DEDICATED

To

MY SUPERVISOR

(Prof. Salahuddin Qureshi)

&

MY PARENTS

(Whose sacrifices laid the foundation of my Success)

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CANDIDATE'S DECLARATION

I, **Rafi Ramzan Dar,** Department of Geogrpahy, Faculty of Science, Aligarh Muslim University, Aligarh, certify that the work embodied in this Ph.D. thesis is my own bonafide work carried out by me under the supervision of **Prof. Salahuddin Qureshi,** at the Department of Geography, Aligarh Muslim University, Aligarh. The matter embodied in this Ph.D. thesis has not been submitted for the award of any other degree.

I declare that I have faithfully acknowledged, given credit to and referred to the research workers wherever their works have been cited in the text and the body of the thesis. I further certify that I have not wilfully lifted up some other's work, para, text, data, result, etc. reported in the journals, books, magazines, reports, dissertations, thesis, etc., or available at web-sites and included them in this Ph.D. thesis and cited as my own work.

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CERTIFICATE FROM THE SUPERVISOR

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

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This is to certify that the thesis entitled, **"Tourism and Management of Wetland Ecosystems in Kashmir Valley"** has been completed by Mr. Rafi Ramzan Dar under my supervision for the award of degree of Doctor of Philosophy in Geography.

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LIST OF ABBREVIATIONS

BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
DPR	Detailed Project Report
ENVIS	Environmental Information System
FFC	Fish Farmer Cooperatives
IUCN	International Union for conservation of Nature and Natural Resources
J&K	Jammu and Kashmir
JKCCC	Jammu and Kashmir Cable Car Corporation
JKTDC	Jammu and Kashmir Tourism Development Corporation
LAWDA	Lakes and Waterways Development Authority
LULC	Land Use Land Cover
pH	Hydrogen Positive ion Concentration
PHE	Public Health Engineering Department
RSGC	Royal spring Golf Course
SKICC	Sher-e-Kashmir International Convention Centre
SKIMS	Sher-e-Kashmir Institute of Medical Sciences
STP	Sewage Treatment plant
WTO	World Tourism Organization
WUMDA	Wular and Manasbal Development authority

INTRODUCTION

➢ Conceptual Framework

Man has been a traveler through the ages in the instinctive quest for new horizons, resources and amusement. From the very early historical period, man has a fascination for travel. However, much of the travel in the initial stages was largely subconscious and a simple affair. The annals of tourism literature bear witness to the fact that the origin of word 'Tourist' dates back to the year 1292 A.D[1] and has been derived from the term 'Tour', a circle or a turner's wheel, which signifies movement. In the first half of 17th century, this term was first used for travelling from place to place like an excursion or a circuitous journey touching the principal parts of a country or a region.

The 19th century dictionary defines 'Tourist' as "a person who travels for pleasure of travelling out of curiosity and because he has nothing better to do and even for the joy of boasting about it afterwards". Conceptually, tourism arises from the movement of people to, and their stay in, different destinations.

Recently, tourism has acquired a tremendous economic importance as a significant foreign exchange earner in addition to its numerous socio-cultural benefits such as national integration and international understanding, creation of employment opportunities, removal of regional imbalances and changing the socio-economic scene of many developing nations like India.

According to World Travel and Tourism Council (WTTC), tourism generated 9.8 per cent of World's GDP (US $7.2 Trillion) and nearly 284 million jobs in the world economy in 2015. In fact, one in every 16 workers in World owes his/her job in tourism (Mohanty, 1992)[2]. The number of International tourist arrivals worldwide in 2014 was 1.1 Billion[3] compared to 762 million in 2004 and tourism contributed 6.88 per cent to the GDP of our country, India, in 2015. The number of Foreign Tourist

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1 Misra, S. N., & Sadual, S. K. (2008). *Basics of Tourism Management.* Excel Books: New Delhi. P.8

2 Mohanty, P. (1992). *Hotel Industry and Tourism in India.* Ashish Publishing House, Punjabi Bagh: Delhi. p.43

3 Retrieved from media.untwo.org/pres-release/2015-01-27/over 1.1 billion-tourists-travelled-abroad-2014

Arrivals (FTA's) has increased from 6.96 million in 2013 to 7.70 million in 2014[4] and the Foreign Exchange Earnings (FEE's) from tourism sector in 2014 were recorded to be 1,20,083 crore rupees with a growth of 11.5 per cent[5].

Tourism provides employment to around 12.36 per cent of people across the length and breadth of our country in different sectors of retail, construction, manufacturing and telecommunications as well as directly in tourism companies[6]. These jobs employ a large proportion of women and young people.

Tourism has rightly been described as 'Smokeless industry' (Naik, 2008)[7]. It has a tremendous potential to contribute economically, socially and environmentally in the sustainable development in both developed and developing nations. Its comparative advantage in the startup and running cost can be low compared to various other industries. However, it is vulnerable to International /National crisis and economic recession. The aftermath of September, 11, 2001 terrorist attack combined with the global economic slowdown produced for the first time, in many decades, reduction of international tourists in 2001 compared to the previous years.

Moreover, tourism has also a direct relationship with a wide range of infrastructural services like ease of travel, roads, railheads, airports and ports as well as basic infrastructural services required by hotels, restaurants, shops, malls and recreation centers. In fact, it is the combination of tourism and good infrastructure that strengthens the environmental and socio-economic dimension. Thus, it is important to balance any decision to develop an area for tourism against the need to preserve fragile environments. However, once a decision to develop an area for tourism has been taken, then good infrastructure will be essential to sustain the quality, economic viability and growth of tourism.

Tourism research encompasses several fields of specialization like geography, economics, regional planning, tourism management, environmental and ecological

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4 Retrieved from Knoema.com/atlas/India/topics/tourism/Travel-and-Tourism-total-contribution-to-GDP/total-contribution-to-GDP-oercent-share

5 Ministry of Tourism, Government of India. Retrieved from Tourism.gov.in/annual-report-2014-2015.

6 Ministry of Tourism, Government of India. Retrieved from Tourism.nic.in/E-Book_MOT/HTML page.htm# features/55.

7 Naik, A. B. (2008). Tourism Potential in Ecological Zones and Future Prospects of Tourism in Kashmir Valley. *Unpublished Ph.D Thesis*, Department of Geography, Aligarh Muslim University, Aligarh-India.

sciences etc. However, the basic aim of all the researches is to examine the tourist industry from various viewpoints. The objectives of the research remain characteristically different consisting of evaluation and organization of resources, flow analysis, socio-economic impact, environmental consciousness and the sustainable management of tourism. The 20th century tourism research has stressed mainly on highlighting the tourism potential of various areas, so that tourists can be attracted in large numbers. However, the focus of attention got subsequently shifted towards measuring the economic gains of tourism.

The present study is focused on assessing the uneven pattern of tourist arrivals to the 'Paradise of Earth' (The Valley of Kashmir) and the factors responsible for this unevenness. It has also tried to enquire into the suitable prospects and possibilities of tourism that can be developed and promoted in this region. Besides, it has paid a way to explore the wetlands and water bodies which are present in the length and breadth of the Jhelum Basin of Kashmir Valley so that these ecosystems can be utilized for the boosting up of the tourism of this naturally very beautiful and attractive landscape.

These wetlands are the vital link between land and water. They are the corridors through which life evolved, prospered, came ashore and conquered terrestrial areas. They are the 'kidneys of Biosphere' as well and the last refuge to a wide variety of flora and fauna. Human beings are invariably intertwined with these ecosystems in the evolution of their civilization. More than three quarters of food required for mankind is still being derived from wetlands in the form of rice and fish. Thus, a key to the future sustenance of human societies lies in the sustainable management and wise use of these highly productive ecosystems (Moraingleima, 2006)[8].

An estimated 6 per cent of the land surface of the earth is wetlands (Bazilavich et. al.,1971)[9]. They are distributed in all the climate zones of the earth except Antarctica. In India, these are distributed in different geographical regions ranging from cold arid zone of Ladakh to wet Imphal, from the warm and arid zone of Gujarat and Rajasthan to the tropical monsoon based regions of central India and wet and humid regions of

8 Moirangleima, K. (2010). Sustainable Management of Wetlands-Central Valley of Manipur, B. R. Publishing House: Delhi.

9 Bazilevich, N. I., Rodin, L. Ye., & Rozov, N. N. (1971). Geophysical aspects of Biological Productivity. *Soviet Geography*, *12*: 293-317.

southern peninsula. Approximately, an area of 4.1 million hectares (0.44%) of India's total area is under natural and man-made wetlands.

However, these water bodies are subjected to both natural as well as anthropogenic stresses which include rising sea level, erosion, sedimentation, eutrophication, weed infestation (natural), population pressure, urbanization, land use/ land cover dynamics and technological development (anthropogenic) etc. Around 50% of the world's wetlands have been lost in the last century primarily through drainage for intensive agriculture, over grazing of cattle, over fishing, excessive hunting and poaching, urban development and water system regulation.

Wetlands are among the least protected ecosystems in the developing countries and India, the heavily populated country, is particularly vulnerable to their degradation and loss. There are thousands of lakes, ponds, marshes, lagoons, estuaries, backwaters and mangrove swamps that are vital to the country's water needs, food production and biodiversity but environmental policies have largely failed to acknowledge their contribution.

Of the total area of Kashmir Valley**,** nearly 42,661 hectares (426.61 square kms.) of area is under wetlands[10] and the total number of these small and large water bodies is 755. However, LISS-III data of 2012 shows the number of wetlands in Kashmir Valley to be 315 only[11].Almost all the natural wetlands, except few higher altitude ones, like Dal Lake, Wular Lake, Hokersar, Anchar ,Manasbal, Haigam and Shalbug etc. are located in and around Jhelum basin of Kashmir Valley. Whatever may be the number, these water bodies play an important role in physical, biological, ecological and economic security of this region but at the same time are under severe anthropogenic pressures and stresses. These highly productive and beneficial ecosystems are facing untold miseries of gradually becoming arid and dull lands as a result of senseless gluttonous exploitations of their invaluable natural resources. Thus, we must come forward and protect these masterpieces of nature that host a wide variety of plants, animals, insects, amphibians, reptiles, birds and fish and sustain large sections of population as well before it is too late.

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10 National wetland Atlas: Jammu and Kashmir. (2010). Ministry of Environment and Forests, Government of India.

11 State Action Plan on Climate Change: Jammu and Kashmir (2014). *Department of Ecology, Environment and Remote Sensing*, Government of Jammu and Kashmir. p.141

- **Significance of the Study**

The present study entitled "Tourism and Management of Wetland Ecosystems in Kashmir Valley" has tried to make an attempt to enquire about one of the significant aspects of Tourism Industry (A phenomenon without which the development of Kashmir economy is incomplete and unimaginable) and thereby relate it with environmental aspects of the region by going through the intensive ecological, hydrological and environmental assessment of the five wetlands of Kashmir Valley (Dal, Wular, Anchar, Hokersar and Manasbal) located in the Jhelum Basin.

The spindle shaped valley of around 93 miles (150 Kilometers) long and 26 miles (40 Kilometers) wide constitutes 16 per cent area of Jammu and Kashmir State and 52.70 per cent of its total population size. The other two regions of Jammu and Ladakh constitute about 26 per cent and 58 per cent of the total area of state and 45.105 per cent and 2.187 per cent of its total population[12].

Kashmir Valley, famous for its natural beauty and grandeur as 'Switzerland of the East', is a land of salubrious climate, meandering rivers, lofty waterfalls, deep blue lakes, sweet springs and alpine forests surrounded by flowering meadows and picturesque snowcapped mountains ranges which makes it an ultimate tourism destination of the continent. Thus, in Kashmir Valley, tourism is seen as a key role player in socio economic development of the people. It is one of the largest job providers in the Valley and a crucial source of employment and income generation.

Tourism has its roots deeply grounded in historical past of Kashmir Valley. Right from the times of Mughals, this region has received travelers from almost every nook and corner of the world in large numbers. Thus, Nature has left no stone unturned in endowing this small mountain grit valley with every possible opportunity and facility for the development of tourism. However, this industry is still at crossroads in the Valley than its counterpart, Jammu. There is unequal distribution of both the number and frequency of tourists to all the three regions of Jammu and Kashmir State and the main reasons responsible for that have been assessed in the present study. Not only that but also the solutions to these political, socio-economic and environmental/ecological problems have also been suggested. In addition to it, various

12 Census of India. (2011). Office of the Registrar general and census commissioner, Ministry of Home Affairs, Government of India.

prospects for enhancing the canvas of tourism industry of this region have been provided.

Since, Kashmir Valley is a land of springs, lakes, waterfalls and rivers. Thus, the major water bodies of the valley have been assessed at micro level, their wide range of functions analyzed and their main problems and threats highlighted clearly so as to manage these wetlands in a sustainable manner and to develop them into sites of tourism attraction and potential. Once these presently deteriorated wetlands are brought to their state of good health, they will prove as 'wealth lands' by enhancing the income and employment opportunities of the people. Not only this, but also the level of infrastructure and overall development of the region will go up. This will prove as a major factor for building the peace in this politically dilapidated region.

- **Objectives of the Study**

The Valley of Kashmir is a unique geographical region enclosed with lofty mountain ranges from all its sides. Despite being a geographically isolated region, there exist innumerable opportunities for the development of tourism. However, tourism of Kashmir Valley has become victim to the undulations and disturbances of insurgency, political instability, infrastructural bottlenecks as well as poor socio-economic background of people. In order to bring this already derailed and negligent sector of economy on the track of development again, management and restoration of the major wetland ecosystems of the valley is looked up on as the last refuge. Thus, need of the hour is to preserve these wealth lands so as to develop tourism sector of the valley and the resultant socio-economic life of the residents as well.

The purpose of this study is to conduct an extensive study on the evolution of Kashmir Valley Tourism, its seasonal, yearly and decadal pattern of growth from the perspective of the foreign and domestic tourists as well as its future prospects and problems. Besides, a micro level intensive study of the five wetlands of Jhelum Basin of Kashmir Valley, two larger wetlands (Dal and Wular) and three smaller wetlands (Anchar, Hokersar and Manasbal) has also been conducted to examine their major problems and suggest remedial measures and management plans in order to save them from further loss and utilize them as a means of boosting up tourism of Kashmir Valley.

The present study has certain specific research objectives such as:

1. To conduct an extensive inquiry into the geographical aspects of the Kashmir Valley with a focus on its Drainage, Scenic beauty and Altitudinal zonation for the development of potential sites of tourism.

2. To assess the chronological evolution and development of Kashmir Valley Tourism as well as highlight the causes responsible for bringing doldrums in its path of smooth development.

3. To identify the motivating forces for Kashmir Valley tourism.as well as its Prospects and Problems.

4. To examine the nature, characteristics and distribution of wetlands and their classification in Kashmir Valley.

5. To conduct micro level assessment of the origin, catchment area, morphometry, hydrological regimes, water chemistry, land use/ land cover dynamics and biodiversity of Dal Lake, Wular Lake and three smaller lakes of Anchar, Hokersar and Manasbal.

6. To analyze the socio-economic conditions of the sampled settlements (villages) located in and around the five sampled wetlands of Jhelum Basin of Kashmir Valley.

7. To assess the functions of these wetland ecosystems- physical/hydrological (flood mitigation, ground water recharge and discharge, water purification, protection of shoreline and storms, global warming mitigation), biological (floral diversity and vital habitats), economic and ecological (food, fishery, irrigation, tourism and recreation, education and research).

8. To assess the natural (eutrophication, erosion, weed infestation) as well as anthropogenic (encroachment, pollution, population pressure, modification of catchment area) problems faced by these ecosystems.

9. To suggest suitable measures for the management of these water bodies through ecosystem conservation (catchment conservation, water management, biodiversity management, tourism development), Sustainable Resource

Development and Livelihood Improvement (fisheries development, economic utilization of aquatic vegetation, livelihood improvement), Institutional Development (establishment of development authorities, capacity building, monitoring and evaluation) and Community Awareness and Participation (communication, education and public awareness, community participation and celebration of wetland days).

- **Research Hypotheses**

The present study shall make an attempt to test the following hypotheses:

1. Whether the growth and development of tourism in Kashmir Valley has been victim of insurgency and unrest prevalent in the region since 1990.
2. Whether the huge potential of tourism development lies still untapped and unutilized in Kashmir Valley.
3. Whether Wetland Ecosystems have a great importance in terms of ecological, social and economic benefits.
4. Whether Wetlands of Kashmir Valley are inhabited by marginalized people of poor socio-economic background.
5. Whether with the increasing population and associated demands, the problems of wetlands are ever mounting.
6. Whether newly identified Wetlands can be utilized as potential sites for the development of Tourism

- **Data Base**

The study is based on both primary and secondary sources of data. Primary sources of data were collected through:

1. Survey of all the existing major tourist spots of Kashmir Valley like Mughal Gardens, Tulip Garden, Botanical Garden, Pahalgam, Gulmarg, Sonamarg, Aharbal, Kokernag, Verinag, and Achabal.
2. Survey of two major Wetlands (Dal Lake and Wular Lake) and three minor wetlands (Anchar, Hokersar and Manasbal) of Kashmir Valley.

3. Survey of the selected settlements/villages located around and dependent on these water bodies.

4. Survey of the sampled households located in the selected villages.

5. Data was collected through Questionnaire interviews put to the Tourists (domestic and foreign), Fishermen, House boat owners, Farmers, Government officials and Local people. Field work was carried during years 2014 and 2015.In order to get accurate information, the selected villages and the sampled households were visited frequently.

Secondary sources of data were collected from various government offices like:

1. Department of Tourism, Srinagar, Jammu and Kashmir.

2. Lakes and Waterways Development Authority (LAWDA), Srinagar, Jammu and Kashmir.

3. Wular and Manasbal Development Authority (WUMDA), Manasbal, Jammu and Kashmir.

4. Warden Office Hokersar, Srinagar, Jammu and Kashmir.

5. Department of Ecology, Environment and Remote Sensing, Government of Jammu and Kashmir, Srinagar.

6. Pahalgam Development Authority, Pahalgam, Anantnag, Jammu and Kashmir.

7. Year wise Statistical Digests and Economic Survey Reports (2006, 2012, 2014), Government of Jammu and Kashmir.

8. Decadal Census Reports, Census Office, Srinagar, Jammu and Kashmir.

9. Allama Iqbal Library, University of Kashmir, Srinagar., Maulana Azad Library, Aligarh Muslim University., Seminar Library, Department of Geography, A.M.U., Library, Department of Geography, University of Kashmir., Library, Department of Geology, University of Kashmir.

10. Various Journals, Atlases, Guides, Reports, Magazines and Research Papers published monthly, bi-annually and annually by a number of organizations and publishing houses.

- **Research Methodology**

Following research methodology was employed:

A systematic comprehensive survey of 14 major tourist spots of Kashmir Valley was carried out in which 150 foreign tourists and 300 domestic tourists from different age groups, source regions and socio-economic backgrounds were randomly sampled.

Mapping of the Wetlands of Jhelum Basin of Kashmir valley was done with the help of field surveys and SOI Topographic Maps (43 K/5, 43 K/6, 43 K/7 43 K/9, 43 K/10, 43 K/11, 43 K/12, 43 K/13, 43 K/14, 43 K/15, 43 J/11, 43 J/12, 43 J/15, 43 J/16, 43 N/3, 43 N/4, 43 N/7, 43 N/8, 43 O/1, 43 O/2, 43 O/3, 43 O/5, 43 O/6, 43 O/7) of 1969.

- **Preparation of Questionnaire**

The data was collected with the help of an ellaborate questionnaire which was developed with the help of questionnaires used in similar studies (Gatewood and Cameron, 2007, Maltby, E, 1986, Moirangleima, K, 2010) and other relevant literature as well as extensive discussions with my supervisor and research mates. A draft schedule was then prepared consisting of two major sections (Section A and B) which were further divided into three parts each. Section A was related to tourists visiting Kashmir Valley and the Section B was related to residents of wetland ecosystems of the Valley. The three parts of Section A dealt with general profile of tourists, questions related to tourist motivation and infrastructure and general image of Kashmir valley. Three parts of Section B dealt with general information about the selected villages/ Households, environmental conditions and livelihood patterns and questions related to status and general health of wetland ecosystems. The first Part of Section A seeks information on the name, residence, age, educational qualification and occupation of tourists. The second part focused on number of tourist visits, mode of transportation, level of comfort, means of information, pleasant season to visit Kashmir, daily expenditure and forces of motivation and the third part seeks information about highly beautiful tourist places of Kashmir Valley, major prospects

and problems of Kashmir Valley tourism and their suggestions about tourism management. Similarly, the first part of Section B tried to seek general information of residents along the wetlands about their age, sex, educational qualification, levels of education and size of family. The second part dealt with their household environmental conditions, housing types, water supply and sanitation conditions, livelihood pattern, occupational status and monthly income. The third part focused on getting information about the utilization of these wetlands, their problems and management.

- **Sampling Procedure**

For the purpose of selecting the sample size from the visiting tourists, simple random sampling procedure was used in which 450 tourists (150 Domestic, 300 Foreign) were randomly selected from major existing tourist spots of Kashmir Valley and in order to select sample size from wetlands, multi stage stratified sampling procedure was adopted. It consisted of following steps:

i. Two major wetlands (Dal and Wular) and three smaller wetlands (Anchar, Hokersar and Manasbal) were sampled.

ii. Villages located around these water bodies were selected on the basis of their location and dependency (fishing, agriculture, vegetables, domestic use etc.) on these wetlands. The total sample size consisted of 22 settlements sites/villages namely Bud Dal, Locut Dal, Nishat, Hazratbal and Dal Gate Basins (around Dal Lake), Garoora, Nadihal, Laharwalpora, Ashtlongu, Kehnus, Watlab, Janwara, Hathlangu and Sadrakote (around Wular Lake), Soura, Sangam and Gadoora (around Anchar Lake), Soi-bug, Gund-Hasibhat, Dehramana (around Hokersar) and Gratbal and Kondbal (around Manasbal Lake).

iii. From every selected village of rural landscape, 10 per cent of the total number of households were randomly sampled and from Dal Lake, which is a wetland of urban surrounding landscape, only 5 per cent of the total number of households were randomly sampled. The total sample size consisted of 450 tourists, 5 wetlands, 22 villages, 1,715 households with 11,714 inhabitants.

iv. From the selected households, the head (Male or Female) was selected as respondent.

- **Collection of Data**

Nearly one year time was spent in data collection. (2014-2015). The selected tourists and respondents were interviewed personally by the researcher on the basis of interview schedule. The tourist spots and households were visited at least twice to cross check the information provided. The data collected from 450 tourists and 1,715 respondents were then tabulated and entered in spread sheets and by using Microsoft Excel Package, graphs and figures were constructed.

Analysis was done by adopting simple percentage methods for easy understanding and interpretation of the data.

- **Organization of the Work**

The present work is organized into four parts and spreads over nine chapters. Part one is devoted to geographical personality and review of related literature. It consists of two chapters. In the first chapter, an attempt has been made to assess the climate, drainage pattern, landforms and scenic beauty, altitudinal zones and natural vegetation of Kashmir Valley and in the second chapter, review of related literature on tourism and wetlands has been taken at different levels.

The second part is devoted to tourism in Kashmir Valley which consists of two chapters (Chapter III and IV). Chapter three traces the origin, evolution and growth of tourism in Kashmir Valley through different periods of time including Ancient, Medieval, British and Post British periods as well as causes responsible for its uneven growth. The fourth chapter deals with the concept and analysis of tourism motivation and profile of visiting tourists to Kashmir Valley as well as its prospects and associated problems.

The third part is devoted to micro level analysis of wetland ecosystems of Kashmir valley. It comprises of four chapters (Chapter V, VI, VII and VIII). Chapter V has tried to assess the concept, definitions, characteristics and different classifications of wetlands as well as their distribution. Chapter VI and chapter VII deal with the micro level analysis of Dal Lake and Wular Lake -their origin, catchment area,

morphometry, hydrological regimes, water quality, land use/land cover dynamics and biodiversity respectively. In chapter VIII an attempt has been made to analyze three smaller wetlands of Anchar, Hokersar and Manasbal together and focus has been made to understand their general characteristics. Besides all this, socio economic conditions of the sampled villages located in and around and dependent on the five selected wetlands of Kashmir Valley have been analyzed in chapter six, seven and eight respectively.

The fourth part is devoted to the management of wetland ecosystems in Kashmir Valley and is studied under chapter IX. In this, chapter an extensive description of the functions (physical/hydrological, biological, economic /ecological), problems (natural and anthropogenic) and management of wetlands has been attempted. The management part has been studied under four sections of Ecosystem conservation (catchment conservation, water management, biodiversity management and tourism development), Sustainable resource development and livelihood improvement (fisheries development, economic utilization of aquatic vegetation and livelihood improvement), Institutional development (establishment of development authorities, capacity building and monitoring and research) and Community awareness and participation (communication, education and public awareness as well as community participation and wetland day celebrations).

CHAPTER I

GEOGRAPHICAL PERSONALITY OF KASHMIR VALLEY

"*Agar Firdoos Barooy-e-Zameen ast*, Hamin *astoo Hamin astoo Hamin ast"*

(If there is paradise on Earth, It is here, It is here, It is here)

(Mughal Emperor, Jahangir)

1.1 Introduction

Kashmir Valley has rightly been called as the "Paradise on Earth" and "Switzerland of Asia". Bernier, the first European traveler to enter Kashmir, wrote in 1665 that "In truth, the kingdom surpasses in beauty all that my warmest imagination had anticipated" (Young-husband, 1911)[1].

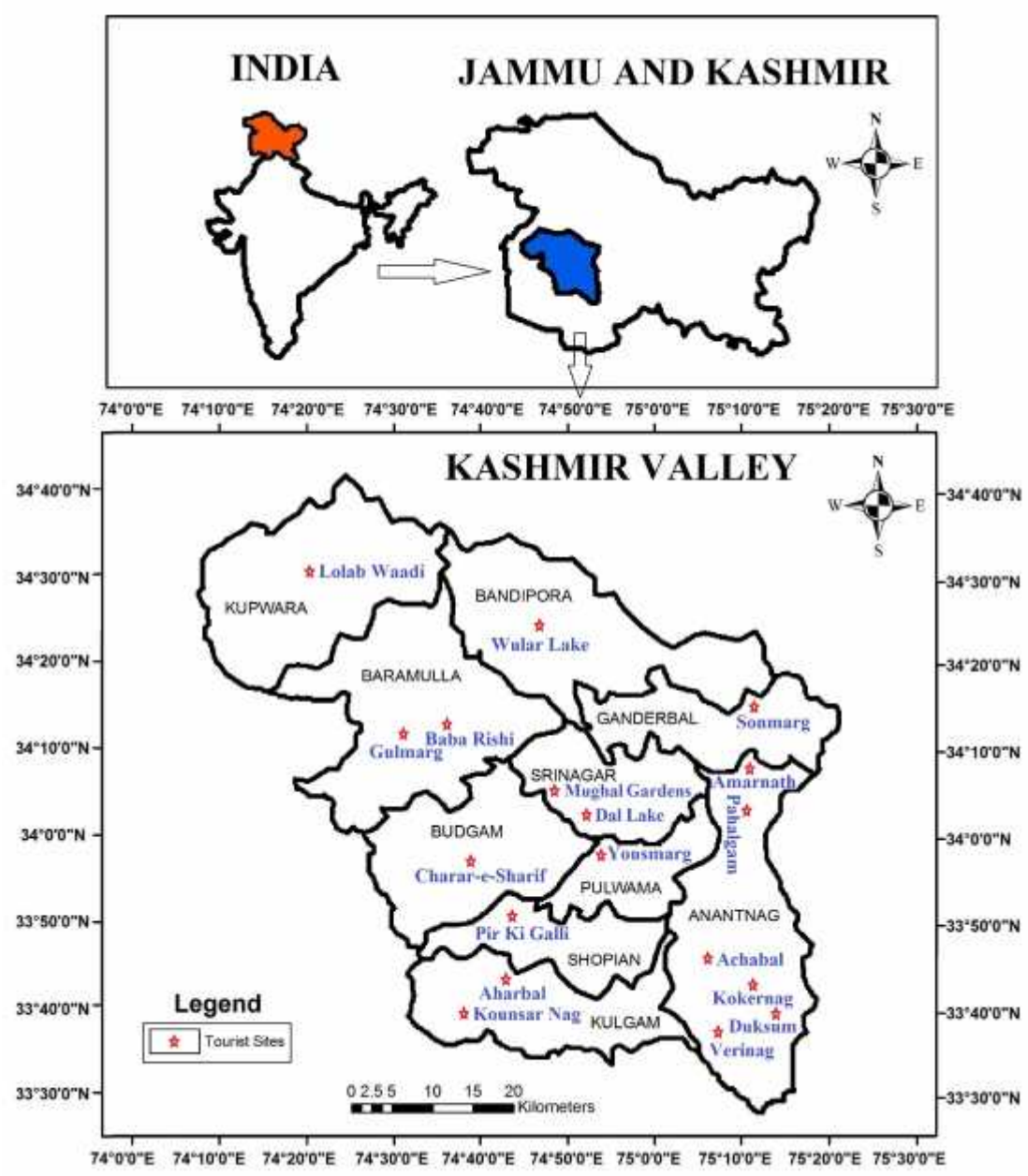
Geographically and climatically, Kashmir is the core of mighty Himalayas receiving in abundance its grace in the form of captivating scenic beauty, lush green pastures and lofty glistening snow covered mountain peaks which capture the changing hues of the brilliant sun, in many ways, the enchanting rivers and rivulets and the great lakes of mythological fame. In her valleys grow the rarest of trees and herbs, including the most precious of all flowers - the *Zaafran* (Saffron). In her forest are found the best pines and deodars. From her orchards come apples, apricots, pears, walnuts and cherries of different kinds. On her green meadows graze the lambs bearing the most exquisite wool. Her Dal lake and her house boats, Gulmarg and her glaciers have made her an international tourist spot. What to talk of her temples, the dream of every devout Hindu - the Holy Amarnath where lakhs of pilgrims trek every year, regardless of inclement weather and a host of other dangers; the Shiva temple, the Khir Bhawani, all with their lofty associations with great masterminds and the impeccable Shaivite philosophy (Sadhu,1984)[2]. Surely the name of Kashmir should conjure up a thrill in all Indians.

Kashmir Valley, a separate geographical entity, is one of the three Meso regions (Jammu, Kashmir and Ladakh) of the state of Jammu & Kashmir which are separated by the Himalayan mountain ranges from one another. These divisions have been referred to as a three-storey building in the middle of which lies Kashmir Valley

1 Younghusband, S, F. (1911). *KASHMIR*. Adam and Charles Black: London.

2 Sadhu, C. L. (1984). *Kashmir- The Crown of India*. Vivekananda Kendra: Kanyakumari.

having half closed Ecosystem (Raza, et.al,1978)[3]. The oval shaped valley (figure-1.1) extending between latitudes 33˚30´ N to 34˚40´ N and longitudes 73˚45´ E to 75˚35´ E stretches over an area of



Source: Cartographed by the Researcher

Figure 1.1

3 Raza, M., Mohammad, Ali., & Ahmad, A. (1978). *The Valley Of Kashmir- A geographical Interpretation- The Land*. Vikas Publication: New Delhi.

15,853 km^2 (out of 1,12,387 km^2 area of J&K), giving the appearance of an old lacustrine bed.[4]The Jhelum which rises at the southern end of the valley near Verinag (Anantnag district) flows approximately through its middle, receiving numerous tributaries before it enters the Wular Lake out of which it flows again through a gorge at Baramullah. On the left bank of the river, roughly west, lies the Pir Panjal range from the slopes of which numerous mountain torrents rush to swell its waters. The mountains surrounding the Jhelum Valley have an average height of 3,636 meters but many peaks exceed 4,242 meters. At the southern end of the valley, they dip to about 2,727 meters where the Banihal pass gives an exit to the Jammu region. The main Kashmir valley averages about 1,666 meters with Srinagar (1,576 meters) at its Centre. North of the valley are situated the Great Himalayan Ranges and the well-known Zanskar range. A number of attempts have been made in the past to delineate Kashmir valley. Ptolemy's work is the only classical one which furnishes an idea of delimitation of Kashmir Division, but he included major parts of the present Punjab, North West provinces and central India to it. The Ptolemy's work indicates that the present Kashmir Region or Valley was subject to great foreign dominion. Spate and Learmonth treat it as second order region of Kashmir Region which is further sub divided into the Jhelum Plain, The Karewas (terrace) and The Rimlands (Spate,1972)[5].

Historians say that Kashmir Valley was originally known as 'Kashyapmar' or the Abode of Kashyap Rishi-a saint, who once went on a pilgrimage to Kashmir. On reaching Naukabandan near Kausarnag via Rajouri, he killed Bahudev, The Giant of Satisar at the request of people and let the water of the lake flow out near Baramulla. The land, therefore, came to be known as Kashyapmar, which afterwards changed into kashmar and from kashmar to Kashmir. But some historians are of the opinion that when the people of "Kash" caste settled here permanently the valley came to be known as Kashmir. Kashmir is known by many other names also. The Greeks called it Kaspeiria, while the Chinese named it Shie-in or Kia-shi-lo. The Tibetans called it Kanapal and Dards named it Kashart[6].

