resource provided services. Each approach includes several methods. They are

1. Market Prices –Revealed Willingness to Pay

The values of some ecosystem goods or services can be measured using market prices. Some ecosystem products, such as fish or wood, are traded in markets. Thus, estimating consumer and producer surplus can estimate their values, as with any other market good. Other ecosystem services, such as clean water, are used as inputs in production, and their value may be measured by their contribution to the profits made from the final good. Some ecosystem or environmental services, like aesthetic views or many recreational experiences, may not be directly bought and sold in markets. However, the prices people are willing to pay in markets for related goods can be used to estimate their values. For example, people often pay a higher price for a home with a view of the ocean, or will take the time to travel to a special spot for fishing or bird watching. These

kinds of expenditures can be used to place a lower bound on the value of the view or the recreational experience. These methods include:

- Market Price Method (MPM),
- Productivity Method (PM),
- Hedonic Pricing Method (HPM), and
- Travel Cost Method (TCM)

2. Circumstantial Evidence –Imputed Willingness to Pay

The value of some ecosystem services can be measured by estimating what people are willing to pay, or the cost of actions they are willing to take, to avoid the adverse effects that would occur if these services were lost, or to replace the lost services. For example, wetlands often provide protection from floodwaters. The amount that people pay to avoid flood damage in areas similar to those protected by the wetlands can be used to estimate willingness to pay for the flood protection services of the wetland. These methods include:

- Damage Cost Avoided,
- Replacement Cost, and
- Substitute Cost Methods

3. Surveys –Expressed Willingness to Pay

Many ecosystem services are not traded in markets, and are not closely related to any marketed goods. Thus, people cannot “reveal” what they are willing to pay for them through their market purchases or actions. In these cases, surveys can be used to ask people directly what they are willing to pay based on a hypothetical scenario. Alternatively, people can be asked to make tradeoffs among different alternatives, from which their willingness to pay can be estimated. These methods include:

- Contingent Valuation Method, and
- Contingent Choice Method

Economic value (consumer’s surplus) of a particular output (e.g. sport fishing) of a public project also can be found by estimating the consumer demand curve for that output (US Department of the Army Corps of Engineers, 1999).

Economic values associated with ecosystems or sites that are used for recreation are generally measured with the application of the TCM. Credit for the TCM is attributed to Harold Hotelling, who proposed the basic notion of the method to a park service director in a 1947 letter. It was not put into practice extensively until the late 1960's, and has only reached a more refined state in relatively recent years. Jack Clawson and Marion Knetsch are widely regarded as two of the most important figures in the early development of the TCM. Philosophically, the TCM falls into the general category of neo-classical welfare economics, which assumes that individuals maximize their utility subject to certain constraints. This has implications for both the technical exposition of the method and for the premises upon which it is built. Debate about the merits or demerits of alternative economic theories exceed the scope of this study, but it is important to be conscious of the model's theoretical foundations.

The basic premise of the TCM is that time and travel cost expenses that people incur to visit a site represent the "price" of access to the site. Thus, peoples' willingness to pay to visit the site can be estimated based on the number of trips they make at different travel costs. This is analogous to estimating peoples' willingness to pay for a marketed good based on the quantity demanded at different prices.

The Australian Government Publishing Service (AGPS, 1995) has recommended applying the TCM to know;

- How does the value of recreation change when the environment changes?
- Do increases in recreation benefits from improvements in environmental quality exceed the cost of the improvements?
- Does the increase in recreation benefits from conserving an area exceed the loss in development benefits from conservation?

To resolve these questions, monetary values need to be estimated for the benefits of recreation and environmental quality and the costs of deterioration in environmental quality and recreational amenity. AGPS (1995) has explained that this technique has been applied to value the benefits of recreation in the Grampians forests of Victoria (1973), the Warrumbungles National Park of New South Wales (1978), the Great Barrier Reef in (1987), Kakadu National Park in the Northern Territory in (1991), and the state forests of southeastern New South Wales and East Gippsland in Victoria in (1992).

TCM is an appropriate choice for this research, because;

- The site is primarily valuable to people as a recreational site.
- The expenditures for projects to protect the site are relatively low.
- A relatively inexpensive method like the travel cost makes the most sense.

The travel cost approach is based on the theory of consumer demand. The fundamental principle of TCM is that the value people attach to a location of environmental significance can be inferred from the cost they incur in traveling to it. Value is placed on non-marketed environmental goods by incorporating the patterns of consumption in related markets. Such costs of consuming the services of an environmental asset include travel costs, entry fees, on-site expenditure, outlay of capital expenditure necessary for consumption, and the opportunity cost (the sacrifice of some good or service made because of a decision to acquire some other good or service) of time. The method assumes a complementarity between an environmental asset and consumption expenditure, and thus can also be applied to determine the marginal utility of quality improvements. Therefore, if consumption expenditure becomes zero, the marginal utility also becomes zero. For example, if the travel cost to a national park becomes so expensive that the number of visitors is zero, then the marginal social benefit of an increase or decrease in quality is also zero. TCM has also been applied to determine the willingness to pay (WTP) for sites where the cost of visiting substitute sites is also taken into account (Shammin, 1999). Hanley and Spash (1993) have described the total cost for each individual “i” to visit a given site “j” as;

$$C_{ij} = C(DC_{ij}, TC_{ij}, F_j) \text{ where, } i = 1 \dots n$$

Where,

C_{ij} = Total cost for individual "i" to visit site "j".

DC_{ij} = Distance costs for each individual dependent on the distance the person has to travel and the cost per mile of travelling.

TC_{ij} = Time costs which include the time spent in travelling to the site, the time spent inside the site and the value of the individual's time.

F_j = Entrance fee to the site

Wood, Trice, Knetsch and Clawson used an approach to TCM known as the zonal model. In this approach, the area around the site is divided into several zones and travel costs for each zone are calculated to generate the demand curve. Typically the surrounding area of the site is divided into

concentric circles of specified distance with some reference to the administrative districts. The demand curve is estimated by regressing the number of visits from each zone against the travel costs. People's willingness to pay for the given site is expressed as cost per visitor day. Another model for generating the demand curve is to take the number of visits made by each individual as the dependent variable, rather than the number of visits per zone (Hanley and Spash, 1993.) This study uses the zonal model. In order to estimate willingness to pay for an increase in the quality of a site, a trip generating function (TGF) is used where the zonal population as the dependent variable divides the number of visits from each zone. The TGF is used to derive the demand curve, which shows the number of visits in relation to a change in price. The key assumption is that, as the travel costs increase, the number of visits falls. A typical TCM demand curve is shown in figure 1.1. At price P , the cost of travel will be so high that no one will visit the site (Shammin, 1999).

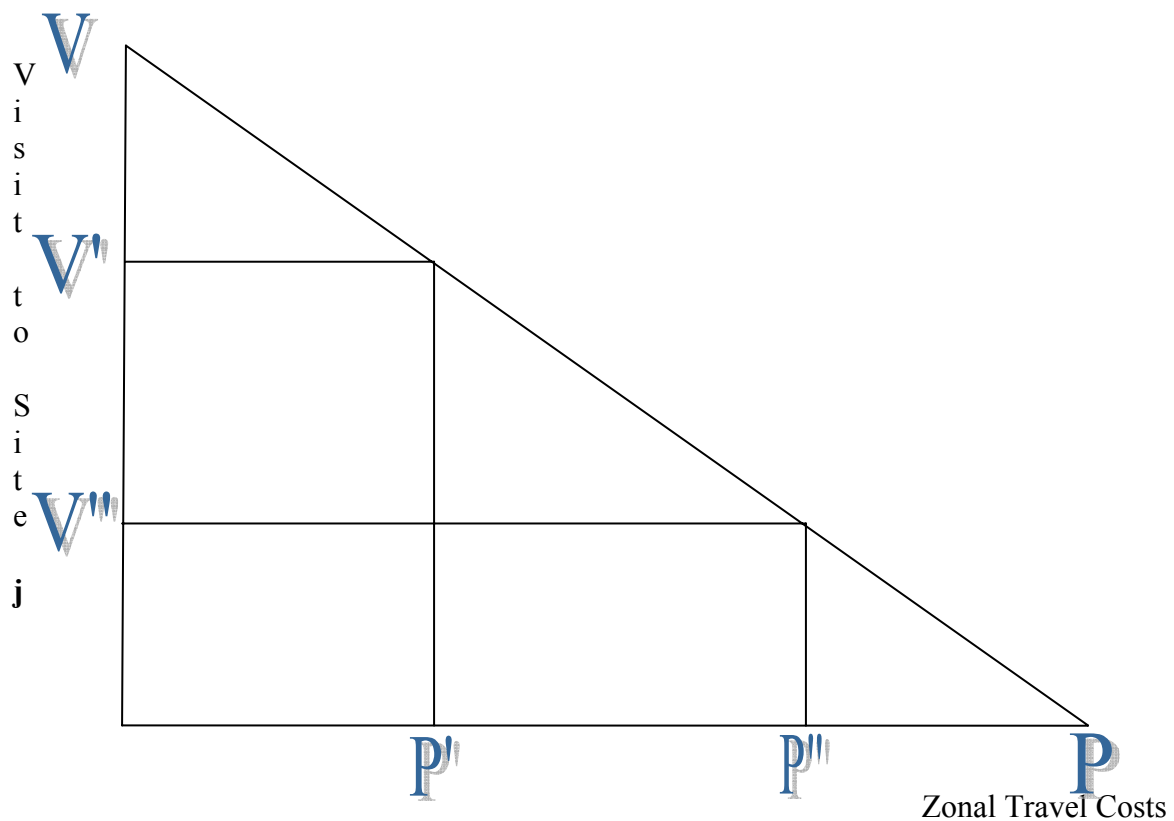


Figure 2.1: Demand Curve showing visitor's demand and travel cost

Shammin (1999) studied economic valuation of the Dhaka Zoological Garden, using TCM. With rigorous analysis of demand curves developed from a Zonal data model, he concluded that WTP for the Dhaka Zoological Garden is Taka 300.64. Chowdhury (1999) applied WTP-Contingent

Valuation Method to identify the WTP for water in Dhaka slums. Based on interviews with 232 respondents she concluded that the monthly average WTP for water is Taka 82.62 per household. Khalil (1999) studied valuation of the Mangrove ecosystem along the Karachi coastal areas and concluded that this resource has a significant importance to the region and to the country as a whole. This study has also focused on resource degradation due to threats like decreased river flow, overuse, pollution, and other pressures.

Khan (2004) has studied the demand for Ecotourism in Margalla Hills National Park in Northern Pakistan using TCM. He has estimated the annual benefits from the park as US \$ 0.4 million. He has concluded that travel cost, household income, and quality of the park have influenced the visitors demand.

Cesario et al. (1970) have concluded that the opportunity cost of time taken to travel to a site should be included along with the out of pocket costs of travel. Failure to include time costs results in an underestimate of site value. Estimating the opportunity cost of time, however, is difficult. Cesario (1976) concludes based on a review of a number of studies that the cost of time is equivalent to between one-quarter and one-half of the wage rates. Freeman (1979) correctly observes, however, that these estimates used by Cesario are based on travel to work which are not applicable to recreational travel. Indeed, studies by Sutherland (1982) and Walsh et al. (1985) indicate that travel time can be a benefit improving the overall recreation experience, not a cost. Another problem noted by Bishop et al. (1979) is that the wage rate overestimates the opportunity cost of time because it is unlikely that the time spent traveling to a recreational site would otherwise be spent working at the same job. The issue of appropriate travel time costs continues to be an unresolved problem which can bias estimates.

