

## Tourism and Solid Waste Problem in Ayubia National Park, Pakistan (A Case Study, 2003-2004)

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### Abstract

Beautiful Ayubia National Park (ANP) lies at  $34^{\circ} - 1'$  to  $34^{\circ} - 3.8'$  N latitude and  $73^{\circ} - 22.8'$  to  $73^{\circ} - 27.1'$  E longitude. Its elevation ranges between 1050 to 3027 m. it spread over an area of 3312 hectares. The mean annual rainfall is well above 1500 mm in addition to precipitation received in the form of deep snow in winters. The Park supports three types of forest ecozones; sub tropical chir pine forest, moist temperate coniferous forest and sub alpine meadows. Among different tourist attraction places, Ayubia National Park is one of the highly fascinating spot in Pakistan. About 50,000 people live in surrounding villages of ANP. Every year more than 120,000 tourists visiting the park during summer season. During last few years tourists pressure create solid waste problems in the area. Hotels and restaurants generate 2940-3225 Kg/day, while 505-600 Kg/day waste is generated from summer resident houses. In ANP tourists, generate 3.38 to 3.84 Kg/capita/day solid wastes. That amount is alarming, because this amount is 3.1 to 3.22 times greater than the solid waste generated at national level per capita per day. Different health care centers generate 0.24 tons medical waste per month.

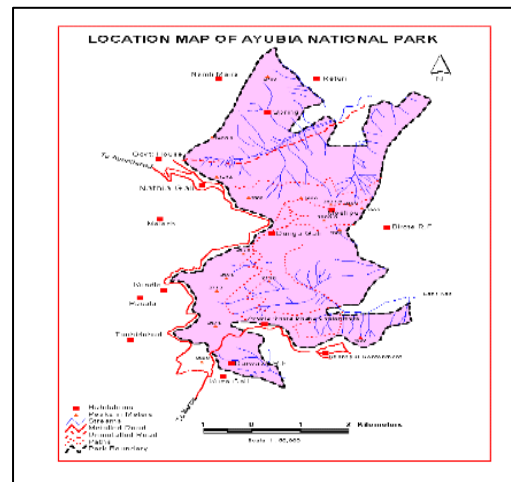
The Park loosing its charm due to pollution left behind by the tourist and improper disposal of waste by the local hotels and restaurants. Solid waste problem not only disturb the biodiversity of the Park but also badly affecting water sources in the Park. More than 11% registered patients (locals) of two Civil Hospitals were affected with sever dysentery and diarrhea diseases in year 2003. After analyzing the composition of waste, geographical, environmental and hydrological conditions of the area in detail, a solid waste management program was proposed for the area that includes awareness raising, recycling and land filling techniques.

**Key words:** Tourism, solid waste, environmental, hydrological, recycling, land filling.

## INTRODUCTION

### 1.1 Location

Beautiful Ayubia National Park (ANP) lies between the co-ordinates  $34^{\circ} - 1'$  to  $34^{\circ} - 3.8'$  N latitude and  $73^{\circ} - 22.8'$  to  $73^{\circ} - 27.1'$  E longitude. ANP is located at three hours drive north of Islamabad in the Galliat Hills (North West Frontier Province) of Pakistan. It was declared as a national park in 1984 with the aims of preserving its beautiful landscapes, forests and biodiversity for scientific research, education and recreational purposes. The initial area of the park was 1684 hectares, expanded through a northern extension in 1998 to make 3312 hectares. Its elevation ranges between 1050m to 3027m<sup>1</sup>.



Location map of Ayubia National

## 1.2 Climate

Climate is temperate in summer with the influence of monsoons. In winter, it is sever cold. Mid December to mid March the snow season prevails<sup>2</sup>. The mean annual rainfall is well above 1500mm in addition to precipitation received in the form of deep snow in winter<sup>1</sup>.

## 1.3 Geology

Mountains of the ANP are 40million to 170 million years old. The rocks are sedimentary of varied variety. Mostly limestone but also alternating shale and sandstones. Where these rocks are exposed heavy folding and faults are visible, with various colored clay due to inter phase. The soil is mainly clayey, but also mixed with gravel and sand at places<sup>2</sup>.