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4 Retrieved from http://www.jammu_kashmir/geography

5 Spate, O. H. K., & Learmonth, A. T. A. (1972). *India, Pakistan and Ceylon- the Regions.* B.I Publications: New Delhi. pp.407-409

6 Retrieved from http://www.peacekashmir.org/jammu-kashmir/geography

Geologically, Kashmir Valley is tectonic in origin (Krishnan, 1968)[7]. Some geologists even believe that about 100 million years have passed when Kashmir Valley was formed. Subsequently, it was called "Satisar", the lake of goddess Sati, and came into present form.

The Valley of Kashmir presents an interesting morphology and the various regions on the criterion of geographical configuration include:

1.1.1 The Valley Floor

Like all sedimentary basins the Valley floor has a queer combination of depositional and erosional features. The low lying areas which are either waterlogged or subjected to recurrent inundation go on receiving layer after layer of fine silt and coarse gravel. The numerous affluents of the Jhelum which fall down the slopes of the bordering mountains bring tons of detrital material to the Valley floor, building levees and deltaic fans over extensive areas at their confluences. The Valley floor includes the flood plains and Bahil (loamy) tracts and sprawls from Khanabal (Anantnag) in the South-East up to Baramulla in the North-West. The region has rich deposits of alluvium that are deposited by the Jhelum and its tributaries. Consequently, it is known as "The Rice Bowl of Kashmir". The Valley is densely populated and is the hub of economic activities. The agricultural landscape is dominated by paddy and orchards. The Valley floor has an elaborate road transport system and enormous potential for tourism development. Almost all the urban places of Kashmir valley are situated in the Jhelum Valley Region.

1.1.2 The Karewas (Wudars)

The Karewa formation is a unique physiographic feature of the Valley of Kashmir. Karewas are flat topped or undulating surfaced mounds on the sides of Jhelum flood plain, flanking the surrounding mountain precipices. These are lacustrine deposits and sprawl over an area of about 13 to 26 kilometers (Hussain 1998)[8] on the left flank of Jhelum. However, on the right hand side of the river, they are not contiguous and have the shape of tableland. The dry and bare surfaces of these table lands have been subjected to intensive sub aerial erosion ever since their emergence. In fact, the

7 Krishnan, M. S. (1968). *Geology of India and Burma*. Higginbotham Pvt. Ltd: Madras.

8 Hussain, M. (1998). *Geography of Jammu and Kashmir*. Rajesh Publications: New Delhi. pp 9-12

prolonged erosion has reduced them to a highly dissected mass with a confusing network of ravines and inter twingled gullies.

The karewa formations cover a wide area on the southern periphery of the Valley all along its longitudinal extent. The Karewas of Pampore, Mattan, Bijbehara, Nagam, Tral, safapore, Kulgam, Badgam and Bandipora are famous. Karewas are also found in Handwara and Sogam in the shape of isolated tracts. The karewa series differ vastly in their surface characteristics and are divisible into two main types- the sloping karewas and the flat topped karewas. The former, however, are the dominant type. Their gently sloping surfaces towards the Valley floor have been cut into deep ravines ranging from 50-150 meters in depth. The level topped Karewas are few and farther apart, found mainly in Pampore, Payech and Anantnag. Karewas have deep underground water table and owing to undulating terrain, they are not adequately irrigated.

The Karewas have great economic and agricultural importance. Commercial and cash crops like almond, walnuts, apples, pears, peaches and saffron flourish luxuriously on the Karewas. The higher reaches are generally under maize cultivation, while the flat topped levelled areas are devoted to saffron, oats, wheat, mustard and rapeseed. Saffron is a perennial cash crop which on the average gives returns for about fifteen years. Inter culture of saffron and orchards are an emerging pattern of crop land use in the Karewas.

1.1.3 The Side Valleys

The Valleys of the major tributaries of Jhelum have been termed as the side Valleys. These Valleys have relatively steep gradients owing to which the insolation rate is low and winters are severe. The soils are immature and deficient in humus content. Paddy cultivation is confined to the flat irrigated fields while undulating terraces and *kandi* tracts are devoted to the cultivation of maize. Side Valleys like Sindh , Naranag, Liddar and Daksum are occupied by *Gujjars* who are largely dependent on pastoral activities.

1.1.4 The Mountain Ranges

The Valley of Kashmir is surrounded by an unbroken ring of mountains which give it the character of an enclosed feature. While the Pir Panjal forms quite a formidable

barrier on the South and Southwest, separating it from Jammu region, the Great Himalayan and the North Kashmir ranges shut it off from the frost bitten plateau deserts of Ladakh and Baltistan.

The Pir Panjal is a lofty mountain chain with many of its peaks rising above the perennial snowline. Some of them rising above 3,500 meters and are capped with extensive glaciers which project their tongues down the slopes. The highest of these peaks, Tatakuti and Barhma Sakal, rise above 4,500 meters. The Pir Panjal descends through a long gentle slope towards the Valley of Kashmir as opposed to its sharp escarpment-like ascent from the plains of Jammu. This gentle and graded nature of the slope on the northern flank makes it ideally suited to the accumulation of snow. Practically all Pir Panjal glaciers rest on the northern slopes.

Two distinct sections are usually recognized in the Pir Panjal range, as is evident from its alignment into two different axes. In its West-East axis the range extends for over 48 kilometers, ultimately originating in Rupri ridge. The head streams of all important left bank affluents of the Jhelum rise in this precipituous ridge. The other section of the range, having a North- North west to south- south East axis, runs for about 64 kilometers upto the Jhelum gorge at Baramulla. Moreover, the passes of Pir Panjal range assume special significance. Of these, the Pir Panjal (3,491m), Budail Pir (4,216m) and the Banihal pass (3,224m) have been the most important. The Banihal marks a low passage in the range and offers a natural line of communication into the Valley.

The Great Himalayan Range, a massive topographic barrier, extends uninterruptedly for over 150 kilometers from West to East and has a maximum width of 40 kilometers. At a point near zoji-la, the range takes a bend towards southwest and is often described as North Kashmir range. Some of the highest peaks of this stretch include Harmukh (4,876 meters), Shutiyan (4,371 meters), Kutbal (4,344 meters) and Viji (3,622 meters) etc. the Harmukh precipice is a vast snow field that feeds the Madhumati and the Erin river systems which flow into the Wular Lake. To the Northwest of Baramulla the Kazinag ridge of the North Kashmir range describes the Western boundary of Kashmir Valley. A striking feature of the Great Himalayan range is the asymmetrical development of slopes on the two flanks in sharp contrast to the gentle slope towards Ladakh, the descent from the Zoji-la to the Kashmir Valley is very steep.

The drainage of the Great Himalayan range is antecedent with remarkable development of terraces on either flank of the stream channels. These narrow upland valleys offer interesting contrasts in cultural features and human geography.

Recent account on the delimitation of Kashmir Valley is given by Raza and his colleagues who treat the valley as the land which lies within the two mountain ridges from crest to crest and from its watershed. On this basis, the valley includes all the land lying within the water divides formed by Pir Panjal range in the south Kashmir and the Great Himalayan ranges in the north and encircles the great synclinal trough occupied by Jhelum, the main channel of drainage. The flat alluvial basin measures only 150 kilometers from South-East to North-West and 42 kilometers from South-west to North-East. However, the transverse ranges of the surrounding mountain ramparts on the south-east and the north-west are located on an average distance of 220 Kilometers when measured from crest to crest.

In its administrative setup, Kashmir Valley consists of 10 Districts of Anantnag, Badgam, Bandipora, Baramullah, Ganderbal, Kulgam, Kupwara, Pulwama, Shopian and Srinagar which are further sub-divided into lower administrative units called 'Tehsils' (41 in number). Out of the total area of the valley, nearly half is under Karewa soil formations and an area of about 260 sq. kilometers is under various water bodies. Physiographically, Kashmir Valley consists of a sizeable depression with an almost flat basin nestled in the heavily eroded mountains and bounded on the East, South, South-West and North-West by the districts of Udhampur, Rajouri and Poonch of Jammu Division and on the North-West and North by PoK (Pakistan occupied Kashmir).On the North-East, it is surrounded by the Kargil district of Ladakh Division (Raza,et.al.1978)[9]. Of the physical features of Kashmir, mountains are the predominating features and have affected the history, habits and agriculture of the people.

1.2 Climate of Kashmir Valley

Sir Walter Roper Lawrence writes in his book, "*The Valley of Kashmir*" that in latitude Kashmir corresponds with Peshawar, Baghdad and Damascus in Asia, with Fez in Morocco and South Carolina in America, but it presents none of the

9 Raza, M., Mohammad, Ali., & Ahmad, A. (1978). *The Valley Of Kashmir- A geographical Interpretation- The Land.* Vikas Publication: New Delhi.

characteristics of those countries. People have linked the climate of Kashmir to that of Switzerland until the end of May and of Southern France in July and August. But it is impossible to speak of Kashmir as possessing any one climate or group of characteristics. Every thousand feet of elevation brings some new phase of climate and vegetation. In fact, climatic variations are found even at micro-level (Lawrence, 1967)[10]. The main factors governing the climate of Kashmir Valley include:

1.2.1 Factors Governing Climate of Kashmir Valley

1.2.1.1 Relief

The surrounding mountains with their snow clad peaks exert an overriding influence on the local weather making processes. They protect the Valley from the blasting cold of the north as well as the scorching heat of the south and contribute significantly to its notable temperate character. This, however, does not nullify the fact of its continental climate, though it certainly distinguishes the Valley climate from the extreme continental quality of the climate of the plains of North India, south of the Pir Panjal.

1.2.1.2 Monsoon Winds

The role of the Himalayas as a major determinant in the climate of Kashmir Valley can hardly be over emphasized. The southern arm of the mountains certainly acts as an effective barrier to the summer monsoon- the chief barrier of moisture in the sub-continent. The summer rainfall of the Valley clearly reflects the shadow effect. The Greater Himalayas, however, exercise little obstructive influence on the influx of the westerly troughs which frequent the Valley from the west and the North- West during winter.

1.2.1.3 Altitude

The location of the Valley at a high altitude in the North-Western nook of the continent and enclosed within high mountain ranges gives it a distinctive character with its own climatic peculiarities. Within the Valley, interesting variations in weather are witnessed, largely owing to the variations in altitude and aspect. This diversity is well observed in the side Valleys of Kashmir and in such parameters of weather as

10 Lawrence, W. R. (1967). *The Valley Of Kashmir*. Kesri Publishers: Srinagar. p.23

radiation, annual and daily ranges of temperature, humidity, snowfall and rainfall. Despite the fact that all visitors to Kashmir, particularly to its upper Valleys, such as Sind Valley, Liddar Valley and the Lolab Valley are well aware of these contrasts, the climatic diversity remains largely notional.

1.2.1.4 Forests

Forests influence winds, rainfall and temperature. The moisture laden winds cause rainfall in the forests on the hills making the temperature to fall in summer. Thus, Pahalgam and Gulmarg, which are at higher altitude and rich in dense forest cover have comparatively milder climate than that of Srinagar or Sopore.

Kashmir weather has a marked seasonality. The Valley has rather a longish, fairly cold and showery weather extending from March through April into half of May. Summers are much less rainy than spring and quite warm. In Srinagar, the mean daily maximum temperature in July may be as high as 31º C with a diurnal range of 12.5ºC. The total rainfall received during the South-West monsoon period is only three-fifths of the spring rains. As usual the behavior of the summer rainfall is highly erratic and an unequal distribution within different parts of the Valley is a norm rather than an exception. Both the daily maximum and the minimum temperatures start falling by August and are quite low by October. Although radiation from the earth is rapid in the latter months, September and October have the highest diurnal ranges. Although the Valley normally receives the first snowfall only in December, the surrounding mountains may get it earlier any time by the middle of October.

By the end of December, snow is almost universal and for two months, up to middle of February, the Valley remains under the grip of a “Cold dampness” with snow covering the ground almost completely and a perennial fog hanging over it. Kashmir weather is, however, only a “dreary monotony” during the winter and not exceptionally rigorous as the minimum temperature in January rarely goes below minus 5ºC .The snow generally disappears from the Valley by the end of February but not the dampness with rains replacing the snow almost everywhere in the following spring.

1.2.2 Seasons of Kashmir Valley Climate

On the basis of general characteristics of Weather, the year can be divided into the following four Seasons:

1.2.2.1 Winter Season (Mid-November to Mid-March)

In the Valley of Kashmir, the winter season lasts from November to February. The mean maximum and mean minimum temperatures in November read about 14ºC and 1.5ºC. In December, there is a further decrease in temperature, the mean minimum being about -1.40ºC and the mean maximum 8ºC. Consequently, most of the lakes including the Dal and Wular freeze and become the playgrounds for the adventurous sportsmen of Srinagar.

January is the coldest month of the year in Kashmir which is locally known as the period of *Chilla-kalan* (a long period of forty chilly days). Occurrence of heavy snow in the Valley in this month is a common feature. The non- occurrence of snow and precipitation leads to various epidemic diseases and scarcity of water in the rivers during the subsequent seasons. The maximum snow occurs in the month of January. On an average, the three months of December, January and February receive about 120 centimeters of snow, out of which about 50 centimeter (42 per cent) is recorded in the month of January alone.

In winters, Kashmir Valley rainfall occurs from the western disturbances, also known as the temperate cyclones. These disturbances as stated at the outset have their origin in Mediterranean Sea. The rainfall generated by these cyclones is fairly widespread. There are, however, variations in the rainfall recorded at the different stations of the Valley.

In general, the Valley has highly monotonous winters with very little sunshine. The relative humidity is generally over 90 per cent during this season. To combat cold, the people use *Pheran* (a loose woolen garment), *kangri* (Earthen fire pot) and *Bukhari* (indigenous room heater). In winters, the consumption of *zalan* (fuel wood) is enormous. The Kashmiris spent a substantial portion of their earnings in the purchase of fuel wood and coal to be used in winter season. During this period the agricultural activities remain suspended, leading to unemployment. Consequently, many of the laborers and small farmers out migrate from the Valley to the relatively warmer parts

of the country like Punjab and Himachal Pradesh to seek employment and to pass their gloomy winters.

1.2.2.2 Spring Season (Mid-March to Mid-May)

At the advent of March, the weather starts improving and the temperatures start moving up steadily. The snow starts melting in March. In March, the day temperature fluctuates between 10ºC to 16ºC. Wide variations in temperatures are, however, observed from place to place and year to year. The mean minimum temperature remains around 3ºC as a result of which the nights are cooler. The weather becomes further inclement at the occurrence of snow and rains.

The day temperature in April and May shoots up abruptly. The night temperature also registers a steady increase. In May, the mean maximum and mean minimum temperatures read about 25ºC and 12ºC respectively. About 30 to 40 percent of the total annual rainfall is recorded during spring season.

In this season, with the steady increase in temperature, lush green grass develops over the surface and leaves appear on the dormant vegetation. Leaves generally appear on willow and poplar trees as early as the last week of March and on *Chinar* (Maple) in the first week of April. This is the period when the Valley is in full bloom and the almond, apple, peach and pear flowers add more fragrance to the fresh air of the Valley. Agricultural activities which remain suspended during the long winters are again started in April and May. The seeds of vegetables are germinated in the *Radhs* (floating gardens) of the Dal Lake and the *Demb* (marshy) fields. Ploughing of paddy fields and sowing of rice nurseries also commence in the early parts of May.

1.2.2.3 Summer Season (Mid-May to Mid-September)

This season extends from Mid-May to Mid-September in Kashmir Valley. The mean monthly temperature of June at Srinagar reads about 22°C. July is the hottest month in which the absolute temperature on a particular day may shoot up to 37°C. The mean maximum and mean minimum temperatures in this month being about 30°C and 15°C respectively. Under clear skies and rarified atmosphere this temperature is very oppressive. July and August are the months when electric fans are needed and the well-off residents of Srinagar plan their outings for Gulmarg, Pahalgam and other hill stations which record relatively low mean maximum temperatures.

June to September is the period of summer monsoon in the sub-continent of India, but the Valley of Kashmir receives relatively less quantity of rainfall during this season. The Pir Panjal range obstructs the inflow of monsoon winds in the Valley. Consequently, less than one-fourth of the total rainfall is recorded in this season.

The high temperature of June and July helps in the rapid sprouting and development of paddy and vegetable crops. These conditions also help in the ripening of *Glaas* (Cherry), Peach, Pears and early varieties of apples.

1.2.2.4 Autumn Season (Mid-September to Mid- November)

September and October are the months of autumn season in the Valley. These months mark a transition from the warm sub-tropical summers to the temperate winters. Autumn is characterized by least disturbed weather. In this season, the skies generally remain clear, the duration of sunshine is longer and very little precipitation is recorded. It is perhaps the most enjoyable weather in the Kashmir Valley which attracts large number of tourists from within and outside of the country.

In September, the mean maximum and mean minimum temperatures read about 25ºC and 11ºC. At the occurrence of clouds, the temperature, however, slumps abruptly. In October the diurnal range of temperature is quite pronounced.

The cool nights and warm days of September and October help in the ripening of walnut, almond, apples and the latter parts of October are conducive for the emergence of Saffron flowers. It is the period when the people collect and purchase *Zalan* (fuel wood) for ensuring the winter requirements and harvest the numerous varieties of apples. The farmers of the Valley generally arrange the wedding of their children in autumn after the harvest of paddy, saffron and orchards.

1.2.3 Kashmiri Nomenclature of Seasons

The Kashmiris recognize the following six seasons of two months each in a year as: (1) *Sonth* (Spring)- Mid-March to Mid-May (2) *Grishim* (Summer)- Mid-May to Mid-July (3) *Wahrat* (Rainy)- Mid-July to Mid-September (4) *Harud* (Autumn)- Mid-September to Mid-November (5) *Wandh* (winter)- Mid- November to Mid- January (6) *Sheshur* (Severe Cold)- Mid January to Mid-March

The Kashmiri nomenclature is more expressive of the typical weather conditions that prevail in different parts of the year, although the periodization of the year into seasons is of notional value only. There is, for example, no specific *Wahrat* (Rainy season) in Kashmir and the *Wandh* (winter) certainly subsumes the *sheshur* (Ice cold weather).

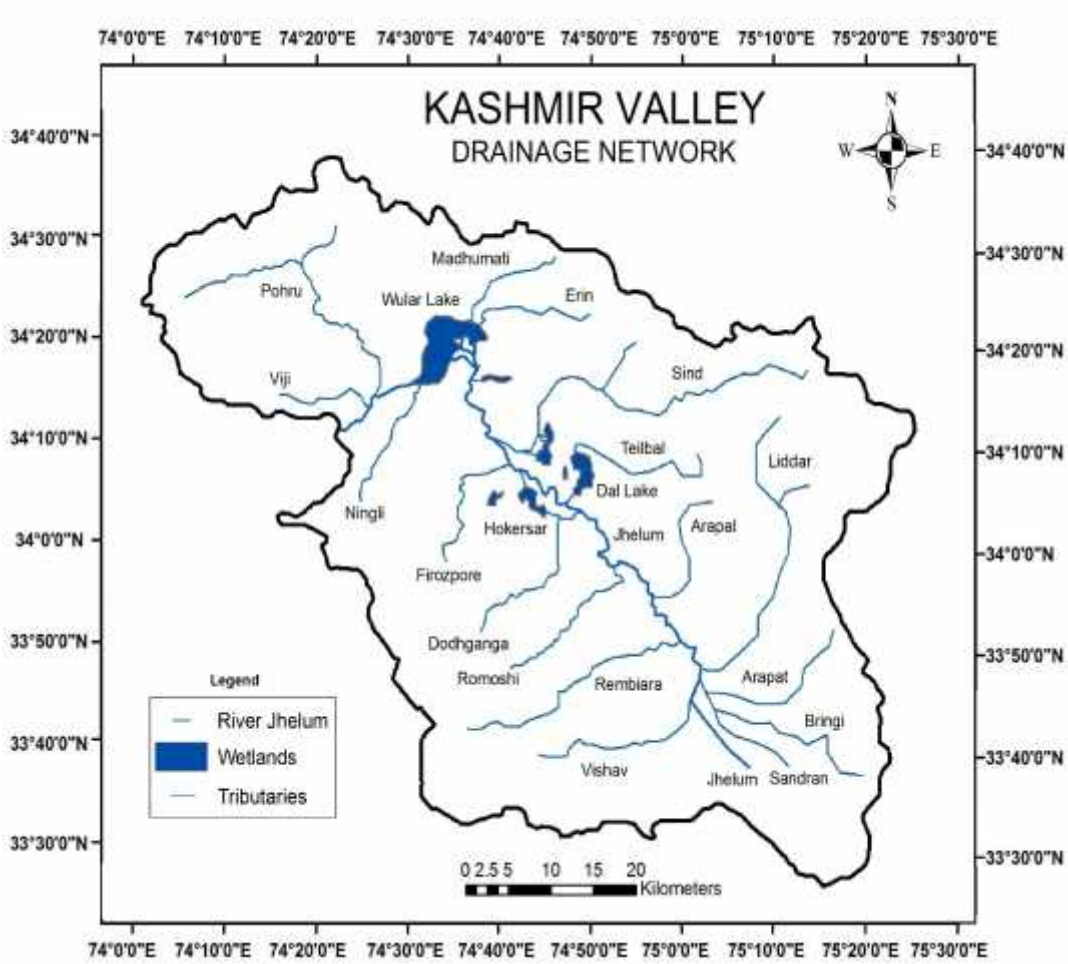
It is difficult to classify the Valley of Kashmir in a specific climatic regime as sharp variations are observed from year to year and the climate swings between temperate Sub-Mediterranean in all its variants from single (unixeric), double (bixeric), triple (trixeric) to quadruple(quadrixeric) dry periods in a year. However, at best it can be classified as an irregular type with no specific affinity with the standard climatic regimes of the world. A mild summer, a not too vigorous winter and an absence of a regular rainy season are the three distinctive features of the climatic regime of the Kashmir Valley.

1.3 Drainage Network of Kashmir Valley

The Jhelum and a host of streams that drain the bordering mountain slopes together constitute the drainage network of Kashmir Valley. Set within the frame of disparate geomorphic and geological locales, the Kashmir fluvial systems have distinctive characteristics of their own. They have evolved in the course of a chequered history marked by stupendous changes in level, rejuvenating at one time and at others becoming sluggish or even choking their channels with their own debris with consequent diversions and the ever threatening process of mutual piracy.

River Jhelum has a paramount importance in the regional structure of Kashmir Valley. It has a binding force that gives coherence to the Kashmir region (Stein, 1978)[11].

11 Stein, M. A. (1978). *Kalhan's Rajtarangini- A chronicle of the kings of Kashmir*. Motilal Banarsidas: Patna, Bihar.



Source: Prepared by the Researcher

Figure 1.2

1.3.1 River Jhelum

This river, mentioned in most reliable and ancient volumes of history, is known by different names. In Sanskrit, it is called "Vitasta", in Greek as "Hydapses", and Ptolemy called it as "Biduspes" (Koul, 1977)[12]. Al Biruni named it as "Jhelum" that continues till today.

The source of river Jhelum is a spring at an altitude of about 3000 meters above mean sea level at Verinag in Dooru tehsil of Anantnag District. After its origin from the spring in the form of a nullah or rivulet, it flows towards North-West. Near Khanabal, a village in Anantnag district, the water of 'Sandran' and 'Bringi' streams from South-East and that of 'Arapat' stream from North-East join with this nullah and thereafter the Jhelum takes the shape of a River. It then flows to the North-West,

12 Koul, A. K. (1977). *Evolution of Kashmir Landscape*. Inquiry: Srinagar,p.5

gradually swelling as it goes on receiving the water from its tributaries on either bank. Ahead of village Khanabal, the river receives the water from 'Liddar' stream flowing from pahalgam glacial zone. Below the town of Bijbehara, at 'Sangam' village the river is joined by the streams of Vishaw and Rambiara. Below Awantipora, the river assumes a zig-zag course exhibiting a good topography of meanders. From Khanabal to Awantipora , River Jhelum flows along the boundary of Bijbehara, Kulgam, Pulwama and Tral tehsils. The River leaves Pulwama tehsil at Pampore and enters Srinagar tehsil where its flow is reduced considerably due to the carving out of a few channels from it to distribute its water. The boat population of Srinagar city resides along the banks of these canals which rejoin the main river in the city itself at Chattabal.

Photo Plate 1: Verinag Spring- Source of River Jhelum

Below Chattabal, the river is joined by the Doodhganga and Shaliganga streams. After leaving Srinagar Tehsil, the river flows through extreme north of Budgam tehsil for a short distance and enters Sonawari Tehsil near village Mirgund. From here it is joined by 'Sindh' river at Shadipora village wherefrom it enters into Wular Lake. From Khanabal to Wular lake (113kms) the river is fully navigable. In the days when surface transport was not plying in Kashmir, the Jhelum used to offer the transport link between the North and South Kashmir (Mayer, 2007)[13]. The settlements have come into existence all along this river where the land is flat. After leaving the Wular, the river takes the south –west direction and is joined by river Pohuru at a place called Doabgah , near Sopore. Below Baramulla the nature of Jhelum entirely changes from

13 Mayer, I. A. (2007). *Medical Geography*. A.P.H Publishing House: New Delhi.p.57

sluggish to roaring torrent, passing over rapids and steep slopes of Baramulla Gorge (Bates, 1980)[14]. In Uri Tehsil, the Jhelum changes its direction from South-West to West and then leaves the Kashmir Valley. Thus, every fiber of Kashmir is woven by Vitasta.

All along its course in Kashmir Valley the Jhelum is characterized by two main features- A sluggish flow (merited to be described as a "sleeping lion") and a highly levelled nature of the Valley floor.

In its course from Khanabal to the Wular, the fall of the river is 18 meters in 113 kilometers or 1: 6,250 meters. The river makes some of the finest meanders over this stretch and lays down a good deal of its suspended load along its banks. The alluvial deposits of the Valley offer the best scope for such undercutting and deposition on the outer and the inner bends, which have grown into big meander loops. The Srinagar lakes, as one would tend to agree, may be regarded as the "enlarged old oxbows and abandoned courses of the Jhelum". This is certainly not true for Wular, whose connections with the original deluge of Kashmir seem to be quite intimate.

In a very broad manner, the drainage network of Kashmir Valley can be classified into two main categories as the Himalayan Drainage or the Right bank tributaries of River Jhelum and the Pir Panjal or the Left bank tributaries of River Jhelum.

1.3.1.1 The Himalayan Right Bank Tributaries of River Jhelum

The Himalayan Drainage includes all those tributaries which flow from Dooru in Anantnag District to Karnah in the Kupwara District. All these tributaries meet the Jhelum from the right and are therefore also known as right bank tributaries. These include The Sandran, The Bringi, The Arapat, The Liddar, The Arapal, The Harwan, The Sind, The Erin, The Madhumati and The Pohru rivers. The drainage of Great Himalayan Slopes is dendritic, though in certain areas it tends to be linear and even irregular. Perhaps the best example of a dendriform is seen in the Pohru River System which makes a huge Banyan tree like canopy with its trunk attached to the Jhelum near Sopore. Another notable feature of this drainage arm of the valley is its antecedence, typical examples of which are seen in the Sind and the Liddar river

14 Bates, C. E. (1980). *A gazetteer of Kashmir and the adjacent districts of Kishtwar, Badrawar, Jammu, Naoshera, Punch and the valley of the Kishen Ganga*. New Delhi: Light & Life Publishers. p.4

valleys. Around Kolahoi one notices the radial nature of the drainage while the bowl of the Wular Lake stresses the centripetal character of the rivers. The main tributaries of Himalayan Drainage include:

1.3.1.1.1 The Sandran: The Sandran rises in the Pir Panjal, below the Kakut Peak. From its source to a point close to Verinag, the river passes through a deeply carved channel studded with big boulders. Below Verinag its wide sandy bed is aligned parallel to that of the Jhelum, Southeast-Northwest. As it debouches into the plain, the river sheds its load and divides itself into a number of channels which later unite to form a main stream. The Sandran has a perennial flow of water only in its lower reach of about 8 kilometers before its merger with the Bringi. The combined waters of Bringi, Sandran and the Arapat Kol merge with the Jhelum a little above Khanabal, near Anantnag. The Sandran has a small catchment area extensive over only 291 Square Kilometers. From source to its confluence with the Bringi river, it has a total length of 51 kilometers.

Photo Plate 2: River Sandran at Village Nipora

1.3.1.1.2 The Bringi: The headstreams of the Bringi catch the snow melt from over a wide area in the Pir Panjal close to the source of the Sandran. After the Anlan and the Razparyin unite above the village of Wangom, the river after the confluence is called Bringi. Thereafter, the stream takes a West- Northwest course flowing for some 25 kilometers up to south of Anantnag where it unites with the Sandran.

1.3.1.1.2 The Arapat kol: Before merging with the Sandran, the Bringi receives the waters of the mountain torrent known as Arapat Kol. It has a small catchment area

below the Niltup and Astanbal peaks in the Great Himalayan Range and drains the Kuthar Valley.

1.3.1.1.3 The Liddar: In Liddar the Jhelum has the first of its major right bank tributaries. It has a long and picturesque Valley which is surpassed only by that of the Sind. Rising at the base of Kolahoi and Sheeshnag snow fields, its two main upper streams- The West and the East Liddar unite at Pahalgam. The western branch,after having received the Liddarwat, an upland torrent from Tarsar, flows for 30 kilometers before its merger with the East Liddar. The latter collects the snow melt from the Sheeshnag and traverses a course of little over 24 kilometers before reaching Pahalgam.

Before Pahalgam the Liddar passes through a narrow Valley, studded with massive boulders and overlooked by dense forests till it debouches into a wide alluvial fan. At the head of its delta, the main stream divides itself into a number of channels, braiding being a common characteristic of all the rivers in the Valley, which fan out to form a wide alluvial plain and merge with the Jhelum between Khanabal and Gur.

Between Pahalgam and gur, the Liddar falls from 2,129 meters to 1,591 meters or about 14 meters in 1 kilometer. The gradient between the source and the confluence is, however, far more steep.

1.3.1.1.4. The Arapal: The Liddar and the Sind hold between themselves the entire drainage of the southern and southwestern slopes of the Great Himalayan Range, leaving little scope for any other stream to survive. The two tiny streams- the Arapal and the Harwan- are tightly interposed between the two major affluents of the jhelum in an outer fringe of the ridges skirted by the Pambagai and the nao Gul heights. The Arapal, besides getting its water supply from the famous Arapal Nag (Spring), also drains the Wusturwan before its confluence with the Jhelum above Awantipora.

1.3.1.1.5 The Harwan: All the drainage from the slopes of Harwar, Burzakut, Mahadeo and Sarbal escapes into the Dal Lake through the Harwan and a number of other mountain torrents. Some of the feeders of the Harwan originate as high up as the glacial tract west of Tarsar.

1.3.1.1.6 The Sind: The Sind, with a course of about 100 kilometers and a basin area exceeding 1,556 square kilometers, is perhaps the most well developed side

Valley of the Jhelum. Its upper most feeders rise below the lofty peaks near Zoji-la, as a number of other head streams join from the Amarnath, Kolahoi and Panjtarni snow fields. At Sonamarg, the gushing torrent flows through a narrow channel with deepely incised caves in the bordering rocks on either bank. Further down, the river bed deepens more and more to assume the character of a gorge below the steep banks filled with virgin stands of silver fir, junipers and birch. Below Kangan, the Valley widens out, although the incised tongue of the arable reaches as far up as Wangat (1,989m) in the Wangat Valley and Gund (2,437m) in the Sind Valley. The Sind receives the Kanaknaz or Wangat on its right bank a little above Dragti-yung. Flowing on the northern flank of a boldly projected ridge culminating in Harawar (3,449m), the river makes a knee bend above Ganderbal before entering into a wide flood plain. As the river sheds its load, its own channels choke with debris and the main stream bifurcates into a number of channels over an extensive deltaic core. One of the branches escapes into Anchar Lake while the others merge with Jhelum near Shadipur.

Up to Kangan, the Sind falls 3,433 meters in about 69 kilometers or 50 meters in 1 kilometer. From Kangan to Shadipur, the gradient is gentle- 6 meters in 1 kilometer.

1.3.1.1.7 The Erin: Both the Erin and Madhumati belong to a larger group of tiny streams which feed the Wular lake. The Erin rises from the western flank of Harmukh. After pursuing a course of about 24 kilometers through a neatly cascaded valley, it falls into the Wular, south of Bandipora. The stream serves as an important artery of transport for timber. The Erin is characterized by a steep gradient. It falls 88 meters in 1 kilometer.