Chapagain (1984) studied the common property right issues and clearly addressed the problems of public land use in Nepal from an institutional point of view. He discussed the open access and common property right on public lands of Nepal. He has explained how people are intentionally encroaching the forest both individually and institutionally.

Budhathoki (1992) has studied the cause of deforestation and its impacts in the Nepalese economy. He has discussed on the rate of deforestation and role of various stakeholders in deforestation for different purposes like open grazing, Shifting cultivation etc.

Hamilton and Lutz (1996) have documented few case studies of resource and environmental accounting. Natural resource accounting has been identified as one of 15 possible policy changes to promote (ecologically) sustainable development in Australia. Canadian has developed pilot physical and monetary accounts of forest resources in Alberta, covering the period 1964-1990. The intention is to gain information on sustainability of the services that natural capital provides. Similar studies from Costa Rica, Finland, France, Germany, India, Indonesia, Japan, Mexico, the Netherlands, New Zealand, Norway, Papua New Guinea, the Philippines, Sweden, Tanzania, Thailand, United Kingdom, United States of America, Zimbabwe etc also address the need of economic valuation and policy changes for sustainable management of resources.

Adhikari (2003) has tried to examine the contribution of community forestry to household level income with particular emphasis on group heterogeneity and equity in benefit distribution. He has concluded that poor people are relatively less benefited and are less dependent on forest resources.

Kandel et al. (2003) has studied on impact on the income distribution due to private tree farming and analyzed the significance of upland (Pakhobari) for livelihood improvement of such people.

Bhattarai (2003) has made an econometric analysis of environmental degradation in Nepal, using secondary data. It focuses on degradation of different resources like forest, energy, soil, water, loss of biodiversity etc. Bhattarai (2004) worked on valuation of Nepalese wetlands using the contingent valuation method. He has compared different parameters and their relation with the willingness to pay for wetlands.

Dhital (2003) has evaluated the Royal Chitwan National Park, using environmental economic methods (Economic survey, contingent valuation, labor-day method of shadow pricing, crop yield conversion factor, logit binary choice model, time use study method etc.). He estimated the economic value of the annual consumption of forest products per household from the park source. The economic value of all kinds of product is estimated. Among the products fuelwood has

remained the largest consumption item. Dangol (2002) has explored the economic uses of forest plant resources in western Chitwan (Nepal). He has documented medicinal, oil, resin and gum yielding, timber and fuelwood plants, plants for paper and pulp medicinal purposes etc.

Khan (2004) has documented that there are a number of studies related to environmental valuation, but only a few have used an economic approach to calculate welfare measurement,. The Lumpinee Park study in 1986 and TDRI/HIID study on Khao Yai National Park in 1995 are two important studies conducted in Thailand that have used economic valuation methods. Both studies have combined the TCM with the open ended contingent valuation method in order to assess willingness to pay.

III. Objectives and Scope

3.1. General objectives of the Study

The objective of this study is to identify the nature of visitors of the Central Zoo and their zonal distribution. It aims to investigate economic value of the zoo and the degree of relationship between visitors and the services provided by the zoo.

3.2. Specific Objectives

1. To investigate the existing management structure, financial arrangements and problems of the CZ;
2. To identify the nature and structure of the visitors;
3. To identify the relationship between the travel cost and actual number of visits and economic value of the zoo using TCM;
4. Based on the findings, to develop and suggest a sustainable management plan for the zoo.

3.3. Scope and Limitation of the Study

It is an attempt to analyze natural resources from an environmental and economic perspective at the same time. Due to the present political situation of the country foreign tourists inflow rate is highly reduced and the local tourists are major clients of the zoo. There is no uniformity in visitor's usual place of residence, because more than one-third of the mid-western population has migrated to India and other neighboring countries due to the present civil war. There is no similarity in the economic status of the people. The rate of urbanization in Nepal exceeding 14.2% per annum clearly shows that economically better off population of the country is living in the cities and others are in rural areas. This reality should be borne in mind while interpreting the findings of the present study. Most of the primary data were gathered through personal interview and schedules, where personal biases may be higher especially with regard to information related to economic status of people. Problems of the Zoo identified in this paper are based on the views of the visitors and direct survey of the field. For the calculation of the economic value foreign visitors were ignored to generate reliable information, due to their less number of visits.

IV. Materials and Methods

Since the study is focused on finding out the linkages between the visitors willingness to pay and the services provided by the zoo, the methodology adopted consisted of activities in the following premises.

- Information collection,
- Hypothesis setting
- Data analysis, conclusion and recommendation

4.1. Information Collection

Data collection was started in April 2004. Data was tabulated during July/August 2004 and processing and analysis was completed by the end of August 2004. The information related to zoo facilities, cash inflow, zoo administrative structure, list of animals etc. was collected from the official publication and records of the zoo.

Most of the information was gathered through primary sources, using,

- Field notes
- Field survey
- Key informant interview
- Questionnaire survey
- User/visitor's meetings

Various published and unpublished documents such as project documents, thesis reports, published books, journals and electronic media on the Internet were reviewed to gather additional information and other references supporting the primary data. Possible results and experiences of case studies on economic valuation of environmental resources from around the world were collected and studied. Official documents and other related literature regarding the features, attributes and services of the zoo were collected and analyzed. Most of the research reports and booklets (soft copy) were downloaded and studied from websites of the International Society of Ecological economics (ISEE), European Society of Ecological Economics (ESEE), The Beijer Institute for Ecological Economics, The Royal Swedish Academy of Sciences (Stockholm), Environmental Economics Unit (EEU, Sweden), World Bank (WB), South Asian Network for

Development and Environmental Economics (SANDEE), Asian Development Bank (ADB), Ecological Economics Journal, Zoo online, US Army Corps of Engineers (Walla Walla District), Journal of Forest Economics, Mountain Research and Development (Journal), IUCN-The World Conservation Union, Worldwide Fund for Nature (WWF), Environment News Centre (ENS Newswire), King Mahendra Trust for Nature Conservation (KMTNC), Ministry of Population and Environment (MoPE, Nepal), Ministry of Forest and Soil Conservation (MFSC, Nepal), National Planning Commission (NPC, Nepal) etc

4.2. Hypothesis

Null hypothesis: There is no association between actual number of visit and the travel cost

Alternate hypothesis: There is association between actual number of visit and the travel cost

4.3. Data Analysis

It is obvious that the number and frequency of zoo visitors is a multivariate function. It may be the function of socio-economic status of the people, travel cost, zonal distribution, mode of transport and its availability, association with environment related institutions or directly with nature, age factor etc. Methodologically, this study applies the TCM incorporating different dependent and independent variables. Statistical Package for Social Studies (SPSS Ver.10), Microsoft Excel 2003, and other relevant softwares were used to analyze the gathered information. Different regression models were developed to know the relationship between (i) travel cost and the actual number of visits and (ii) Monthly income and the number of visits. ANOVA was carried out for further analysis. A low p-value implies that the consequences of rejecting a true H_0 erroneously are not very severe and hence we are safe in rejecting H_0 . Therefore we accepted H_0 if the p-value is too high (more than 10%).

The TCM has some common biases, which were accommodated in the calculation of the travel cost for each individual. The value of time has been taken as one-third of the regular wage (McConnell and Strand, 1981; Markandya, 1992). Also, time spent by visitors inside the zoo has been recorded and incorporated in this calculation. Sometimes visitors come to the Kathmandu Valley for multiple purposes – one of them being to visit the zoo. In this case, the cost of travel and the discounted cost of time have been halved for purposes of the analysis. It may also be noted that statistically the dependent variable is truncated since only visitors to the site have been

sampled and no information was available on the determinants of the decision to visit the site. The calculation of time cost may also be biased by two facts. First, one-third of the daily wage has been used based on TCM studies carried out elsewhere in the world and may not be correct. Second, there are no plausible alternate sites on which to base opportunity costs. To account for this bias, the willingness to pay was also calculated without considering the opportunity cost of time. Both results have been given to enhance the scope of this report for future use.

To analyze the travel cost on a regional basis, 7 theoretical zones were developed. Nepal was divided into 5 different Zones, each covering 50 NM (1 NM = 1852 meters) distance from Kathmandu Airport. One zone was considered for SAARC countries and one for the rest of the world, as listed in table 4.1.

Table 4.1: Different zones developed for the study

Zones	1	2	3	4	5	6	7
SN	Nepalese Districts (in alphabetical order)²					SAARC³	World⁴
1	Bara	Bhojpur	Arghakhanchi	Banke	Accham	Bangladesh	
2	Bhaktpur	Dhanusha	Baglung	Jajarkot	Baitadi	Bhutan	
3	Chitwan	Dolakha	Dang	Jumla	Bajhang	India	
4	Dhading	Kaski	Dhankuta	Mugu	Bajura	Maldives	
5	Gorkha	Khotang	Dolpa	Rukum	Bardiya	Pakistan	
6	Katmandu	Lamjung	Gulmi	Salyan	Dadeldhura	Srilanka	
7	Kavre	Mahottari	Illam	Surkhet	Dailekh		
8	Lalitpur	Manang	Jhapa		Darchula		
9	Makwanpur	Mustang	Kapilbastu		Doti		
10	Nuwakot	Nawalparasi	Morang		Humla		
11	Parsa	Okhaldhunga	Myagdi		Kailali		
12	Ramechhap	Palpa	Panchthar		kalikot		
13	Rasuwa	Rupandehi	Parbat		Kanchanpur		
14	Rautahat	Sankhusabha	Pyuthan				
15	Sarlahi	Saptari	Rolpa				
16	Sindhuli	Shyangja	Sunsari				
17	Sindhupalchowk	Siraha	Taplejung				
18	Udaypur	Solukhumbu	Terhathum				
19		Tanahu	Arghakhanchi				
Population	7163678	6153561	5436215	1140350	2843130		
Total	22736934 ⁵						

² Zone classification is based on Aeronautical Map Developed by the Civil Aviation Authority of Nepal, 1999

³ Nepal Excluded

⁴ Excluding SAARC countries

⁵ All the information related to population was generalized as per Statistical Pocket Book, CBS (2002).

V. Result and Discussion

5.1. Management and Financial aspects of the Zoo

The present study is an effort to identify different aspects of the zoo and the nature of the visitors. The Central Zoo is comprised of different facilities of animals and bird watching, rafting, elephant riding etc. The category and number of the creatures in the zoo, and the structure of the zoo management is listed in table 5.1 and 5.2.

Table 5.1: Zoo creatures by category

Type	June 2004		August 2004	
	Species	Number	Species	Number
Mammals	32	280	33	286
Reptiles	9	15	9	16
Birds	56	368	57	351
Fishes	16	394	16	395
Total	113	1057	115	1048

Source: Field survey and zoo record.

Table 5.2: Key Employees of the Central Zoo

Designation	Number
Director	1
Curator	1
Veterinary Doctor	1
Administrative Officer	1
Account Officer	1
Conservation Officer	1
Assistants	26
Helper/Keeper/Sweeper	41
Total	73

Source: Based on an interview with the zoo administration.

From a direct observation of the zoo it is clearly seen that, the zoo is in the earlier phase of development. It has many constraints to tackle on its way to development, such as extension or relocation of the zoo area. Due to the small area the cages of one species are placed very close to others and even the number of individuals in few cages was found to be higher than the allowed limit. Resting places for the visitors is limited and greenery is relatively less. Table 5.3 shows the facilities provided for the visitors.