## 1.4 Ethnic groups

Twelve major villages and three small towns (Nathiagali, Ayubia and Khanspur) surrounded by the Park. The two main ethnic groups are Karlal and Abbasi. Karlal are dominated to the north side and Abbasi are dominated to the southern side of the Park<sup>3</sup>.

## 1.5 Ecosystems of the Park

The Park supports three type of forest ecozone;

- Sub tropical Chir pine forest (1050m asl)  
*Pinus Roxburgii*, *Quercus incana* and *Rhododandron arboreum* are the dominant species and include area around Lahoor Kas forest compartment.

<sup>2</sup> Z. B. Mirza, Training Material Wildlife survey and techniques, August, 2003

<sup>1</sup> H. Kamran, impact of grazing on infiltration capacity of soil, WWF-Pakistan Report, 2003

<sup>3</sup> H. Shabana, Impact assessment of interventions adopted by the Ethnobotany Project WWF-Pakistan for the sustainable use of plant resources at ANP, 2003

- Moist temperate coniferous forest (2000m asl)

Trees are *Pinus wallichiana*, *Taxus wallichiana*, *Abies pindrow*, *Cedrus deodara*, *Horse chestnut*, *Aesculus indica*, *Poplus ciliate*, *Acer ceasium*, *Ulmus wallichiana*, *Quercus leucotrichophora*, *Q. glauca* and *Q. floribunda*.

Shrubs and herbs include; *Rubus paniculata*, *Vibernum nervosum*, *Lonicera purpurascens*, *Rosa macrophylla*, *Skimia laureola*, *Indigofera heterantha*, *impatiens edgworthii*, *Viola biflora*, *Fragaria nubicola*, *Arisaema jacquemontii* and many more.

- Sub alpine meadows (3000m asl)

This zone is representing on a very short area, o the relatively broader peaks of two mounts, which are Merranjani and Mukshpuri of the Park. Poa grass cover the ground and herbs like *Polygonum*, *saxifrage*, *Euphorbia* etc.

## 1.6 Biodiversity of the Park

In Pakistan, it is one of the rich areas in species diversity. The species recorded from this National Park includes 757 Plant Species, 650 Insects, 203 bird species, 31 mammals, 19 reptiles and 3 amphibians.



Ayubia, a major tourist hotspot

## 1.7 Economy

Majority of people living in the periphery of ANP are poor. People rely on agriculture, livestock rearing, natural

resources (fodder fuelwood, wild vegetables and fungi) and tourism as an economic basis. Mostly men have seasonal (summer) jobs with revenues, which vary from Rs. 1000 - 5000 or US\$.20-100 per month<sup>4</sup>.

### 1.8 Literature Review

The World Trade Organization (WTO) in 1993 defined tourism as "activities related to persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business or other purposes." (India Tourism, Annual Report, 2001-2002, p 6]. Tourism is sustainable when its development and operation include participation of local population, protection of the total environment, fair economic return for the industry and its host community, as well as a mutual respect for and gratification of all involved parties" [Jafari, 1996, p.959]. Tourism to the Least Developed Countries (LDC) collectively is still at a low level [pro-poor tourism partnership 2004, sheet.7]. In Pakistan, foreign exchange earnings from tourism amounted to 120 million USD in 1992 and were the ninth largest foreign exchange earner. Between 1990 and 1992, foreign tourist arrivals in Pakistan actually declined, but the annual growth rate in domestic tourism remained at 3.5 per cent [Newsletter: 28, Mountain tourism; constraints and opportunities]. Contribution of tourism economy to GDP in 1999 was 5.1% being a least developed country [pro-poor tourism partnership 2004, sheet.7].