1.3.1.1.8 The Madhumati: Farther north, the Madhumati or the Bod Kol, drains the northern slopes of the Harmukh precipe with its feeder streams spread over a vast area between Narmarg in the west and Sarbal Nag in the east. From a point a little above Bunakut, the valley starts opening up laterally, forming an alluvial triangle which lends itself to intensive exploitation. The Madhumati empties itself into the Wular lake near Bandipora after traversing a course of 39 kilometers. Like the Erin, the Madhumati also falls steepely, the average fall being 103 meter in 1 kilometer.

1.3.1.1.9 The Pohru: The Pohru with its network of confluent streams, perhaps ideally dendritic in pattern, occupies the northwestern corner of Kashmir Valley.

Consisting of a number of sizable tributaries such as Lolab, Kahmil, Talar and the Mawar, the Pohru has a series of palm- leaf shaped valleys with their interesting mosaic of land uses. Almost all the tributaries have their origin at high elevations in the crest of the North Kashmir Range which divides the waters of Pohru from Kishenganga system.

The Lolab, perhaps the most fascinating and the picturesque of the Himalayan valleys in Kashmir, has its sources in Nagmarg and Bagalsar heights, north of Wular. Below Khumarial it receives the tribute of an upland affluent flowing from Kalarosh and takes a southerly bend to merge with the Pohru, a little below Rainpura. The mainstream of the Lolab has a length of 23 kilometers only.

At almost the same point where the Lolab flows into the Pohru, the Kahmil joins from the west. It drains a wider plain and has a longer course with a general South-West to North-East trend. The headstreams of the Kahmil draw their water from a series of ridges between the Shams Abri in the west and Phishaitong in the north. A litte above Handwara, the Pohru receives the waters of its winding tributary Talar on its right bank, while the Mawar joins 17 kilometers downstream. The Mawar drains the northern flank of the Kazinag range and passing through Lingayat merges with the Pohru below Khohanu. From its confluence with the Lolab and the Kahmil, the Pohru flows for 56 kilometers before its merger into the Jhelum, below Achhibal.

The Pohru is a highly tortuous stream all through, though meandering is most marked between the confluence of the Talar and the Mawar. This is largely due to the level nature of the plain with a gentle slope. From Rainpora, near the confluence of the Kahmil and the Lolab to its merger with the Jhelum, the Pohru falls over 23 meters in 54 kilometers, between Handwara and Siul, above a distance of about 30 kilometers, the fall is only 4 meters.

1.3.1.1.10 The Viji: The Viji, a tiny stream flowing from the northern slopes of the ridges culminating in Viji Peak(12,111m), merges with the Jhelum just below Dobagh, close to the confluence of Pohru. The Dakil joins the Jhelum 5 kilometers downstream at Ludur. The Viji and Dakil together drain a basin area of about 140 square kilometers.

1.3.1.2 The Pir Panjal Left Bank Tributaries of River Jhelum

It constitutes all those streams which drain Pir Panjal chain of Mountains from Dooru Tehsil to Uri Tehsil and joins the river Jhelum from the left bank. Its main tributaries include The Vishav, The Rembiara, The Romshi, The Doodhganga, The Sukhnag, The Ferozepore and The Nigal Rivers. The drainage of Pir Panjal offers a sharp contrast to that of the Great Himalayan Slopes. The Northern flank of the Pir Panjal Range is less extensive in width and does not seem to promote the lateral development of stream channels- the short lateral course of the Vishav being the only exception. The streams come down the mountains in parallel and often irregular lines. In the upper reaches they have a dendritic pattern, lower down their courses are aligned parallel to each other. As the streams cut across the Karewa beds, they develop braided channels- braiding and constant shifting of channels being caused by rapid deposition of sand and gravel in the stream beds. This inter karewa beds have all added to the complexity of the drainage along the southern flank of the valley. The main tributaries of this branch of drainage include:

1.3.1.2.1 The Vishav: The source of Vishav lies in the Southeastern corner of Kashmir Valley, close to that of the Jhelum. The river drains the entire northern face of Pir Panjal between Sundartop and Budil Pir and thus has an extensive catchment area which reduces the upper Jhelum to a tiny rivulet. In fact, the Jhelum draws heavily on Vishav feeders in the initial stage. While passing through the volcanic strata in the Pir Panjal Range, the Vishav forms the famous cataracts of Aharbal. Near Dani Hunzpur, the Vishav receives a lateral stream from the side of Sundertop, the united stream forming a wide sandy bed occupied by a number of braided channels. It merges with the Jhelum about 12 Kilometers below Kulgam. One of the bifurcated channels of the Vishav, however, continues farther north, merging into the Rembiara near Nyaiyun village not far from the latter's confluence with the Jhelum.

The Vishav falls from 3,975 to 1,568 meters or 41 meters in 1 kilometer. The fall in the lower reach between Kulgam and and the confluence is, however, very gentle.

Photo Plate 3: River Vishav near Kongwatan, Aharbal

1.3.1.2.2 The Rembiara: The Rembiara rises in the Rupri Ridge of Pir Panjal. Its main feeders originate from Rupri Peak and the Bhag Sar Lake, on the one hand, and the Pir Panjal and the Naba Pir passes, on the other. Above Shopian, the river divides itself into a large number of channels, two of them being well marked and called Rembiara and the Sasara. While the Rembiara merges with the Jhelum near Nyaiyun, the Sasara loses itself into the marshy land west of Awantipora before finally merging with the Jhelum. The Rembiara alone has a course of 60 kilometers and the Sasara branch flows for another 40 kilometers.

From its source to the confluence, the Rembiara registers a fall of 2,466 meters or 41 meters in 1 kilometer which is similar to the gradient of Vishav.

1.3.1.2.3 The Romoshi: The headstreams of Romoshi or Kachgul draw their waters from the snowy peak of Kharmarg (4,603m) near Naba Pir pass in the Pir Panjal.The upper torrents unite near Pakharpur to give rise to a sizable stream which passes through a wide sandy bed in the Karewa slopes. The Romoshi merges with the Jhelum near Wudipur, below Awantipora. In all it traverses a course of 51 kilometers and its bed below Pakharpur has an average gradient of 16 meters in 1 kilometer.

Table 1.1 Characteristics of Drainage of Kashmir Valley River Basins

S. No	Drainage Basin	Area (Sq.Kms)	Drainage Length (Kms)	Number of Streams
1	Sandran	258	82	63
2	Bringi	595	317	176
3	Arapat Kol	362	255	96
4	Liddar	1,243	679	281
5	Arapal	571	355	119
6	Harwan	395	144	102
7	Sind	1,556	766	342
8	Erin	321	210	96
9	Madhumati	476	397	157
10	Pohru	1936	1,130	470
11	Viji	143	96	30
12	Vishav	828	448	163
13	Rembiara	751	373	130
14	Romishi	459	262	70
15	Doodhganga	580	236	87
16	Sukhnag	932	411	203
17	Ningil	538	232	76
	Jhelum	**12,262**	**6,697**	**2,704**

Source: Raza, M., Mohammad, Ali., & Ahmad, A. (1978). *The Valley Of Kashmir- A geographical Interpretation- The Land.* Vikas Publication: New Delhi. p.59.

1.3.1.2.4 The Doodhganga: Rising below the Tatakuti peak in the Pir Panjal Range, the Doodhganga flows North to Northeast to finally merge in the marshy land west of Srinagar. Near Bagh Sahib Ram the Shaliganga joins the Doodhganga before the united stream loses itself into Nambal , a few kilometers below. A good amount of the discharge from the river is never allowed to pass into the Jhelum as it is diverted

towards the west into marshy land. The Doodhganga traverses a course of 50 kilometers and has an average gradient of 63 meters in one kilometer.

1.3.1.2.5 The Sukhnag: The slopes of the Pir Panjal Range between the Nurpur and he Chinamarg passes are drained by a multitude of torrents unifying themselves into the Sukhnag and the Firozpora. Between themselves the two streams take care of the drainage of Toshamaidan and Gulmarg respectively. Descending from the mountains, the Sukhnag passes through a sand choked bed across the Karewas, finally merging into the marshes of Rakh-e-Arat, west of Hokersar. The Firozepora empties itself through myriad channels into the Haigam Jhil and the Sultanpurich Rakh. Both the marshes are connected by a spill channel constructed to drain out the flood water. With a total length of just over 51 kilometers, the Sukhnag has a fall of 56 meters in 1 kilometer.

1.3.1.2.6 The Ningil: The Ningil is the last major stream in Kashmir Valley that joins the jhelum on the left bank.The upper feeders of the Ningil rise below the Khan Pathri(3809m), and Apharwat (4141m) peaks of the Pir Panjal above Khilanmarg. Flowing for about 38 kilometers in a northeasterly direction, the Ningil pours itself into the Jhelum immediately after the latter's deboucher from the Wular Lake.

1.4 Landforms and Scenic Beauty of Kashmir Valley

In his introduction to the Rajatarangini, Kalhana says about the Valley of Kashmir:

"It is a country where the sun shines mildly, being the place created by Kashayapa as if for his glory. High school-houses, the saffron, iced water and grapes, which are rare even in heaven, are common here. Kailasa is the best place in the three worlds, Himalaya the best part of Kailasa, and Kashmir the best place in Himalaya"(Agarwal and Agarwal, 1995)[15].

The scenic valley of Kashmir is well known throughout the world for its Natural beauty. Here, nature has been prodigal enough in crowning this ancient land with all its splendor and glory. Gulmarg, Pahalgam and Mughal gardens attract visitors from all over the world. Its lakes, green meadows, dancing and foaming streams, majestic forests full of Fir and Pine, snow-capped peaks are common attractions to the outsider

15 Aggarwal, J. C., & Agrawal, S. P. (1995). *Modern History of Jammu and Kashmir: Ancient times to Shimla Agreement.* Concept Publishing Company: New Delhi.

as well as to the native. Some of the landforms depicting the scenic beauty of Kashmir Valley are discussed as under:

1.4.1 Srinagar- The Lake City

Located in the heart of the oval shaped Valley of Kashmir at an average elevation of 1,730 meters above mean sea level, between 74º56' and 75º79' East Longitude and 33º18´ and 34º45´ North Latitude, Srinagar as well as its hinterland is bounded by natural wall of mountains (Sub-mountain branches of Pir Panjal Ranges and Zanskar mountains). In the east, it is bounded by Zabarwan Mountains with lush green vegetation, locating famous Dachigam Sanctuary and Mughal Gardens and is environed by the shallow and swampy lakes of Dal and Nagin with the eminence of hillocks of Takth-i-Suliman in the east and Kohi-Maraan (Hariparbat) in the center adding to its beauty and making surroundings of the city invigorating. Because of its locational advantage, it has acquired greater degree of centrality despite the constraints which the surroundings and physiography of the region pose to the physical growth of the city. Being the center of economic, commercial and other activities. It also acts as major tourist destination and terminating center in Kashmir Valley.

The city enjoys a sub-Mediterranean type climate with severe winters and moderate summers associated with relatively higher humidity throughout the year varying from 78 per cent to 91 per cent (minimum 45 per cent). Normally, the temperature ranges between 29ºC to 34ºC, occasionally touching the highest 39ºC in summer and in winter temperature varies from 5ºC to 10ºC. Rainfall in the city is almost spread over throughout the year varying from 15 to 21 centimeters. During winter season, it is in the form of snow and sleet while as in the rest of the year it is in the form of rains and hail.

River Jhelum which enters Srinagar in the south-east flows through the city in serpentine manner with a number of meanders, leaving it in west after dividing the city into two parts. It is around this river that the city has initially evolved and prospered, as a result Kashmir is often referred as “Water Civilization”. Special features in the form of places of scenic beauty, buildings and monuments attributed to the invigorating surroundings and important events occurring in city’s socio-political life distinguish the city from the rest. Because of the rich historical past and bountiful natural setting, Srinagar is endowed with a number of such heritage areas that lend the city a place of pride. The city of Srinagar has been known as “Venice of the East” and

was eulogized as a charming and beautiful as garden cities with its beautiful gardens, lush green mountains, charming lakes, magnificent parks, rich cultural heritage, grandeur of salubrious climate and perennial rivers.

1.4.1.1 Dal Lake

World famous Dal Lake is one of the most beautiful tourist destinations of the valley of Kashmir. This lake measuring about 13.4 km^2 is an intricate waterway divided into 3 parts viz Gagri Bal, Lokut Dal and Bod Dal by a series of causeways. Two smaller islands, Sona Lank (Gold island) and Rupa Lank (silver island) –also known as 'Char Chinar'- are the popular picnic spots within the Dal lake. Tourists most often enjoy 'Shikara' rides and stay and experience Kashmiri hospitality onboard numerous House-boats on Dal. Besides, water sports like water skiing, water scooter, canoeing and other sports can also be enjoyed in this lake.

Photo Plate 4: Dal Lake, Srinagar

1.4.1.2 The Mughal Gardens

The beautiful Mughal gardens with terraced lawns, cascading fountains and bright flowerbeds with the panorama of Dal lake in front of them presents a mesmerizing concept of the Mughal Emperors Concept of Paradise. There are numerous large and small gardens/Baghs in the valley of Kashmir. Prominent Mughal Gardens include The Shalimar, The Nishat and Chashm-e-Shahi.

1.4.1.2.1 The Shalimar Garden

Shalimar Bagh is the most beautiful of Mughal Gardens. Built in 1616 by Emperor Jahangir for his beloved wife 'Nur-Jahan'.It is divided into 4 terraces of Gardens, one above the other decorated with beautiful fountains and mighty Chinars on the sides. The topmost of the 4 terraces called the 'Abode of Love' was reserved for the emperor and the ladies of court. There is a huge tank and about 150 fountains dazzling with their beauty and splendor inside the garden.

Photo Plate 5: Shalimar Garden, Srinagar

1.4.1.2.2 The Nishat Bagh: The Garden of Joy

Nishat Bagh, considered to be second only to the royal Shalimar Garden in size and significance, is found on the eastern side of the Dal Lake in the vicinity of Srinagar within the Vale of Kashmir. This "Garden of Delight" is reputed to be the work of Nur Jahan's elder brother, Asaf Khan. The garden is rectangular in shape, 544 meters long by 329 meters wide, and is oriented east-west; its eastern side is higher in elevation, and its western side touches the edge of Dal Lake[25]. A central water stream, nearly 4 meters wide and 20 centimeters deep, flows down from the top of the garden through a channel decorated with fountains and occasionally divided into fountain pools[16]. Chadars, stone ramps engraved with wave patterns to render the flowing water more beautiful, transfer water between the various terraces. In several places, stone benches cross the axial water stream near a chadar, and serve as seating platforms for the visitor's enjoyment.

16 Nishat Gardens. Retrieved from *http//:www.smc.org/Nishat Gardens*

Photo Plate 6: Nishat Garden, Srinagar

1.4.1.2.3 Chashm-e-Shahi: The Royal Fountain

Close to Srinagar lies the smallest of all Mughal Gardens. This garden set in beautiful surroundings in 1632 is attributed to Mughal Emperor Shah Jahan. This is a beautiful garden laid in terraces which commands a magnificent view of Dal Lake below and surrounding mountain ranges. The cool water of this spring is highly refreshing and has digestive properties. (Villiers, 1913)[17]

Photo Plate 7: Chashm-e- Shahi, Srinagar

1.4.1.3 Tulip Garden

This wonderful Garden of Tulip flowers lie in the foothills of Zabarwan Mountains on the eastern side of Dal lake. This garden spreading over 5 hectares of land grows

17 Villers, S. (1913). *The Gardens of The Great Mughals.* Adam and Charles Black: Soho Square, London.

about 1.2 million Tulips of 60 varieties. Its foundation has been laid by Shiraz, a General in Dogra army around 150 years back. This garden earlier known Shiraz Bagh has recently been renamed as Indira Gandhi Tulip Garden.

Photo Plate 8: Tulip Garden, Srinagar

1.4.1.4 Pari Mahal (Abode of Fairies)

Located on the spur of a hill overlooking the beautiful lake city of Srinagar, Pari Mahal is part monument and part garden. Originally a Buddhist monastery, Mughal emperor Shah Jahan's eldest son Dara Shikoh[18] converted it into a school of astrology in the middle of 17th century. This garden comprises of six terraces. In the upper most terrace, there are the ruins of two structures resembling a baradari and a reservoir. In the middle of second terrace, it is a large tank. The façade of the retaining wall is ornamented with a series of twenty one arches built in descending order. The third terrace has the main entrance. This terrace consists of spacious rooms on either side of it. The fourth terrace has the remaining of the tank. The fifth terrace has an arcade retaining wall with pigeon holes. The sixth terrace has a rectangular tank in the middle and octagonal bastions at its ends. Fragments of earthen water are still to be seen in this structure[19]

18 Pari Mahal. Retrieved from *http://www.smc.org/pari- mahal*

19 Retrieved from http://www.asisrinagar.com/kashmir-valley.html

Photo Plate 09: Pari Mahal. Srinagar

1.4.2 Wular Lake

Wular Lake, the largest fresh water lake in India, lies at a distance of about 34 kms North-West of Srinagar. It is one of the beautiful lakes located at an altitude of 1,530m above msl between 34º20´ N latitude and 70 º 24´ E longitudes. It is elliptical in shape with a maximum length of 16 kms and breadth of 7.6 kms. The lake is surrounded by high mountainous ranges on the northeastern and northwestern sides, which drain their run-off through various *nallahs*, prominent being Erin and Madhumati .On the eastern and southern sides are the low lying areas of Sonawari and on the western side in the Sopore-Watlab section, lowlying areas have also been brought under paddy cultivation. On the eastern side of the lake is an island which was raised and shaped by a famous ruler of Kashmir, Zainul-Abidin, who ruled Kashmir from 1420- 1470AD.

Photo Plate 10: Wular Lake at Laharwapora, Bandipora

Wular Lake, plays a significant role in the hydrography of the Kashmir valley by acting as a huge absorption basin for floodwaters. The lake with its associated wetlands is an important habitat for migratory water birds within Central Asian Flyway and supports rich biodiversity. It is a major fishery resource in the valley supporting a large population living along its fringes. The wetland also generates revenue to the state government through fisheries and auctioning of water chestnut, fodder, and other economically important species. The catchment of the lake supports coniferous forests, and Alpine pastures adding to the natural beauty and biodiversity of the wetland area. Recognizing importance of the wetland for its biodiversity and socio economic values, the Wular Lake was designated as a Wetland of International Importance under Ramsar Convention in 1990 (Action Plan for Wular Lake,2007)[20.]

1.4.3 Pahalgam (The Valley of Shepherds)

Pahalgam ,situated at the confluence of Sheshnag lake and The Liddar river, is one of the most beautiful tourist resorts of Kashmir which remains cool even in the summer heat and the temperature rarely touches 25º Celsius here[21]. This is extremely popular among tourists for its outdoor activities like fishing, Horse riding, Golf and Trekking. It also serves as a basecamp for many expeditions and excursions like Kolahoi Glacier, Sheeshnag, Sonmarg and the Amarnath Yatra. Under the shadow of tall pine trees with the flow of crystal clear water, Pahalgam offers several tourist attractions like Baisaran meadow and Beetab Valley which are the dream of every tourist visiting Kashmir.

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20 Comprehensive Management Action Plan for Wular Lake, Kashmir. (2007). Final Report prepared for the Department of Wildlife Protection, Govt. of J&K, *Wetlands International, South Asia*. Retrieved from http://www.wetlands.org

21 Retrieved from *http://www.trekibex.net*

Photo Plate 11: Pahalgam, Anantnag

1.4.4 Gulmarg (The Meadow of Flowers)

Gulmarg, the mountain resort of exceptional beauty, is located at a distance of 56 kilometers North-west of Srinagar at an altitude of 2,690 meters above msl. Originally called as 'Gaurimarg' by the shepherds, this world famous winter tourist spot was named Gulmarg by Sultan Yusuf Shah in 16th century, who was inspired by the sight of its grassy slopes adorned with wild flowers. Gulmarg was the favorite haunt of Emperor Jahangir who once collected 21 varieties of different flowers from here.

Photo Plate 12: Gulmarg

Flowers blooming in this meadow include Bluebells, Daisies, Forget-me-Nots and Buttercups etc. Picturesque Gulmarg Biosphere Reserve and The Alpather Lake add attraction to this tourist place. The prime tourist attractions to the tourists travelling to Gulmarg include skiing, golf and Gondola lifting. Besides, it serves as a trekking base for Khilanmarg, Nanga parbat and Pir Panjal range.

1.4.5 Sonamarg (The Meadow of Gold)

Sonamarg, one of the popular hill resorts of Kashmir valley, lies at a distance of 84 kms from Srinagar on the Srinagar-Ladakh Road at an elevation of 2,740 metres above msl. Sonamarg is famous for its scenic beauty. In fact, it is popular throughout the world for its alpine flowers, Sycamore, Silver Birch and Pine trees. The famous Sind River

Photo Plate 13: Sonamarg

flowing through the heart of this meadow offers ample opportunities for fishing to the tourists. Besides, Sonamarg is also an important trekking base for Vishansar lake, Kishansar lake, Gadsar, and Gangbal making it an interesting place to visit.

1.4.6 Kheir Bhawani (Mysterious Holy spring)

Kheir Bhawani which is widely known to change its color from time to time lies towards the north of Srinagar at a distance of about 14 kms and can be reached within an hour by bus. The main spring dedicated to Goddess Kheir Bhawani has an irregular septagonal shape with its apex called Pad (feet) to the East. The northern and the southern sides are longer than the western side which is called Siir (Head). The water of the Spring changes various hues like red, pink, orange, green, blue and has often light green, red rosy and milky white shades (Sadhu, 1984)[22]. Any shade of black color is supposed to be inauspicious for the inhabitants of the valley. This color was prominent in the year 1947 when the Pakistani raiders attacked the peaceful valley.

22 Sadhu, C. L. (1984). *Kashmir- The Crown of India*. Vivekananda Kendra: Kanyakumari.

Photo Plate 14: Kheir Bhawani Temple, Tulamula

To conclude with the scenic beauty of the landforms of Kashmir Valley, it is worthwhile to mention here that Kashmir is a land of fabled beauty and eternal romance. It is blessed by nature with beauteous scenery, wondrous fertility and salubrious climate. It is rightly described as one of the finest countries upon which the sun shines and "the sub-Alpine region of Asia's Italy". Unsurpassed land for its scenery, Kashmir is verily "the terrestrial paradise of the World. A fairy land, where each mountain fold presents a grand picture and every horizon a new scene, each leaf a distinct lesson and each flower a new book.

Thus, The poetic description of Kashmir as a garden land of picturesque scenery, lovely landscapes, unrivalled vistas, majestic forests, green pastures, shimming waters of vast silent and transparent lakes and rivers, perennial snows, mighty Chinars of snow-clad mountains rumbling cataracts and roaring waterfalls stands justified.

1.5 Altitudinal Zones of Kashmir Valley

Vertical zonation of natural features in the mountains is a well-known and frequently described phenomenon. It describes the natural layering of ecosystems that occur at distinct altitudes due to varying environmental conditions. Temperature, humidity, soil composition, and solar radiation are important factors in determining altitudinal zones, which consequently support different vegetation and animal species[23].The notion of altitudinal zonation is used to account for the discontinuities associated with altitude in mountain areas[24] .

23 Altitudinal zonation. Retrieved from *http://en.wikipedia.org/Altitudinal_zonation*
24 Retrieved from *http://www.hypergeo.eu/Altitudnal_zonation*

Representatives of various disciplines tend to build their own classification schemes dealing with the zonation of natural environment. For instance, climatic (Hess, 1974), geo-ecological (Kotarba, 1987), vegetative (Pawłowski, 1927), landscape (Kondracki, 1967, Kalicki 1989) and hydrographic (Witjozwik,1974) zones have been distinguished. In most cases, the boundaries between individual zones coincide with either disappearance or appearance of different types of ground coverage: forests, dwarf pine, alpine vegetation, rocky terrains and permanent snow line (Marcin and Pawe, 2014)[25].

The valley of Kashmir, covering an area of 15,853 km^2, has a unique geographical personality. Nestled in north-western folds of the Himalayas, the Valley is surrounded on almost all sides by mountain ranges characterized by snow covered lofty peaks. The mountain ranges rising to a height of 5,550 meters on the north east side dip-down to about 2,770 meters in the south, where the Banihal-pass (Jawahar Tunnel) provides an exit from the valley. The only outlet for rivers is the Baramulla gorge, where the placid Jhelum River leaves the smooth grassy banks and hurries headlong down its rocky course to the plains of the south. The oval shaped valley is filled with thick deposits of alluvium, which has blanketed even the lower slopes of the surrounding ranges (Malik, 2012)[26]. On the basis of Stratigraphy and altitude, the valley of Kashmir may be divided into following five altitudinal zones:

1.5.1 Zone I (1,250-1,850 meters)

This is a zone of low relief consisting of low lying plains and flat lands. It lies between 1250 to 1850 meters and is characterized by depositional features laid down by numerous streams of river Jhelum. It is divided into two sub-zones:

1.5.1.1 Between 1250-1650 meters

This zone is conterminous with the flood plain of Jhelum where the average slope remains within 5º. Here, average annual temperature ranges from 7.39º Celsius to 19.02º Celsius and average rainfall is 5.87 centimeters. This tract of land consists of

25 Marcin, G., & Pawe, S. (2014). Applying geometrics to determination of landscape altitudinal zones in the mountains. *Landform Analysis, 11,* 25–32.

26 Malik, M., Imran. (2012). Spatio-temporal analysis of urban dynamics in Kashmir valley (1901-2011) using geographical information system. *International Multidisciplinary Research Journal, 2* (8), 21-26.

17.2 per cent of the total area of the Valley and is predominantly devoted to the cultivation of rice in Kharif season and wheat over drier parts in Rabi season. It is an area of level plain, by and large, but the alluvial levees with pronounced slope are also not uncommon and have been sufficiently terraced for paddy cultivation. The level nature of terrain also rules out erosion, though siltation is a serious menace all along the lower course of the Jhelum in the Valley.

1.5.1.2 Between 1,650-1,850 meters

This zone with gentle slope (5º-10º) is mostly found in higher parts of the valley floor and along the Karewa lands. It is less fertile but known for 'Saffron' cultivation. The important flat topped Karewas occur at Pampore, Bijbehara, Handwara, Awantipora, Martand, Tral, Saffapura, Ganderbal, Bandipora and Sogam. Average annual temperature of this zone ranges from 6.37º Celsius to 18.5º Celsius and average rainfall is 10.5 centimeters. This zone covers about 19.8 per cent of the total area of Valley.

Most of the existing Tourist resorts and Wetlands like Nishat Bagh, Shalimar, Harwan, Wular Lake, Dal Lake, Nageen Lake etc. are located in Zone-I and the topography of the Valley has permitted only this zone to develop good transport facilities both in terms of traffic flow and Road network. This zone has fairly good socio-economic setup wherein almost all the villages are connected by the roads.

Flowing through the heart of the Valley in this zone is the river Jhelum, which has many tributaries and forms the main source of irrigation in this region. The Valley shows considerable topographical, altitudinal and climatic variation, resulting in great habitat diversity. Lakes, rivers and nullahs, springs, floating gardens, marshes and swamps, cultivated fields and orchards, plantation sites, graveyards, roadsides and Karewa lands are the main characteristic features of this zone.(Dar and Khuroo,2013)[27].The climate of this zone is predominantly temperate with wet and cold winters and relatively dry and hot summers. It is marked by well-defined seasonality, with four seasons a year: winter (December-February), spring (March-May), summer (June-August) and autumn (September-November) (Husain, 2001)[28].

27 Dar, G. H., & Khuroo, A. A. (2013). Floristic Diversity in the Kashmir Himalaya: Progress, Problems and Prospects. *Sains Malaysiana*, *42* (10), 1377-1386.

28 Hussain, M. (2001). *Geography of Jammu and Kashmir*. New Delhi: Rajesh Publications.

So far as the Rainfall pattern is concerned, Kashmir Valley receives precipitation both in the form of rain and snow. It has been noted that the rainfall has a peculiar distribution pattern through the year. It is overwhelmingly concentrated in the winter and spring months in all parts of the Valley. The share of the winter and spring rainfall is, however, more than three- fourths of the annual total in the northwest (e.g., Handwara, Baramulla, Langet and Sopore), while it is only about one-third in the central and the southeastern parts of the Valley (e.g., Srinagar, Pulwama, Anantnag, Kulgam and Ganderbal). The annual rainfall shows a regular increasing trend from Badgam and Srinagar in all directions. It is the lowest at Budgam (579mm) and increases towards the northwest from Srinagar (663mm) through Sopore (756) Langet (873) to Handwara (1,005mm); and towards the Southeast from Pulwama (592) through Kulgam (898) to Dooru (1,195).(Indian Meteorological Dept., New Delhi, 2004).

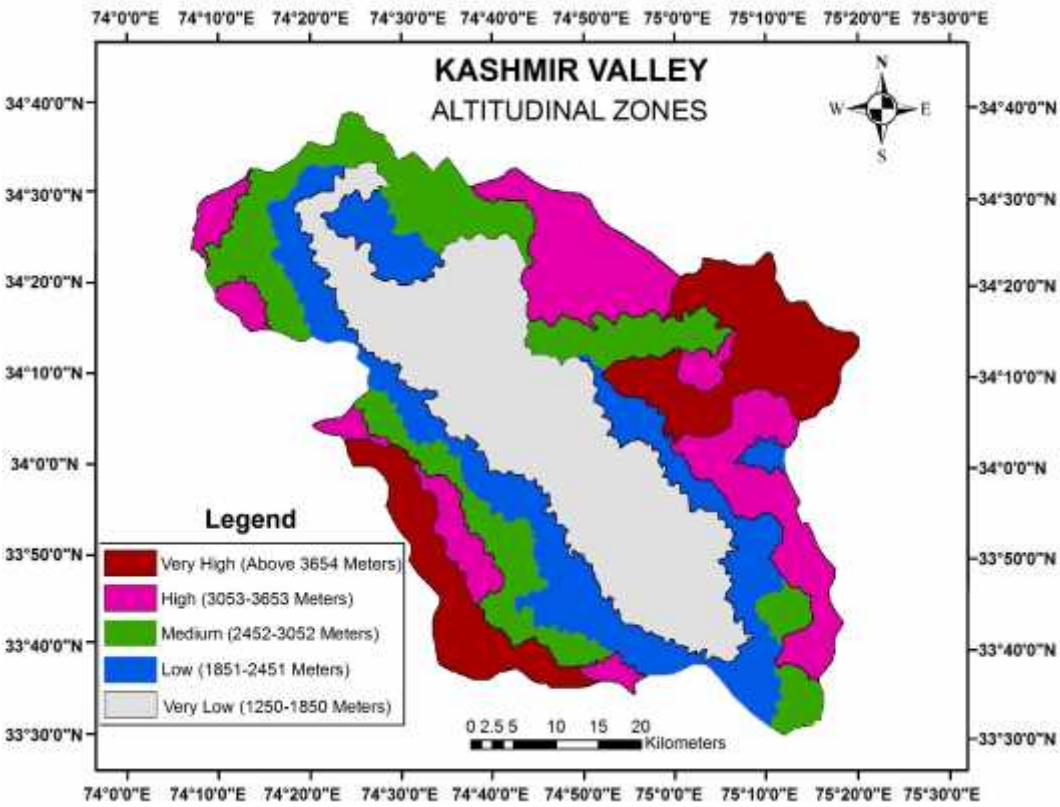
Another interesting feature of the rainfall of Kashmir Valley is its low average intensity per rainy day. An analysis of the Fifty-Year Data (1950-2001) by Nawaz and Taseem has indicated that the average intensity varies from 5.08mm to 26.27mm. Dooru has a consistent record of highest intensity throughout the Valley which remains well above the other recording gauges in as many as nine months in a year. The rains are usually heavy in the southwest monsoon period in the central parts and in winter or Spring in the rest of the Valley. There is a high expectancy of heavy rainfall in august or September which is often caused by a sudden cloudburst and is invariably followed by widespread floods in the Jhelum.(Nawaz and Taseem,2013)[29]

The river systems of the Valley are fed both by rain and snow. Naturally, the flow is poor during winter months as most of the precipitation comes in the form of snow. The quantum of surface run-off increases with the onset of summer when the snow melts, and with the rain, generates a higher run-off. Normally, not less than three-fourth of the total annual discharge of the Jhelum flows during the summer months, April to August. In winter the discharge falls down substantially-only ten percent of the annual discharge passes down during November-February, and not more than fifteen percent during October-February. The streams rising in the Pir Panjal have a lesser share of the snow melt and their supplies are augmented by summer rains. The

29 Ahmed, N., & Ahmad, T. (2013). Problems of water resource management in Kashmir Valley. *IOSR journal of Humanities and Social Science, 12* (3), 76-82.

streams of the Greater Himalayan Range, on the other hand, are dependent more on snow than on rain. This produces interesting contrasts between the flow pattern of the Pir Panjal and the Himalayan Rivers. The discharge of Pir Panjal Rivers is not only low; it is highly variable as the quantity of rainfall is the major component.