Table 5.3: Important facilities provided by the Central Zoo

Zoo Facility		Quantity	Remarks
Land area		6 ha	
Lakes/pond		1	
Cages	Animals	35	Few cages are empty
	Birds	17	
Raft and boats	Raft	1	
	Paddle boat	4	
	Duck boat	2	
Public toilet		3	
Fountain		1	
Play ground for children		1	
Animal hospital		1	
Artifacts		1	
Fish Aquarium		7	
Information and Research Center		1	
Friends of the Zoo (Conservation Education Center)		1	
Stores		3	
Temples		2	
Statue		2	
Restaurants		2	
Shop		1	
Drinking water tanks		2	

Source: Field survey and interview with the zoo administration.

The annual cash flow of the Central Zoo is given in table 5.4. Considering the estimates of the year 2001-2003, the annual operating cost of the zoo is about NRs. 19,6489,33. More than one-fifth of the budget goes to the salary of the staff. More than one-half of the budget is allocated to the ongoing programs including conservation education program, animal management program and the programs of Friends of the Zoo (FOZ). The Central Zoo generates about NRs. 20 million annually from the entry fee alone.

Bhotojatra is the peak event for the zoo as well, because it receives the maximum number of visitors ranging from 25,000 to 30,000 (more the 12 times of daily average). Other peak times for zoo visitors includes the Nepalese New Year, every Friday and Saturday. Being a part of the national economy and politics the zoo is not apart from national events. Rainy days and different types of political strikes have highly affected the number of zoo visitors falling in number up to 2000. Natural systems are also limiting factors for the zoo visitors. Table 5.5 gives a glimpse of such events and estimated number of visitors in the zoo.

Table 5.4: Income and Expenditure of CZ for consecutive three years

	Fiscal Years	2057/58(2000/1)	2058/59	2059/60
Income	Entry fee/entrance fee*	13473200.00	16489000.00	17602000.00
	Income from interest	405200.00	800200.00	514700.00
	Other income	2529700.00	2534000.00	2575900.00
	HMG/N Support	6420000.00	0	0
	Restricted donation balance			
	Total income in NRs.	22828100.00	19823200.00	20692600.00
Expenditures	Salary, Wages and Allowances	3508600.00	3297000.00	3187300.00
	Traveling	15700.00	15600.00	13500.00
	International Promotion and Travel	526300.00	274300.00	401800.00
	Utilities	1399200.00	1438800.00	1607600.00
	Fuels and Lubricants	284000.00	289800.00	299900.00
	Printing And Stationary	328300.00	304300.00	280900.00
	Books, Newspaper and Periodicals	13000.00	12400.0	14800.00
	Staff Welfare	265900.00	265900.00	302900.00
	Staff Uniforms	55000.00	71500.00	67800.00
	Expendable Office Materials	82300.00	78200.00	84300.00
	Repairs and Maintenance	306400.00	379500.00	436500.00
	Insurance Premium	82300.00	139800.00	135700.00
	Training and Development	16800.00	9500.00	24800.00
	Entertainment	105800.00	151000.00	103500.00
	Publicity and Advertisement	49800.00	76900.00	68000.00
	Staff Gratuity	398000.00	984500.00	437600.00
	Annual and Sick Leave Expenses	0	160100.00	999000.00
	Depreciation	414400.00	424900.00	434300.00
	Miscellaneous Expenses	209500.00	111900.00	169700.00
	Program Expenses**	10515100.00	12218300.00	10191100.00
	Gardening, Fencing and painting	124800.00	102500.00	0
	Mobile Clean-Up	41800.00	59100.00	44200
	Toilet Renovation	0	32800.00	0
	Institutional Support	0	0	0
	Total Expenditure in NRs.	18743000.00	20898600.00	19305200.00
	Surplus/Deficit in NRs.	+ 4085100.00	- 1075400.00	+ 1387400.00
**Program expenses				
Animal Management Program		9024300.00	10724600.00	9224200.00
Conservation Education Program		475700.00	1493700.00	966900.00
Friends of the Zoo Program		1015100.00	0	0
Sub-Total		10515100.00	12218300.00	10191100.00
*Number of Visitors				
Adult Nepali		703271	577464	584698
Children Nepali		244884	233011	253018
Adult Foreigner		6005	4350	3632
Child Foreigner		909	787	644
Adult SAARC Nationals		2484	1065	1231
Child SAARC Nationals		662	219	326
Sub-Total		958215***	816896	843549

***Number of visitors in the year 2001/2 is relatively higher than any other years because of recurrence of Bhotojatra, a famous event in Kathmandu, close to the Central Zoo.

Source: Documents provided by the zoo office.

Table 5.5: Estimated number of visitors in special Events

Event Days	Visitors flow range
Saturday (Maximum in a week)	4000 – 6000
Normal	1800 – 2200
New Year	12000 – 17000
Bhotojatra	25000 – 30000
Nepal Band and Chakkajaam and Strikes*	500 – 1200
Whole rainy day	400 – 800
Average visitors no. per day for survey week	2423

(Source: Based on interview with zoo staff)

5.2. Nature and structure of the visitors

The Sampling of zoo visitors was held in the month of April 2004. A summary of the visitors in the sampling week is given in table 5.6. It is seen that number of nationals other than Nepali (especially from India and non-SAARC countries) is negligible, whereas no visitors were observed from SAARC countries excluding India and Nepal.

Table 5.6: Number of Visitors during sampling week

SN	Type of Ticket	Apr. 2	Apr. 3	Apr. 4	Apr. 5	Apr. 6	Apr. 7	Apr. 8
1	Nepali Adult	1731	1304	2110	0	1024	862	1249
2	Nepali Children	1027	634	1149	0	353	308	448
	Nepalese Total	2758	1938	3259	0	1377	1170	1697
3	Foreign Adult	22	27	21	0	12	20	36
4	Foreign Children	6	16	5	0	0	1	14
5	SAARC Adult	3	1	0	0	0	2	0
6	SAARC Children	4	0	0	0	0	0	0
	Other's Total	35	34	26	0	12	23	50

Source: Based on Zoo records and interview with zoo staff.

Visitors were asked to list a maximum of 10 most liked creatures of the zoo. Findings show that the tiger, hippopotamus and ostrich are three major attractions of the zoo. Peacock, bear, pheasants, fishes in the aquarium etc are other mentionable popular features inside the zoo. Figure 5.1 shows details of the findings.

* Nepal Band is a political strike in which all the economic activities like industries, transportation, schools and colleges, offices etc. are forced to close by the organizers. Chakkajaam is relatively light step of strike in which transportation is closed.

Figure 5.1: Visitors ranking of Zoo features

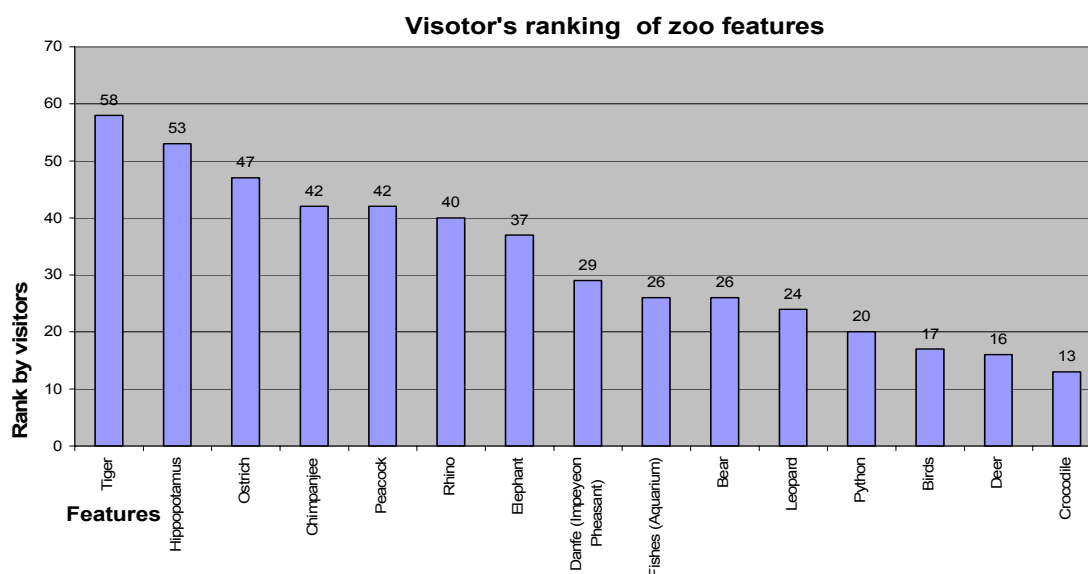


Table 5.7: Visitor's mode of Transport

Transport	Frequency	Percent	Discussion
Bus and taxi	1	0.9	Less than 10% visitors use private vehicles including motorcycle whereas about 80% of visitor's mode of transport is public vehicle and about 9% of visitors are not using any vehicle. It clearly reflects the economic status of the visitors. It also shows easier availability of buses, minibuses, tempos and other public vehicles in respective routes.
Car	1	0.9	
Private vehicle	1	0.9	
Bus and on foot	2	1.7	
Microbus and Taxi	2	1.7	
Minibus and Microbus	2	1.7	
Bus and Tempo	4	3.4	
Bus and Microbus	7	6.0	
Motorcycle	9	7.8	
On foot	10	8.6	
Tempo	10	8.6	
Taxi	13	11.2	
Microbus	25	21.6	
Bus	29	25.0	
Total	116	100	

Table 5.8: Income groups of Visitors

Monthly Income	Count	%	Cumulative %	Discussion
<2000	23	19.8	19.8	Considering the middle and low income group as those, whose monthly income is less than NRs. 5,000. More than 70% visitors are from these groups. It is also due to a higher proportion of students with relatively less or no income.
2000-3000	22	19.0	38.8	
3000-5000	40	34.5	73.3	
5000-10000	15	12.9	86.2	
10000-15000	7	6.0	92.2	
>15000	9	7.8	100.0	

Regression between Number of Visit and Monthly Income:

$$Y=A+BX$$

Where,

Number of sample=116

Y=Number of Visits (dependent variable),

X=Monthly Income (Independent variable)

A is constant and B is Regression Coefficients

Model Summary			
R	R Square	Adjusted R Square	Std. Error of the Estimate
0.496	0.246	0.057	11.6939

ANOVA					
Model	Sum of Squares	df	Mean Square	F	p-value
Regression	178.343	1	178.343	1.304	.317
Residual	546.991	4	136.748		
Total	725.333	5			