Solid waste generation in Pakistan ranges between 0.283 to 0.612 kg/capita/day and the waste generation growth rate is 2.4% per year (Draft Environmental Assessment Report, Stockholm, November 1993). In recent years increased tourist influx and lack of concern for planning and

infrastructure by the concerned authorities, many tourist sites are facing serious problems. For instance, in Pakistan, Hazara and Swat valley, being the most popular tourists sites are suffering from the increasing number of hotels. Problem of solid waste and wastewater is becoming a serious threat to the environment in high mountain regions where, because of the cold climate, decomposition of waste material is a slow process. Large quantity of non-biodegradable garbage, human waste and contaminated water supplies along the trekking routes have been observed [<http://www.edu.iucnp.org/themeMountains/envdegradation.htm>]

### 1.9 Existing nature of tourism in the Ayubia National Park

Ayubia National Park is a major recreation place in the country. According to the available information more than 120,000 tourists per year visit the park. Most of the tourist comes from Punjab and NWFP provinces of the Pakistan. They spend three to four days in the area. But the tourists who came from Sindh and Balochistan, and foreing spend more than a week time in average. A large number of university graduates also conduct study tours in the area from all over the country.

The park authorities has developed some fairly good infrastructure for the tourists. The major attractions for tourist in the area are walking treks, chairlifts, horse riding and camping facilities besides, a number of hotels and restaurants, bazaars are also available in different places around the Park.

Tourism has positive impacts on the local economy of the area. It creates a number of job opportunities in hoteling sector. More than 50% population of the surrounding villages directly interlinked with tourism industry. Galliat

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<sup>4</sup> R. Afza, Collection of economically important medicinal plants as a fodder requirement, 2003, WWF-Pakistan Report

Development Authority is the main agency in the area from government side, which involved in revenue collection.



A view of PTDC hotel

Besides, adding revenue to the local economy, the drastic increase in tourist over the last ten years has also put some adverse impacts on the panoramic landscape of Ayubia National Park. The pollution left behind by the tourists and improper disposal of solid waste by the local hotels and restaurants are some of the bi-attributes of the tourism threatening the fragile ecosystem of the Park. Lack of awareness on part of the visitors, local communities and line agencies regarding the proper solid waste management is one of the most important factor contributing to the degradation of environment.

The study recommend a comprehensive solid waste management programme coupled with target specific environmental education and awareness programme.

### 1.10 Study objectives

Study designed to quantify the solid waste generation during the summer season by the tourists, monitor the existing situation of solid waste management in the Park vicinity and to propose mitigating measures in order to solve the problem.

## 2. Methodology

Study was conducted during the tourist's peak season from May 17 up to August 20 (96 days) in two consecutive years 2003-2004. Data was collected through

interviews, questionnaire surveys, personal observations and literature review.

Shops, hotels, restaurants, visitors, garbage collectors, and different sales companies' representatives were interviewed. Different sale products quantified. Sanitary staff of GDA was interviewed. Monitor hotels sanitation system In order to make the results more reliable for future planning. Properly quantify the hospital waste. Identify the main sources of solid waste and their composition and critically examine the existing waste disposal system.

## 3. Results and discussion

Solid waste may be defined as unwanted, unused, useless or discarded materials available in the solid form. Municipal sludge and semi solid food waste may also be included in the municipal solid waste.

It was estimated that the solid waste generated every day in Pakistan is about 0.5 million tons, half of which is produced by 70% of the population living in rural areas. Most of the wastes in these areas are decomposed by natural process (Mahmood, 1996). It is estimated that the rate of waste generation per person in Pakistan is 0.283 to 0.613 kg/day, while the rate of waste generation per house is about 1.8962 to 4.291kg/ day.

Every year more than 120,000 individuals visiting the Ayubia National Park during summer season. Through this study, negative impacts of tourism on natural environment of the park were analyzed in general and solid waste in particular. Solid waste generation during the summer season was quantified, existing situation of solid waste management in the Park vicinity was monitored, at the end propose different mitigating measures in order to solve the problem.

**a. Solid waste generated by summer residents and hotels**

Area was divided in to two main sections "A" and "B". Generated solid waste was quantified through regular monitoring during summer season (96 days). Results of the study revealed that main sources of solid waste generation are hotels and restaurants while the summer residences have very limited contribution. Hotels and restaurants generate 2940-3225 Kg/day while 505-600 Kg/day solid wastes contributed by summer residence. So in total both the sources generate 3445-3825 Kg/day waste.