Besides, this is the zone of diverse floristic wealth because of heterogeneity in habitat-both terrestrial and aquatic ones. The aquatic vegetation abounds in a variety of habitats, including lakes, wetlands, marshes, swamps, rivers, hill streams and springs. The lakes occur from the bed of the valley to the alpine zone and are usually classified as Valley, Forest and Glacial Lakes. All these freshwater habitats, except the alpine lakes, support a wide array of vegetation, including various forms of hydrophytes, rushes, sedges and reeds. A significant component (About 15 per cent) of the Kashmir flora comprises shrubs and trees. According to Ara et al. (1995)[30] the overall arboreal flora in this region is represented by 295 species of trees and shrubs (both indigenous and exotics), distributed over 120 genera and 60 families.



Source: Prepared by the Researcher from Topographic Maps and Geo- Eye Imageries.

Figure 1.3

30 Ara, S., Naqshi, A.R., & Baba, M. Y. (1995). Indigenous and exotic trees and shrubs of Kashmir Valley, Indian. *Journal of Forestry*, *8*, 233-272.

This zone is the major producer of agriculture which is the mainstay of more than 60 per cent of population of valley of Kashmir. The major field crops in the Valley are rice, wheat, maize, mustard and barley. Some interesting food crops (pseudo-cereals) are occasionally grown in some hilly areas; these include buckwheat, grain amaranths and millets. Because of the assured irrigation facilities, timely rainfall, levelled nature, fertile soils and easy availability of H.Y.V seeds, chemical fertilizers and pesticides this zone exhibits the belt of high productivity (Andrabi and Zamir,2012)[31]

Zaafran or Saffron (*Crocus sativus*), the pride crop of Kashmir, is grown in this zone. Saffron, a perennial herb belongs to Iris family Iridaceae is the most expensive spice in the world known for its aroma and color and used for flavoring and coloring in medicinal and pharmaceutical industries. It is derived from the dry stigmas of the plant popularly known as the "Golden Condiment". It contains crocin, picrocrocin and saffranal which are very important constituents for both medicinal and aesthetic purpose. Due to very high crocin content and rich aroma, the Kashmiri saffron is famous worldwide and commands a premium price over the saffron available from Spain or Iran. It is a legendry crop of Jammu and Kashmir produced on well drained karewa soils of Kashmir and Kishtawar where ideal climatic conditions are available for good growth and flower production. It grows at an elevation of 1,500-2,000 m above msl. Photoperiod and temperature exerts a considerable influence on the flowering of saffron. An optimum period of 11 hours illumination and moderate temperature of about 18-20° C during flowering is found optimum. Unusually low temperature coupled with high humidity during flowering season affects flowering. Spring rains boost production of new corms. Slightly acidic to neutral, gravelly, loamy, sandy soils are suitable for saffron cultivation. The plants are bulbous, perennial with globular corms, 15-20 cm high. It has 6 to 10 leaves present at anthesis, one to two flowers with a lilac-purple color with perianth segments of 3.5-5 cm and style branches of 2.5-3.8 cm arise directly from the corms. Flowers have tri-lobed stigma, which along with the style top forms the commercial saffron. These stigmas along with their styles are dried to form the most precious spice.

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31 Andrabi, A., Zamir, R., (2012). Regional Variation in Food Crop Production in Kashmir Valley. *The Geographer*, *59* (1), 102-112

In Kashmir, the saffron cultivation begins first by the preparation of the fields in early July. The earth is tilled with the traditional hoe or tractors and from the loosened earth raised beds of convenient size formed which provide good soil aeration and drainage on which corms are planted. By October end the blossoms are in full bloom. The stigmas are bright orange-red and are clearly visible among the Lilac flowers. The harvesting is done regularly once the blossoms reach maturity to get the stigmas in their prime. The flowers bloom only in the morning making early picking necessary. Traditionally, planting, harvesting, separation of the stigma from the flower, drying of the saffron is done by all the members of the family. Timing of harvest and speedy processing is very important, as there can be rapid loss of quality, particularly in the coloring and aromatic properties of the saffron. Simultaneously, while the crocus blooms are being collected, the stigmas are separated from the flowers. The stigmas are naturally and slowly dried, where the stigma shrinks to one fifth of its original size and enhances its bright red color. Stigmas are either dried under sun or by using blower dryers for fast drying. People prefer sun drying under partial shade to preserve the shiny color of the saffron. Rigid, dry and stigmas without wrinkles are preferred for use. About 1,50,000 fresh flowers yield about one kilogram of stigma. In the world, Iran, Greece, Spain and India are the major saffron producing countries with, Iran occupying the maximum area of 43,408 hectares with a total production of 174 tons, and productivity 4.00 kg/ha, contributing about 88% to world's saffron production. Though, India occupies the 2nd largest area of 3,265/ha but the production is only 7.50 tons with an average productivity of 2.30 kg/ha. Spain, however, with 600 ha of land is the 3rd largest producers with an average productivity of 8.33 kg/ha which is highest in the world[32].

The leading saffron growing countries like Iran, Spain and Greece with intensive production technologies are able to achieve higher production and productivity (4-8kg/ha) which is much higher than our productivity and posing great threat to our saffron industry as imports are increasing every year. Thus, there is a need to increase production by bringing more area under cultivation and double the average productivity by adopting intensive production system, efficient processing and marketing to make it globally competitive and remunerative to growers.

32 Saffron present status and future strategies. (2012, November2). Retrieved from http://www.kashmirlife.net/saffron-present-status-and-future-strategies

Unfortunately, from the last few years, both area and production in J&K has come down from 5707 ha area in 1996-97 to 2742 ha during 2003-04 and the production from 15.95 MT to just 5.15 MT. After 2003-04 with the coming of Horticulture Technology Mission (MM-I and MM-II), the crop got the technological boost and incentives for area expansion and production with the result area since then increased from 3143 to 3785 ha and production from 6.86 to 9.46MT by 2009-10.

The productivity of saffron is very low mainly because saffron is grown as rainfed , so soils are thirsty and unfertile and overloaded with pathogenic fungi and rodents. Irrigation and nutrient management, corm rot and rodent control shall be the crucial factor to achieve high productivity. The traditional method of long planting cycles of 10-12 years are not good to manage as there is low plant population due to corm rot, no irrigation, hardly any manure and fertilizer application resulting in too many nonproductive corms. To improve production and productivity, the weaknesses in our production system need to be upgraded and replaced with new elite high yielding clones and intensive production and protection technologies including the large scale production of quality flower bearing corms and its post-harvest management so that that the production and productivity is doubled.

1.5.2 ZONE-II (1,851-2,451 meters)

This Zone of undulating slope (10-20)º embraces about 30 per cent of the total area of Valley. Being a transitional zone between the Hills and the Valley Floor, it displays an intermingling of the land use characteristics of both. While a good proportion of area is given to crops, an equally sizeable area lies under forests or is used as grazing land. Areas characterized by less steep slopes are normally preferred for cultivation, which give way to grazing as the angle of slope finally rules it out. “Locally called as “Margs” or “Bahks”, grasslands or meadowlands are a common feature of this zone which over the years have evolved into species rich communities and provided the ecologists and botanists with many opportunities for the ecological research. Beyond this academic interest these ecosystems have also served as potential summer pastures and cattle grazing areas for low lying populace since ages, wherein the people seasonally migrate to the higher Alpine areas to graze their livestock.[33]

33 Retrieved from http://www. Kashmir dispatch.com

It is evident that carrying capacity of the grasslands in the mid altitudes in the Himalaya is low, the primary reason being their excessive exploitation by unlimited number of herbivores throughout the growing season. It is also evident that these grasslands can recoup remarkably once the biotic factor, i.e. the grazing animal is deferred and the grasslands protected, the rate of recovery depending on the soil and climatic factors The nutritional quality of the herbage from the higher altitude grasslands is superior to that of the lower altitude, which comprise mainly of tropical and sub-tropical species and are devoid of legume component. Carrying capacities of these grasslands can be increased further by split application of 80 kg/N/ha (Sharma and Ghosh, 2012)[34]. Excepting the Alpine pastures, there are no true grasslands in India. Intermixed with forest vegetation are found at times fairly extensive stretches of grasslands in different altitudes in the Himalayan ranges. Some of these grasslands have existed since the recorded history of pastoralism in India. Examples of such grasslands are "Margs" in Kashmir and "Bughiyals" in Uttar Pradesh. With the increase in population pressure, more and more forests are being felled and these areas are being converted into grasslands.

Higher up the forest seems to be the only conceivable land use. This zone includes the side valleys of River Sind upto Wangat and Sonamarg, River Madhumati, Erin.Pohru and other affluent tributaries of Lolab Valley. Tourist spots like Kokernag and Tangmarg and few religious places like Charar-e-Sharif are located in this zone (Naik,2008)[35].

1.5.3 ZONE-III (2,452-3,052 meters)

This zone of moderate to steep slope (20-30)º extends over 16.4 per cent of the total area of Valley. With increasing altitude, the forest becomes sparse, leaving summer grazing as the only option. These grazing lands attract nomadic tribesmen with their herds of sheep and goats from far and near. More than half of the geographical area of the state is alpine grasslands and under permanent snow. The alpine grasslands of Jammu and Kashmir account for 77% of the total alpine grassland area of 1,71,464

34 Sharma, J. R., Ghosh, A. N. (2012). Grassland Productivity in the Himalaya and Performance of Introduced Temperate Forage Species in Cold and Semi-Arid Environment, Temperate and Tropical Grasslands, Session 21. Retrieved from *lib.icimod.org/record/2217/files/5-parks.pdf*

35 Naik, A. B. (2008). *Tourism Potential in Ecological Zones and Future Prospects of Tourism in Kashmir Valley*. An unpublished Ph.D. thesis: Dept. of Geography, A.M.U-Aligarh.

km^2 of the Indian Himalayas (Lal et al. 1991)[36]. These grasslands, which are regarded as the outcome of forest regression, are characterized by a large number of herbaceous communities with varying proportions of tussock-forming grasses and sedges (Rawat and Rodgers, 1988)[37]. Besides being essential and integral to the bovine economy of the state, the grasslands play a vital role as a storehouse of various important medicinal plants (Dhar and Kachroo, 1983)[38].The climate of these grasslands is temperate with four usual seasons a year. The grassland remains snow-free from late April to late October, which determines movement of nomads. The mean monthly air temperature during this growing season ranges from 11˚C in September to 29˚C in July. Frequent winds, cloudiness, drizzling mist and fog are common in the first part of the growing season, while clear sky with longer duration of sunshine is prominent in the latter part. Besides sheep, goat and cattle, some wild animals such as Himalayan black bear, Brown bear and Common leopard are seen in these grasslands. The grassland comprises following broad zones; flat undulating valley, lower slope and upper slope.

1.5.3.1 Flat valley

This zone is a flat and long area of the grassland, which is comparatively exposed to no arboreal element. In this zone Sibbaldia cuneata, a tussock-forming grass, with woody stems grows well as a dominant species Theother species include Cirsium wallichii, C. falconeri, Malva neglecta and Sambucus wightiana besides Rumex nepalensis.

1.5.3.2 Lower slope and Upper slope

The zone of lower slope adjoins a forest and is comparatively rich in shrubs. Because of the medium slope, grazing animals use the zone evenly. The upper slope zone represents the highest elevated area of the grassland. Steep slopes, rock boulders, stone crevices and passes that lead to the other higher areas are the major features of this zone. To explain the differences in the floristic composition among these zones of

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36 Lal, J. B., Gulati, A. K., & Bist, M. S.(1991). Satellite Mapping of Alpine Pastures in the Himalayas, *Int..J.Rem.Sens*, *12*, 435-443.

37 Rawat, T. (2010). *Mountain Tourism: Research and Development.* Sarup Book Publishers Pvt. Ltd: New Delhi.

38 Dhar, U., & Kachroo, G. (1983). *Alpine Flora of Kashmir Himalayas. Scientific Publishers*: Jodhpur. pp.1-28

the grassland, it is necessary to consider both environmental conditions (e.g. microclimate, topography, number of habitats and grazing intensity and frequency) and characteristics of plant species in the individual zones.

Among these zones, snow melting starts earliest and occurs fastest in the flat valley, while it usually starts at the end of May and takes 2–3 weeks to complete in the lower and upper slopes. The flat valley is, thus, available for grazing at the earliest time and some shepherds camp in and around this zone with their animals before ascending to the higher alpine grasslands .The alpine grasslands of Kashmir Himalayas have been subjected to various threats (Bhat, 1987)[39]. In recent years, overgrazing has occurred in these mountain grasslands due to a decrease in grazing area and an increase in livestock population. While the decrease in grazing area is attributed primarily to the widespread land conversions at lower elevations, political instability has restricted the availability of high-elevation grasslands to herders through the use of the grasslands as military barricades. The increase in livestock population reflects what we commonly observe as a ‘‘cattle boom’’ in particular areas. The end result of such changes has been an alteration in the structure and life forms of the alpine grassland ecosystem. Since Species richness and diversity decrease with increasing degree of disturbance, thus, the degree of human interference is most severe on the flat valley zone, while the upper slopes experience a light to moderate grazing due to steep slopes and high elevations. Although the species richness is highest in the upper slope Zone

World famous places like Gulmarg (2,690 metres) and Khilanmarg (3,100 meters) are the main spots of tourist attraction in this zone. The Gulmarg is believed to have been called *'Gurimarg'* in ancient times and the modification of the original name is said to have been made at the instance of 15th Century Kashmiri king Sultan Yusuf Shah Chak, who was enamored with the place. If it were historical endorsements that Gulmarg sought, then the visits of the Mughal emperor Jahangir established the measure of its worth[40].The resort was a great attraction for several British officials posted in India and their families made Gulmarg their home for the summer months. The presence of these holiday makers was also responsible for the foundations of the

39 Bhat, G. A. (1987). Analysis of animal Community in Dachigam Pasturelands. *M.Phil. Thesis, University of Kashmir*, Srinagar.

40 Kuchay, N.A., & Bhat, M. S. (2013). Tourist Flow and Tourism Potential Regions of Gulmarg in Kashmir Himalayas. *Global Journal of Human Social Science Research, 13* (4).

two activities that Gulmarg today is best known for golf and skiing, initiation of both dating back to the early twentieth century.

Gulmarg is located 46 km from Srinagar city, geographical coordinate's 34.05°N 74.38°E. It has an average elevation of 2,690 m above mean sea level. The average temperature varies from its minimum of -4°C in January to maximum of 31°C in the month of July Gulmarg has a long history of tourist activities as it has remained a favourite destination of early Muslim rulers like Yusuf Shah Chak and the Britshers ruling India. Gulmarg is an all-weather resort with refreshing summer meadows and pastoral scenes and deep powder, long-run skiing and snowboarding during winters. Therefore, tourist flow to this all season tourist destination continues throughout the year.

1.5.3.2.1 Tourism Potential Regions

Gulmarg is a multiple attraction tourist place and offers a varied range of tourist related attraction, therefore to analyze the different areas of tourist interest it has been divided into following tourist regions.

1.5.3.2.1.1 Gulmarg Gondola Region

Gulmarg Gondola is the world's second highest and Asia's highest and longest operating cable car since the closure of the Mérida cable car of Venezuela in 2008. The gondola operates in two stages – first stage is from Gulmarg base to the bowl of Kangdoori and the second stage is from Kangdoori to Ararat peak. The two-stage ropeway ferries about 600 people per hour to and from the gondola main station in Gulmarg to Arara summit

1.5.3.2.1.2 Gondola Lift to Gulmarg to Kangdoori

Gondola car is one of the main attractions of the place. The first of two sections of the cable car rises from the cable station at Gulmarg at an altitude of 2,700m to bowl shaped Kangdoori at an altitude of 3,100 m –a vertical rise of 400m.

1.5.3.2.1.3 Gondola Lift to Kangdoori to Afarwat

The second stage of the Gulmarg-Afarwat cable car project connects Kangdoori station at 3,100 m with the heights of Afarwat peak at 3,979 m – Afarwat is the mountain that looms over Gulmarg and is the magnet for serious skiers.

1.5.3.2.1.4 Golf Course Region

Gulmarg Golf Course is the world's highest golf course. The 18-hole, par 72 Gulmarg golf courses is quite hilly. The Golf club itself was built in 1904 by British residents. It also offers table Tennis and Billiards. Temporary membership can be bought for the duration of stay. Course remains open from April to November, after which it is covered in a blanket of snow. This Government Golf Course was the second to be built by the British in India after the Royal Calcutta Golf Club. By the 1920s the resort had two 18-hole courses, the 'Upper Course' and the 'Lower Course' and one 9-hole middle course (the "Rabbits Course"). The only course to survive, however, exists where the Upper Course used to be. It was redesigned in 1970s by Peter Thomson. At an altitude of 3,730 m, Gulmarg Golf Course is among the highest and most beautiful green golf courses in the world.

1.5.3.2.2 Gulmarg Skiing and Snow-Boarding Region

While Gulmarg is an all-weather resort with refreshing summer meadows and pastoral scenes, the main reason to come here, at least in winter, is the long-run skiing and snowboarding. The Himalayan resort of Gulmarg is one of the newest and increasingly popular ski destinations. Due to its geographic location Gulmarg gets some of the heaviest snowfalls in the Himalayas and it has earned the distinction of being the best ski resort in the Himalayas. Skiing was first introduced to Gulmarg by two British Army officers who established the first ski club in 1927 although it wasn't until 7-8 years ago when Gulmarg's name really first started to appear on the cognoscenti's hot list. Some of the best slopes in the country for beginners and intermediate skiers are available at Gulmarg. Skiing equipment is available on hire from the Ski-Shop. In winter Gulmarg's natural slopes and inclines turn into the country's premier skiing resort. Not all tourists who visit in winter come for skiing – some simply are there to watch the skiing or to enjoy a holiday in the snow. Among the multitudes of slopes, there are a few which are serviced by ski lifts. Most of the skiing becomes centered on these slopes, which are specially suited to beginners and intermediate level skiers, with ski runs ranging from 200 m to 3kms, instructors are available for both levels. With the operation of the Gulmarg Gondola Cable Car, it has become all the more convenient for advanced skiing enthusiasts, as they can gain a ski

run of nearly 3 km with the help of this cable car which goes through Kangdoori to Afarwat.

1.5.3.2.3 Other Attractions

This includes Khilanmarg, Alpathar Lake and some religious shrines which are elaborated as under:

1.5.3.2.3.1 Khilanmarg

A path of some six kilometers and an ascent of about six hundred meters from Gulmarg take to the little highland dale of Khilanmarg. The narrow bridle path is lined by grassy knolls and a variety of trees and shrubs that include masses of daises, mulberry, berberis and walnut among others.

1.5.3.2.3.2 Alpathar Lake

At a distance of about 13 kilometers from Gulmarg, at an altitude of around 3,840 m is the little lake of Alpather. Like many other high-altitude lakes in the mountainous parts of the western Himalayas, this lies in a shallow mountain bowl and is surrounded by limited plant growth.

1.5.3.2.3.3 Religious Shrines

There are four main religious shrines in and around Gulmarg. A few kilometers from this glade, is the tomb and *'Ziarat'* (shrine) of the noted Muslim saint *Baba Rishi* built in 1480AD. Other important religious sites include Rani temple, dedicated to *Lord Shiva*, and the old St. Mary's Church built by the British holiday-makers. Also in Gulmarg's vicinity is the Avanti swami temple that dates back to the ninth century and is dedicated to *Lord Vishnu*. Thus Nestled with stunning peaks in the Himalayan ranges, Gulmarg is a spectacular picnic spot attracting all kinds of tourists with its lush green backdrop, beautiful landscapes, flowering gardens, serene lakes and pleasant climate during the summers and falls. This imposing hill station was a pleasure resort for kings and royal family members and a summer retreat for the British officers during the British rule in India. Gulmarg Gondola, one of the highest cable cars in the world, reaching 3,979 meters. Gulmarg is the heartland of winter sports in India. Due to its steep terrain, the region is popular amongst advanced and extreme skiers from around the world and has been visited by a number of ski

professionals. Gulmarg golf club is the highest green golf course in the world. There are a few places of religious importance near the resort. The summer is equally busy. With temperatures ranging from 25 to 30 °C, Gulmarg attracts outdoor sports fanatics with its world class golfing, trekking, mountain biking, horse riding, water skiing, and fishing. It has been observed that the tourist flow is highly imbalances vis-a-vis the various tourist regions and different seasons of the year. During the summer months certain regions remain over crowded, beyond their carrying capacities which is a great threat to the fragile ecological setup of the region. Therefore, there is an urgent need to regulate the tourist flow across the different tourist regions and different seasons of the year through proper marketing, infrastructure development and better accessibility. This in turn will help in minimizing the adverse environmental impacts, maximizing the economic gains and over all sustainable development of the region.

1.5.4 ZONE-IV (3,053-3,653 meters)

This altitudinal zone lies higher-up in the hills where the angle of slope ranges between 30˚-40˚. It can't be put into any productive use. The slopes facing the river beds are, however, occasionally used for grazing purposes. The land is devoid of any vegetation cover except a variety of poor grasses which don't invite much grazing activity. However, the migration from one particular altitude to another is necessitated by various factors like availability of additional area and the inherent quest of the human mind to explore and know new areas. Thus, the migratory flocks of *Gujjars* and *Bakerwals* accompanied by both male and female members of the family disperse towards these alpine and sub-alpine pastures in summers. However, the females don't go beyond the subalpine areas where most of the Gujjars have constructed their summer huts of mud. The women stay here till the return of flocks from alpine areas. Buffaloes and cows are not taken for grazing in alpine areas because of the steeper slopes and they remain here during summer. There are no dwellings in the alpine areas and the grazers have to brave the rains and cold climate in open, sitting under a rare tree or a rock cliff. Every flock of sheep has 2-3 goats who act as guide for grazing. The sheep always follows the goat for foraging. Besides the goats, every flock has 2-3 ferocious dogs that guard the sheep during night. The night dwellings for the sheep and goat are well marked and can be easily identified being a flat, circular patch of bald land. In most of the pastures the grazers earmark certain grazing areas and do not use these for grazing. These preserved areas are opened for grazing

before downward migration. The *Gujjars* believe that grazing in these areas fattens the sheep and goat and it helps in withstanding the arduous journey to the lower hills. Some of the important grasslands of this zone are as:

1.5.4.1 Matri (Mantri Gali)

Located too close to district headquarters of Bandipora, this is the only grassland site which falls outside Gurez valley and is grazed for relatively longer periods than others. It extends between 34°30´N - 34°31´N and 74°46´-74°47´E, with altitude ranging from 3,100- 3,500 m above sea level. Soils are mostly hill type with brown to black at surface and brown in sub-soil. Enroute to higher alpine areas; it acts as a main grazing base, with relatively little variation in slope and habitat types compared to others. The nomads and pastorals from both nearby and far off places use this area as a first summer grazing ground and a resting place for their livestock. Users are mostly Kashmiri Chopans and Gujjars whose livestock consists mostly of sheep, goat, few cattle and horses but no buffaloes. The adjacent forest has *Pinus wallichiana* and *P. roxburghiana* on drier slopes while *Cedrus deodar*a occurs occasionally deep down the area. While patches of *Juniperus wallichiana* are found scattered towards its lower elevations, a few trees of *Pinus* are also found scattered towards higher slopes which possibly appear as remnants of an old forest patch. Himalayan Black Bear and Common Leopard were commonly sighted here.

1.5.4.2 Viji (Viji Gali)

Extending between latitudes (34˚33´- 34˚34´N and 74˚43´- 74˚45´E) and altitudes (3,668 to 4,170 m above m.s.l.), this grassland exhibits a typical alpine topography with a distinct landscape. Relatively high soil wetness, total absence of tree species in and around its immediate periphery and occurrence of big sized rocks and stony boulders over its vast tracts are few of its important topographical features. Soils are coarse, well drained but acidic all over. It remains snow bound for almost seven months a year from late October to early May. During summer, days are warmer and temperatures range from 12ºC (early June) to 27°C (July) during the growing season. But nights are cool with high speed cool winds blowing across the grassland. Grazers comprise mostly of *Chopans* and *Bakerwals* while *Gujjars* are very less. The area is grazed mostly by sheep, goat, few cattle and horses, while brown Bear, Himalayan black bear, common leopard and long tailed marmot are notable wildlife of the area.

1.5.4.3 Minimarg

Located at a distance of 16 kms from the headquarters (Dawar) of Gurez Valley, on its eastern side, this grassland extends between 34º31´- 34º33´ N and 74º 51´-74º53´at an altitude of 3,100 meters above m.s.l and is accessible only by foot on a steep path. The diverse topographic features offer many habitats and microhabitat types for a variety of herb species to grow in main grassland area while woody *Pinus*, *Oak*, *Betula* and *Cedrus* grow in nearby adjacent forest. A few *Betula* trees are also scattered in main grassland, which is traversed by a stream running across it. With the melting of snow, vegetation starts growing from late April and comes to its full bloom during July to September and starts dying out by the end of October. At its lower altitudes, grazing starts in early June and reaches a maximum in July-August when its higher altitudes are also grazed and stops by early October. The area is also important as all three ethnic communities (nomadic Bakerwals, semi nomadic Gujjars and semi-sedentary Kashmiri Chopans) utilize it, with Gujjars almost equal in number as *Bakerwals* while *Chopans* are least. Besides domestic livestock, some wild animals like Himalayan black bear, barking deer and Marmot (*Marmota himalayana*) are also common in this area.

1.5.4.4 Patalwan

Extending between 34º31´N- 34º35´N latitude and 74º49´E-74º51´E longitudes and altitudes at 3,190 meters above m.s.l., this grassland also occurs on the eastern side of Dawar in Gurez valley. Users are a mix of all three ethnic tribes with Bakerwals dominating, followed by Chopans with Gujjars the least. The grassland is characterized by boulders of varying size and has a big stream originating from higher mountain reaches and flowing across on its eastern side. The slope shows marked fluctuations with rocky outcrops and cliffs being present at many locations across the grassland. The area is traversed by numerous human tracks and trails which people use to visit Gurez. A patch of *Betula utilis*, most of them growing in a tilted fashion exist on the relatively steep slope on its north western side while a small patch of forest also grows on the main grassland, within which small herbaceous patches occur in an interspersed fashion. The lower reaches of the area (not included in the grassland) are heavily forested. Forest also grows on the main grassland, within which small herbaceous patches occur in an interspersed fashion. The lower reaches of the

area (not included in the grassland) are heavily forested. The wild life and the pattern of grazing are similar to Minimarg.

In the recent years migratory grazing is declining at a faster rate in the case of the Gujjars because of their sedentary agricultural practices but the Bakarwals still practice it and the sub-alpine and alpine pastures are still a matter of concern. The high stocking rates and poor management have rendered these pastures as low producers of herbage biomass. A considerable amount of research and development inputs are required to manage these pastures so that their real potential is exploited.

1.5.5 ZONE-V (Above 3,654 meters)

This constitutes the topmost altitudinal zone of the Kashmir Valley which is suitable for Adventure Tourism like Trekking. Skiing, Rock climbing and Shooting etc. It is the steepest (slope above 40˚) and the coldest zone were winters are very severe and temperatures even dip to -20ºC (Ara, 1994). At these higher elevations, vegetation is rather sparse and dotted mostly with moraines, boulders and slopes of varying steepness with few important shrubs like cassiope fastigiata and Rhododendron growing as extensive patches. The reported wildlife includes endangered snow leopard (Panthera unicia), Hangul deer (Cervus elaphus hangul), barking deer (Muntiacus muntjak), musk deer (Moschus moschiferus), Himalayan black bear (Selenarctos thibetanus), Himalayan brown bear (Ursus arctos), common leopard (Panthera pardus), markhor (Capra falconeri), ibex (Capra ibex) and long tailed marmot (Marmota caudata) besides few reptiles like Mabuya carinata, Agama himalayana and Gloydius himalayanus. A number of glacial lakes which remain frozen for most part of the year are also found in this zone. Thus, with the increase in the gradient and altitude, land remains covered with perennial snow and it is these snow fields which feed all the rivers and are the ultimate source of all the life in Kashmir Valley. Because of prolonged persistence of snow which inhibits its formation and development, soil appears thin, highly unstable, poor and less productive here. This zone comprises the hillocks and mountains surrounding the main valley and the side valleys. Some of the important mountain ranges include following:[41]

41 Peace Kashmir. Retrieved from http://www.peacekashmir.org/jammu-kashmir/geography.html

1.5.5.1 Pirpanjal Range

It separates Kashmir valley from the outer Himalayas and is about 2,621 Kms in length and 50 Kms in breadth. Famous Banihal pass (2832 meters) lies in the shape of a tunnel on its peak; it remains covered with snow during winter making it impassable. At a height of 2,200 meters above sea level 'Jawahar Tunnel' has been constructed. The tunnel is 2,825 metres long and it was opened for traffic on 22nd Dec. 1956. On the other end of this range lie Baramulla pass (1,582 metres) and Hajipir pass (2,750 metres). Hajipir joins Poonch and Uri.

1.5.5.2 Harmukh Mountain

This is a range of the Himalayas and is situated at a height of 5,141 meters above sea level towards Bandipore between the rivers Jhelum and Kishan-Ganga valley.

1.5.5.3 Amarnath Mountain

This is famous for its holy Amarnath Cave, at a height of 5,372 meters above sea level, which thousands of pilgrims visit every year on *Rakshabandan* (Festival). They have to pass Mahagunas pass on their way to Shri Amarnathji. Gwasharan (5,450 metres) is situated in the Liddar valley towards Pahalgam; on it lies the famous glacier Kolahi. Sheeshnag mountain also spreads in this valley. It is called Sheshnag as its peaks resemble the heads of seven big snakes.

1.5.5.4 Toshmaidan

Toshmaidan (4,270 meters) and Kajinag (3,700 meters) mountains lie in the Inner Himalayas. They remain clad with snow throughout the year, but during summer when the snow melts, the water flows down into the Jhelum River.

To conclude with the above discussion, it can be rightly noted down here that while making a vertical ascent from the floor of the Kashmir Valley towards the mountains, the clear cut changes in the geographical phenomena become distinctively visible; e.g., in case of the settlement patterns and density which are of linear type along River Jhelum and denser in and around the valley floor comprising the first altitudinal zone of our study and keep on becoming sparse and dispersed towards upper zones by decreasing in their number and increasing their inter-spatial distance because of the relatively steeper slopes. Secondly, the Valley Floor is much fertile bearing huge

potential to produce agricultural crops mainly Rice, wheat and mustard which decreases and paves way to maize and barley etc. towards the upper zones because of the decreasing water availability and thin layer of the soil. Thirdly, the valley floor zones are rich in the diversity of forest cover but under huge pressure due to deforestation activities and other human encroachments these are getting depleted. Thus, forest cover increases because of lesser degree of disturbances and then deceases towards the steeper mountain slopes in the upper zones. On the other hand grassland cover which is almost negligible in the Valley floor zone, because of dense settlements and vast agricultural land, increases quite drastically towards the upper zones and shows a rapid decrease in the uppermost zone because of the barren topography. Lastly, the lower zones are the areas of high density of transportation and communication networks and other infrastructural facilities which become lesser in proportion towards the upper zones because of the undulating topography and rugged terrain especially the steeper slopes.

1.6 Natural Vegetation of Kashmir Valley

The character of natural vegetation in a region is the outcome of various environmental factors viz- lithology, slope, altitude, climate, soil and Rainfall. Kashmir Valley presents a highly varied picture in this respect. It has its own distinctive type of vegetation cover which is different to that of middle mountains and forms one of its greatest charm. The delightful pine trees, the magnificent walnuts; the endless willows, the poplars and the elms, the countless orchards of apples, pears and apricots give the valley the appearance of a well-wooded park (Lawrence, 1967)[42]

Besides being highly variegated, the natural vegetation of Kashmir Valley is luxuriant and well developed or stunted in tracts where edaphic and climatic factors thwart its growth. The primordial vegetation has, however, been substantially modified by climatic change and millennia of human interferences, as evident from intensive exploitation, clearance of forest cover for agriculture and indiscriminate felling and overgrazing.

There is some paleontological evidence to show that the vegetal cover of Kashmir Valley underwent a stupendous change from tropical and sub-tropical to temperate

42 Lawrence, W. R. (1967). *The Valley of Kashmir*. Kesri Publishers : Srinagar.

types during the glacial phase of the Pleistocene. While recurrent glaciation destroyed the original vegetation completely, the uplift of the Pir Panjal also played a key role in this climatic and floral transformation by preventing the South West monsoon from penetrating the Valley. This expedited the disappearance of the broad leaved species which were once predominant in the low lying areas in the Valley and their replacement by coniferous types, such as Deodar, became a smooth affair.

In fact, a classification of the natural vegetation is quite possible according to their habitat and based on compositional variations which are caused by locational factors. While the ecological and locational factors generate variations in the character and composition of plant communities at any level, far more interesting is the zoning of vegetation in the vertical plane which is explained by locational factors like terrain, slope and soils, altitude and aspect. Although altitude and aspect play an important role in determining the availability of heat, moisture and humidity, structure and soils exercise a far greater influence than altitude or climate.