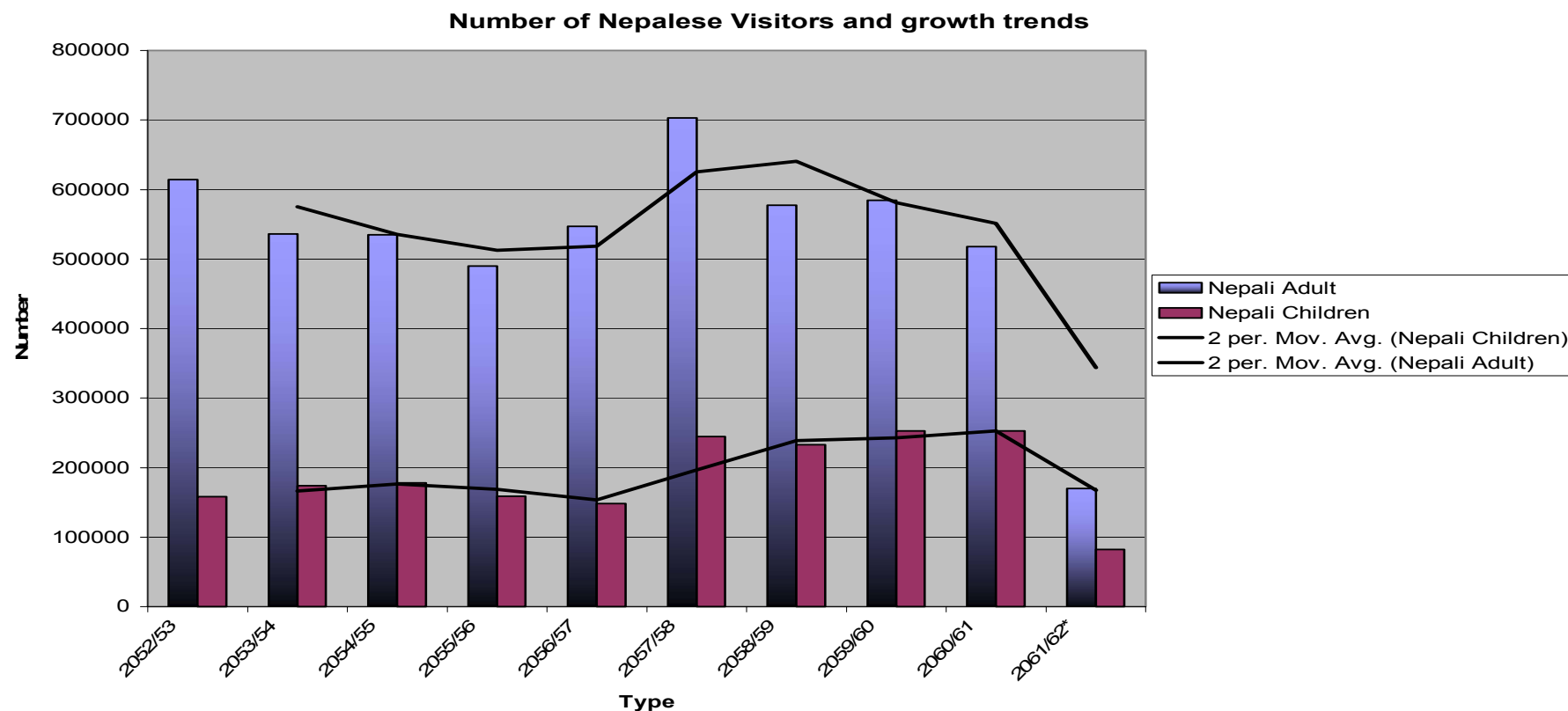
Model	Coefficient	Std. Error	t	Sig.
Constant (A)	22.844	5.678	4.023	.016
Monthly Income (B)	-1.560E-04	.000	-1.142	.317

The value of coefficient of determination and the p-value was found to be 0.057, indicating a weak relationship between the number of visits and monthly income.

Table 5.9: Number of Visitors, (BS 2052/53-2061/62)

Type of Ticket	2052/53 1995/96	2053/54 1996/97	2054/55 1997/98	2055/56 1998/99	2056/57 1999/00	2057/58 2000/01	2058/59 2001/02	2059/60 2002/03	2060/61 2003/04	2061/62 [†] 2004	Total
Nepali Adult	614216	535900	534986	490177	547021	703271	577464	584698	517980	170107	5275820
Nepali Children	158450	174000	178357	158682	148150	244884	233011	253018	253109	82304	1883965
Foreign Adult	5837	6361	6231	6123	6060	6005	4350	3632	4340	1482	50421
Foreign Children	5882	1451	1081	1009	977	909	787	644	845	249	13834
SAARC Adult	-	3600	4403	3691	4013	2484	1065	1231	1211	238	21936
SAARC Children	-	1519	1598	1202	1308	662	219	326	303	55	7192
Total	784385	722831	726656	660884	707529	958215	816896	843549	777788	254435	7253168

Figure 5.2: Number of Nepalese Visitors and growth trends for last decade



[†] Figure of Fiscal year 2061/62 covers visitors for first five months only (July 18 to November 23 2004)).

Table 5.10: Frequency Table of Sex and Caste of the visitors

Sex	Count	%	Discussion
Male	93	80.2	Direct observation shows that the proportion of male to female is about 3:2. This figure obtained from questionnaire survey is different because many female visitors rejected to participate.
Female	23	19.8	
Caste	Count	%	Discussion
Brahmin	32	27.6	There is high proportion of Brahmin and Chhetri visitors in the zoo because of their higher population in the country (about 40%). About 20% visitors are from Newar society because of their remarkable presence in all the cities of Kathmandu Valley (Kathmandu, Kirtipur, Lalitpur and Bhaktapur). There is remarkable presence of Janajati; most of them are working as laborers in Kathmandu. There are limited visitors from the dalit society, who are supposed to be economically weak. It may be due to their engagement as labor most of time. Number of international tourists is limited due to less exposure of the zoo in media and less facilities which are not sufficient to meet their expectations.
Chhetri	21	18.1	
Newar	23	19.8	
Janajati	16	13.8	
Dalit	2	1.7	
Int'l tourist	2	1.7	
Other	20	17.2	
Total	116	100	

Table 5.11: Peoples WTP as an entry fee if zoo improves its services

Choices	Count	%	Discussion
No change	49	42.24	About 69% visitors are not willing to pay higher prices for services provided by the zoo. Out of them 27% visitors suggested zoo management to reduce entry fee, whereas other 42% accepted present entry fee is suitable. About one third of the total zoo visitors (most of them are belonging to age group 15-24), suggested to increase entry fee, at least along with improvement in present services and the facilities provided by the zoo.
Reduce entry fee	31	26.72	
Increase entry fee	36	31.03	
Total	116	100	

Table 5.12: Frequency tables for Major purpose of visit, Occupation and Direct association with environment related organizations

Major Purposes of the Visit		Count	%	Discussion
Animals, boating		1	0.9	About 21% visitors in the zoo come to watch birds and animals, who are especially people, from rural areas. About 36% visitors were found to be in the zoo without any special purposes. Most of them were young couples, and their unexplained purpose was dating. It is mainly due to lack of greenery and romantic places in the town. Simply they are using the zoo as dating place because it is safe, relatively cheap (in comparison to expensive restaurants) and there is flexible limit of time. There is remarkable presence of people who are visiting zoo to entertain their children and other family members or relatives. There are limited visitors who are really visiting for conservation education except school children. Greenery, peaceful environment, elephant riding and boating are other popular features in the zoo.
Entertainment, for family		1	0.9	
Entertainment, to visit friends		1	0.9	
Environment		1	0.9	
For children, time pass, educational		1	0.9	
For peaceful environment, animals and birds		1	0.9	
Fun, friend and holiday		1	0.9	
Peace		1	0.9	
Picnic, educational		1	0.9	
Social welfare, for children		1	0.9	
Time pass, study		1	0.9	
Trekking, cultural, time pass		1	0.9	
Boating and elephant riding		3	2.6	
Visiting friends		3	2.6	
Conservation education		4	3.4	
Entertainment, for children		4	3.4	
For children		9	7.8	
Entertainment		12	10.3	
For family members		13	11.2	
Time pass		13	11.2	
No thing special		21	18.1	
Animals and birds		22	19.0	
Total		116	100	
Occupation		Count	%	Discussion
Tourism professional		2	1.7	There is limited presence of tourism professionals. Students are the dominant group in terms of Zoo visit. Job holders and labor workers are also utilizing zoo as a good “time pass station”. Especially on Friday and Saturday school children and teachers accounts about 30% of total visit, for picnic and conservation education.
Teacher		6	5.2	
Housewife		10	8.6	
Business		12	10.3	
Agriculture		15	12.9	
Labour		15	12.9	
Job		23	19.8	
Student		30	25.9	
Other		3	2.6	
Total		116	100	
Direct association with environmental organizations				
Choice	Count	%	Discussion	
Yes	8	6.9	This study reveals that there is no relation between the total visit and direct association with Environment related organizations (In case of school children direct association is ignored).	
No	108	93.1		
Total	116	100		

Table 5.13: Categorization of Zoo visitors according to age group

Age Group	Count	%	Discussion
0-14	1	0.9	Excluding children directly from schools, there is a small number of visitors below 14 years of age. Few of them are with their parents. There is relatively less proportion of elderly people. The dominant visitor age group is 15-24 years.
15-24	55	47.4	
25-59	57	49.1	
60+	3	2.6	
School children for picnic and other function of School			There are remarkable visitors from school and few of them are members of “friends of the Zoo”, a conservation education based program conducted by the zoo.

Table 5.14: Educational Level of the Zoo visitors

Years of Education	Count	Discussion
0 (Illiterate)	5	Increasing or decreasing years of education don't show any direct relationship with the number of visits. School children have extensive presence in the zoo.
1	1	
3	3	
4	3	
5	3	
6	1	Other groups with higher number of visit in the zoo include students of class 12 and class 10. But they rarely visit zoo for educational purpose and education is not the key factor behind their visit.
7	2	
8	4	
9	5	
10	26	
School Children in School functions	Remarkable	Another cause for large visits of students (certificate level) also shows social transformation, mainly changes in the mode of life and their higher preferences for recreational sites.
11	4	
12	29	
13	6	
14	5	
15	6	
16	8	
17	5	

Table 5.15: Preferred season to visit Zoo

Preferred Season	Count	%	Discussion
Spring and Autumn	1	0.9	When visitors were asked to suggest for optimum season to visit the zoo, about 65% of them answered spring. 5.2% answered that they have no idea, about 10% suggested winter and second largest group (about 14%) recommended winter as suitable season to visit the zoo. Notable number of visitors suggested summer as suitable season to visit the zoo.
Spring and Summer	1	0.9	
Spring and Winter	3	2.6	
Autumn	5	4.3	
No comment	6	5.2	
Summer	11	9.5	
Winter	15	12.9	
Spring	74	63.8	
Total	116	100	

Table 5.16: Level of Satisfaction

Satisfaction level	Count	%	Discussion
Yes	105	90.5	Visitors, when requested to comment on level of satisfaction in present visit, about 91% replied that they are satisfied but are expecting further development in the Zoo. About 9% visitors were not satisfied with environmental hygiene present in the Zoo.
No	10	8.6	
Better than expected	1	0.9	
Total	116	100	

Table 5.17: Area of improvement for Zoo suggested by the visitors (language edited)

Develop system of guides to inform people about Zoo features	2
Improve visitors hospitality, make staff friendly	2
Put suggestion box	2
Add updated information board	3
Don't ignore the situation of decrease in number of animals	3
Develop monitoring mechanism to clean the zoo	5
Add sport facilities for children	7
Take care of animal health	7
Manage lighting systems during evening	8
Reduce the prices at the canteen	9
Increase greenery by gardening	15
Relocate the zoo	16
Increase area of the Zoo, cages are narrow and congested and may have problem of aeration	19
Increase resting places for the visitors	19
Improve drinking water facility	21
Add toilet facilities	27
Reduce entry fee	31
Develop efficient waste management mechanism	31
Control bad smelling	34
Add more animals and birds with complete representation	57
Reduce pollution levels and improve sanitation status in cages	103

Visitors were requested to share their dislikes in the Zoo and suggest ideas to improve zoo facilities to meet their expected level of satisfaction in the next visit. Nearly all visitors worried about water pollution in the pond and in the cage of Hippopotamus. About 50% of them suggested adding more animals and birds (if possible complete representation of biodiversity). One-fourth of them worried on present system of waste management (burning), and more than 25% disagreed with the present entry fee. They suggested reducing the entry fee, but few visitors favored increase in the entry fee to manage zoo facilities. Few of them raised their voice to increase the area of the zoo or to relocate it. They believed that being limited to a small area,

cages are small and even closer to each other and there is danger of disease spreading. However, the zoo authorities claim that there is no disease prone situation in the zoo and the cages look like dirty since it is desirable to make them natural. A detailed list is given in Table 5.16.