Results of both the sites were given as under;

**a.i Section "A"**

This section lies between 2300-to-2601m above sea level having three major places Mochi Dara, Nathiagali and Dungagali from tourist point of view. Mochi Dara and Dungagali have residential places, while Nathiagali is a commercial point having different category hotels, restaurants and shops. Area having historic places i.e. Pipeline track, the Catholic Church, historic Nathiagali bazaar that is also a joining point of mukshpuri, meranjani and baragali track. Wildlife information Center for tourists established in Dungagali.

Sarhad tourism corporation chalets, summer residences and cottages are available in all the three places. The main sources of solid waste generation in Mochi Dara are tourist and residents while hotels and tourists are the main sources in Nathiagali and tourists in Dungagali. It was estimated that about 875 to 975 Kg solid waste generated from hotels and restaurants per day, while about 155 to 200 Kg waste is produced from the residences during summer days. Details of solid waste generation from section "A" were given in table 2.

**Table 2: Solid Waste generation from point sources of Section "A"**

Area	Hotels & restaurants (Kg/day)	Residences (Kg/day)
A Mochi Dara	75-100	30-40
Nathiagali	700-750	75-100
Dungagali	100-125	50-60
<b>Total</b>	<b>875-975</b>	<b>155-200</b>

**a.ii Section "B"**

Section "B" having four major places Kuzagali, Ayubia, Khanspur and Changlagali. Hotels and restaurants of Ayubia generate 2065-2250Kg solid wastes per day, while residences generate 350-400Kg per day waste. Pakistan first chair left and other recreational facilities availability in Ayubia attract tourists and visitors. While Khanspur area is a summer residence place and having a Punjab University summer Campus. Changlagali have relatively a small bazaar. Solid waste generation in different places of section "B" are as under;

**Table 3: Solid Waste generation from point sources of Section "B"**

Area	Hotels & restaurants (Kg/day)	Residences (Kg/day)
Kuzagali	200-250	30-40
Ayubia	1540-1600	40-50
B Khanspur	200-250	200-250
Changlagali	125-150	50-60
<b>Total</b>	<b>2065-2250</b>	<b>350-400</b>

Kuzagali bazaar is a joining point between Ayubia and Changlagali, Dungagali and Changlagali.

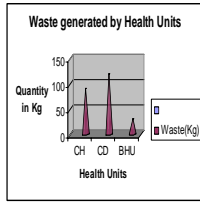
**b. Solid waste generated by tourists during walk**

During walk inside the park tourists generate 547.23-737.31 Kg/day waste during these days. That includes packs of milk & juices, tea, biscuits, chips, Sigrate, disposable bottles, glasses etc.



### c. Solid waste generated by medical units

There are three types of health care units in and around ANP; Civil Hospitals (CH), Civil Dispensaries (CD), and Basic Health Unit (BHU). In



and around ANP there are three CH, six CD and three BHU besides private clinics and traditional herbalists. During summer season number of patients in the hospitals increased because of tourist's pressure. Calculated average is 30-40 patients per day. Hospital waste constitute on disposable syringes, saline and other materials. All these units generate 240Kg/month medical waste. It was estimated that 90, 120 and 30Kg of medical waste was generated by CH, CD, and BHU respectively per month during summer. Hospital waste generation quantity is low as compare to national level in the area. The medical staff properly disposes the medical waste in Civil Hospitals but in dispensaries and basic health units, it was not properly disposed.

### 3.2 Composition of Solid Waste

It is important here to describe the properties of solid waste in evaluating alternative equipment's needs system and management program and plans, especially with respect to the implementation of disposal, resource and energy recovery options, so therefore we can classify the properties of solid waste.



Open dumping site inside the Park

Solid waste composition was analyzed during the study period it was mainly comprised of plastic, paper, metals and foodstuff. Percentage wise its composition is as following in section A; 35% plastic, 10% papers, 5% metals and 50% foodstuff. While in section "B" its composition is; 45% plastic, 10%papers, 15% metals and 30% food stuff. Plastic includes; disposable bottles, polythene bags, chips packets, small sashays, milk and juice packs. Paper product includes; biscuits pack, cottons, sigrate packs, tea packs, disposable glasses & plates, etc. Metal includes; especially cold drink bottles, toothpastes and shaving cream pack. Foodstuff include remain of vegetables and other products from hotels and restaurants.