The following belts may be identified as a generalized expression of the altitudinal zoning of vegetation as (1) A low altitude temperate forest occurs in the Kashmir basin between 1,525 meters and 2,286 meters consisting of mixed vegetation of broad leaved varieties such as poplars, walnuts, elms and conifers, mainly blue pine and deodar. (2) Above 2,135 meters, the broad leaved varieties are outnumbered by conifers. This is the zone of the coniferous forests par excellence. The elm is, however, known to occur up to an elevation of 2,745 meters. The chief coniferous varieties which occur between 2,100 and 3,200 meters include blue Pine, fir and low level silver fir. (3) The next zone consists of the alpine forests usually above 3,200 meters. Initially, at altitudes of 3,200 to 3,660 meters, occurs the white Birch, the most common species. Above it, between 3,660-4,110 meters, the most common tree is the stunted Juniper. (4) The alpine forest is often associated with alpine meadows in which temperate species such as Poa, Glyceria and Fescuta are predominant.

The vegetation of Kashmir Valley may be broadly classified into two categories as:

1.6.1 Forests

Forest Ecosystems have a much greater significance for man than is revealed by mere statistics. In the first place, they play a crucial role in the maintenance, preservation

and reservation of the gamut of land resources. They enrich the soil by providing much needed organic matter and enhance its water holding capacity. Equally important is their role in checking soil erosion and excessive run off from hill slopes and other areas susceptible to erosion. In fact, they are a vitally important component in man's environment and are inextricably linked with all other ecosystems.

Forests spread over 51 per cent area of Kashmir Valley (Dar and Khuroo, 2013)[43] mostly where the annual rainfall is about 100 centimeters. However, scrub forests are found in the areas receiving even less than that amount. Baramulla and Anantnag districts have 71 per cent and 60 per cent of their areas under forests respectively. The Valley of Kashmir has deciduous vegetation. The Chinar, Poplar, Deodar, Fir, Pine, Kail, Mulbery, Walnut as well as the fruit trees grow throughout the Valley.

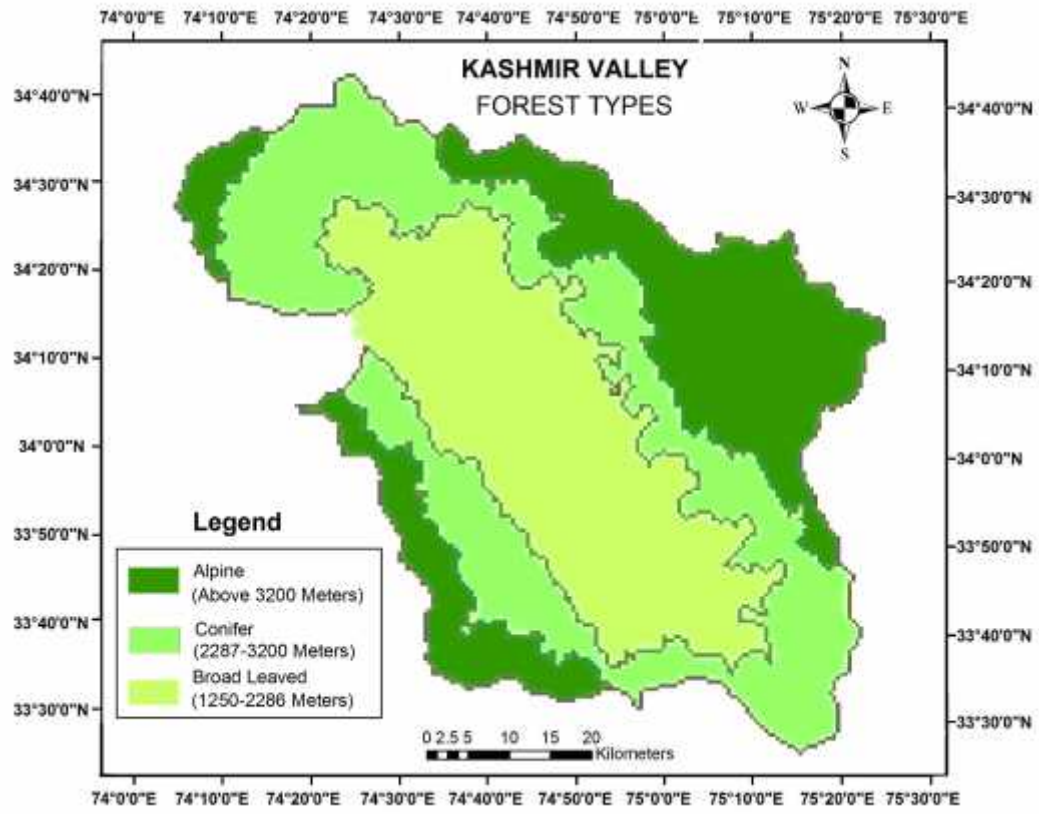
Table 1.2 - Most Common Trees found in Kashmir Valley Forests

Common Name	Local Name	Botanical Name	Characteristics
Deodar	Deodar	Cedrus deodara	Evergreen
Himalayan Blue Pine	Kairu (Kail)	Pinus excels	Used as timber
Himalayan Silver Fir	Budal	Abies webbiana	Provides timber
Yem	Posthal	Taxus baccata	Medicinal use
Elm	Brenn	Ulmus wallichiana	Rare species
Walnut	Dun	Juglans regia	Anti pest
Italian Poplar	Phrast	Populas nigra	Used as timber
White Poplar	Dudh phrast	Populus alba	Used as timber
Maple	Kanar	Acer spp.	Commercial use
Willow	Vir	Salix tetrasperma	Used for bat making
White Birch	Burza	Betula utilis	Rare species
Plane	Boin (chinar)	Platanus orientalis	Cooling effect

Source: Department of Forests and Wild life, Srinagar, Jammu and Kashmir

43 Dar, G. H., & Khuroo, A. A. (2013). Floristic Diversity in the Kashmir Himalaya: Progress, Problems and Prospects. *Sains Malaysiana, 42* (10), 1377-1386.

On the basis of their genetic characteristics, forests of Kashmir valley are classified into Montane, Temperate and Alpine. The Montane and Temperate forests are usually found between 1,500 and 3,200 meters. They have a lower zone (1,500-2,100 meters) in which the broad leaved varieties are preponderant and a higher zone (2,100- 3,200 meters) in which the conifers predominate. The Alpine forests occur at an average elevation of 3,200 meters and above. The main features of the flora of Kashmir Valley include (1) Absence of Oaks as a climax species and of Laurels and low level Rhodendrons (b) A preponderance of Fir, and (c) Negligible occurrence of Spruce.



Source: Forest Department, Srinagar, Jammu and Kashmir

Figure 1.4

1.6.2 Grasslands

Climatic and edaphic conditions, particularly in the surrounding highlands, favour the growth of a variety of temperate and alpine species of grasses. These pastures are of immense economic significance to the Gujjars and Bakerwals whose transhumant pastoral economy is based on them. However, they play a far more important role in thwarting run-off and soil erosion from the steep slopes with a thin soil cover. An abundant supply of sunshine and moisture are the only necessary conditions required

for the growth of grasses in these highland meadows called *"Margs"*. These pastures cover extensive areas on the periphery of glaciers on tracts having glacial moraines and other deposits providing the soil base for the rapid regeneration of grasses under optimal climatic conditions. (Raza, et. al, 1978)[44].

The grasslands of the Kashmir Valley are a temperate variation of the mesophiclons group. They are recognized as bio-edaphic communities. Puri has noted the growth of a variety of species of grasses mixed with other forms of vegetation in two main types of Alpine meadows: Glacial moraines and other types of soils in situ or transported by snow melt (Puri, 1960)[45]. The grasslands occupy about one tenth of the total area in the Valley. The main pastures have been depicted in figure below. They are subjected to intensive grazing by Gujjar pastoral groups who cross the Pir Panjal Range with their herds of goat and sheep during summer. The Gujjar transhumant economy, like that of the Kirghiz in the Tien Shan, is an interesting phenomenon of great social significance.

Summary

This chapter has tried to make a brief attempt to understand the geographical personality of Kashmir Valley in the light of its climate, drainage pattern, landforms, scenic beauty, altitudinal zonation and natural vegetation. It has been highlighted that Kashmir Valley, a separate geographical region, is the core of mighty Himalayas. It includes all the land lying within the water divides formed by Pir Panjal Ranges in the South and Himalayan Ranges in the North Kashmir and encircles the great synclinal trough occupied by River Jhelum.

In its administrative setup, Kashmir Valley consists of 10 districts and 41 tehsils. This flat alluvial basin measures only 150 kilometers from South-East to North- West and 42 Kilometers from South -West to North- East. Out of the total area of the Valley, nearly half is under *Karewas* and an area of around 260 square kilometers is under water bodies. River Jhelum that passes through the heart of Kashmir Valley has a paramount significance in its regional structure. It acts as a binding force to give

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44 Raza, M., Mohammad, Ali., & Ahmad, A. (1978). *The Valley Of Kashmir- A Geographical Interpretation- The Land*. Vikas Publication: New Delhi. Vol (1).

45 Puri, G. S. (1960). *Indian Forest Ecology*: *A comprehensive survey of vegetation and its environment in the Indian subcontinent.* Oxford Book & Stationery Company: New Delhi.

cohesion to the Kashmir Valley. The lakes of Srinagar may be regarded as the enlarged ox -bows and abandoned courses of this river.

In latitude, Kashmir Valley corresponds with Peshawar, Baghdad, Damascus, Fez and South Carolina. Here, every thousand feet of elevation brings some new phase of climate and of vegetation to it. The Valley is well known throughout the world for its natural beauty. Its lakes, green meadows, dancing and foaming streams, majestic forests full of fir and pine and snowcapped mountains are common attractions to the outsiders as well as to the native.

The Valley floor is much fertile, highly dense and urbanized with better levels of transportation and communication than the surrounding hilly areas of the region. This is also the area of largest number of wetlands and water bodies as well as the huge tourism potential.

CHAPTER II

SURVEY AND REVIEW OF RELATED LITERATURE

2.1 Literature Survey: Concept and Significance

A Literature Review is a "systematic, explicit and reproducible method for identifying, evaluating and synthesizing the existing body of completed and recorded work produced by researchers, scholars and practitioners." *(Arlene Fink)*[1]

Survey of related literature is the foundation of a scientific enquiry. A perusal of the existing and relevant literature which has appeared in different forms like books, papers, articles, published and unpublished theses and reports etc. provides information about the nature of enquiry already undertaken to understand the remaining problems more thoroughly and accurately. It is very essential for every investigator to know the literature related to his/her problem under study which has already been done or worked out by others. It is considered as the most important prerequisite to actual planning and conducting a research. It assists the researcher not only in providing information available in the field of research but also in suggesting the methods to be adopted, avoiding the mistakes done by others and locating the gaps in the earlier works by others as well

Researchers seek help from the existing knowledge which has been collected in the past as a product of constant human attempt. In the process they help generate futuristic knowledge. Any worthwhile research in a field of knowledge requires an adequate familiarity with the work which has been done already in the area. A summary of the writings of recognized authorities and of previous researches provides sufficient evidence that the researcher is familiar with what is already known and what is still unknown. Since effective research is based upon previous knowledge, this step helps to eliminate the duplication of what has been already done besides helping in the fixation of useful objectives, formation of appropriative hypothesis, drawing of meaningful conclusions, and making commendable suggestions.

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1 Fink, A. (2005). *Conducting Research Literature Reviews: From internet to paper*. Sage Publications: Thousand Oaks.

A brief review of the previous investigations pertaining to the present study is very essential as not only it gives the present investigator an understanding of the previous works that have been done but also enables him/her to know the means of getting to the front in the field of study. Unless it is learnt what others have done and what still remains to be done, the present investigator cannot contribute to the further knowledge in the field.

According to Hart, "Literature review is the use of ideas in the literature to justify the particular approach to the topic, the selection of methods, and demonstration that this research contributes something new" (Hart, 1998)[2]. Shah is of the view that "Review of literature explains how one piece of research builds on another" (Shaw, 1995)[3]. According to Webster & Watson "Literature review creates a firm foundation for advancing knowledge" (Webster & Watson, 2002)[4].

In the light of the importance of the survey of literature, the investigator felt that a careful study and exploration of the related literature is a guideline to pursue a work with effective parameters. The investigator has, thus, reviewed the related studies along with findings in chronological order starting from the oldest. The whole chapter has been broadly studied under two broad sections and both these sections have been sub-divided under three headings viz., international studies related to the problem, national studies and studies related to the particular area of concern. The description is given as under:

2.2 Survey of Related Literature on Tourism

This section can be studied under three sub headings of International, National and Regional (Kashmir Valley) level Tourism as follows:

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2 Hart, C. (1998). *Doing a literature review: Releasing the social science research imagination.* Taylor & Francis: London.

3 Shaw, J. (1995). A schema approach to the formal literature review in engineering theses. *System, 23* (3), 326. p.326

4 Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly, 26* (2), 13. p.13

2.2.1 Literature on Tourism at Global Level

Vaughan and Long (1982)[5] opine that tourism has often been supported by government agencies on the basis that it is capable of generating income and jobs in the areas where there is a shortage of both with special reference to Britain. He revived the nature of the jobs created by tourism and assesses the attitudes of people to such jobs in an attempt to suggest how tourism compares with other activities in generating the employment.

Murphy (1985)[6] advocated an approach centred on the goals and aspirations of the communities affected by tourism. He argued that one of the important elements has been neglected in the tourism research. i.e. the needs and desires of the local communities affected by the tourism and suggested that tourism should be considered as a renewable resource, subjected to the same strains of degradation and overuse as forest, air and water.

Karan and Mather (1985)[7] studied the impact of tourism on the environment in the Khombu area of Nepal wherein they pointed out that tourism has brought a plethora of environmental disruption to this formerly remote, unspoiled region. The hotels built by Japanese firms have caused local pollution. Aeroplane landing in the nearby Shyangboche airstrip has shattered the splendid silence of the mountains, the trekking on yak contributed to the environmental damage of the land, scenic sites and loss of local monuments like the Mani wall along the trekking routes. Although government has taken steps to conserve the environment, but a lot needs to be done still.

Douglas Pearce (1987)[8] presented a carefully reasoned systematic approach that has demonstrated the ties between geography and the dynamics of tourism in his book 'Tourism Today'. He highlighted useful definitions and discussions in a context that includes points of origin, destinations, linkages and motivation for travel. His book marks a significant contribution by assimilating important but disconnected findings into a structure for a current geographical understanding and for future geographical research.

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5 Vaughan, R., & Long, J. (1982). Tourism as a generator of employment in Great Britain. *Journal of Travel Research, 21* (2), 27-31.

6 Murphy, P. E. (1985). *A community Approach*. Methuen Publishers: New York.

7 Karan, P., & Mather, C. (1985). Tourism and Environment in the Mountain Everest Region. *The Geographical Review, 75* (1), 93-95.

8 Pearce, D. (1987). *Tourism Today: A Geographical Analysis*. John Wiley and Sons: New York. pp. xv-299

Antonia Hussey (1989)[9] highlighted the positive and negative impacts of tourism on Kuta village of Indonesia. He observed that the fishing village changed to a modern town with a large number of hotels increasing from 2 in 1970 to about 100 in 1975. The land prices increased from $17 to $8000 for 100 sq. metre of land. The demography also changed drastically. The negative impacts being high traffic jams, pollution of the beach, increase in crimes, drug use and intrusion of the other cultures on the local one etc.

Hamley (1991)[10] discussed the potential and hindrances in tourism development in the North Western parts of Canada. Although these territories have a large tourism potential, the hindrances like unskilled labour, lack of facilities in major airports, high prices, poor transportation, shortage of camp grounds, litter and the low quality of hotels and information facilities come in the way of tourism development. It has been concluded that community based tourism should be encouraged with stress on tourism that is substantially owned and operated by Northerners.

Mak and White (1992)[11] have discussed about the prospects of international tourism in the Asia- Pacific region wherein they mentioned that international tourism in the Asia-Pacific region has grown rapidly since the 1960s primarily because of increased intra-regional travel among Asia- Pacific residents. They compared tourism development among major Asia- Pacific countries, focusing especially on countries as receivers of tourists and tourism receipts and as generators of tourist travel and concluded that tourism development in Asia–Pacific region will depend on continued economic growth and the willingness of governments to open their countries to foreigners and to allow their own nationals to travel freely abroad.

Abrahim Pizman (1994)[12] has investigated the differential perception of residents, entrepreneurs and tourists towards negative environmental impact of tourism on the Greek island of Mykonos where he interviewed 115 residents, entrepreneurs and tourists in Hora, the capital city of Mykonos and found perception gaps between

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9 Hussey, A. (1989). Tourism in a Balinese Village. *The Geographical Review, 79* (3), 311-325.

10 Hamley, W. (1991). Tourism in the Northwest Territories. *The Geographical Review, 81*(4), 389-399.

11 Mak, J., & White, K. (1992). Comparative Tourism Development in Asia and the Pacific. *Journal of Travel Research, 31* (1), 14-23.

12 Pizman, A. (1994). Environmental impacts of tourism-whose responsibility is it anyway? *Journal of Travel Research, 33* (2), 26-32.

tourists and other two groups in his study. Tourists considered both residents and entrepreneurs to be more responsible than themselves for the negative environmental impacts of tourism. No gap was found between residents and entrepreneurs responses. Both entrepreneurs and residents perceived the environmental impacts to be lower than tourists did. The most interesting finding was that all the three groups, including residents themselves, considered the residents to be more responsible than anyone else for the creation of negative impacts of tourism.

Nicholas and Pizman (1996)[13] investigated the impacts of tourism as perceived by residents of Pythagorion on the Greek island of Samos. The interviews revealed that residents not only support the current magnitude of tourism industry but also favoured its expansion. However, residents identified a number of negative impacts that affected the town like high prices, drug addiction, vandalism, sexual harassment and crimes. Secondly, those respondents who were economically dependent on tourism had more positive attitudes towards the industry than those who were not.

Wahab and Pilgrim (1997)[14] discussed how tourism can be developed in sustainable manner. They mentioned that sustainable tourism is a reality and that it needs a proper management. Sustainability and sustainable tourism have been brought forth as not merely an end but an ongoing progressive attempt to rebuild our planet and its inhabitants. Secondly, demand can be tailored for sustainable tourism development through parsimonious use of image building agendas and channels.

Sonmez and Graefe (1998)[15] explored in their study the relationships between selected factors and several key stages of the international vacation tourism decision making process wherein the international attitude, risk perception level and income were found to directly influence international vacation destination choice and touristic experience and education were indirect influences.

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13 Nicholas, H., & Pizam, A. (1996). Perceived Impacts of Tourism. *Annals of Tourism Research, 23* (3), 503-526.

14 Wahab, S., & Pilgrim, J. J. (1997*). Tourism Development and Growth: The Challenges of Sustainability*. Routledge London: New York.

15 Sonmez, S.A., & Graefe, A. R. (1998). Influence of Terrorism Risk on Foreign Tourism Decisions. *Annals of Tourism Researc*h, *25* (1), 112-144.

Timothy (2000)[16] discussed the nature of education for destination community members and examines how vocational, entrepreneurial and general community awareness education is occurring in a developing country's tourism destination. In developing countries with entrepreneurial endeavours and public awareness, the residents are in a better position to participate in tourism development.

Boris Vukonic (2002)[17] explains and supports the idea that the economic impacts of religious tourism should not be neglected or underestimated although religious institutions have traditionally attempted to downplay this in the past. He argued that religion and tourism have much in common.

James Mark (2004)[18] highlighted the economic benefits of tourism and pointed out that tourism is a major economic activity which can foster peace by reducing world poverty and promoting cross cultural understanding.

Coccossis and Mexa[19] (2004) have focused on the carrying capacity of tourism wherein they have mentioned that Nature has its limits and we are crossing those limits. With the result, Nature starts wreaking havoc on humans. Besides, they also suggested that as far as tourism planning is concerned, we can have a maximum acceptable level of development measured in terms of the number of beds and desirable densities. On the basis of that number, associated infrastructure and related urban development can then be projected.

Gossling et. al. (2005)[20] reveal that tourism is not necessarily environmentally more beneficial than other economic activities. In this paper it has been indicated that eco-efficiency depends on the source and destination of the vacation, tourist's culture and the environments chosen for vacation. It also mentions that short travel distances are a

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16 Timothy, D. J. (2000). Building Community Awareness of Tourism in a Developing Destination. *Tourism Recreation Research*, vol. 25(2), pp. 111-116

17 Vukonic, B. (2002). Religion, Tourism and Economics: A Convenience symbiosis. *Tourism Recreation Research, 27* (2), 241-249.

18 Mark, J. (2004). *Tourism and Economy: understanding the economics of Tourism.* University of Hawaii Press: Honololu, U.S. pp.45-55.

19 Coccossis, H., & Mexa,A. A. (2004*). The Challenge of Tourism Carrying Capacity Assessment; theory and practices.* Aldeshot: U.K. pp. xvi- 293

20 Gossling, S., Peeters, P., Ceron, J. P., Dubrois, G., Patterson, T., & Richardson, R. B. (2005). The Eco-efficiency of Tourism, Ecological Economics. ELSEVIER, *54*, 417-434.

precondition for sustainability and the distance and mode of transport are the most important factors influencing eco-efficiency in tourism.

Bonham and Mak (2006)[21] reviewed the recent trends in travel and tourism in the United States and Hawaii to ascertain how the terrorist attack of 9/11 and subsequent terrible global events affected tourism flows.

Desbiolles (2006)[22] argues that tourism is in fact a powerful social force that can achieve many important ends when its capacities are unfettered from the market fundamentalism of neoliberalism and instead are harnessed to meet human development imperatives and the wider public good. Examining the human rights aspect of tourism, investigating phenomena such as 'social tourism', exploring a few non- western perspectives of tourism and outlining some of the tantalising promises that tourism holds, this paper attempts to revive and reinforce a wider vision of tourism's role in societies and the global community.

Nicholas and Amelung (2007)[23] attempted to explain the impact of climate change on tourism. According to him, in fact, tourism is a climate dependent industry and many destinations owe their popularity to their pleasant climates during traditional holiday seasons. He further explores the potential implications of climate change for global tourism with specific emphasis on seasonality.

Farhani and Ghazali (2008)[24] examined the residents' profile, attitudes and perception towards tourism development in Masooleh, Iran. Based on 250 respondents interviewed, this paper worked out that even though local people strongly support tourism development, they are little involved with the planning and management of tourism in the region. Thus, it is proposed that for the sustainability of tourism development, future planning should consider the inclusion of local people.

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21 Bonham, C., & Mak, J. (2006). The impact of 9/11 and other Terrible Global Events on the Tourism in the United States and Hawaii. *Journal of Travel Research, 45* (1), 99-110

22 Desbiolles, F. H (2006). More than an 'Industry': The Forgotten Power of Tourism as a social force. *ELSEVIER: Tourism Management*, 27,1192-1208.

23 Nicholas, S., & Amelung, B. (2007). Implications of Global Climate Change for Tourism flow and seasonality. *Journal of travel research, 45* (3), 285-296.

24 Farahini, H. Z., & Ghazali, M. (2008). Residents' Attitudes and Perception towards Tourism Development: A Case Study of Masooleh, Iran. *ELSEVIER: Tourism Management*, 29, 1233-1236.

Richins (2009)[25] discusses an inclusive community based sustainability framework with a focus on a resort destination in providing a potential model for more inclusive long range destination planning and implementation. The model attempts to address the many difficult challenges of development through more inclusive and comprehensive long range destination planning, implementation and management.

Richard Sharpley and Jepson (2011)[26] consider the extent to which a relationship exists between rural tourism and spiritual experiences. Drawing on research into tourists' experience of the English Lake District, it identifies the extent to which a spiritual dimension to tourism is verified in practice, revealing that although tourists don't purposefully visit the Lake District in search of spiritual fulfilment, their visits frequently embrace a subconscious emotional dimension.

Dan Wang and John (2013)[27] have tried to develop a conceptual framework describing the factors affecting the implementation of tourism policy and illustrate the framework with the experience of tourism policy implementation at the local level in China. In their study, it was found that four factors including: Economic and social macro-environment, institutional arrangements, inter organizational relations & inter-organizational co-ordination structures and interest groups were influential in the implementation of tourism policy. Moreover, it also addresses some solutions which may enrich the tourism policy literature in Asian and in the context of developing countries.

Lane, et. al., (2013)[28] in their study examine the development of industrial heritage and rural tourism in Europe. It outlines the value of tourism sectors in economic, environmental and socio-cultural terms. It presents a series of case studies of organizations, enterprises, communities and regions in a number of European countries that have had a range of experiences in these sectors. Discussing current

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25 Richins, H. (2009). Environmental, Cultural, Economic and Socio-Community Sustainability: A framework for sustainable Tourism in Resort Destinations. *Journal of Environment development and sustainability, 11*, 785-800.

26 Sharpley, R., & Jepson, D. (2011). Rural Tourism: A Spiritual experience. *Annals of Tourism Research, 38* (1), 52-71.

27 Wang, D., & John, Ap. (2013). Factors affecting tourism policy implementation: A conceptual framework and a Case study in China. *ELSEVIER: Tourism Management, 36*, 221-233.

28 Lane, B., Kastenholz, E. ,Lima, J., & Majewsjki, J. (2013). Industrial Heritage & Agri/Rural Tourism in Europe, Policy Department B: Structural and cohesion Policies, European Parliament. Retrieved from http: // www.europarl.europa.eu/studies.

issues and future possibilities, it suggests ways in which industrial heritage and rural tourism could be expanded, made more viable and sustainable, and deliver greater benefits for their local communities and for Europe's economy and its natural and cultural heritage as a whole

2.2.2 Literature on Tourism at National level

Ummant (1979)[29] analysed the growth of tourism in India since the fifties when efforts were made to encourage its growth. He also highlighted those factors that have decelerated this growth. According to him in view of the widening trade deficit, it is imperative that India should step up efforts at boosting the invisible foreign earnings which comes from tourism. Tourism –yielded foreign exchange , worth 330 crores in 1978, offers greater scope for narrowing gap in the balance of payments. This article also touches upon the economic benefits, especially employment, that can be derived from tourism.

Chakarvarthy (1999)[30] laid emphasis on using tourism as a planning strategy for promoting regional development. He concluded that tourism infrastructure holds the key towards the development of tourism in addition to the preservation of ecology and culture of tourism region.

Caprihan and Kumar (2002)[31] have proposed some short term and some specific long term plans to redefine tourism marketing strategies so that the concepts of ecotourism, dental tourism, incentive tourism or conference tourism should be fully exploited.

Biju (2002)[32] stressed on the major problems that the travel and tourism industry is facing. He mentioned that the major problems that the tourism industry is facing today is that the economists, social scientists, administrators and political leadership who influence government policies and decisions do not exactly know the enormous economic impact of tourism . Tourism has expanded fast and in a revolutionary way. The old economic theories are outdated so far as tourism is concerned. He concluded that tourism or what we now popularly call the travel industry has become a

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29 Ummant, R. C. (1979). Fostering Tourism why Dither. *Eastern Economist, 73* (16), 804.

30 Chakarvarthy, I. (1999). Regional development by tourism in Maharashtra. *Indian Journal of Regional science, xxxi* (2), 58-71.

31 Caprihan, V., & Kumar, K. S. (2002). Redefining Tourism Market Strategies, *Sanjopsis*, 139-143.

32 Biju, M. R. (2002). Global Tourism: The evolutionary Process, *Sanjopsis*, 144-147.

comprehensive social science that needs a serious study and attention as it affects millions of human beings all over the globe. Its management, development and future are vitally important and can be best seen in the perspective of history of travel.

Kohli (2002)[33] has asserted in his paper that strict conservation of Himalayan region is no solution. It is necessary to develop this region by allowing the tourist to improve the standard of living of the local people and to promote further growth of national economies of this region. The solution lies in carrying out all this in a new era of heightened cooperation without disturbing the ecosystem of Himalayas.

Gangopadhyay and Chakrabarthy (2003)[34] highlighted the ill effects of unplanned growth of tourism in Digha (west Bengal) wherein he reported that in order to accommodate tourism flow, new hotels are being made by cutting the dune tops and thus destroying the sea dune dynamics of the area which is necessary for its survival. He also mentioned about the unplanned management of tourist waste. Further he concluded that peoples' awareness and government interference is necessary to save the fate of digha and its tourism industry to a great extent.

Mitra and Chattopadhya (2004)[35] have discussed the possibilities, prospects and sustainable development of nature based tourism in Arunachal Pradesh. They tried to ascertain the potential for ecotourism development, both in terms of the number of visitors and economic growth. They attempted to determine the limits to be set in view of carrying capacity of the state particularly with respect to environmental ecological aspects.

Bhattacharya and Bhagabati (2005)[36] made an attempt to identify and assess the potential pockets of tourism activity in Assam where they identified seven pockets of the two hill districts considering their accessibility and high probability of tourism based on development of potential link. To gauge the demand of choice of tourism, a

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33 Kohlii, M. S. (2002, August). Ecotourism and Himalayas, *Yojana*, *46* (8). Retrieved from *yojana.gov.in/cms/(S(wsljhx55qopm1rr1dwmytsrz))/.../Yojana/.../Aug_Vol46_No8.*

34 Gangopadhyay, N., & Chakraborthy, P. (2003). Tourism a Blessing or disguise: A case study of Digha (West Bengal). *Indian Journal of Regional Science*, *xxxv* (1), 40-44.

35 Mitra, A., & Chattopadhyay, K. (2004). *Problems and Prospects of Tourism in Arunachal Pradesh*. Reference Press: New Delhi.

36 Bhattacharya, P., & Bhagabati, A.K. (2005). Potential of Tourism Development in the District of Assam. *Geographical Review of India*, *67* (2), 145-161.

resource inventory has been prepared incorporating both existing and potential resources possessed by the selected pockets of the hill district.

Chakrabarthy (2006)[37] reveals the accommodation and transport problems in Panchmarhi. The proper tourism management policies like designing integrated ecotourism strategy focusing on land use zoning, site development, educating visitors, controlling and regulating their flow on the basis of spot character, infrastructure development and peoples' awareness is recommended for the implementation of an effective ecotourism strategy.

Kant (2007)[38] has mentioned in his study that in little over a decade, India has become one of the significant emerging countries of the world. Its economy is growing at over 8 per cent per year making it the fastest growing free market democracy. Indian industry is ticking along a double digit while service sector continues to lead the overall growth surge and it is tourism which has recorded the highest level of growth, more than 15 per cent per annum, over last three years.

Sebastian and P. Rajagopalan (2008)[39] have compared residents' perceptions on socio-cultural impacts of tourism at Kumily and Kumarakom in Kerala. The article explores whether tourism activities in kumily, with its planned intervention, are more sustainable than in Kumarakom, without any interventions. The conversion of ex-poachers into forest protectors and the involvement of the marginalized people in community based ecotourism are a few among the many transformations that have occurred at kumily while haphazard tourism development at Kumarakom gave rise to several socio-cultural challenges.

Moutinho, Vanherwade and Krystel (2013)[40] tried to develop a list of best practices and recommendations for sustainable tourism and ecotourism that are specific to

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37 Chakarbarthy, P. (2006). Tourism, Economy and Environment: A Case Study of Panchmarhi in Madhya Pradesh. *Indian journal of Regional scienc*e, *xxxviii* (2), 58-71.

38 Kant, A. (2007, May 20). Riding on tourism. *Times of India*. Retrieved from http://www.timesofindia. indiatimes.com/Archives/2007/May/20

39 Sebastian, L. M., & Rajagopalan, P. (2009). Socio-cultural transformations through Tourism: A comparison of Residents' Perspectives at two Destinations in Kerala, India. *Journal of tourism and Cultural Change*, *7* (1), 5-21.

40 Moutinho, T., VanHerwarde, G., & Krystel W. (2013*). Promoting Ecotourism in Himachal Pradesh*. An Interactive Qualifying Project Report submitted to the faculty of Worcester Polytechnic Institute in cooperation with Indian Institute of Technology – Mandi

Himachal Pradesh. This report analyses tourist locations for their capacity to sustain ecotourism at potential ecotourism sites in Himachal Pradesh.

2.2.3 Literature on Tourism at Regional level

Mehmooda (1994)[41] has tried to evaluate the performances, problems and prospects of tourist trade in the post-independence period and Mirza (1995)[42] has touched the management of tourism in Jammu and Kashmir and has highlighted the policies and prospects of the state government.

Lala and Anisa (2008)[43] perceived adventure tourism as the fastest growing segment that can turn out into an immense business opportunity for Kashmir Region. It could be a catalyst factor for positioning of brand Kashmir in the world. This paper examines the scope of adventure tourism in order to formulate the guidelines for the future tourism planning growth in Kashmir Valley. It indicates that adventure tourism is still in the early phases of development and is viewed by the respondents as having great potential for development in the Valley.