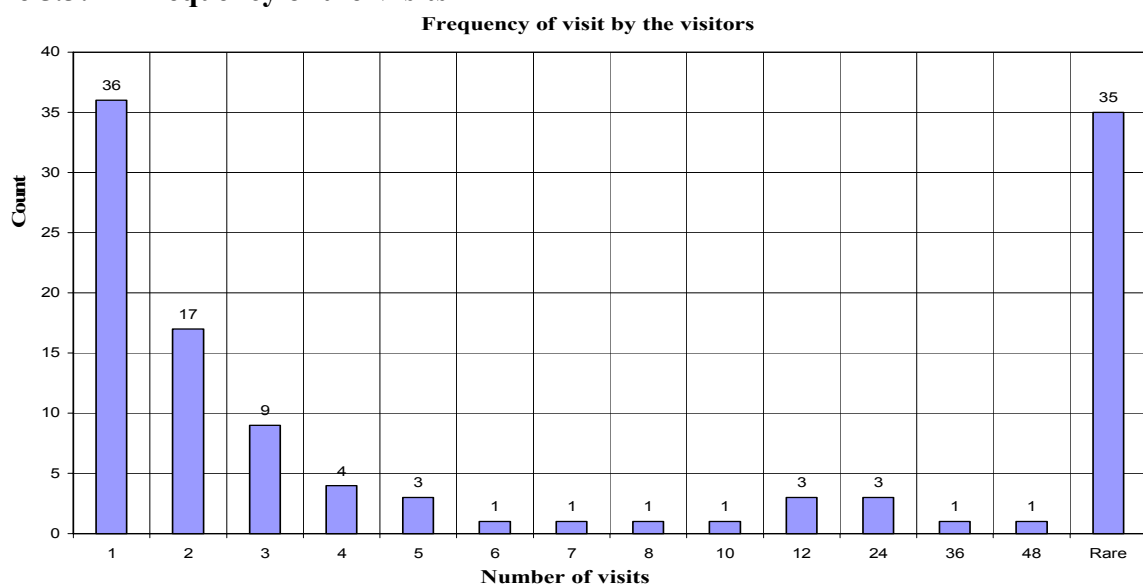
As more than one-fourth of the visitors complained about entry fee, visitors were asked to suggest possible sources of fund for the Zoo. More than 40% of them suggested looking for donations and about 22% suggested asking the government for financial support as listed in table 5.18.

Table 5.18: Visitors suggestions to raise funds for sustainable management of the Zoo

Suggested sources	Count	%
Don't know	27	23.3
Donation	47	40.5
Government Support	25	21.6
Income generating activities	9	7.8
Increase entry fee	8	6.9
Total	116	100

Visitors were inquired to estimate the number of annual visits to the zoo. More than one-fourth of them were rare visitors of the zoo, whereas about 46% of them were visiting the zoo annually once or twice. There were few notable visitors visiting the zoo more than 12 times. They were either using the zoo as their dating place, or they were member of the FOZ. Few visitors were visiting the Zoo frequently, because they are getting free entry. A graphic presentation is given in figure 5.3.

Figure 5.3: Frequency of the Visits



Regression model between Actual visits and Travel cost:

$$Y=A+BX$$

Where,

Number of cases=13

Y=Actual Visits (dependent variable),

X=Travel Cost (Independent variable)

A is constant and B is Regression Coefficients.

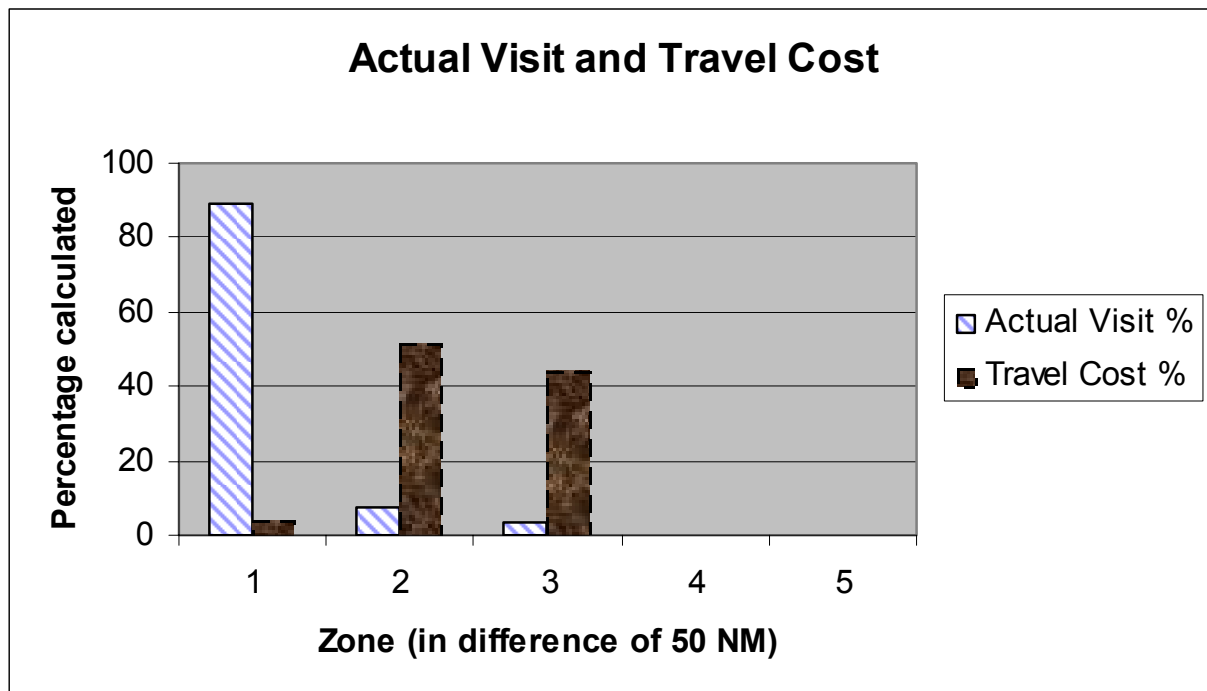
Model Summary			
R	R Square	Adjusted R Square	Std. Error of the Estimate
0.984	0.969	0.937	237.5914

ANOVA					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1745633.011	1	1745633.011	30.924	0.0993
Residual	56449.655	1	56449.655		
Total	1802082.667	2			

Model	Coefficient	Std. Error	t	Sig.
Constant (A)	1867.511	257.805	7.244	0.087
TC (B)	-3.138	0.564	-5.561	0.113

The adjusted value of the coefficient of determination (0.937) clearly shows that the actual number of visits significantly depends on the travel cost and the low p-value (0.0993) implies the rejection of null hypothesis.

Figure 5.4: Bar diagram showing travel cost and actual visits for different zones



5.3. Economic value of the Zoo

For the analysis to identify economic value of the zoo, information related to the Nepalese national only was considered. Because presence of international tourists is negligible and hence may truncate other values obtained from the majority of the population.

Observed number of visit: 116

Total number of visit = 14,342

Multiplying factor is calculated as $((14342/7)/116) = 17.66256158$

Real data for each zone is produced by multiplying the observed data and the above calculated multiplying factor. Considering the total travel cost, Shadow pricing of time spent during the zoo visit, other expenses during zoo visit and entry fee. Per capita Economic value of the zoo is NRs. 226.286 or US \$ 3.15. (1 US Dollar = NRs. 71.74, as December 12, 2004).

Average number of Visit per Day = 1800

Total number of Visit per Year = 843,549 (Reference to 2002-03)

Yearly revenue from entry fee = NRs. 20,692,600 (Reference to 2002-03)

Yearly willingness to pay by consumers based on this study = NRs. 1,908,83,329.014 (US \$ 2,660,766).

Yearly willingness to pay by consumers for the features and services per hectare of land in the Zoo;

=NRs. 31,813,888.169

Table 5.19 shows people's willingness to pay for different recreational sites. American and Australian cases show higher WTP in comparison to South Asian examples. It is mainly due to vast difference in economic status of the people and their preferences to visit such recreational sites. This can be explained with reference to the Human Development Index (HDI) 2002, as listed in Human Development Report (HDR) 2004 (UNDP 2004). It has calculated HDI as 0.946 for Australia, 0.939 for USA, 0.509 for Bangladesh and 0.504 for Nepal. Higher budget allocated for recreational purpose in developed countries is also influenced by their mode of life and matured status of tourism in those countries. In developing countries like Nepal and Bangladesh, recreation is an optional issue and this activity receives less preference. The proportion of recreational sites and neighboring urban areas also affects the WTP for such visits.

Results from Dhaka Zoological Garden and Central Zoo, Kathmandu are quite comparable. The result for the Central Zoo is higher because of consideration of shadow pricing of time spent during Zoo visit. Otherwise the result for Dhaka Zoological Garden may be higher.

Table 5.19: Comparative Table of TCM results from around the world (After Shammin 1998)

Location	References	Results in US \$
Warrumbungle National Park, NSW, Australia	Ulph & Reynolds, 1981	\$200
Green Island Queensland, Australia	Economic Associates Australia, 1983	\$29
Grapians State Forest, Melbourne, Australia	Graig, 1977	\$3
Gerringgong-Gerroa, NSW, Australia	James, 1993	\$104
Hiking in Colorado, USA	Sorg & Loomis, 1984 & Young 1991	\$23
Backpacking in Oregon, USA	Sorg & Loomis, 1984 & Young 1991	\$133
Rivers of Rocky Mountains, Colorado, USA	Sanders, Walsh & McKean, 1991	\$41
Dhaka Zoological Garden, Bangladesh	Shammin, M.R. (IUCN 1998)	\$2.94
Central Zoo, Kathmandu, Nepal	Mahat, Tek Jung (TU & ESDO 2004)	\$ 3.15

VI. Conclusions and Recommendations

6.1. Key findings of the study

- About 800,000 visitors visit the Central Zoo annually generating about NRs. 20,692,600 as revenue from entry fees. Bhotojatra, Nepalese New year day, every Saturday, Sunday are the peak hours and Nepal band, Chakkajaam, strikes and rainy days usually hit the zoo severely. Spring is the most popular season for Zoo visit followed by winter and summer respectively.
- Being located in the heart of the valley, the zoo has excellent access of transportation facilities and most popular mode of transport includes City bus, Tempo, Microbus etc.
- In terms of actual number of visit and frequency of visit, the dominant groups are school children, adults and visitors belonging to middle or low levels of income.
- Due to lack of greenery and peaceful and safe areas elsewhere and also because of expensive restaurants, popularity of the Zoo is growing among the adults of 15 to 24 years. The Zoo is also increasing its recognition as a picnic site but limited facilities are available and may cross the carrying capacity..
- The number of foreign visitors is small and they are not satisfied with the limited zoo facilities. Local visitors are also worried about poor environmental hygiene inside the zoo. Most of the respondents suggested for addition of new species in the zoo, extension of the zoo and recovery of environmental hygiene.
- The number of male visitors is higher than female. Brahmin and Chhetri alone account for about 46% of the Zoo visit followed by the Newar community.
- Level of education and visitor's direct association with environment related organizations is not significant to define the number and nature of the visits.

6.2. Recommendation

The Zoo has great potential as a holiday and recreational site and is a safe place for young couples. Very recently the zoo has released few of antelopes in the forest of Pashupati area. The zoo is getting success to increase conservation awareness through its conservation platform Friends of the Zoo (FOZ). The Assistant Curator of the zoo informed that the zoo is planning to increase recreational facilities for children very soon. Dramatic change in the Zoo is not likely possible however. It needs immediate action for its improvement and sustainable development. The zoo is also planning to add and replace few animals and birds.