### 3.3 Existing situation of solid waste management in ANP

Ayubia National Park loosing its charm due to pollution left behind by the tourist and improper disposal of solid waste by the local hotels and restaurants. In ANP tourist, generate 3.38 to 3.84Kg/capita/day waste during summer season. That amount is alarming, because this amount is 3.1 to 3.2 times greater than the solid waste generated at national level per capita per day.

Galliat Development Authority (GDA) is a government department engaged in sanitary work in and around the Park area. During summer, they collect waste on daily basis from residential places and hotels. After solid waste collection, they had thrown the waste with along the roadsides of the Park. Authorities have no proper disposal mechanism of solid waste. Generated waste not only polluting the natural environment but also badly affecting the water sources in the Park. Rainwater passing through the solid waste mixed with run off at different places and causing health problems in the low land areas. When that water move through the village territory, locals for

daily uses used it, that results water bond diseases among the villagers. According to the registered patients, data of two civil hospitals more than 11% patients of the area were effected with sever water bond disease in the year 2003.

### **3.4 Proposed Solid Waste Management (SWM) Program for ANP**

The discipline associated with the control of generation, collection, transfer and transport processing and disposal of solid waste in a manner that is in accord with the best principle of public health, economic, engineering, conservation, aesthetic and other environmental considerations, and that is responsive to public attitude.

The over all objective of solid waste management in ANP is to minimize the adverse environmental effects caused by the indiscriminate disposal of solid waste. During the assessment of solid waste management following possibilities were consider;

- Material flow in the society
- Reduction in solid waste quantity
- Reuse of material and material recovery mechanism

Proposed activities for solid waste management program were as under;

- Awareness and publicity
- Proper solid waste disposal mechanism

#### **3.4.i Awareness and publicity**

Awareness and publicity activities include;

- Capacity building of sanitary staff regarding proper waste collection and disposal
- Training and workshops for proper waste management at point sources in the hotels and restaurants for local staff
- Establish environmental protection committees for summer residents
- Establish environmental protection clubs at school level

- Engage students in different activities
- Raise awareness amongst the target audience through print and electronic media

#### **3.4.ii Proper solid waste disposal mechanism**

Based on waste composition following activities are proposed for the safer disposal of solid waste.

##### **a. Non-biodegradable waste (recycling and reuse)**

It is possible to collect and reprocess many materials found in solid waste into new product of the same or different type. Recycling is preferred over incineration and landfill disposal because it conserve our naturally resources and it is more environment friendly. Plastic bottles, cans etc are non-biodegradable materials therefore they are recycled or reused. On the spot elimination/segregation will be more help full. Recycling has also a positive effect on the economy by generating jobs, revenues from recycled materials selling.

##### **b. Biodegradable waste**

Composting and land filling techniques are suitable for the biodegradable waste disposal in ANP. Composting technique introduced at village level will be more fruit full. While Khanspur area is suitable for area land filling technique. Selected site have a wide range of land and completely safe from all kind of pollution up until now. There is no evidence of earth quick source exist in the area. Mitigating measures should be adapted to control any leachate and gases moment in future. Basic principal for land filling methods is same; i.e refuse spread and compacted in thin layers with in a small area. Thin-layered structure known as cell. Compacting is done to reduce the cell in smallest possible volume and the cell depth should not be exceeded to two meters. The cell covered with a thin layer of soil, which uniformly spread and compacted.

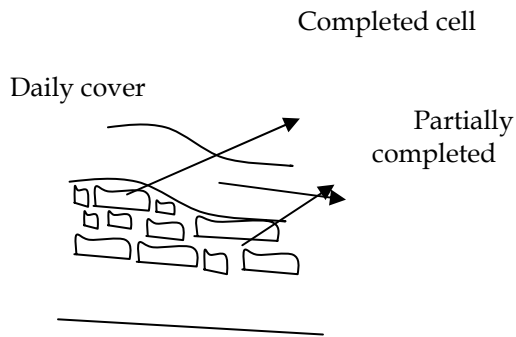


Diagram # 1: Area method, land filling

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