Chauhan and Khanna (2009)[44] point out that Kashmir Valley tourism has been prey to the severe setbacks of insurgency especially in the last two decades that has hindered its smooth growth. Thus, following the principle of tourism as a strategic tool to counter terrorism, the present research has been conducted to study the tourism's contribution to the peace building in Kashmir in terms of residents and tourists' perception. This paper concludes that tourism has a significant contribution towards peace building in the study area. It also suggests a strategic model based on developing guest-host relationship.

Itoo and Nengroo (2011)[45] revealed that there has been a negative impact of turmoil on the sectors associated with tourism industry. Turmoil in the state has hindered the

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41 Mehmooda, S. (1994*). Tourism Dynamics in Developing Economy*. Gulshan Publishers: Srinagar.

42 Mirza, N. (1995). *Management of Tourism in Jammu and Kashmir*. Gulshan Publishers : Srinagar.

43 Lala, M. F and Bhat, A. M. (2008). The Prospects of Developing Kashmir as an Adventure Tourism Destination. *South Asian journal of Tourism and Heritage, 1* (1), 75-79.

44 Chauhan, V., & Khanna, S. (2009). Tourism: A Tool for Crafting Peace Process in Kashmir, J&K, India. *Tourismos: An International Multidisciplinary Journal of Tourism, 4* (2), 69-89.

45 Itoo, M. A., & Nengroo , A. H. (2011). Impact of Turmoil on Tourism of Kashmir. *Journal of Economics and Sustainable Development, 2* (7), 1-7.

smooth growth of tourism and has discouraged most of the travellers from visiting India's most popular tourist destination. Add to this, it has also affected not only tourism but also indirectly the economic activities related to tourism.

Aijaz and Musadiq (2011)[46] have attempted to use the three broad critical attributes of the destination viz. tourist information, tourist infrastructure and tourist services and facilities to measure the tourist satisfaction. It has been highlighted in the paper that the satisfaction of tourists depends on the overall quality of these three critical attributes at tourist destination. While planning and implementing the strategies for the successful tourism development. It is very imperative that the quality of these three attributes should exceed or at least met the expectations of visiting tourists to the destination.

Lone et. al., (2013)[47] have tried to assess the existing situation of tourist infrastructure quality in Jammu and Kashmir. In this study, 08 variables have been used to measure the quality of tourist infrastructure and correlation matrix has been used to show the relationship between these variables.

Itoo (2013)[48] has highlighted the historical development of tourism industry in Kashmir and the causes responsible for its fluctuations during 1947- 1989.The data of tourism arrivals has been statistically represented to reveal the fact that tourism industry in Kashmir saw a great progress and reached to its full bloom in eighties of the 20th century despite many ups and downs during this period.

Itoo and Rather (2014)[49] pointed out that in 1989 a popular movement demanding independence from India and backed by various militant organizations badly disrupted life in Kashmir Valley so much so that hardly any tourists came to Srinagar and the famous houseboats on its lakes were found deserted since 1990. The tourist inflow started dwindling and the tourism almost came to a grinding halt from 1989-90 onwards and those who depended on this industry in one way or

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46 Khaki, A. A., & Sahaf, M. A. (2011). Satisfaction of Visiting Tourists to Kashmir Division. *South Asian Journal of Tourism and Heritage, 4* (1), 63-71.

47 Lone, P. A., & Rather, N. A. (2013). An Empirical Analysis of Tourist Infrastructure Quality in Jammu and Kashmir. *Radix international Journal of Research in social Science, 2* (2), 1-16.

48 Itoo, M. A. (2013). Tourism Industry of Kashmir (1947-1989). *International Journal of Management and Sustainability, 2* (4), 63-71.

49 Itoo, M. A., & Rather, F. A. (2014). Tourism of Nineties: A case study of Kashmir Valley. *IMPACT: International Journal of research in Arts and literature, 2* (4), 109-112.

the other suddenly found themselves without an occupation and no means of livelihood.

Safeer (2014)[50] has tried to investigate the impact of tourism on the economic growth and development as well as on the natural and cultural resources. The main objective of this paper is to analyse the contribution of tourism in income generation and carrying capacity of different tourist destinations of the most beautiful region of the state i.e. Kashmir. He has found out that the income of the state through tourism sector is consistently increasing and the carrying capacity of the beautiful Dal lake has been almost exhausted while the remaining other tourist destinations have lot of carrying capacity in the study area.

Sofi, Hakeem and Gadoo (2014)[51] have measured the tourism service and its impact of tourist satisfaction by examining the parameters like main services, accessibility and infrastructure in Jammu and Kashmir Tourism. The research study depicts that quality is considered as philosophy in guiding tourist destinations in relation to tourism services.

Nazir, Hakeem and Khan (2014)[52] highlighted that Health tourism or Medical tourism, a term used to refer tourists' wellbeing at economical costs, can greatly change the image of Kashmir in the minds of tourists and make it a popular travel destination again. Even though right now in Kashmir there is not the infrastructure to support the aspirations of changing the face of tourism but there is a huge scope of development and infrastructure build-up and once this concept is popularized through campaigns, workshops and youth awareness a dream of Kashmir as the new healthcare destination in India can become reality.

2.3 Survey of Related Literature on Wetlands

This can broadly be studied under three main sub headings of literature on international, national and regional level.

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50 Mukhtar, S. (2014). Sustainable Tourism Development with Special reference to Jammu and Kashmir. *International journal of applied financial Management perspectives, 2* (2), 419-424.

51 Sofi, M. R., Hakim, I. A., & Gadoo, M. R. (2014). Service Quality Variables and Tourist Satisfaction at Destination Level- A Study of J&K Tourism. *International Journal of Applied Research and Studies, 3,* (2).

52 Nazir, S., Hakim, I. A., & Khan, F. Y. (2014). Prospects of Health Tourism in Jammu and Kashmir. *BEST: International Journal of Management, Information Technology and Engineering, 2* (7).

2.3.1 Literature on Wetlands at Global Level

Turner (1991)[53] worked out that of all the environmental resources, wetlands are among the most threatened ecosystems. They are being over utilized as a result of various pressures of economic development, failure of information and failure of market and intervention failure. Thus, need of the hour is to strike a balance between conservation of wetland ecosystems, their sustainable utilization and their conversion. Besides, sustainable utilization and maintenance of a sustainable flow of income derived from wetlands has been highlighted as the main issue for the developing economics.

Nicholas et. al (1999)[54] pointed out that by 2080[s], 22 per cent of world's coastal wetlands could be lost by rise in the sea level and if combined with other losses due to direct human action, this loss could be around 70 per cent and the largest losses will be around the Mediterranean and Baltic and to a lesser extent on the Atlantic coast of central and North America and the smaller islands of Caribbean. In nutshell, these results show that if there is no adaptive response, significant adverse impacts could be seen by the insignificant global rise in sea level.

Turner et al. (2000)[55] highlighted that in spite of various national and international policies and agreements, wetlands all over the world are under consistent threat because of various products and services that they provide. Besides this, there are user externalities imposed on other stakeholders and failures of policy intervention that are because of lack of consistency in different areas like environment, protection of nature, economics and physical planning etc among policy makers. Thus, an integrated wetland research suggested for the combination of economic valuation, stake holder analysis, multi criteria evaluation and integrated modelling can provide complementary insights into sustainable wetland management.

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53 Turner, K. (1991). Economics and Wetland Management. *Ambio: Springer, 20* (2), 59-63.

54 Nichollas, R. J., Hoozemans, F. M. J., & Marchand, M. (1999). Increasing flood risk and wetland losses due to global sea level rise: Regional and global analysis. *Global Environment Change: Elsevier,* 9, S69-S 87.

55 Turner, R. K., Jereon, C. J. M., Bergh, V. D., Soderqvist, T., Barendregt, A., Straaten, J. V. D., Maltby, E., & Ierland, C. V. E. (2000). The values of Wetlands: Landscape and institutional perspectives. *Ecological Economics: Elsevier, 35*, 7-23.

Brazner et al. (2001)[56] are of the opinion that wetlands have not only an important role to play in hydrological cycle but these also act as vital ecosystems for storing flood water, enhancement of water quality , storage of carbon and used as buffers. Moreover, wetlands can also be utilized economically for the production of timber and for the recreational purposes also. In nutshell, the authors have termed the wetland as the hotspots of primary and secondary production.

Turner et.al. (2003)[57] have evaluated the management strategy of wetland ecosystems after developing a decision support system and its application for Norfolk and Suffolk wetlands of UK. They reviewed that need of the hour is to develop some strategies and policies through which change in the dimensions of wetlands can be detected as well as the possible drivers of change whether socio-economic or environmental should also be detected.

Whigham and Jordan (2003)[58] have examined the isolated wetlands for their water quality in three hydro-geomorphic classes viz. flats, slopes and depressions wherein they have found highly variable characteristics in quality of water of these isolated wetlands which depends mainly on the source of water, characteristics of substrate and land uses related to the watershed of wetland. From this study, they have come to the conclusion that isolated wetlands act as nutrient sinks and their loss would affect the water quality of the downstream systems negatively.

Khan (2006)[59] highlights the wetland review of Afghanistan from the point of view of current status, issues of conversion and recommendations for future initiatives. While mentioning the vitality of wetlands, he maintains that in arid climates like Afghanistan, the existence of water plays a crucial role not only in maintaining livelihoods of human beings but also in creating pristine ecosystems that provide services to the local communities. Such wetland habitats act as an important resting,

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56 Brazner, J. C., Sierzen, M. E., Keough, J. R., Tanner, D. K. (2001). Assessing the ecological importance of coastal wetlands in a large lake context. *Verh. Int. Ver. Limnol*, 26.

57 Turner, R. K., Georgiou, S., Brouwer, R., Bateman, I. J., & Langford, I. J. (2003). Towards an integrated environmental assessment for wetland and catchment management. *The geographical journal*, *169* (2), 99-116.

58 Whigham, D. F., & Jordan, T. E. (2003). Isollated wetlands and water quality. *WETLANDS*, *23* (3), 541-549.

59 Khan, A. (2006). A review of the wetlands of Afghanistan. *Waterbirds around the world.* Eds. G. C. Boere., C. A. Galbraith., & D. A. Stroud. The Stationery Office: Edinburgh, UK.

feeding and staying areas for a large number of migratory birds in an arid country like Afghanistan.

Dale and Knight (2008)[60] point out the use of wetlands by the mosquitoes in their egg laying and larval stages and thereby the diseases spreading by them. This may have a partly negative impact on tourism. They also highlight land use and climate change and maintain that the changes in these aspects affect the wetlands through management processes. Finally, the critical issue of maintaining a balance between human health and the health of wetlands is addressed by the authors.

Pritchard (2009)[61] examines the integral role of wetlands so far as the climate change is concerned and maintains that wetlands act as carbon sinks and reduce the emissions taking place because of deforestation and forest degradation.

Erwin (2009)[62] points out that wetlands are susceptible to change both qualitatively as well as quantitatively and expectations are that wetland ecosystems will be markedly affected by climate change with great global variability through the alterations in their hydrological regimes. Moreover, the authors highlight their view that diverse habitats are with different degrees of stresses and hence different management strategies will be needed for their restoration which, however, will be made more complex by climate change.

2.3.2 Literature on Wetlands at National Level

Studies on national level can be divided into wetlands in tourist places, wetlands in agricultural areas, wetlands in urban areas and wetlands in coastal areas as:

2.3.2.1 Wetlands in Tourist places

This has been further sub divided into three categories as wetlands of North, wetlands of North East and wetlands of South as follows:

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60 Dale, P. E. R., & Knight, J. M. (2008). Wetlands and Mosquitoes: A review. *Wetlands Ecology Management*, *16*, 255-276.

61 Pritchard, D. (2009). Reducing emissions from forest degradation in developing countries (REDD)- the link with wetlands. *FIELD: Foundation for International Environmental Law and development. Retrieved from http://ccsl.iccip.net/wetlands.pdf*

62 Erwin, K. L. (2009). Wetlands and global climate change: the role of wetland restoration in a changing world. *Wetlands ecological management. 17*, 71-84.

2.3.2.1.1 Wetlands of North

Vijayan (1991)[63] worked on the ecology of Keoladeo National Park at Bharatpur, Rajasthan wherein he put forth various aspects of its management and suggested an integrated development program should be launched which would include the maintenance of the water bodies both inside as well as outside the park and the overall management of the park in its ambit**.**

Pant et. al.,(2003)[64] have worked on human induced eutrophication wherein they tried to highlight the point that increasing human interventions are responsible for the accelerated rate of eutrophication in Nanital lake of Uttrakhand. The limnological survey conducted by these scholars clearly reflect the rapidly increasing eutrophication of the lake water which is clearly visible by its low transparency, deficiency of oxygen, high concentration of free carbon dioxide and increased concentration of nitrogen and phosphorous. They concluded that the biological life and ecological balance of the lake have been greatly disturbed by the all these factors.

Gairola et al. (2009)[65] have put in every effort to exhaustively map out the wetlands of Uttrakhand. In this paper, the authors first begin with the utilities of wetlands and then point out the large data lacunae in the previous studies and maintain that somewhere data is not readily available to those who are in need of it. They have, thus, tried to generate a wetland inventory of Uttrakhand by using various satellite data from IRS-P6 and LISS-III wherein they analyzed the distribution of wetlands geographically and created database of ground truthing sites on the basis of GIS. Moreover, the scholars point out that the policy makers by utilizing the combined data from Remote Sensing, GIS and GPS at multiple scales can formulate plans of management in wetlands that are utilized for intensive fisheries and agriculture by local communities and hence can preserve these ecosystems for future.

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63 Vijayan, V. S., & Vijayan, L. (2002). Conservation of Wetlands in India- A review. *Tropical Ecology, 43* (1), 173-186.

64 Pant, M. C., Sharma, A. P., & Sharma, P. C. (1980). Evidence for increased eutrophication of lake Nainital as a result of human interference. *Environ. Bulletin (B),* 149-161.

65 Gairola, S., Kimothi, M. M., Patel, J. G., & Singh, T. S. (2009). Wetland inventory, mapping and change analysis of Uttrakhand, India, using Multi Temporal Satellite data. *Abstract of Geomatics National conference, Dehradun.*

Attri and Santvan (2012)[66] tried to develop a database in terms of socio- cultural and ecological aspects of Prashar Lake of Himachal Pradesh. They tried to highlight the importance of this lake for the local people and other stakeholders. Besides, they have also tried to identify the threats to the high altitude waterbodies and suggested the necessary measures for their conservation as well. It is worthwhile to note down that people were willing to take part in the joint management of initiatives with the state.

2.3.2.1.2 Wetlands of North East

Moirangleima, K (2010)[67] in her book 'Sustainable management of Wetlands' has mentioned in details about the classification, characteristics and distribution of wetlands in the central valley of Manipur. After that she has also tried to examine the socio-economic condition of the villages located around these wetlands and has then assessed the functions, impacts and the threats on these lake ecosystems. Finally, she has also suggested some of the measures for the sustainable management of these wetlands.

Saud et. al., (2012)[68] have clearly depicted the uses of Urpod wetland for fisheries and migratory birds. However, they have also pointed out various threats which need to be immediately addressed like illegal land use in and around the wetland, immense siltation and lack of a comprehensive management policy. The authors maintain that all these threats have caused a sort of imbalance in Urpod wetland ecosystem which is further accentuated by the storm waters from the adjoining settlements resulting into hazardous environment for its aquatic plants and animals.

Dutta and Konwar (2013)[69] have studied the wetlands of Upper Brahmaputra Valley wherein they point out that since the people of Assam are very eco-friendly but still the wetlands there are under gradual anthropogenic impacts. This study brings forth

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66 Attri, P. K., & Santvan, V. K. (2012). Assessment of socio cultural and ecological conservation in conserving wetlands- A case study of Prashar Lake in Mandi District, Himachal Pradesh. *International Journal of plant, animal and Environmental sciences, 2* (1).

67 Moirangleima, K. (2010). *Sustainable management of wetlands- Central Valley of Manipur*. B.R Publishing Corporation: Delhi.

68 Saud, B. J., Chetia, M., V. K, Ver., & Kumar, D. (2012). Eco-hydrobiology with special emphasis on ichthyo-faunal diversity of urpod wetland of Goalpara, Assam, India. *International journal of plant, animal and environmental sciences, 2* (3).

69 Dutta, P., & Konwar, M. (2013). Morphological aspects of floodplain wetlands with reference to the upper Brahmaputra River Valley. *International journal of scientific and research Publications*, 3(9).

the wetlands of Assam by utilization of GIS techniques and then maps out the degradation of these wetland habitats brought by streams and riparian alterations.

Kanwal et al. (2013)[70] in their study firstly make it clear as to what they understand by high altitude wetlands wherein they point out that Arunachal Pradesh is ranked second in India after Jammu & Kashmir with 1,672 High altitude wetlands cover a large area that accounts for 7.6 per cent of total area as wetland in the state. Secondly, they mention that there will be an increase of 2.2ºC-2.8ºC temperature by 2030 and 2.8ºC- 5ºC by 2080 and then they maintain that climate change impact can be visualized significantly on these high altitude wetlands because of numerous ecological services that they provide and livelihood benefits and religious significance.

2.3.2.1.3 Wetlands of South

Kiran and Ramachandra (1999)[71] have attempted to bring forth some of the major problems and the real threats that the India's wetlands face in the present time. Therefore, these scholars have presented some feasible suggestions also in order to make attentive all the concerned authorities like wetland biologists, planner's conservationists and policy makers.

Prasad et al. (2012)[72] have studied Uppalapadu lake in Andhra Pradesh for human bird related issues and subsequent management strategies. They have collected the required information from the field surveys and have drawn conclusions on that basis. In their study, the scholars have mainly focused on how the forest department, local communities and other organizations take part in protecting the birds from any type of harm or disadvantage. Besides, ecological importance of the wetland as well as the alternative ways that have been adopted by the migratory birds have been identified by the researchers.

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70 Kanwal, K. S., Samal, P. K., Lodhi, M. S., & Kuniyal, J. C. (2013). Climate change and high altitude wetlands of Arunachal Pradesh.*Current Science, 105* (8).

71 Kiran, R., & Ramachandra, T. V. (1999). Status of Wetlands in Bangalore and its conservation aspects. *ENVIS Journal of Human Settlements, 16* (24), 2-10.

72 Prasad, P. R. C., Kumari, J. A., Mathew, M., & Thomas, R. (2012). Human-Bird conflicts and Management Issues: A case study of birds at Uppalapadu lake, Andhra Pradesh, India. *International Journal of Zoology, 1* (1).

Karpagavalli et al. (2012)[73] have studied Pallikaranai wetland of Tamil Nadu. In this study, the authors state that this wetland is ecologically very significant being a habitat of a large biodiversity. However, due to rapid urbanization, industrialization and dumping of solid waste, the water of this wetland has become highly toxic which is analyzed by the heavy concentration of metals in it like zinc, iron, nickel, lead, cadmium and copper. The study highlights that its surface water is not safe for aquatic and domestic life. Thus, necessary management actions are the need of the hour.

Pragatheesh and Jain (2013)[74] in a report submitted to EIA resource and response centre, Nilgiri, Tamil Nadu start with the history and importance of Coimbatore wetlands. Then they touch the threats and later on discuss about the fading glory of these ecosystems. The main threats highlighted in this report include poor drainage, dumping of waste, encroachment, water pollution, eutrophication and destruction of avian habitat. Lastly, this study suggests an action plan which comprises of following actions to be taken to save the wetlands of Coimbatore as (1) Removal of solid waste and other wastes (2) Removing encroachments along the supply channels (3) Protection of wetland birds and their nests (4) Eradication of alien invasive species (5) Regular monitoring of quality of water (6) General awareness among the local people.

2.3.2.2 Wetlands in Agricultural Areas

Jerath et al (2008)[75] in their report on the three main wetlands of Punjab viz Harike,Ropar and Kanjli have firstly mentioned their importance being the habitats for diverse flora and fauna. Thereafter, they have analyzed the main threats that these ecosystems face and the subsequent measures of conservation. The main threats mentioned in the study include agricultural run-off, siltation and weed infestation. The main focus of this study was on the efforts made for the sustainable utilization of resources from these wetlands and to sensitize the importance of wetlands in public for their large scale participation in the management of these ecosystems.

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73 Karpagavalli, M. S., Malini, P., & Ramachandra, A (2012). Analysis of heavy Metals in dying wetland Pallikaranai, Tamil Nadu, India. *Journal of Environment Biology, 33*, 757-761.

74 Pragatheesh, A., & Jain, P. (2013). Environmental degradation of the Coimbatore wetlands in the Noyyal River basin. *EIA Resource and Response centre (ERC), Nilgiri*, Tamil Nadu, India.

75 Jerath, N., Ladhar, S. S., Saxena, S. K., Sharma, J., & Sharma, V. (2008). Enhancing community participation for conservation of wetlands. Retrieved from http://wldb.ilec.or.jp/data/ilec/WLC13_papers/others/29.pdf.

Jha (2008)[76] in his study on terai wetlands points out the immense uses of these ecosystems for humans. He, then, elaborates their causes of loss and threats to their sustainability in the form of pollution and over exploitation. After that he maintains that it is because of a general idea prevalent in the society that wetlands are unproductive and waterlogged areas that act as habitats for disease carrying insects and other poisonous organisms that these highly fragile ecosystems are filled for agriculture, industries and other built up areas which reduce and deteriorate their sustainability.

Anand and Joshi (2013)[77] have utilized remote sensing technique to monitor the dynamics of Kanwar lake in Begusarai, Bihar and have come out with the conclusion that this lake which was being used as a habitat for migratory birds has vanished to carry out that function properly now which is clearly visible from the declining number of the migratory birds found here that has significantly reduced from several lakhs in 1970's to around 5,000 in 2012. The main reasons that the study puts for this decline is the conversion of wetland into agricultural venues.

Mabwoga and Thukral (2014)[78] have made use of Landsat data for analyzing the land use/land cover dynamics of Harike wetland of Punjab. The authors by utilizing the satellite data clearly point out that there has been a shrinkage of 13 per cent of wetland area since 1989 till 2014 and the wetland is under tremendous stress in its north eastern side. The main reasons that the authors highlight for the deterioration of this ecosystem include conversion of wetland vegetation into agricultural land which diverted the course of river Sutlej and left lot of wetland area as barren land.

2.3.2.3 Wetlands in Urban areas

Ramachandra (2001)[79] in his study aims to identify the status of wetlands in Bangalore city and the related impacts due to factors like urbanization and to explore suitable management strategies based on the level of pollution. He propagates that in

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76 Jha, S. (2008). Status and conservation of lowland Terai wetlands in Nepal. *Our Nature*, *6*, 67-77.

77 Anand, S., & Joshi, P. K. (2013). Remote sensing to quantify wetland loss. *3-14th Esri India User Conference.*

78 Mabwoga, S. O., & Thukral, A. K. (2014). Characterization of change in the Harike wetland, a Ramsar site on India, using landsat satellite data. *Springer Plus*, *3* (1), 576.

79 Ramachandra, T. V. (2001). Restoration and management Strategies of wetlands in Developing countries. *Electronic Green Journal*, *1* (15).

Bangalore city which covers about 4.8 per cent of the wetland area of Karnataka state and having only man made wetlands, the environmental pressure of unplanned urbanization and growing population has taken its toll on wetlands so much so that a decrease of almost 35 per cent of wetlands has occurred since 1969 mainly because of increasing urbanization and sewage from households and industries. The author concludes that since there is a high level of dependency of people on these wetlands as indicated by the conducted socio economic survey. Thus, need of the hour is to immediately restore these deteriorated ecosystems and to take appropriate steps for their management and to maintain ecological balance in the region.

Ramachandra et al. (2011)[80] maintain that wetlands being the most productive ecosystems are recognized worldwide for sustaining wide range of biodiversity and providing a wide range of goods and services. But, due to ever increasing anthropogenic factors like intensive agriculture, indiscriminate disposal of industrial effluents and sewage wastes these highly delicate ecosystems are under consistent threat which is clearly revealed by the changes in their physical, chemical and biological characteristics. The study reveals that the loss of this wetland has resulted in the disappearance of local species and prevalence of alien exotic species of plants and breeding of diseases which necessitates the execution of a sustainable management plan to recover the lost benefits of this wetland.

Manral et al. (2012)[81] have taken National Capital Region of Delhi as the study area and have focused on Okhla Bird Sanctuary which is feeded by the highly polluted waters of Yamuna River. The authors highlight the various causes of pollution of Yamuna and Hindon rivers which include dumping of partially treated or untreated waste water into the river from the industries, sedimentation and deforestation in the river basin and other developmental activities on the flood plains of Yamuna river. All this, as the study upholds, has led to the high eutrophication of its waters and narrowing of its floodplains which has given rise to a community of aquatic weeds in

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80 Ramachandra, T. V., Alakananda, B., Rani, A., & Khan, M. A. (2011). Ecological and Socio-Economic Assessment of Varthur wetland, Bengaluru. *India. Journal of Environment, Science and Engineering*. *53* (1), 101-108.

81 Manral, U., Raha, A., Solanki, R., Hussain, S. A., Mohan, D., Talukdar, G., & Veeraswami, G. (2012). Hydrological characteristics of flood plain vegetation of human impacted wetlands: A case study from Okhla Bird Sanctuary, NCR, India. *Asian journal of conservation Biology, 1*(2), 110-119.

the sanctuary and has reduced its water area substantially. Thus, the scholars point out that need of the hour is to treat the generated waste water before discharging into the river and to control industrial pollution through the development of industrial and residential areas thoughtfully. Besides, Yamuna flood plains should be given due recognition in city planning and treated as ecologically sensitive areas.

2.3.2.4 Wetlands in Coastal Areas

Chatrath and Acharya (1990)[82] worked on Chilka lake management and arrived on the conclusion that the linchpin to the management strategy of this wetland lies in its sustainable utilization.

Jagtap et al. (2001)[83] have tried to assess the coastal wetlands of Maharashtra and Goa by using LANDSAT data in which they highlight that the central western coastal wetlands are utilized mainly for pisciculture, paddy cultivation and for salt pans. However, large areas of these wetlands have been lost due to urbanization and agricultural practices. These inter tidal zones are under consistent human pressure which has resulted in the loss of vegetative cover in these ecosystems. The study reveals that the coast of Maharashtra has noticed erosional changes while the coast of Goa is subjected to progradation.

Khaleel and Jaleel (2009)[84] studied wetlands of North Malabar wherein they highlighted the importance of mangroves which are of basic necessity for society. The authors aim to identify the challenges to these ecosystems and thereby try to put forward the way ahead for their sustainable development. The challenges which this study focuses upon include over exploitation of mangrove ecosystems by local communities, urbanization, illegal encroachments, construction of recreational purpose canals and aquaculture ponds.

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82 Chatrath. K. J. S., & Acharya, B.C. (1990). Management for sustainable development in Chilka lake, Orissa. Paper presented at the seminar on Wetland Ecology and Management at Keoladeo National Park, Bharatpur.

83 Jagtap, T. G., Naik, S., & Nagle, V. L. (2001). Assessment of Coastal wetland resources of central west coast, India, using LANDSAT data. *Journal of Indian society of remote sensing, 29* (3).

84 Khaleel, K. M., & Jaleel, C. A. (2009). Environmental challenges to the Mangrove wetlands of North Malabar (Kerala), India: Their sustainable development and influence on local people. *Knowledge and management of aquatic ecosystems,39* (2).

This study also provides for some suggestions for the sustainable development of mangrove ecosystems as (1) Designing of coastal structure in such a way as to avoid excess erosion and sedimentation (2) Avoiding dumping of dredged materials, sewage and industrial wastes into these wetlands (3) Encouraging nondestructive aquaculture practices (4) Constructing of jetties and other settlement stilts without damaging the forest (5) Going for partial extraction and replanting of plant species.

2.3.3 Literature on Wetlands at Regional level

Joshi et al (2002)[85] have carried out the temporal mapping of Hokersar wetland by utilizing the data for the autumn and spring seasons to assess the land use/ land cover and the areal extent of the wetland. An information base has been developed by these authors for designing schemes of conservation for the maintenance of Hokersar wetland in long run.

Khan et al (2004)[86] have tried to study Hokersar wetland from the perspective of its environmental status. i.e. the changing water quality, manner of plant communities, rate of sedimentation and hydro-edaphic characteristics wherein they concluded that there is a paramount need of eco restoration of this wetland on urgent basis for the diversity of residents and other aquatic migratory birds.

Yaqoob et al (2007)[87] have utilized physico-chemical parameters to the trophic status of three lakes- Sheeshnag, Nilnag and Dal wherein they observed that Sheeshnag, the high altitude lake, has still maintained its low trophic nature, despite the seasonal stresses of Amaranth Yatra. While as Nilnag, the pine forest lake, has started its march towards high trophic nature because of high influx of silt that is rich in nutrients brought from the catchment area and so far as the world famous Dal lake is concerned, it is under rapid trophic evolution which is clearly evidenced from its eutrophication levels produced as a result of human interactions.

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85 Joshi, P. K., Rashid, H., & Roy, P.S. (2011). Landscape dynamics in Hokersar wetland- J&K, An application of geospatial approach. *Journal of Indian society and remote sensing, 30* (1).

86 Khan, M. A., Shah, M. A., Mir, S. S and Bashir, S (2004). The environmental status of a Kashmir Himalayan wetland game reserve: Aquatic plant communities and eco-restoration measures. *Lakes & reservoirs: Research and managemen*t, *9*, 125-132.

87 Yaqoob, K., Pandit, A. K., & Wani, S. A. (2007). Comparative physico-chemical limnology of three lakes of Kashmir Himalaya. *Proceedings of Taal. The 12th World lake conference: 1922-1927.*

Mir et al. (2009)[88] have worked out that the patterns of distribution of sustained biota and the wetland dynamics of Hokersar have undergone a significant change because of ecological factors such as loss of habitat due to siltation, increasing agricultural activities, pollution and drastic hydrological fluctuations which is clearly visible from the reduction of wetland area from once 13.26 sq. Kms to mere 5.6 sq. Kms. The scholars have clearly pointed out that the Hokersar wetland is rapidly deteriorating which needs urgent ecological restoration.

Parray et al. (2010)[89] are of the view that anthropogenic factors like encroachments, draining of water for irrigation, grazing, dumping of domestic, municipal and agricultural wastes etc. have caused immense pressure on the Chatlam wetland. The authors, after the analysis of the chemical parameters of the water, noted down a gradual increase in the concentration of pH, conductivity, chlorides, nitrates, phosphates and ammonia etc. Finally, this study highlighted the need to restore this wetland.

Alam et al. (2011)[90] have worked on the multi temporal land use and land cover dynamics of Hokersar wetland in which it has become clearly discernible that there is a continuous inflow of sediment load and other nutrients from the upper catchment into the wetland as a result of which there is fragmentation of wetland into various zones of varying physic- chemical properties. Moreover, there is a significant reduction in the water depth and enhancement in eutrophication which has resulted in the overall degradation of the wetland.

Romsho et al. (2011)[91] have also focused on the analysis of Hokersar wetland from the perspective of its Spatio-temporal dynamics during the last 40 years (1969-2008). The authors have observed significant changes that have taken place in the land use

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88 Mir, A. A., Mahajan, D. M., & Saptarishi, P. G. (2009). Composition and distribution of macrophytes in Hokersar- A wetland of international importance in Kashmir Himalaya. *International Journal of Climate Change: impacts and Responses, 1* (4).

89 Parray, J. A., Kamili, A. N., Bhat, A. A., & Hamid, R. (2009). Microbiological analysis of Manasbal Lake with reference to fungal community. *J. Himalayan Ecol. Sustain. Dev., 4,* 22-26.

90 Alam, A., Rahid, S. M., Bhat, M. S., & Sheikh, A. H. (2011). Impact of land use/ land cover dynamics on Himalayan Wetland Ecosystem. *Journal of Experimental Sciences, 2* (3), 60-64.

91 Romshoo, S. A., Ali, N., & Rashid, I. (2011). Geoinformatics for characterizing and understanding the spatio-temporal dynamics (1969 to 2008) of Hokersar wetland in Kashmir Himalayas. *International journal of the Physical Sciences, 6* (5), 1026-1038.

/land cover of the wetland and its surrounding uplands. The authors have highlighted various factors responsible for the deterioration of this wetland as sediment load carried by river Doodhganga, encroachment by farmers and extension of willow plantations in the wetland.

Dar et al. (2013)[92] have tried to evaluate the pollution load and anthropogenic pressure on the Manasbal Lake on the basis of its physico-chemical properties. They have come to the conclusion that Manasbal Lake which is around 30 kms from Srinagar towards its north is undergoing an increasing pollution load due to human induced as well as climatic factors resulting in its eutrophic condition which need immediate measures of protection.

Badar et al. (2013)[93] have mainly focused on the land use and its impact on the hydrological response patterns of Dal lake. Firstly, they have presented a better understanding of what land use/land cover change is and then highlighted its driving forces and its overall impact on the hydrological processes in Dal catchment by making use of remote sensing and simulation modelling. Conclusively, the scholars have considered the changing land use/ land cover as a major concern that has disrupted the functioning and the ecological stability of the dal lake ecosystem.