- The entry fee to the zoo may be raised to NRs. 15 to 20 for students while keeping unchanged for school children and others. This would immediately generate enough additional revenue to cover the operating and maintenance expenses of the zoo. This study suggests that people would be willing to pay a much higher price for the zoo, if it could maintain environmental hygiene in the zoo premises.
- Since visitors to the zoo come from a variety of income groups, the zoo may consider developing several levels of service with progressively higher fees. The simplest option is to allow the visitor a self guided tour. The next level may include a briefing at the information center with a documentary on the zoo that will help the visitors make a better plan. At the third level, the package may include a fully guided tour along with refreshments. The idea is to cater to the needs of the visitors of differing socioeconomic and cultural backgrounds. This way, it could generate more funds for the zoo.
- In Addition to animal manure, wastes inside the zoo include remains of fruits and food materials, plastic, papers etc. sold in the shop inside the zoo and the market close to zoo entrance gate. Hence following the “polluters to pay principle”, zoo may introduce nominal taxes for these market stalls. The funds thus generated should be allocated to improve the environmental quality of the zoo, maintenance and renovation to enhance the quality of its facilities as mentioned in table 5.17.
- Light systems in the zoo should be improved for evenings and the zoo opening hours should be increased. An alternate system to clean the zoo is promptly needed and Monday should be open for zoo visitors.
- Zoo should increase required facilities and develop monitoring mechanism, to regulate picnic and other gatherings inside the zoo, keeping harmony to natural environment

- Unhealthy or lean animals and birds should be immediately treated or replaced. The Zoo should add more animals and birds in few empty cages (observed during direct observation). Special care should be given to most liked animals and birds as listed in figure 5.1.
- Finally, information in this study on willingness to pay, composition of visitors by income, mode of transportation used, and features of attraction should be used in the national budget, in preparing development plans for the zoo, in identifying areas of weaknesses, and in assessing the benefits derived from the Central Zoo.

6.3. Recommendation for further study

There are various issues yet to be explored in economic valuation in Nepal. Few of them are as follows;

- A large-scale survey could generate more and important issues for the zoo management.
- Different issues related to green accounting on micro areas by applying Willingness to pay (WTP) and Willingness to Accept (WTA) in various sectors such as water supply schemes, solid waste management, forest management, protected area management, river ecosystems, lakes and ponds and other issues of urbanization and tourism destinations.
- Impact measurement of pollution, deforestation, loss of biodiversity, global warming and other environmental degradation.
- Trade, environment and public debt.
- Environmental fiscal policy.
- Issues of Intellectual property Right (IPR) and Trade Related Intellectual Property Rights (TRIP).
- Measurement of loss and benefits at ecosystem level, like impacts of water pollution in particular species of a fish, loss of endangered species etc, with the application of econometric tools.

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Photo Plates



Couples resting near the pond



Obtaining information through questionnaire survey



Obtaining information through questionnaire survey



Obtaining information through questionnaire survey



Visitor's queue at drinking water tank



Hippopotamus resting inside the cage



Zoo is growing its popularity as a favorite picnic destination among schoolchildren



Ostrich in the Central Zoo



Schoolchildren enjoying zoo facilities



Major sources of manmade waste pollution inside the zoo



Major sources of manmade waste pollution inside the zoo

Visitors survey Questionnaire

Dear visitors,
“Namaste”

2004, KTM

May I request you to fill up the questionnaire? This is designed to estimate the visitors demand for “Central Zoo”. This is the part of my M.Sc. dissertation work. I thank you for the cooperation.

Wish the best wishes for happy visit to Nepal.

Yours,
Tek Jung Mahat, TU.

Please select the appropriate choices in case of multiple choices or specify if necessary.

- 1. Name (Not compulsory) and caste:**
- 2. Age (in Yrs.):** 5-15 15-25 25-40 40-60 Above 60
- 3. Sex:**
- 4. Nationality and Geography :** For e.g. Asia/Nepal/Biratnagar
- 5. Education (Please fill in the blanks):** Class 10-... Class 10+... Class 10+2+...
- 6. Occupation:**
- 7. Monthly Income in NRs/US \$ (use parents income if you do not earn and dependent on their income) :**
Below 2000 2000-3000 3000-5000 5000-10000 10000-15000 Above 15000
- 8. Estimated family wealth and number of family members... /...**
- 9. Estimated family expenditure per year.....**
- 10. What is your major purpose of Zoo visit?**
- 11. List most liked Zoo features, please specify in order;**

11.1.

11.6.

11.2.

11.7.

11.3.

11.8.

11.4.

11.9.

11.5.

11.10.
- 12. What is your mode of transport? Please specify in order along with estimated fare; in US \$ or NRs.(For e.g. Taxi (24) +Airplane (200) +Microbus (2))**
.....
- 13. Type of Visit:** Sole on the way If on the way specify the major.....
- 14. Time taken to visit (estimated):**
- 15. Associated with environmental organization? Please specify.....**
- 16. Number of Visits (with reference to appropriate Unit):** Monthly Yearly
- 17. Total expenditure during visit (including Entry fee, Transportation cost, Lodging and Fooding etc):**
- 18. What is your highest Willingness to Pay as entry fee?**
- 19. If Escorting School Childs, what is the number of children?**
- 20. In which season do you prefer to visit?**
- 21. Would you like to visit Zoo again, why?**
- 22. If answer is no, why?**
- 23. Do you have suggestion for Zoo management?**
- 24. Which alternate do you suggest zoo management to raise funds for the zoo?**

Increase entry feeHMG SupportDonationsOther

King Mahendra Trust for Nature Conservation/ Central Zoo

Check List of Animals, June, 2004 (Jestha 2061)

F. Y. 2003/2004 (2060/61)

Mammals

S.N.	Common Name	Scientific Name	Total	Male	Female	Infants	Unknown	Remarks
1	Spotted Deer	<i>Axis axis</i>	36	9	19	8		
2	Swamp Deer	<i>Cervus duvauceli</i>	2	2				
3	Black Buck	<i>Antelope cervicapra</i>	89	27	45	17		
4	Clouded Leopard	<i>Neofelis nebulosa</i>	2	1	1			
5	Large Indian Civet	<i>Viverra zibetha</i>	3	2	1			
6	Himalayan Palm Civet	<i>Paguma larvata</i>	1		1			
7	Common Palm Civet	<i>Paradoxurus hermaphroditus</i>	1					
8	Red Flying Squirrel	<i>Petaurista petaurista</i>	1	1			1	
9	Indian Giant Squirrel	<i>Ratufa indica</i>	1	1				
10	Barking Deer	<i>Muntiacus muntjak</i>	13	2	8	3		
11	Common Langur	<i>Presbytis entellus</i>	3	3				
12	Porcupine	<i>Hystrix indica</i>	2	2				
13	Rabbit (Domestic)	<i>Oryctolagus cuniculus</i>	20				20	
14	Angora Rabbit		2	1	1			
15	Royal Bengal Tiger	<i>Panthera tigris</i>	7	1	2	4		
16	Guinea Pig	<i>Cavia aperea</i>	39				39	
17	White Mice		24				24	
18	One-Horned-Rhinoceros	<i>Rhinoceros unicornis</i>	2	1	1			
19	Hippopotamus	<i>Hippopotamus amphibious</i>	2	1	1			
20	Mongoose	<i>Herpestes nepalensis</i>	1		1			
21	Sloth Bear	<i>Melurus ursinus</i>	2	1	1			
22	Striped Hyena	<i>Hyaena hyaena</i>	2		2			
23	Jackal	<i>Canis aureus</i>	3	3				
24	Common Leopard	<i>Panthera pardus</i>	5	3	2			
25	Asian Elephant	<i>Elephas maximus</i>	1		1			
26	Lion Tailed Macaque	<i>Macaca silenus</i>	2	2				
27	Wild Buffalo	<i>Bubalus bubalis</i>	1	1				
28	Assamese Monkey	<i>Macaca assamensis</i>	2	1	1			
29	Blue Bull	<i>Boselaphus tragacamelus</i>	6	3	2	1		
30	Jungle Cat	<i>Felis chaus</i>	2		2			
31	Leopard Cat	<i>Felis bengalensis</i>	1		1			
32	Siamang	<i>Hylobates syndactylus</i>	2	1	1			
Sub-Total			280	69	94	33	84	

Reptiles

S.N.	Common Name	Scientific Name	Total	Male	Female	Infants	Unknown	Remarks
1	Giant Land Tortoise	<i>Testudo gigantia</i>	3	1	2			
2	Yellow Headed Turtle	<i>Indotestudo elongata</i>	1				1	
3	Pond Turtle	<i>Melanochelys trijuga</i>	1		1			
4	Tricarinate Hill Turtle	<i>Melanochelys tricarinata</i>	1				1	
5	Indian Roofed Turtle	<i>Kachuga tectum</i>	1				1	
6	Asiatic Rock Python	<i>Python molurus</i>	2	1				
7	Cobra	<i>Naja naja</i>	2				2	
8	Chinese Alligator	<i>Alligatoridae sinensis</i>	1				1	
9	Gharial Crocodile	<i>Gavialis gangeticus</i>	3	1	1	1		
Sub-Total			15	3	4	1	7	

Fishes

S.N.	Common Name	Scientific Name	Total	Male	Female	Infants	Unknown	Remarks
1	Yellow & Blue Aurtus		195				195	
2	Silver Dollar Fish		15				15	
3	Yellow Sivrum		1				1	
4	Black Tiger Shark	<i>Morulus chrysophekadion</i>	24				24	
5	White Tiger Shark		6				6	
6	Silver Shark		4				4	
7	Black Redtail Shark		52				52	
8	White Redtail Shark		14				14	
9	Kotra Kotri		3				3	
10	Pearlskill Goldfish		2				2	
11	Subun King	<i>Carassius sp.</i>	20				20	
12	Koi & Manila Carp		4				4	
13	Kissing Gourami	<i>Helostoma temmincki</i>	3				3	
14	Tinfoil Barb	<i>Barbus schwanenfeld</i>	2				2	
15	Sucker Mouth		1				1	
16	Red Oranda		48				48	
Sub-Total			394				394	

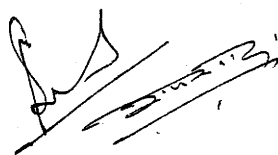
Birds

S.N.	Common Name	Scientific Name	Total	Male	Female	Infants	Unknown	Remarks
1	Common Peafowl	<i>Pavo cristatus</i>	6	2	4			
2	Eurasian Spoonbill	<i>Platalea leucorodia</i>	3				3	
3	White Ibis	<i>Pseudibis papillosa</i>	8				8	
4	Grey Heron	<i>Ardrea cinerea</i>	1		1			
5	Redheaded Vulture	<i>Sarcogyps calvus</i>	1				1	
6	White-rumped Vulture	<i>Gyps bengalensis</i>	1				1	
7	Sarus Crane	<i>Grus antigone</i>	2	1	1			
8	White Naped Crane	<i>Grus vipio</i>	2		1		1	
9	Common Crane	<i>Grus grus</i>	1				1	
10	Black Necked Stork	<i>Ephippiorhynchus asiaticus</i>	2	1	1			
11	White Stork	<i>Ciconia ciconia</i>	1				1	
12	Lesser Adjutant Stork	<i>Leptoptilos javanicus</i>	2	1	1			
13	African Ostrich	<i>Struthio camelus</i>	1		1			
14	Impeyan Pheasant	<i>Lophophorus impejanus</i>	2	1	1			
15	Silver Pheasant	<i>Lophura nectinea</i>	5	4	1			
16	Nepali Kaliz	<i>Lophura leucomelana</i>	9	3	6			
17	Golden Pheasant	<i>Chrysolophus Pictus</i>	17	4	3	6	4	
18	Lady Amherst Pheasant	<i>Chrysolophus Amherstiae</i>	9	3	2	4		
19	Elliot Pheasant	<i>Symaticus elliotti</i>	1		1			
20	Ring Necked Pheasant	<i>Phasianus colchicus torquatus</i>	3	1	2			
21	Pink-Crested Cockatoo	<i>Cacatua moluccensis</i>	2				2	
22	Sulpher-Crested Cockatoo	<i>Cacatua galerita</i>	14				14	
23	White Cockatoo		3				3	
24	Oriental Pied Horn Bill	<i>Anthracoceros balhirastris</i>	1		1			
25	Budgerigar	<i>Melopsittacus undulatus</i>	33				33	
26	Love Bird	<i>Agapornis personata</i>	1				1	
27	Robin	<i>Saxicoloides fulicata</i>	6	3	3			
28	Rosy Pastor	<i>Sturnus roseus</i>	1				1	