Khan et al. (2013)[94] have made Physico-chemical characteristics as the basis to understand the water chemistry of Dal Lake. They have highlighted the overall pressure and the causes responsible for the eutrophication of the lake and have maintained that world famous dal is exhibiting negative changes so far as its trophic status is concerned.

Mushtaq et al (2013)[95] also tried to determine basic physico- chemical properties of Dal lake water. After the sampling of surface water on monthly basis, they found that the lake is continuously being deteriorated as a result of anthropogenic activities in

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92 Dar, J. A., Mir, M. F., Bhat, N. A., & Bhat, M. A. (2013). Pollution studies of a Monomictic Lake, Srinagar, Jammu and Kashmir. *Forest Research, 2* (1).

93 Badar, B., Romshoo, S. A., & Khan, M. A. (2013). Modelling catchment hydrological responses in a Himalayan Lake as a function of changing Land use and Land cover. *J. Earth syst. Sci. 122* (2), 433-449.

94 Khan, N. A., Khan, M. Y., Raja, I. A., & Bhat, A. A. (2013). Water chemistry of famous Dal Lake Kashmir. Nature and Science, 11 (4), 22-23.

95 Mushtaq, B., Raina, R., Yaseen, T., Wanganeo, A., & Yousuf, A. R. (2013).Variations in the physico- chemical properties of Dal Lake, Srinagar, Kashmir. *Journal of Environmental Science and technology, 7* (7), 624-633.

general and urbanization in particular which is evidenced by its low transparency, shallow water depth and higher concentration of other minerals like sulphates, phosphates, chlorides and nitrates.

Bhat et al. (2013)[96] worked on Anchar Lake for a period of 6 months and found human induced factors as the main causes responsible for the deterioration of this wetland.

Mukhtar et al. (2014)[97] have also utilized physico-chemical parameters to understand the quality of surface water of Nageen basin and Brari-Nambal lagoon of Dal Lake. They brought to the forefront the 'water quality index' which they thought can be used largely to represent the reliable picture of water quality.

2.4 Literature on Problems and Management of Wetland Ecosystems

Prasad et al (2002)[98] highlighted that wetlands occupying about 58 million hectares in India are highly usable and diverse in their spatial extent. They are found in hot and humid coastal zones as well as in cold deserts of the country. This paper highlights the causes and consequences of wetland losses and utilization of highly advanced technique of GIS for irrigation monitoring, analysis of water quality, mapping of flood zones and cropping patterns etc. The authors provide the methodology to evolve at a conservation plan at national level by making use of IRS-LISS III data for analyzing various physico-chemical characteristics of wetlands and to carry out simultaneous extensive field works for ground realities.

Ministry of Environment and Forests, Government of India (2007)[99] in its report first highlighted the benefits of wetlands and then enumerated the threats and lastly bring forth the action plan for their management. It mentions that so far as the benefits of

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96 Bhat, S. A., Meraj, G., Yaseen, S., Bhar, A. R., & Pandit, A.K. (2013). Assessing the impact of anthropogenic activities on spatio-temporal variation of water quality in Anchar Lake, Kashmir Himalayas. *International journal of Environmental sciences, 3* (5).

97 Mukhtar, F., Bhat, M. A., Bashir, R., & Chisti, H. (2014). Assessment of surface water quality by evaluating the physico chemical parameters and by checking the water quality index of Nigeen Basin and Brari Nambal Lagoon of Dal Lake, Kashmir. *Journal of Matter. Environ. Sci., 59* (4), 1178-1187.

98 Prasad, S. N., Ramachandra, T. V., Ahalya, N., Sengupta, T., Kumar, A., Tiwari, A. K., Vijayan, V. S., & Vijayan, L. (2002). Conservation of Wetlands in India- A review. *Tropical Ecology, 43* (1), 173-186.

99 *Conservation of Wetlands in India: A profile (Approach and Guidelines).* (2007). Ministry of Environment & Forests, Government of India.

the wetlands are concerned, these act as life support systems, winter resorts for migratory birds, suitable living places for fish and other organisms and valuable for educational, recreational and aesthetic purposes. The major threats included are both biotic as well as abiotic. Biotic ones comprise of siltation, weed infestation, discharge of industrial effluents, loss of soil due to cutting of trees, and habitat destruction and the abiotic ones include encroachments, dredging, hydrological interventions and pollution. The report highlights that all the threats need to be addressed by conservation and management measures which include comprehensive strategy, institutional mechanism, capacity building and community participation. Lastly, the report suggests formulation of management action plans the checklist of which includes knowhow of the geographical personality of the wetland, Baseline data of the wetland, Land use pattern of the catchment area, sources of inflow and outflow, distribution of flora and fauna, households dependent upon the wetland, their socio economic survey and jurisdiction of concerned departments dealing with the management of wetlands, monitoring mechanism at local and state levels, community participation and wise use of wetland research.

Agarwal (2007)[100] in her paper has presented some facts about the wetlands in India by stating that India being a land of streams and rivers supports a rich diversity of both coastal and inland wetlands. However, most of the wetlands are under various pressures because of the fact that wetlands are considered as wastelands and their importance is neglected. Rapidly increasing population and the consequent pressure to feed the increasing mouths result in bringing more and more land under agriculture increase in settlements etc. result in the degradation of these ecosystems. This increasing deterioration is further accentuated by the addition of effluents from industries etc. making these wetlands the least protected ecosystems. Furthermore, the author points out that it is high time for the individuals , governments and institutions to come together and act together and increase awareness about the importance of these highly fragile ecosystems.

100 Agarwal, N. (2007). Wetlands: Future on stake. *Proceedings of Taal: The 12th World Lake Conference*, 1312-1314.

The report of expert committee constituted by Ministry of Environment and Forests (2008)[101] on the status of Vembanad Lake in Kerala highlight that water quality of the lake especially in its southern corridors appears to be very bad. It can't support any useful fauna or flora. Secondly, the life and health of people living in and around this wetland have been adversely affected by the deterioration of this wetland. Thus, the report provides for some measures that should be taken to save the life of this wetland which includes few recommendations like (a) Lake Inventory should be developed (b) Catchment areas of the lake should be conserved (c) State government should set-up Vembanad lake conservation body (d) Pollution and water quality studies should be carried out on a regular basis (e) Tourism in the lake should be regulated (f) Studies on biodiversity of the wetland should be undertaken (g) Legal framework and appropriate mechanism for lake conservation should be there (h) A sustainable action plan for the restoration of this wetland should be evolved at the outset.

Punjab urban planning and development authority in its master plan (2009/10-14/15)[102] of Gurdaspur LPA analyses the general characteristics of Keshopur wetland, its major issues of deterioration and the consequent measures to reclaim this ecosystem. The master plan highlights that 85 per cent area of the wetland is under long term lease agreements for resource use, half is under fishponds, one third (1/3rd) under commercial crops of lotus and about 5 per cent area is under grasslands which clearly indicates that this lake is under high degree of extinction. The main threats that the master plan highlights include (1) Commercialization which has depleted lake diversity and water quality (2) Rapid urbanization around the wetland (3) Growth of alien species of Aquatic vegetation (4) Absence of clear demarcation of wetland boundary (5) Lack of awareness on the importance of wetland (6) Absence of long term policy for its management.

The management initiatives include the demarcation of boundary, zoning of wetland, management of habitat, management of invasive species, development of ecotourism, and effective monitoring of wetland.

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101 Report on Visit to Vembanad Kol, Kerala, a wetland included under the National Wetland Conservation and Management Programme of the Ministry of Environment and Forests (2008). Retrieved From http:*//planningcommission.nic.in/reports/E_F/Vembanad%20Kol.pdf*

102 Master plan of Gurdaspur L.P.A. (2009/10- 2014/15). Punjab Urban planning and Development authority.

Deka et al. (2011)[103] have worked on Deepor Beel Lake of Assam wherein they have found out that this wetland is highly invaded by alien species of Hyacinth besides being under huge anthropogenic pressure that has led to its fragmentation and the consequent disturbances in the regular flow of water into it. They have taken two time periods of 1991 and 2010 in which they highlighted the rapid shrinkage of lake area because of growth of the aquatic vegetation and encroachments. The authors have also put forward some recommendations to protect this wetland from loss of its habitat which include regular monitoring of wetland using modern sophisticated techniques of remote sensing and GIS, awareness of environmental importance among locals, provision of alternative livelihood options to the local communities, afforestation around the wetland, minimization of encroachments and eradication of algal blooms and other invasive species.

Bhattacharjee and Bargali (2012)[104] studied wetlands around Corbett in Uttrakhand wherein thay highlighted the major threats to these wetlands and thereby suggested appropriate recommendations to overcome these threats. The authors in their report enumerate the main threats as habitat encroachment by local people, algal infestation, excessive grazing and hunting. They suggested that immediate steps should be taken to sort out these issues. The concerned fisheries department, forest department and irrigation department should work together and seek the cooperation of police department also, wherever necessary, in controlling the illegal encroachments of wetlands and intensive grazing etc. Besides, special awareness camps should be organized for the local villagers, children and gujjars etc. and further intensive research should be carried out on the dynamics of these wetlands.

Sreejith (2013)[105] has studied Kutanad wetland, a unique water body of Kerala important for its beauty and ecological significance. The author points out that this wetland is slowly and gradually losing its charm because of the highly intensive anthropogenic pressures which if not controlled would be in its worst condition. He

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103 Deka, J., Tripathi, O. P., & Khan, M. L. (2011). A multi-temporal remote sensing approach for monitoring changes in spatial extent of fresh water lake of Deepor Beel Ramsar site, a major wetland of Assam. *Journal of Wetland Ecology, 5*, 40-47.

104 Bhattacharjee, A., & Bargali, H. S. (2012). Status and trend of Waterbirds in Wetlands around Corbett. *The Corbett foundation, India. Technical report submitted to Uttrakhand state forest Department*.

105 Sreejith, K. A. (2013). Human impact on Kuttanad Wetland Ecosystem- An Overview. *International journal of science, Environment and Technology, vol 2* (4), 679-690.

then provides for some management plans to avoid the deterioration of this wetland like coordination of government agencies, voluntary organizations and local communities for its management and recommends a massive eco restoration programme to conserve this ecosystem.

Bassia et al. (2014)[106] has highlighted the aspects of wetlands that have been worked upon as well as those that have not been noticed yet. They are of the view that the limnological studies have remained a primary concern in most of the wetland studies. However, the physical, socio- economic and the institutional processes that bring about those limnological changes have not been taken into consideration. Thus, the authors point out that more attention is required to be given towards these aspects in the form of better management policies for these wetland ecosystems that are under a consistent natural and anthropogenic threat.

Summary

Literature Review is an important prerequisite to actual planning and conducting a research which assists the researcher not only in providing information available in the field of research but also in suggesting the methods to be adopted. It also helps in avoiding the mistakes done by others and locating the gaps in the earlier works by others.

To sum up with the survey of the related studies on the tourism and wetlands, it is worthwhile to note down here that almost all the above studies have tangentially touched upon few broad aspects of tourism like spatial and temporal growth of tourism, trends and prospects of tourism and the impacts and problems associated with this phenomenon. So for as the studies on Kashmir Valley tourism are concerned, special focus has also been given towards the setbacks of tourism.

Most of the studies have focused upon the positive as well as negative impacts of tourism wherein it has been highlighted that tourism can act as an employment generator and can be used as a planning tool for providing regional development and fostering peace by reducing world poverty and promising cross cultural understanding. Secondly, tourism development has been taken into account which has

106 Bassia, N., Kumarb, M. D., Sharma, A., & Saradhi, P. P. (2014). Status of Wetlands in India: A review of extent, ecosystem benefits, threats and management strategies. *Journal of Hydrology: Regional Studies*, 2, 1-9.

been said to depend upon continued economic growth and the willingness of governments to open their countries to foreigners and to allow their own nationals to travel freely abroad. Thus, it has been brought to the limelight that tourism industry of not only Kashmir Valley but also of the whole nation (India) needs a serious attention as it affects millions of human beings.

A number of studies highlighting that tourism has brought a plethora of environmental degradation have also been reviewed. These studies focus on the crimes, traffic Jams and pollution as the menaces of tourism development. At regional or local level, adventure tourism, eco-tourism and religious tourism have been highlighted as few broad prospects of tourism in Kashmir Valley. The growth and smooth development of tourism industry in Kashmir Valley that has been prey to the severe setbacks of insurgency and political gimmicks besides infrastructural loopholes and inaccessibility bottlenecks have also been reviewed.

Similarly, almost all the reviewed studies on wetlands focused mainly on the problems of wetlands, their spatial and temporal dimensions and few broad aspects of management. It has been clearly pointed out that wetlands are among the most productive ecosystems of the world which not only play an important role in hydrological cycle but also act as vital ecosystems for storing flood waters, enhancement of water quality, storage of carbon and used as buffers.

However, a large number of works have focused on the wetlands as the most threatened ecosystems of the world. These studies highlight the processes of industrialization, urbanization and dumping of solid and liquid wastes into these delicate ecosystems as the main causes of their deteriorating health which not only degrade their water quality but also make them unfit and unsafe for human and aquatic consumption. Thus, need of the hour is to strike a balance between conservation of wetland ecosystems, their sustainable utilization and their conversion.

CHAPTER III

ORIGIN, EVOLUTION AND GROWTH OF TOURISM IN KASHMIR VALLEY

3.1 Concept of Tourism

Tour' in English and French means a journey, a circular trip. The 19th century Travel and Tourism Dictionary defines 'Tourist' as "a person who travels for pleasure of travelling out of curiosity and because he has nothing better to do and even for the joy of boasting about it afterwards"[1]. According to Universal Dictionary, "The Tourist is a person who makes journeys for the sake of curiosity, for the fun of travelling, or just to tell others that he has travelled"[2].

The League of Nations (1937) defines the term 'Foreign Tourist as "Any person visiting a country, other than that in which he usually resides for a period of at least 24 hours"[3]. The people that are to be considered tourists within this definition include (a) Persons travelling for pleasure, for domestic reasons and health (b) Persons travelling to meetings or in a representative capacity of any kind (scientific, administrative, diplomatic, religious, athletic) (c) Persons travelling for business purposes (d) Persons arriving in the course of a sea cruise even when they stay for less than 24 hours and the categories of people that are not to be regarded as tourists include (a) Persons arriving with/ without a contract of work, take up an occupation or engage in any business activity in the country (b) Persons coming to establish a residence in the country (excursionists) (c) Students and young persons in boarding establishments or schools (d) Residents in a frontier zone and persons domiciled in a country and working in an adjoining country, and (e) Travelers passing through a country without stopping even if the journey takes more than 24 hours.

The above definition was confirmed by the United Nations in 1945 and it was stated that a 'Tourist' was a person who stayed in a foreign country for more than 24 hours

1 Bhatia, A. K. (2006). *The Business of Tourism- Concepts and Strategies.* Sterling Publishers Pvt. Ltd: New Delhi.
2 Chiranjeev, A. (2008). *Concept of Tourism*. Jnanada Prakashan: New Delhi
3 Ibid.,p.60

and less than 6 months for any non-immigrant purpose. This definition was adopted by many countries for the compilation of travel statistics.

Conceptually, tourism arises from the movement of people to, and their stay in, different destinations. It is composed of three basic elements as (a) A dynamic element which involves travel to a selected destination or destinations (b) A static element which involves the stay in the destination (c) A consequential element resulting from the two preceding elements which is concerned with the effect on the economic, physical and social sub systems with which the tourist is directly or indirectly in contact.

In the words of Professor Walter Hunzikar and Kurt Krapf (1994), "Tourism is the sum of phenomena and relationship arising from the travel and stay of non- residents, in so far as they do not lead to permanent residence and are not connected with any earning activity"[4].

As per the International Union of Travel Organization (IUOTO), now called as World Tourism Organization (WTO), Tourist is a temporary visitor staying for at least 24 hours in a country visited when the purpose of the journey can be classified under Leisure (recreation, holiday, health, study of religion and sports) or Business (family, mission, meetings).

Herman Von Schullard, An American Economist, defined Tourism as, "The sum of the total operations, mainly of an economic nature which directly relates to the entry, stay and movement of foreigners inside and outside a certain country, city or region".

According to Tourism Society in Britain, "Tourism is the temporary short-term movement of people to destinations outside the place where they normally live and work and their activities during the stay at their destinations, includes movement for all purposes, as well as day visit or excursions".

All the above definitions of tourism bring out few distinct features of Tourism as (a) Involvement of a mobile population of travelers who are stranger to the place they visit (b) It is essentially a pleasure and recreational activity (c) Their stay is not connected with any remunerated activity or an activity involving earnings.

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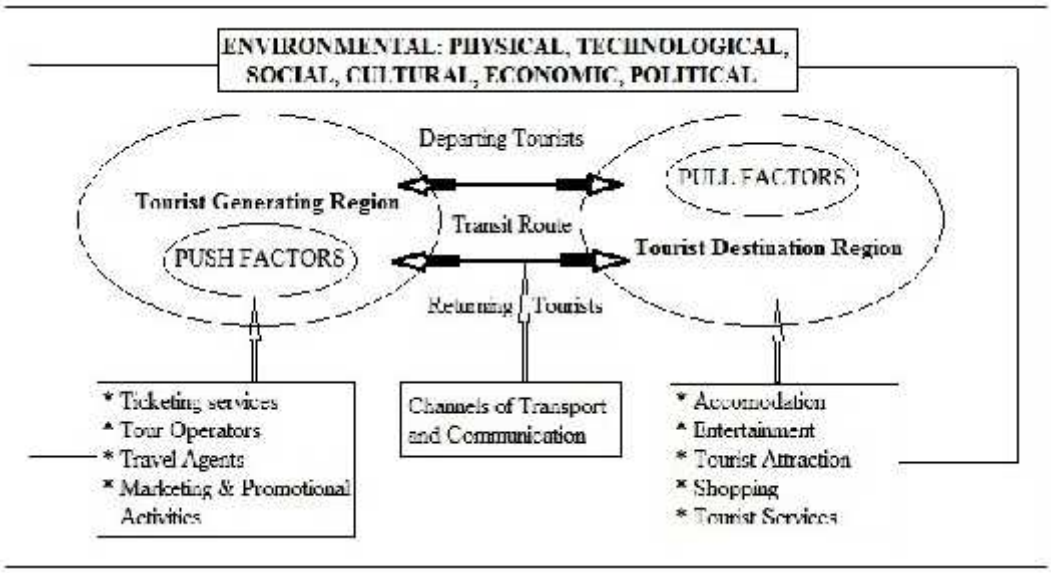
4 Khan, M. A. (2005). *Introduction to Tourism*. Anmol Publication: New Delhi

WTO (World Tourism Organization) has taken the concept of 'tourism' beyond a stereo-type image of 'Holiday making'. The officially accepted definition of Tourism by WTO is "Tourism comprises the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes". It has classified Tourism into three types as (a) Domestic Tourism which consists of residents visiting within their own country and where no formalities are required (b) Inbound Tourism which Comprises non-residents travelling into a country of their choice and (c) Outbound Tourism which Comprises residents of a nation travelling out to foreign country.

These three basic forms of tourism can in turn be combined to derive three categories of tourism as Internal Tourism, National Tourism and International Tourism respectively.

Geographers study the spatial dimension of tourism as a human activity, focusing on the tourism generating and tourism receiving areas. The study can incorporate a variety of scales, climate, tourist courses to local landscape and the tourist resorts. Thus, from the geographical point of view, tourism has three main components as (a) The tourist from one country to another country comprises generating areas (b) The destination area comprises tourist receiving countries or areas, and (c) The route travelled between respective destinations.



Source: Leiper, N. (1990).Tourist Attraction Systems. *Annals of Tourism Research, 17* (3).

Figure 3.1- Leiper's Model of Tourism System

Tourism flow depends on pull and push factors. Push factors depend on the stage of economic development in generating market, number of holidays available and income; and pull factors influence the tourist flow which include accessibility and the relative cost. Thus, tourism has become a major and an integral part of economic, social and physical development. It comprises complete system of nature, the universe, the space and the galaxy which includes the man and his activities, wildlife, mountain and valleys, rivers and waters, forest and trees, social and cultural system, flora and fauna, weather and climate, sun and the sea.[5]

3.2 Origin of Tourism

The splendid array of authoritative guides about evolution of Kashmir Valley begins with the Nilamata purana and continues practically without break to the present time. The age of the Nilamata is uncertain; but there is evidence to show that in one form or the other it was extant in the early Middle Ages. Beginning with the legend regarding the lacustrine origin of the valley and its drainage after the death of Jalodbhava, the water demon, who infested the lake and made human habitation on its shores impossible, the Purana gives us a detailed list of the holy places of Kashmir. To each name it appends a more or less comprehensive topographical description, which is of great value in identification of the numerous places mentioned. Although close to the silk route, seven passes connect the Valley of Kashmir to the other Northern countries.

Man has been travelling throughout the ages. From the very early historical period, man has a fascination for travel. However, much of the travel in the beginning was largely subconscious and a simple affair. Further, no regular travel formalities existed in the early period.

In the distant past, the travel was not undertaken for the purpose of pleasure but the primary motive was related to trade, commerce and the activities associated with it. Besides, pilgrim was another traveler who was a scholar in search of ancient texts and a curious way- farer looking forward to new and exciting experiences whose main aim was to seek knowledge.

Earliest travelers were probably Phoenicians who are credited with the invention of money in around 3000 B.C. Homer's 'Odyssey' records the wanderlust of the ancient

5 Goswami, R. K. (2007). *Tourism and Environment*. Cyber Tech. Publications: New Delhi.

Greeks. Besides, there are innumerable references to great explorers who spent many formidable years of their lives in search of knowledge which subsequently paved the way for modern day travel.

3.3 Evolution of Tourism in Kashmir Valley

Who has not heard of the Vale of Cashmere?
With its roses the brightest that earth ever gave,
Its temples, and grottos, and fountains as clear
As the love-lighted eyes that hang over their wave?
(Thomas Moore in Lala Rukh)

Kashmir Valley is a unique place in the world. There is hardly anyone who is left unimpressed by the romantic scenery of mountain-grit Kashmir Valley right from the olden days. Words of Hieun Tsang, Kalhana, Al-Beruni, Jehangir, Francois Bernier, William Moorcroft, Charles Hugel and other travelers bear a testimony for Kashmir Valley's alluring and enchanting beauty. Kashmir Valley is the most wonderful part of the globe. Its scenic beauty, salubrious climate in different seasons, snowy landscape, vast lakes, historical monuments, orchards, health resorts, monasteries, shrines, serpentine rivers, evergreen forests, colorful and attractive flowers and hospitality nature of its people attract millions of tourists to the Valley[6].

Kashmir Valley has a long tradition of visits by traders, missionaries, fortune seekers, pilgrims and invaders from the very ancient times. Evolution of tourism in Kashmir Valley, its growth and development is closely associated with all its ancient civilization. Travelers from far and wide have visited the Kashmir Valley for centuries past. It has been the main route of cultural and commercial intercourse between India and rest of the eastern world including Middle East and Central Asia. The quantification of Kashmir as a tourist spot in the world has been acknowledged everywhere.

The centrality of the Valley as per Puranic geography was a recognition of the fact that this Valley was a meeting ground for trade and ideas for the four main parts of

6 Mirza, N. A. (2000). *Management of Tourism in Jammu and Kashmir*. Dilpreet Publishing House: New Delhi.

the Old World.[7] In fact, it became more than a meeting ground. Our knowledge of the political, social, and economic conditions which prevailed in early Kashmir is exceptionally ample, and is derived from a variety of sources. References to the country and its people are found in the literature of the Greeks, the Chinese, and the Arabs, as well as in Indian literature. Incomparably, the most authoritative and informative are, naturally, the indigenous writers of Kashmir[8].

In this chapter an attempt has been made to study the evolution of tourism in Kashmir Valley that has been divided into four phases- Ancient Period, Late Medieval Period, British Period and Post British period or Post Independence Period. The use of secondary sources of data has been mainly relied upon in this chapter which can be elaborated as under:

3.3.1 Tourism in Ancient period

This encompasses tourism in Hindu period, tourism in Muslim period as:

3.3.1.1 Tourism in Hindu Period

By far the greatest amount of our information regarding ancient and medieval Kashmir is supplied by indigenous historians, of whom Kalhana is the oldest and most informative. He composed his Rajatarangini, the river of kings, in A.D. 1148-49. His father, Champaka, was the minister of King Harsha (A.D. 1089-1101), but after the murder of his master in A.D. 1101 neither father nor son appears to have taken office under the succeeding rulers. Kalhana claimed to have used 11 earlier works as well as Nilamatapurana. Thus, Rajtarangini has has very great value, not only because it mentions the great historic names of Asoka, Kanishka, etc., but also because it presents us with a fairly detailed account of the general condition of the kingdom before we reach the centuries which immediately precede the time of Kalhana, and for which he had genuine oral and written information.[9]

Kalhana rightly mentions that the great Mauryan emperor Ashoka, a follower of Buddhism, is recorded to have ruled Kashmir. He founded the old city of

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7 Kak, S. (2007). *The Wonder that Kashmir Was.* Retrieved from http://ikashmir.net/subhashkak /index. html

8 Kak, R. C. (1998). *Ancient Monuments of Kashmir*. In Suresh K, S., & Usha S. (Eds.). Kashmir through Ages, New Delhi: Deep & Deep Publications.

9 Ibid.,p.104

'*Pandrethan*' and built many vihars and temples to win the hearts of local people. According to local tradition. Lord Buddha is also supposed to have visited Kashmir that has been beautifully mentioned by Sir Charles Elliot in his book '*Hinduism and Buddhism'*. The scholars also accept the theory that the Valley for over 200 years was ruled by Indo-Greek Kings before the start of Kushan rule in the state. This contact with the Greeks has produced beautiful architectural and scriptural style of old Kashmiri temples and influenced the coinage of later Kashmiri Kings.

According to many scholars, Kanishka held the third great council of the Buddhist church at 'Kundalvan' (Harwan,near Shalimar garden). Nearly 500 Buddhist and Hindu scholars attended this conference and a learned Kashmiri Brahmin Vasumitra presided over its session.[10] Some of the great Buddhist scholars who took active part in this council were Ashvagosha. Nagarjuna, Vasubandu, Sugamitra and Jinamitra. Hien Tsang praises the intellectual calibre of Kashmiri scholars and considered them as incomparable.

As a result of this conference, large number of Kashmiri intellectuals took to missionary work and hundreds of the wisest sons of the Valley carried the torch of Indian Civilization and Culture to many parts of central Asia, China, Tibet and other places.

It was in the 8th century that Karakota dynasty came to power in Kashmir with its great ruler '*Meghvahan'* whose chief Queen "*Amrit Prabha*" built many vihars for foreign pilgrims and students who came to Kashmir in large numbers for learning. It was in the reign of '*Durlabvardhan'* that the great Chinese pilgrim Hien Tsang (631-33 A.D) visited Kashmir through Baramulla. According to the Chinese Annals, Kashmiri rulers controlled the route from China to Ki-pin (Kabul) around 627 A.D[11]. Hieun Tsang also found all the adjacent territories on the west and north, down to the Taksasila, Hazara, Salt range and smaller hill states as tributaries of Kashmir in 631 AD[12].Certainly, the emergence of Kashmir as a great empire was the handiwork of Huns which they bequeathed to the Karkotas who maintained the tradition as true heirs of their great ancestors.

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10 Bamzai, P. N. K. (1962). *A History of Kashmir*. Metropolitan Book Company: Delhi.
11 Cunningham, A. (1891). *Coins of Medieval India*. London: B. Quaritch, 15, Piccadilly.
12 Beal, S. (1884). *Buddhist Records of the Western world*. Trubner & Company, Ludgate Hill: London.

The Karakotas (620-855 A.D) expanded the boundaries of Kashmir Empire beyond any precedent in the history of Kashmir. Kalhana gives a hyperbolic account of the conquest of the great Karakota ruler, Lalitaditya, yet there is no doubt that he defeated Yasuvarman, the famous ruler of Kanauj, and brought all the immediate neighboring territories under his control. Certainly, during the period of Lalitaditya Kashmir emerged the greatest power in the whole of northern India. As a result, there was a great influx of talent from the neighboring world making Kashmir a famous seat of learning and a great centre of hybrid civilization[13]. Thus, Kashmir was a reputed centre of dialogic tradition attracting the scholars of different beliefs to put across their views.

After 856 A.D, new Utpal dynasty came to power, the most important ruler of which was Maharaja Awanti Verman whose reign witnessed a period of peace and consolidation. It was during this time that the Valley rose to great heights in the realm of philosophy, art and letters. The most important foundation of the King was his capital city of Avantipur. In the time of King Yasakara (939-48), a Muth (hospice) was built for the students of India who came to Kashmir for study and meditation.[14] It clearly reveals intimate cultural contact between the valley and plains of India in the 10th century.

From 1089 to 1101 A.D, King Harsha ruled Kashmir. Versed in many languages, a good poet, lover of music and art, he started his rule in a remarkable way and became famous in northern India. His court was a centre of luxury and splendor.

Lohara dynasty ruled Kashmir till the end of Hindu rule in Kashmir (1339 A.D).In the beginning of 14th century, a ferocious Mongol, '*Dulucha'* invaded the Valley through its northern side (zojila pass).With an army of 60,000 men, he destroyed towns and slaughtered thousands which practically ended the Hindu rule in Kashmir. It was in the reign of Raja Sahadev, a weak and worthless man, that three adventurers- Shah Mir from Swat tribal territory on the borders of Afghanistan, Rinchin from Ladakh and Lankar Chak from Dard territory near Gilgit visited Kashmir and played a notable role in political history of the valley.

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13 Stein, M.A. (1978). *Kalhan's Rajtarangini- A chronicle of the kings of Kashmir*. Motilal Banarsidas: Patna, Bihar.

14 Bamzai, P. N. K. (1962). *A History of Kashmir*. Metropolitan Book Company: Delhi.

The last Hindu ruler of Kashmir was Udyan Dev. It was his chief Queen "*Kota Rani"*who practically governed the state. She was a very brave lady and an able ruler. Though she tried her best to save her kingdom but odds were too heavy for her that she was defeated by Shah Mir at Jayapur (Sumbal). Her death in 1339 paved the way to the establishment of Muslim Rule in Kashmir[15].

3.3.1.2 Tourism in Muslim Period

After the death of Queen Kota Rani, Shah Mir ascended the throne under the name of Sultan Shamasud-din, and his dynasty ruled the state for 222 years[16]. This period is one of the most important in the annals of Kashmir and as much as Islam was firmly established here. One of the first travelers from West was Bernier who visited Kashmir Valley during the reign of Aurangzeb. He called Kashmir the '*Paradise of India'* and remarks "In fact the Kingdom surpasses in beauty all that my imagination had anticipated".

Sayed Mir Ali Hamdani, most remarkable personality of the then Muslim world, visited Kashmir Valley in the reign of Sultan Qutub-ud-din. At the time of his third visit, he got with himself 700 Sayeds from Hamdan to establish their missionary centres in different parts of the Valley.[17]

Mohibul Hasan, a modern historian writes, of all the Sultans who sat on the throne of Kashmir, Zain-ul- Aabiden (Budshah) was undoubtedly the greatest. He introduced many arts and crafts for which Kashmir has become famous ever since. He promoted learning, music, art and crafts and made Kashmir the centre of great culture. The Sultan also maintained cordial and friendly relations with the rulers of other countries like Sindh, Bengal, Tibet, Mecca, Jilan and Egypt. Besides, he opened a Royal Kitchen at Rainawari known as Jogi Lankar even now.

The Sultan invited competent teachers from different countries to Kashmir to train people here. Among many industries introduced by him, carpet, paper mashie, paper making, silk rearing, shawls and manufacturing of gunpowder are worth mentioning. Kashmir became so famous for beautiful designs on silk and shawls that it attained an

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15 Naik, A. B. (2008). *Tourism Potential in Ecological Zones and Future Prospects of Tourism in Kashmir Valley*. An unpublished Ph.D. thesis: Dept. of Geography, A.M.U-Aligarh.

16 Hasan, M. (2002). *Kashmir under the sultans*. Gulshan Publishers: Srinagar.

17 Ibid.,p.30

unrivalled fame in Asia. Besides, the Sultan was a great builder. He founded the new city called '*Nowshehar*' which he adorned with splendid houses for his officers, courtiers and learned men. He built a place of 12 stories in it each containing 50 Rooms, Halls and Corridors. It was surmounted by a golden dome and its spacious halls were lined with glass[18].

In nut shell, during the Sultanate Period (1417-1469 AD), significant strides were made to lay the foundations for the promotion of tourism in various forms. The most elegant era in the evolution of Tourism in Kashmir Valley began in 1587 when Akbar, the great Mughal Emperor conquered Kashmir.