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29	Common Myna	<i>Acridotheres tristis</i>	2				2	
30	Talking Myna or Hill Myna	<i>Gracula religiosa</i>	1				1	
31	Cockatiel	<i>Nymphicus hollandicus</i>	11				11	
32	Red billed blue magpie	<i>Urocissa erythrorhyncha</i>	1	1				
33	Black Headed Munia	<i>Lonchura malacca</i>	13				13	
34	Red Avadavat Munia	<i>Amandava amandava</i>	9				9	
35	White throated Munia	<i>Lonchura malabarica</i>	3				3	
36	Scaly-breasted Munia	<i>Lonchura punctulata</i>	23				23	
37	Rose Ringed Parakeet	<i>Psittacula krameri</i>	15				15	
38	Alexandrine Parakeet	<i>Psittacula eupatria</i>	6				6	
39	Red breasted Parakeet	<i>Psittacula alexandri</i>	2				2	
40	Lorikeet	<i>Domicella domicella</i>	4				4	
41	Wood Duck	<i>Aix sponsa</i>	3	2	1			
42	Comb Duck	<i>Sarkidiornis melanotos</i>	3	3				
43	lesser Whistling Teal	<i>Dendrocygna javanica</i>	3				3	
44	Bar Headed Goose	<i>Anser indicus</i>	3	3				
45	Blue Rock Pigeon	<i>Columba livia</i>	1				1	
46	Fantail Pigeon	Family: Columbidae	2	1	1			
47	Yellow-footed Green Pigeon	<i>Treron phaeoptera</i>	1	1				
48	White Dove	<i>Columba sp.</i>	1				1	
49	Red Dove	<i>Columba sp.</i>	4				4	
50	Common Greylag Goose	<i>Anser anser</i>	108				108	
51	White Pelican	<i>Pelecanus onocrotalus</i>	4	2	2			
52	Great Horned Owl	<i>Bubo bubo</i>	1				1	
53	Barn Owl	<i>Tyto alba</i>	2				2	
54	Dark or Black Kite	<i>Milvus migrans</i>	2				2	
55	Crested Serpent Eagle	<i>Spilornis cheela</i>	1				1	
56	Peregrine Falcon	<i>falco peregrinus</i>	1				1	
Sub-Total			368	37	34	10	287	
Total			1057	109	132	44	772	

Categories	Species	Number
Mammals	32	280
Reptiles	9	15
Fishes	16	394
Birds	56	368
Total	113	1057



King Mahendra Trust for Nature Conservation/ Central Zoo
Check List of Animals, August, 2004 (Shrawan 2061)
F. Y. 2004/2005 (2061/62)

Mammals

S.N.	Common Name	Scientific Name	Total	Male	Female	Infants	Unknown	Remarks
1	Spotted Deer	<i>Axis axis</i>	35	9	19	7		
2	Swamp Deer	<i>Cervus duvauceli</i>	2	2				
3	Black Buck	<i>Antelope cervicapra</i>	84	29	45	10		
4	Clouded Leopard	<i>Neofelis nebulosa</i>	2	1	1			
5	Large Indian Civet	<i>Viverra zibetha</i>	3	2	1			
6	Himalayan Palm Civet	<i>Paguma larvata</i>	1		1			
7	Common Palm Civet	<i>Paradoxurus hermaphroditus</i>	1				1	
8	Red Flying Squirrel	<i>Petaurista petaurista</i>	1	1				
9	Indian Giant Squirrel	<i>Ratufa indica</i>	1	1				
10	Barking Deer	<i>Muntiacus muntjak</i>	13	2	9	2		
11	Common Langur	<i>Presbitis entellus</i>	3	3				
12	Porcupine	<i>Hystrix indica</i>	3	3				
13	Rabbit (Domestic)	<i>Oryctolagus cuniculus</i>	20				20	
14	Angora Rabbit		2	1	1			
15	Royal Bengal Tiger	<i>Panthera tigris</i>	7	1	2	4		
16	Guinea Pig	<i>Cavia aperea</i>	49				49	
17	White Mice		24				24	
18	One-Horned-Rhinoceros	<i>Rhinoceros unicornis</i>	2	1	1			
19	Hippopotamus	<i>Hippopotamus amphibious</i>	2	1	1			
20	Mongoose	<i>Herpestes nepalensis</i>	1		1			
21	Pangolin or Scaly Anteater	<i>Manis crassicaudata</i>	1				1	
22	Sloth Bear	<i>Melurus ursinus</i>	2	1	1			
23	Striped Hyena	<i>Hyaena hyaena</i>	2		2			
24	Jackal	<i>canis aureus</i>	3	3				
25	Common Leopard	<i>Panthera pardus</i>	5	3	2			
26	Asian Elephant	<i>Elephas maximus</i>	1		1			
27	Lion Tailed Macaque	<i>Macaca silenus</i>	2	2				
28	Wild Buffalo	<i>Bubalus bubalis</i>	1	1				
29	Assamese Monkey	<i>Macaca assamensis</i>	2	1	1			
30	Blue Bull	<i>Boselaphus tragacamelus</i>	6	3	3			
31	Jungle Cat	<i>Felis chaus</i>	2		2			
32	Leopard Cat	<i>Felis bengalensis</i>	1		1			
33	Siamang	<i>Hylobates syndactylus</i>	2	1	1			
Sub-Total			286	72	96	23	95	

Reptiles

S.N.	Common Name	Scientific Name	Total	Male	Female	Infants	Unknown	Remarks
1	Giant Land Tortoise	<i>Testudo gigantia</i>	3	1	2			
2	Yellow Headed Turtle	<i>Indotestudo elongata</i>	2	1	1			
3	Pond Turtle	<i>Melanochelys trijuga</i>	1		1			
4	Tricarinate Hill Turtle	<i>Melanochelys tricarinata</i>	1				1	
5	Indian Roofed Turtle	<i>Kachuga tectum</i>	1				1	
6	Asiatic Rock Python	<i>Python molurus</i>	2	1			2	
7	Cobra	<i>Naja naja</i>	2				1	
8	Chinese Aligator	<i>Alligatoridae sinensis</i>	1					
9	Gharial Crocodile	<i>Gavialis gangeticus</i>	3	1	1	1		
Sub-Total			16	4	5	1	6	

Signature

Fishes

S.N.	Common Name	Scientific Name	Total	Male	Female	Infants	Unknown	Remarks
1	Yellow & Blue Aurtus		195				195	
2	Silver Dollar Fish		15				15	
3	Yellow Sivrum		1				1	
4	Black Tiger Shark	<i>Morulus chrysophekadion</i>	25				25	
5	White Tiger Shark		6				6	
6	Silver Shark		4				4	
7	Black Redtail Shark		52				52	
8	White Redtail Shark		14				14	
9	Kotra Kotri		3				3	
10	Pearlskill Goldfish		2				2	
11	Subun King	<i>Carassius sp.</i>	20				20	
12	Koi & Manila Carp		4				4	
13	Kissing Gourami	<i>Helostoma temmincki</i>	3				3	
14	Tinfoil Barb	<i>Barbus schwanenfeld</i>	2				2	
15	Sucker Mouth		1				1	
16	Red Oranda		48				48	
Sub-Total			395				395	

Birds

S.N.	Common Name	Scientific Name	Total	Male	Female	Infants	Unknown	Remarks
1	Common Peafowl	<i>Pavo cristatus</i>	7	2	4	1		
2	Eurasian Spoonbill	<i>Platalea leucorodia</i>	3				3	
3	White Ibis	<i>Pseudibis papillosa</i>	8				8	
4	Grey Heron	<i>Ardrea cinerea</i>	1		1			
5	Redheaded Vulture	<i>Sarcogyps calvus</i>	1				1	
6	White-rumped Vulture	<i>Gyps bengalensis</i>	1				1	
7	Sarus Crane	<i>Grus antigone</i>	2	1	1			
8	White Naped Crane	<i>Grus vipio</i>	2		1		1	
9	Common Crane	<i>Grus grus</i>	1				1	
10	Black Necked Stork	<i>Ephippiorhynchus asiaticus</i>	2	1	1			
11	White Stork	<i>Ciconia ciconia</i>	1				1	
12	Lesser Adjutant Stork	<i>Leptoptilos javanicus</i>	2	1	1			
13	African Ostrich	<i>Struthio camelus</i>	1		1			
14	Impeyeen Pheasant	<i>Lophophorus impejanus</i>	2	1	1			
15	Silver Pheasant	<i>Lophura nectinea</i>	5	4	1			
16	Nepali Kaliz	<i>Lophura leucomelana</i>	9	3	6			
17	Golden Pheasant	<i>Chrysolophus Pictus</i>	15	5	6	4		
18	Lady Amherst Pheasant	<i>Chrysolophus Amherstiae</i>	10	6	4			
19	Elliot Pheasant	<i>Syrmaticus ellioti</i>	1		1			
20	Ring Necked Pheasant	<i>Phasianus colchicus torquatus</i>	3	1	2			
21	Yellow legged Buttom Quail		1				1	
22	Pink-Crested Cockatoo	<i>Cacatua moluccensis</i>	2				2	
23	Sulpher-Crested Cockatoo	<i>Cacatua galerita</i>	14				14	
24	White Cockatoo		3				3	
25	Oriental Pied Horn Bill	<i>Anthracerus balbirostris</i>	1		1			
26	Budgerigar	<i>Melopsittacus undulatus</i>	16				16	
27	Love Bird	<i>Agapornis personata</i>	1				1	

S. K. Kurnach

Robin	<i>Saxicoloides fulicata</i>	4	2	2		1	
Rosy Pastor	<i>Sturnus roseus</i>	1				2	
Common Myna	<i>Acridotheres tristis</i>	2				1	
Talking Myna or Hill Myna	<i>Gracula religiosa</i>	1				11	
Cockatiel	<i>Nymphicus hollandicus</i>	11					
Red billed blue magpie	<i>Urocissa erythrorhyncha</i>	1	1				
Black Headed Munia	<i>Lonchura malacca</i>	13				13	
Red Avadavat Munia	<i>Amandava amandava</i>	9				9	
White throated Munia	<i>Lonchura malabarica</i>	3				3	
Scaly-breasted Munia	<i>Lonchura punctulata</i>	22				22	
Rose Ringed Parakeet	<i>Psittacula krameri</i>	15				15	
Alexandrine Parakeet	<i>Psittacula eupatria</i>	6				6	
Red breasted Parakeet	<i>Psittacula alexandri</i>	2				2	
Loriikeet	<i>Domicella domicella</i>	4				4	
Wood Duck	<i>Aix sponsa</i>	3	2	1			
Comb Duck	<i>Sarkidiornis melanotos</i>	3	3				
lesser Whistling Teal	<i>Dendrocygma javanica</i>	3				3	
Bar Headed Goose	<i>Anser indicus</i>	3	3				
Blue Rock Pigeon	<i>Columba livia</i>	1				1	
Fantail Pigeon	<i>Family: Columbidae</i>	4	1	1	2		
Yellow-footed Green Pigeon	<i>Treron phenicoptera</i>	1	1				
White Dove	<i>Columba sp.</i>	1				1	
Red Dove	<i>Columba sp.</i>	4				4	
Common Greylag Goose	<i>Anser anser</i>	108				108	
White Pelican	<i>Pelecanus onocrotalus</i>	4	2	2			
Great Horned Owl	<i>Bubo bubo</i>	1				1	
Barn Owl	<i>Tyto alba</i>	2				2	
Dark or Black Kite	<i>Milvus migrans</i>	2				2	
Crested Serpent Eagle	<i>Spilornis cheela</i>	1				1	
Peregrine Falcon	<i>falco peregrinus</i>	1				1	
Sub-Total		351	40	38	7	266	
Total		1048	116	139	31	762	

Categories	Species	Number
Mammals	33	286
Reptiles	9	16
Fishes	16	395
Birds	57	351
Total	115	1048

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Airfare for Major Air Routes in Nepal (RNAC Standard)

ROYAL NEPAL AIRLINES CORPORATION MARKETING DEPARTMENT

REVISED NO.2 DOMESTIC SCHEDULE EFFECTIVE FROM 01 DEC TO 13TH JAN 2005

S.NO	FLIGHT NO.	SECTOR	DAYS	FARE		REMARKS	FUEL SURCHARGE(YK) NPR	
				NPR	USD		CARGO/KG	PER PAX
1	RA-105	KTM/RJB	7	1500	60	1305/1350	2.75	190
2	RA-105	RJB/BIR	7	600	20	1405/1430	1.50	105
3	RA-106	BIR/KTM	7	600	20	1445/1545	2.75	190
4	RA-105	KTM/RJB	3	1500	60	1450/1535	2.75	190
5	RA-105	RJB/BIR	3	600	20	1550/1610	1.50	105
6	RA-106	BIR/RJB	3	600	20	1150/1215	1.50	105
7	RA-106	RJB/KTM	3	1500	60	1230/1315	2.75	190
8	RA-109/110	KTM/BHP/KTM	1,3 & 5	1800	77	0950/1145	2.30	160
9	RA-117/118	KTM/PPL/KTM	2,4,6 & 7	1480	77	0950/1115	1.90	130
10	RA-121/122	KTM/LUA/KTM	1,3 & 5	1685	83	0800/0935	2.15	150
11	RA-125/125	KTM/LUA/KTM	2,4,6, & 7	1685	83	0800/0935	2.15	150
12	RA-131/132	KTM/RCH/KTM	1,4 & 6	1015	39	1215/1320	1.30	90
13	RA-133/134	KTM/RUM/KTM	2,4,6 & 7	1245	55	1030/1155	1.60	110
14	RA-135/136	KTM/LDN/KTM	5 & 7	1385	66	1100/1235	1.90	130
15	RA-167	KTM/BHR	1,4,5,6 & 7	900	50	1530/1600	1.45	100
16	RA-167	BHR/PKR	1,4,5,6 & 7	850	40	1615/1625	1.25	85
17	RA-149	KTM/BHR	2	900	50	1330/1400	1.45	100
18	RA-149	BHR/PKR	2	850	40	1415/1435	1.25	85
19	RA-149	KTM/BHR	3	900	50	1220/1240	1.45	100
20	RA-149	BHR/PKR	3	850	40	1255/1325	1.25	85
21	RA-173	KTM/HRJ	5	2300	116	1300/1420	4.90	340
22	RA-173	HRJ/KEP	5	780	39	1435/1555	1.30	90
23	RA-174	KEP/HRJ	5	780	39	1100/1125	1.30	90
24	RA-174	HRJ/KTM	5	2300	116	1140/1300	4.90	340
25	RA-177	KTM/DHI	2	3500	149	1100/1300	6.15	430
26	RA-177	DHI/KEP	2	1200	55	1315/1340	1.90	130
27	RA-179	KTM/SKH	1 & 6	2500	99	1100/1230	5.00	350
28	RA-179	SKH/KEP	1 & 6	785	38	1245/1305	1.00	70
29	RA-180	KEP/KTM	1 & 6	2500	99	1320/1445	4.60	320
30	RA-181	KTM/RUK	3	2300	116	1345/1505	4.90	340
31	RA-181	RUK/KEP	3	900	30	1520/1545	1.80	110
32	RA-183	KTM/DNP	4 & 7	2300	106	1330/1450	4.90	340
33	RA-183	DNP/KEP	4 & 7	785	39	1505/1530	1.50	105
34	RA-191	KTM/TMI	1,2,5 & 6	1700	57	1430/1530	2.60	180
35	RA-191	TMI/BIR	1,2,5 & 6	865	43	1545/1610	1.45	100
36	RA-192	BIR/TMI	2,4,5 & 7	865	43	1130/1200	1.45	100
37	RA-192	TMI/KTM	2,4,5 & 7	1700	57	1215/1310	2.60	180
38	RA-168	PKR/BHR	1,2,5,6 & 7	850	40	0940/1000	1.25	85
39	RA-168	BHR/KTM	1,2,5,6 & 7	900	50	1015/1045	1.45	100
40	RA-150	PKR/KTM	2	850	40	1450/1520	1.25	85

Fare per NM - 15.90

ROYAL NEPAL AIRLINES CORPORATION
MARKETING DEPARTMENT
REVISED NO.2 DOMESTIC SCHEDULE EFFECTIVE FROM 01 DEC TO 13TH JAN 2006

S.NO	FLIGHT NO.	SECTOR	DAYS	FARE		REMARKS	FUEL SURCHARGE(YK) NPR	
				NPR	USD		CARGO/KG	PER PAX
41	RA-150	PKR/BHR	3	850	40	1340/1400	1.25	85
42	RA-150	BHR/KTM	3	900	50	1415/1445	1.25	85
43	RA-555/556	PKR/JOM/PKR	1,2,5,6 & 7	\$25(970)	50	0700/0805	1.30	90
44	RA-581/582	PKR/NGX/PKR	1,2,5,6 & 7	\$25(760)	50	0820/0925	1.30	90
45	RA-301/302	BIR/TPJ/BIR	2,3,4 & 7	1340	60	0820/0935	1.75	120
46	RA-305/306	BIR/BHP/BIR	2,3,4 & 7	760	39	0700/0805	1.30	90
47	RA-309	BIR/LDN	7	935	50	0950/1025	1.60	110
48	RA-312	LDN/RJB	7	950	50	1040/1100		
49	RA-311	RJB/LDN	7	950	50	1115/1135		
50	RA-310	LDN/BIR	7	935	50	1150/1225	1.60	110
51	RA-313/314	BIR/RUM/BIR	2 & 4	1040	55	0950/1115	1.90	130
52	RA-315/316	BIR/PPL/BIR	3	1210	66	0700/0835	2.15	150
53	RA-703	KEP/BJH	3	1455	77	0900/0950	2.60	180
54	RA-703/704	KEP/BJH/KEP	6	1455	77	0900/1045	2.60	180
55	RA-782	BJH/DHI	3	1005	61	1005/1035	1.75	120
56	RA-705/706	KEP/BJR/KEP	4 & 6	1350	72	1130/1315	2.30	160
57	RA-707/708	KEP/HRJ/KEP	7	760	39	1600/1705	1.30	90
58	RA-709/710	KEP/RUK/KEP	5	900	39	1100/1215	1.60	110
59	RA-713/714	KEP/DOP/KEP	1,3 & 5	1315	77	0700/0915	2.30	160
60	RA-717/718	KEP/JUM/KEP	1,4 & 6	1350	57	1130/1315	2.30	160
61	RA-731/732	KEP/IMK/KEP	1,4 & 6	1800	88	0700/0915	3.15	220
62	RA-737	KEP/FEB	2	1500	61	1355/1435	2.00	140
63	RA-739	FEB/SIH	2	600	21	1450/1515	1.50	150
64	RA-740	SIH/KEP	2	1615	61	1530/1610	2.15	150
65	RA-761	DHI/BJH	3	1005	61	1050/1130	1.75	120
66	RA-704	BJH/KEP	3	1455	77	1145/1225	2.60	180
67	RA-178	KEP/DHI	3	1200	55	1300/1330	1.90	130
68	RA-178	DHI/KTM	3	3500	149	1345/1540	6.15	430
69	RA-182	KEP/RUK	1	900	39	1330/1405	1.60	110
70	RA-182	RUK/KTM	1	2300	116	1420/1515	4.90	340
71	RA-184	KEP/DNP	4 & 6	785	39	1345/1410	1.50	105
72	RA-184	DNP/KTM	4 & 6	2300	106	1425/1545	4.90	340

NOTE: RA-121/121 KTM/LUA/KTM ,RA-555/556 PKR/JOM/PKR AND RA-581/582 PKR/NGX/PKR
ARE TOURIST PRIOROTY FLIGHTS.

Airport Tax

NRS. 55 for rural districts
NRS. 165 other

Bus Fare for Important Routes in Nepal (For April 2004)

From	To	Fare (Night)	Fare (Day)	
Kathmandu	Taulihawa	190		Source: Sajha Yatayat
	Palpa	179		
	Bhairawa	162	203	
	Baglung	171	214	
	Pokhara	126		
	Besisahar	123		
	Gorkha	86		
	Birjang/Kalaiya	164		
	Dhading	82		
	Birganj	180	180	Source: Private Yatayat
	Narayanghat	120		
	Hetauda	160		
	Lahan	375	310	
	Birtamod	495	430	
	Kakadbhitta	507	440	
	Biratnagar	435	395	
	Ilam	610	590	
	Dharan	450	395	
	Rajbiraj	400	350	
	Nepalganj	450	370	

Water Quality Parameters of the pond during sampling season *

Sample no.	Depth	Hardness (mg\lt)	Dissolved oxygen (mg\lt)	Chlorine content (mg\lt)	Alkalinity (mg\lt)	PH
1	0.5m	116	16.227	59.64	2.68	
	1.0m	116	16.227	56.8	2	
	1.5m	104	10.56910569			
2	0.5m	110	24.34	68.16	1.56	
	1.0m	100	20.283	59.64	1.6	
	1.5m	116	12.17	56.8	1.36	
3	0.5m	88	16.86	66.74	0.64	8.1
	1.0m	104	12.97	52.54	0.76	8.1
	1.5m	108	14.27	58.22	1.36	8.2

Organism	Sampling units				
Macroinvertebrates	1st	2nd	3rd	4th	5th
Tubificidae	28	16	13	18	10
Lumbriculidae	3	7	5	5	8
Gastropoda	0	0	1	0	0
Unidentified	1	0	0	0	0

* Sampling Date: May 21st 2004

List of Photo Plates

Airfare for Major Air Routes in Nepal (RNAC Standard)

Couples resting near the pond

Obtaining information through questionnaire survey

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Visitor's queue at drinking water tank

Hippopotamus resting inside the cage

Zoo is growing its popularity as a favorite picnic destination among schoolchildren

Ostrich in the Central Zoo

Schoolchildren enjoying zoo facilities

Major sources of manmade waste pollution inside the zoo

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