3.3.2 Tourism in Late Medieval Period

This period began with the Mughal Rule in Kashmir and can be studied under following sub headings:

3.3.2.1 Tourism in Mughal Period

The Mughal Rule (1587-1752) in Kashmir that began with the conquest of Akbar in 1587 witnessed the peace and order in the Valley. Akbar built a new town near Hariparbat and called it Nagar-Magar and built the massive wall around the hill[19]. He visited the Valley thrice and the Mughal rulers never came alone, but were always accompanied by hundreds of Nobles, Amirs and Umras, Princes and Army Generals. Thus, the fame of the Valley spread throughout the country and a very large number of people started to visit the Valley of Kashmir. It was in the time of Jahangir that the beauty of the state attracted thousands of visitors to the happy Valley.

Jahangir came virtually, under the spell of the scenic beauty of the place, and wherever he found a hill coming down gently to a spring or a grove of majestic Chinar trees or a beautiful lake, he utilized the place for planting a pleasure garden[20]. Shalimar and Nishat gardens on the banks of Dal Lake, would keep Jahangir's love for natural beauty ever fresh in our memory. Perhaps no other ruler has ever paid so

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18 Qasim, M. (1981). *Tarikh-i-Firishta*, Tr. Briggs, J. under title *History of Rise of Mohammaden Power in India:* New Delhi.

19 Alami, A. F. (1894). *Ain-i-Akbari.* Tr. H, Blochman., & H. S. Jarrett. Calcutta: The Asiatic Society of Bengal.

20 Bernier, F. (1891). *Travels in the Mogul Empire: A.D.1656-1668.* Archibald Constable & Company: London.

much tribute to the beauty of Kashmir as Jahangir did. He visited the scenic valley 13 times[21].

Shah Jahan also visited Kashmir Valley a number of times with a large number of nobles. Owing to the long peaceful rule of Mughal Kings, thousands of people now began to come to Kashmir to find mental peace, regain their health and find spiritual salvation. Shah Jahan laid the foundation of Chashmai-Shahi and also built a portion of Shalimar garden[22].Aurangzeb visited Kashmir Valley only once in 1665. An interesting account of the emperor's journey to the Valley has been given by a French physician 'Francois Bernier' who accompanied the Emperor. In his book '*Travels in The Mogul Empire'*, Bernier remarks:

"It is not indeed without reason that the *Mogols* call *Kachemire* the terrestrial paradise of the *Indies*, or that *Ekbar* (Akbar*)* was so unremitting in his efforts to wrest the scepter from the hand of its native Princes. His son *Jehan-Guyre* (Jahangir) became so enamored of this little kingdom as to make it the place of his favorite abode, and he often declared that he would rather be deprived of every other province of his mighty empire than lose Kashmir.

After the death of Aurangzeb, instability, lack of unity and discriminations of Mughal kings towards the subjects of Valley started which lead to Afghan invasion in 1752.

Table 3.1- Mughal Gardens in Kashmir Valley

Name of the Garden	**Ruler who built**
Nishat	Jahangir
Shalimar	Jahangir
Cheshmai Shahi	Shah Jahan
Harwan	Asif Khan
Verinag	Jahangir
Achabal	Nur Jahan

Source: Department of Tourism, Srinagar, Jammu & Kashmir

21 Fergusson, J. (1973). *Kashmir- A historical Introduction*. Centaur Press: London
22 Ibid.,p.145

3.3.2.2 Tourism in Afghan Rule

Kashmiris could not tolerate the misrule of Mughal Kings and two Kashmiri noblemen Mir Muquim Kant and Khwaja Zahir Didmari invited Ahmad Shah Abdali to take Kashmir under his control who at once dispatched a strong and powerful Afghan army to occupy the Valley and planted Afghan flag on the ramparts of Akbar's town at Nogar in 1752. However, the rulers of Kabul were great despots, and they ruled all the parts of their kingdom ruthlessly with an iron hand. The cornerstone of their policy was terror. As many as twenty eight Durrani Subedars governed Kashmir during their sixty seven years of rule. There was an atmosphere of struggle and uncertainty in Kashmir[23].

3.3.2.3 Tourism in Sikh Rule

In 1819 the State was added to the Sikh Kingdom of Punjab. The Sikh rule over Kashmir lasted only for a brief span of time (1819-1846), during which the rulers at Lahore were far too pre-occupied at home to pay any attention to the affairs of this outlying province of theirs. The misery of the people increased due to natural calamities as well, such as premature snow falls, which would destroy a ripe rice crop leading to famines. These famines were followed by diseases like cholera and plague resulting in a heavy loss of life. Thousands of people migrated to India during these hard days, and no wonder the population of the valley came down to two lakhs from nine lakhs[24].Thus, no any significant development of tourism was made in this period.

3.3.3 Tourism in British Period

The two Anglo-Sikh Wars led to the final extinction of Sikh sovereignty in the Punjab and by virtue of the treaties of Lahore and Amritsar the British became the undisputed masters of India. They transferred the independent position of the Valley to Maharaja Gulab Singh, A Dogra by origin, who had to pay a sum of Rupees 75 lakh in return to British. The greatest service of the first Dogra ruler is the foundation that he laid for the modern Jammu and Kashmir State. The Maharaja died in 1857 after a rule of 11 years, during which period he laid the foundation of a sound system of administration. He was succeeded by Maharaja Ranbir Singh who ruled from 1857 to 1885. In 1885

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23 Kaul, R. N. (1999). *The Wail of Kashmir: In Quest of Peace*. Sterling Publishers Pvt. Ltd.: New Delhi.

24 Ibid., p.61

Maharaja Pratap Singh ascended the throne and he ruled for a period of 40 years. The real modernization of the state and several progressive reforms were carried out by him. (shodhganga.inflibnet.ac.in)

Sir Walter Lawrence brought the first assessment of land revenue system in the state on scientific lines in this period. The two mountain roads, Jhelum valley road and Banihal Cart were built by linking the state with the rest of India. A scheme for drainage of the valley reclaiming wasteland and preventing floods by digging flood channels was put into operation. Construction of water reservoir at Harwan and establishment of electric generating plant at Mohra was also undertaken during this period. Two colleges in the state, besides large number of education institutions, were also established by the order of the Maharaja. The administrative machinery was completely overhauled. There was development in the means of communication and telegraphs. Telephones and post offices were opened in many places. After the death of Maharaja Pratap Singh his nephew Maharaja Hari Singh ascended the throne in 1925. He continued to govern the state till 1949.[25]

While Thomas Moore never set foot in Kashmir, Lala Rukh, his classic poem of romance, intrigue and mystery, provides a canvas upon which future European travelers to Kashmir painted much of their story. Thus, Kashmir had entered the European popular imagination as a spectacular distant land through tales relayed to merchants and travelers in the larger Indian cities. These tales and the push of the British north into the Punjab generated an ever-increasing interest in Kashmir, and attracted the attention of William Moorcroft, a British East India Company veterinarian, who, with his assistant, George Trebeck traveled through Kashmir in an attempt to reach Central Asia. Moorcroft and Trebeck never returned from their journey[26], but their path was soon followed by a number of European elites: the French traveler Baron Charles Hugel, the naturalist Victor Jacque Mont, and Godfrey Vigne.

The treaty of Amritsar (1846) saw the British gaining control of the Punjab, placing a puppet ruler in Kashmir, and opening the door to European travelers. The travelers

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25 Naik, A. B. (2008). *Tourism Potential in Ecological Zones and Future Prospects of Tourism in Kashmir Valley*. An unpublished Ph.D. thesis: Dept. of Geography, A.M.U-Aligarh.

26 Moorcroft, W., & Trebeck, G. (1837*). Travels in Hindustan: Himalayan Provinces of Hindustan and the Punjab in Ladakh and Kashmir, in Peshawar, Kabul, Kunduz and Bokhara. Retrieved from https://archive.org/details/travelsinhimala00trebgoog*

came; not only in pursuit of Bernier's earthly paradise, but also in pursuit of an escape from the oppressive Punjab summers. Srinagar, the capital of Kashmir, became a summer hill resort for British civil servants and military officers who carved out a ground for hunters and adventurers. The mid 1850s mark the emergence of Kashmir as the Happy Vale replete with the imagery of Moore's verse. Kashmir was not simply a respite from life on the plains but became a place of romance, and for displaced Europeans, the 'Eastern' equivalent of 'Western' places of leisure: "Venice of the East", "Playground of the East", "and Switzerland of the East[27]".

To present those who have not visited the country "with a short and general description of the routes to Srinagar; the history, manners and customs of the inhabitants of this beautiful province; and a sketch of the various places and objects of interest to be met with in the space of a short tour"(Wakefield,1879)[28].

Many volumes followed Wakefield in describing their purpose. These "places to be met with", the objects of the travelers gaze, are the places that Europeans sought out and are remarkably consistent through the history of travel writing on Kashmir. The focus of the gaze falls largely on those objects that accord with Moore's depiction of Kashmir as a conjuncture of nature and civilization. Visits to the artifacts of a glorious civilization loom large in most accounts of Kashmir. After textually situating the region in a rich cultural history, many authors follow a well-worn trail to the ruins of ancient temples, shrines and monuments and to the margs, the meadows that provided a respite to those escaping the heat of the Punjab. This is beautifully depicted by the following lines:

Here are the race-course, polo ground, golf links, and tennis courts. Here are the church, post and telegraph offices, ballroom and club, library and native shops, while endless wooden huts are dotted about the turfy slopes. They are built chiefly by English people. With just as great joy as the Mughal emperors and their entourage sought Kashmir do Englishmen on leave, and ladies with children, order their tongas and set their faces to Gulmarg[29].

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27 MacDonald, K. I. (2003). *The Literature of Travel and Exploration: An Encyclopedia*. In J. Speake (eds) London: Routledge.

28 Wakefield, W. (1879). *The Happy Valley: Sketches of Kashmir and the Kashmiris*. Sampson Low, Marston, Searle & Rivington: London.

29 Bruce, C. G. (1910). *Twenty Years in the Himalaya*. London: Edward Arnold.

Almost from the beginning of European travel to Kashmir, dual strands of travel narratives emerged. The dominant strand treats Kashmir and the immediate surroundings as destination. The other treats Kashmir proper as a jumping off point for travel into the depths of the Karakoram Mountains or through Ladakh and into the less pedestrian lands of central Asia. The Vale of Kashmir proper stood on the known routes into the high mountains of the Karakoram and trade routes into Central Asia, and so became a staging point for all expeditions intent on exploring the inner sanctum of the mountains or venturing beyond into central Asia.

Thus, major inflow of tourists was promoted during the British Raj. Their government officials used to visit the Valley to avoid the burning heat of Indian Plains. They visited the diverse landscape of the area and discovered every aspect of tourism the last quarter of 19th century. The construction of Jawaharlal Nehru Tunnel at Banihal and landing of aircraft at Srinagar in 1925 increased the tourist flow to the Valley. From a handful of tourists who visited the Valley previously, the number rose to 8,404 in 1931. A new dimension to the tourism was added by the American soldiers who started visiting the Valley in large numbers. They carried the news of charm and beauty of Kashmir throughout the world. Moreover, the global tourism explosion to the Kashmir Valley was promoted due to the swift means of transport and communication. The magnitude and the trend of tourist traffic were 8,404 in 1931 which rose to 29,362 in 1941 and kept on increasing subsequently thereafter.

3.3.4 Tourism in Post British / Independence Period

In 1947 India got freedom from British rule which resulted in the partition of the country into two dominions. The partition resulted in the blockade of the Rawalpindi Road. A new link via Banihal cart road was redesigned and restructured enabling the State to link itself with the rest of the India. Following independence, it was decided to set up tourism on a firm footing. As a consequence the “Visitors Bureau” which was closed in 1948 was re-opened in 1949[30]. It started afresh with a well-planned publicity campaign for the promotion of tourism. Tourism in this period can be studied under following headings:

30 Mirza, N. A. (2000). *Management of Tourism in Jammu and Kashmir*. Dilpreet Publishing House: New Delhi.

3.3.4.1 Tourism from Independence up to Nineties (1947-1989)

The year 1947 witnessed great disturbance for the Indian-Subcontinent on account of the partition. However, the State of Jammu and Kashmir not being involved in the partition process, succeeded in attracting thousands of tourists (14,568). But in 1948, on account of the armed struggle for liberating Kashmir from the Maharaja's rule led by "Sardar Qayoom Khan"[31], aided by the tribals of Pakistan, followed by Indo-Pak war and genocide and mass exodus of Jammu Muslims, the graph of tourist arrivals came down to almost zero in 1948.

In the subsequent years, the position started showing signs of improvement on account of peace on borders and suppression of the forces of resistance and revolt in the state, till the figure reached upto the mark of 10,579 tourists in 1951. The tourist flow continued to increase up to 1955 when the State received 51,025 tourists, out of which 48,195 were domestic and 2,830 tourists were foreigners. The reasons for the improvement of tourism industry were the schemes undertaken for the development of tourism, such as construction of Tourist Reception Centre at Srinagar and development of tourist resorts at a cost of Rs.21.23 lacs, improvement of Mughal Gardens at a cost of Rs.3.33 lacs (Directorate of Tourism, J&K) besides the publicity it received from print and electronic media across the continental levels. Another reason responsible for the increase in the number of tourists during this period is that there was peace on borders and the valley was politically stable. However, the important point to note down is that the percentage of domestic tourists in total number of tourists was significantly larger. Domestic tourism contributed to 86.6 per cent in 1951, which increased to 94.13 per cent in 1955 but the percentage of foreign tourists was 13.35 per cent in 1951, which decreased to 5.87 per cent in 1955.

In the Second Five Year Plan (1956-1961) an amount of Rs.96 lacs was allocated for the development and promotion of tourism, under the aegis of the department of tourism, however, only 54.49 per cent of the total outlay could be utilized. (Planning Section, Directorate of Tourism, J&K). In this plan several aspects connected with the development of tourism industry were taken into consideration;

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31 Itoo, M. A. (2013). Tourism Industry of Kashmir (1947-1989). *International Journal of Management and Sustainability*, *2* (4), 63-71.

these were improvement of roads for better transport facilities, opening of new tourist resorts, increasing accommodation facilities and so on. Some of the major schemes that came to fruition during the period included construction of huts at Pahalgam, Achabal, Sonamarg etc. New sites included Achabal and Lolab were for the first time opened for tourists. A big hotel namely Bud Shah Hotel with a 104 bed capacity was built in Srinagar[32]. All this resulted in the unprecedented hike of tourist traffic. Such a huge rush of tourists to the valley became possible besides other reasons also due to conducive atmosphere prevalent in Kashmir. However, in 1957, the visit of then Home Minister Pandit G.B. Pant to Srinagar, where he declared that the State of Jammu and Kashmir is an integral part of India and there can be no question of a plebiscite to determine its status afresh, resulted in huge protests in the Valley which slightly affected tourism flow to Kashmir.

In the Third Five Year Plan an amount of 77.08 lacs was allocated for the promotion and development of tourism industry. The new schemes undertaken during this period were the development of Chinar Bagh, Srinagar, and construction of park at Pahalgam, Tourist Reception Centre at Pahalgam, Nehru Park Restaurant and Yatra Complex at Pahalgam. In 1961 there was a positive growth rate of 24 per cent in the tourist traffic as compared to 1960. Then onwards there was a negative growth of 10.03 per cent, 32.22 per cent and 19.71 per cent in the tourist traffic during the years 1963, 1964 and 1965. There were many reasons responsible for this setback, like Chinese attack in 1962, Indo-Pak war in 1965 and also socio-political disturbance in the valley by the event known as “Tahreek-i-Moya Moqaddas”. However the only peculiar feature of tourist traffic during this period was the rise in the percentage of foreign tourists from 15 percent in 1960 to 17.61 percent in 1965.

On account of some abnormal and emergency conditions which prevailed in the country immediately after the Indo-Pak war in 1965, the five year planning process was suspended for about three years, which is commonly known as “Recess Period”. However, the annual plans were prepared for these years which allocated Rs.29.10 lacs, Rs.45 lacs, and Rs. 45 lacs for the years 1966, 1967 and 1968 respectively for tourism promotion and development. The major schemes

32 Ibid.,p.65

which were undertaken during this period included the construction of Lala Rukh Hotel, Pahalgam Golf Course and construction of huts at Pahalgam. The tourist arrivals to Kashmir valley from (1966-1968) reveals that the number of tourists continuously increased from 1966, with a slight decrease in the year 1968.It was mainly because Pakistan supported guerrilla groups in Kashmir increased their activities after the ceasefire of 1965 which intensified in 1968 and 1969. The average growth rate during these years was 60.23 per cent. More important to note down is that the number of foreign tourists also increased from 7,149 in 1966 to 10,428 and 10,945 in 1968.. The reason for the increase in the number of tourists is once again the stability and peace that India and Kashmir saw once again after the end of Indo-China war in 1962 and Indo-Pak war of 1965.

It was during the Fourth five year plan (1969-74) that the clear cut strategy was framed for the smooth, stable and sound development of tourism with the aim of building up sure and stable infrastructure, in order to provide basic amenities to the tourists. It was during this period that the State Tourism Development Corporation was set up in the State of Jammu and Kashmir to run the industry on commercial lines. The total amount allocated for tourism development under this plan was 370 lacs. The schemes undertaken and implemented during this plan enabled the industry to receive a stream of tourists. The domestic tourist flow was 1.05 lacs and the foreign tourist flow reached to 15 thousand in 1970 but in 1971 there was considerable decrease of domestic tourists as well as foreign tourists compared to 1970. The reason for this downfall in tourist number was the "Bangladesh Crisis", which resulted in one more Indo-Pak war. After Indo-Pak war the tourist influx increased again in 1972 and 1973. For instance the year 1973 touched the figure of 1.95 lac tourists. However, the domestic tourist percentage was very high as compared to foreign tourist percentage.

The main aim of the Fifth Five Year Plan (1974-79) was to provide integrated growth of important tourism centers and dispersal of facilities so that the benefits of tourism could be shared in various areas of the State rather than being confined to the traditional tourist places. The major schemes undertaken during this period included the construction of International Convention Complex in Srinagar at a cost of Rs. 660 lacs (Planning Section, Directorate of Tourism), Recreational Complex in Srinagar at a cost of Rs. 259 lacs, Relaying of International Golf

Course at Gulmarg and construction of Tourist Bungalow at Aharbal at a cost of 3.63lacs.

From 1975 onwards the tourist flow shows constant increase and reached to the number of 5.82 lacs in the year1978 as compared to1.67 lacs in1974. The reasons for the increase in the tourist inflow are numerous. Firstly, the government paid a lot of attention towards the promotion of this industry. Secondly, peace and tranquility in the valley at that time became another cause for the increase in the number of tourists. As during this period, the leading Politicians of Kashmir including Sheikh Mohammad Abdullah, dropped the idea of independence and plebiscite. Jailed in 1953, he was released in 1971 and rehabilitated in 1975. A Six point accord/agreement was signed between him and Mrs. Indira Gandhi which reaffirmed Kashmir's status as part of India. Thus, the forces of political resistance went underground and the forces of peace and tranquility came over ground. The new government of Sheikh's started developmental process in the state at a large scale, with particular emphasis on the revival, rebuilding and reactivating tourism industry in the State. The number of tourist arrivals reached to 6.42 lacs in 1981.There after the number had gone down to 6.04 lacs in 1982 and fell sharply to 4.39 lacs in 1983 and to 2.29 lacs in 1984. On an average the negative growth of 13.13 per cent was registered during this period as compared to the accelerated growth rate of 29.19 per cent recorded in (1975-1979). The reason for this de-accelerated growth during the period (1980-1984) was due to political disturbances prevailing in the valley and militancy at its peak in the neighboring state of Punjab. As it was during this period, the then Chief minister Dr. Farooq Abdullah fell out with the center, and consequently defections from his party led to his fall from power[33] which led to unconducive environment for tourism in the valley, following retardation in the flow of tourists.

33 Khurshid, S. (1999). *Beyond Terrorism: New Hope for Kashmir*. UB Publications and Distributors: New Delhi.

Table 3.2- Yearly Pattern of Tourist Arrivals to Kashmir Valley (1951-1989)

Year	Domestic Tourists	Growth Per cent	Foreign Tourists	Growth Per cent	Total	Growth Per cent
1951	9,333	------	1,246	------	10,579	------
1952	11,630	24.61	1,470	17.97	13,100	23.83
1953	19,319	66.11	2,062	40.27	21,381	63.21
1954	32,885	70.22	1,760	-14.64	34,645	62.03
1955	48,195	46.55	2,830	60.79	51,025	47.27
1956	57,341	18.97	7,012	147.77	64,354	26.12
1957	37,172	-35.17	5,846	-16.62	43,018	-33.15
1958	54,017	45.31	6,540	11.87	60,557	40.77
1959	60,354	11.73	10,866	66.14	71,220	17.60
1960	63,373	5.00	11,187	2.95	74,560	4.68
1961	79,241	25.03	13,214	18.11	92,455	24.00
1962	80,334	1.37	12,681	-4.03	93,615	1.25
1963	72,137	-10.2	11,551	-8.91	83,687	-10.60
1964	48,538	-32.71	8,182	-29.16	56,720	-32.22
1965	37,521	-22.69	8,020	-1.97	45,541	-19.70
1966	1,12,117	198.81	7,149	-10.86	1,19,276	161.9
1967	1,35,653	20.99	10,428	45.86	1,46,081	22.47
1968	1,29,750	-4.35	10,945	4.95	1,40,696	-3.68
1969	93,552	-27.89	13,007	18.83	1,06,959	-23.97
1970	1,05,420	12.68	15,737	20.98	1,21,153	13.27
1971	79,612	-24.48	15,240	-3.15	94,852	-21.70
1972	1,08,445	36.21	17,841	17.06	1,25,486	32.29

1973	1,75,829	62.13	20,017	14.50	1,95,846	56.06
1974	1,48,320	-15.64	19,299	-3.58	1,67,619	-14.41
1975	1,62,576	9.61	22,214	15.10	1,84,790	10.24
1976	2,84,412	74.94	38,078	71.41	3,24,490	75.59
1977	3,87,817	36.35	54,223	42.39	4,42,040	36.22
1978	4,43,342	14.31	59,323	9.40	5,82,665	31.81
1979	4,98,067	12.34	55,680	-6.14	5,49,747	-5.64
1980	5,48,591	10.14	46,026	-17.33	5,94,517	8.14
1981	5,98,555	9.10	43,745	-4.95	6,42,300	8.03
1982	5,60,987	-6.27	42,851	-2.04	6,03,834	-5.98
1983	3,98,428	-28.97	41,101	-4.08	4,39,529	-27.21
1984	1,92,684	-51.63	36,458	-11.29	2,29,142	-47.86
1985	4,65,599	141.63	38,015	4.27	5,03,614	119.78
1986	5,36,598	15.24	53,573	40.92	5,89,716	17.09
1987	6,64,681	23.86	57,573	7.46	7,21,654	22.37
1988	6,62,093	-0.38	59,938	4.10	7,22,035	0.05
1989	4,90,215	-25.95	67,772	13.07	5,57,977	-22.72

Source: Department of Tourism, Srinagar, Jammu and Kashmir

The tourist flow to Kashmir after 1984 has increased up to 1988. The flow reached to7.22 lacs in 1988 from 5.03 lacs in 1985. A change of 119.78 per cent was marked in 1985 compared to 1984 and this percentage went on increasing by 17.10 in 1986 and22.37 in 1987. But the depression again started from 1989 in which fall of-22.72 per cent in the total arrivals was recorded as compared to the previous year. In spite of this fall, still a growth of 27.31 per cent was achieved during this period (1985-89). More important to observe is that the number of foreign tourists continuously increased from 0.38 lacs in 1985 to 0.68 lacs in 1989. However, in 1989 the total number of arrivals decreased from 7.22 lacs in 1988 to 5.59 lacs in1989 and this downfall was found mainly in domestic tourists.

The down fall occurred due to the militancy which arose in the valley after 1987 elections, which the Muslim United Front (MUF) won but a conclave of major opposition parties in the state claimed, were rigged. A consequence of this was that all the frustrated workers of the opposition parties, particularly Muslim United Front went underground and later on came on the surface and asserted their presence through armed struggle. In view of the armed struggle about one lac people have lost their lives causing colossal damage to economy particularly tourism and created an atmosphere of political instability and uncertainty.[34]

3.3.4.2 Tourism in Nineties (1990-1999)

Turmoil and disturbance in Kashmir laid a terrible impact on the tourist places of the valley. All the hotspots of Tourism in valley like Gulmarg, Pahalgam, Sonamarg, Dal Lake and Mughal gardens, which used to witness thousands of tourists, all of a sudden turned into not less than any ghost places. The previous two years, before the turmoil started in 1989 had respectively recorded an overwhelming number of tourists. But this number came down substantially to a dismal figure and continued to remain below 10,000 till 1996. The militancy and the concomitant cross-firing, crack-down, hartals and curfews, arrests and interrogations by security forces, abduction by militants collapsed the tourist infrastructure which stopped and almost throttled the chances for the tourists from visiting this place. The negative impact on it was that the domestic as well as foreign tourists changed their destination to other places in India such as Rajasthan, Himachal Pradesh etc. With the passage of time disturbance increased, which created havoc particularly to the tourism industry as not only the domestic tourist flow decreased substantially but also the foreign tourist flow and those connected with this industry, in one or the other form became the worst hit as most of them lost employment. In 1992 Pakistan forces arrested 500 JKLF marchers led by Amanulla Khan in POK to prevent bid to cross the border; India also used intelligence from captured militants and consequently JKLF militancy declined and thus tourism to the Valley increased. But soon after this, the most serious incident of a communal nature namely the murder of sixteen male Hindus in Kishtwar in August 1993 took place which again proved as a setback to the Kashmir Valley tourism. However, tourism again began to grow in Kashmir slightly when the JKLF faction led

34 Itoo, M. A. (2013). Tourism Industry of Kashmir (1947-1989). *International Journal of Management and Sustainability*, *2* (4), 63-71.

by Yasin Malik announced unilateral ceasefire in 1994 and pursues political agenda under the APHC (All Parties Hurriyat Conference) umbrella, followed by Amanulla Khan's JKLF faction's ceasefire in 1997.

During the years 1995, 1996 and 1997 the tourist flow to Kashmir remained very low, especially domestic tourist flow. However, it got sudden boost up and reached to 99,636 in 1998 as compared to 322 in1995 and the number went up to 2,00162 in the next year. The total tourist flow increased from 8,520 in 1995 to 2.17 lakh in 1999. The reason for the increase in the number of tourists after 1998 was that the socio-political conditions were better off as compared to the past years. It was during this period that in the year 1996-97 elected government was established in the state after a gap of six years. And it is after the formation of a popular government that the situation began to improve considerably and tourism related activities started to pick-

Table 3.3- Yearly Pattern of Tourist Arrivals to Kashmir Valley (1989-1999)

Year	Domestic Tourists	Growth Per cent	Foreign Tourists	Growth Per cent	Total	Growth Per cent
1990	6,095	-98.75	4,627	-93.17	10,722	-98.07
1991	1,400	-77.03	4,887	5.61	6,287	-41.36
1992	1,175	-16.07	9,149	87.21	10,324	64.21
1993	450	-61.7	8,026	-12.27	8,026	-22.25
1994	500	11.11	9,314	16.04	9,814	22.27
1995	322	-35.6	8,198	-11.98	8,520	-13.18
1996	375	16.45	9,592	17	9,967	16.98
1997	7,072	1785.86	9,111	-5.01	16,138	61.91
1998	99,636	1314.41	10,247	12.46	1,09,883	580.89
1999	2,00162	100.89	17,130	67.17	2,17,292	97.74

Source: Department of Tourism, Srinagar, Jammu and Kashmir

up speed again. The new government started the process of re-building and restoring infrastructure systems, on a massive scale, that had been severely damaged during the years (1989-97) because of armed struggle.

3.3.4.3 Tourism after Nineties (1999- 2013)

The impact of insurgency and other related political doldrums continued to hinder the growth of tourism in Kashmir Valley up to 2002. It was in the summer of 1999 that the Pakistani involvement in Kashmir reached a new pitch when Kashmiri guerrillas along with Pakistani soldiers were discovered to have occupied strategic Himalayan heights in Kargil giving rise to Kargil War. Secondly, In September, 2000, the massacre of thirty-five Sikhs in *chattisingh pora* village of Anantnag district which occurred while President Clinton was visiting India and the indictment of seven Indian security men in Oct 2000 for firing upon and killing nine Kashmiri Muslims in a crowd of demonstrators which was in protest against the murders of five innocent Kashmiris, whose corpses were defaced and presented to the national and international press by Indian security forces as Pakistan-backed terrorists responsible for killing the Sikhs in Chatisingh Pora. Moreover, In October 2001, Kashmiri assembly in Srinagar was attacked in which 38 people were dead and in December 13, 2001, Indian parliament in New Delhi was attacked. As a result of all these incidences, total number of tourists visiting Kashmir Valley in 2002 collapsed only at 27,356 (Domestic-24,670 and Foreign-2,686)[35].

However, slowly and gradually tourism started to acquire pace in the Valley with the betterment in political and social stability. Until now, tourism was considered a 'trade' activity in the State Government and it was only in May 2002 that the Department of Industries agreed to recognize 'tourism' as an 'industry'. Thus, it was felt that besides the development of tourism activities in the Valley, it is necessary for the State to have sustainable agro industries as support services to the tourist industry and for which special efforts were to be made[36].It was in April 2003, P.M Vajpayee visited Srinagar where he was attended by more than 20,000

35 Directorate of Tourism, Government of Jammu & Kashmir.

36 *Final Report of Twenty Year Perspective Plan for Sustainable Development of Tourism in Jammu and Kashmir.* Santek Consultants Pvt. Ltd: Delhi. Retrieved from incredibleindia.org/lang/images/docs/.../perspective-plans.../jammu%20kashmir.pdf

people. He announced several measures designed to improve the economic situation of the state besides the creation of 1 lakh new jobs and tackling of unemployment problem, he laid the foundation of 2 mega projects- Udhampur-Baramulla Railway project and the section of North-South Super Highway corridor falling in J&K. Thus, tourism in Kashmir Valley maintained pace till 2007 but it was in 2008 when huge anti-India protests were held against the transfer of land to SASB (Shri Amarnath Shrine Board), which was an outside state organization, as it was a direct violation of article 370 of the Indian constitution. This resulted in declining foreign tourism flow in 2008 in the Valley. Tourism flow to Kashmir increased in 2009 but not so significantly because of huge anti-India protests against rape and murder of two young women by Indian armed forces in Shopian village where tens of thousands took to the streets in protest against killings of civilians and several hundreds injured, many of them due to Indian security forces firing into the unarmed crowd of civilian protestors. The tourism industry which started to gain pace after 2009 was again jolted in 2013. Riding high on good tourism season in the year 2012, the tourism players in Kashmir were happy that tourist season would be the same as in previous year, but hanging of Mohd. Afzal Guru in 2013 jolted their hopes as Kashmir was put under curfew and restrictions for more than one month resulting in impact on the domestic tourism sector.[37]

Recently, In September 2014, Kashmir Valley was hit by heavy floods caused by torrential rainfall. By September 24, 2014, nearly 284 people in India and 280 people in Pakistan had died due to the floods. According to the Home Ministry of India, several thousand villages across the state had been hit and 350 villages had been submerged. According to official estimates, the number of tourists coming to Kashmir has dwindled to meager 600 to 800 per day in November, 2014. Last November Kashmir on an average received 1900 tourists per day.[38]

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37 Kashmir hosted 11 lakh tourists in 2013. (2014, Jan 4). Deccan Herald. Retrieved from **Error! Hyperlink reference not valid.**content/378613.html

38 Post-floods: Kashmir tourism industry in deep trouble. (2014, 19 November). Greater Kashmir. Retrieved from http://www.greaterKashmir.com/news/2014/Nov/19/post-floods-kashmir-tourism-industry-in-deep-trouble 51.asp

Table 3.4- Yearly Pattern of Tourist Arrivals to Kashmir Valley (2000-2013)

Years	Domestic Tourists	Growth per cent	Foreign Tourists	Growth per cent	Total	Growth per cent
2000	1,04,337	-47.87	7,575	-55.77	1,11,912	-48.49
2001	66,732	-36.04	5,859	-22.65	72,591	-35.13
2002	24,670	-63.03	2,686	-54.15	27,356	-62.31
2003	1,82,205	638.56	8,959	233.54	1,91,164	598.8
2004	3,58,095	96.53	18,234	103.52	3,76,329	96.86
2005	5,85,702	63.56	19,680	7.93	6,05,382	60.86
2006	4,12,879	-29.5	20,009	1.67	4,32,888	-28.49
2007	4,17,264	1.06	24,576	22.82	4,41,840	2.06
2008	5,50,100	31.83	22,000	-10.48	5,72,100	29.48
2009	5,77,348	4.95	23,904	8.65	6,01,252	5.09
2010	7,10,504	23.06	25,984	8.7	7,36,488	22.49
2011	12,82,360	80.48	32,110	23.57	13,14,470	78.47
2012	12,74,674	-0.59	37,166	15.74	13,11,840	-0.2
2013	11,33,000	-11.11	28000	-24.66	11,61,000	-11.49

Source: Directorate of Tourism, Govt. of Jammu and Kashmir

Figure 3.2

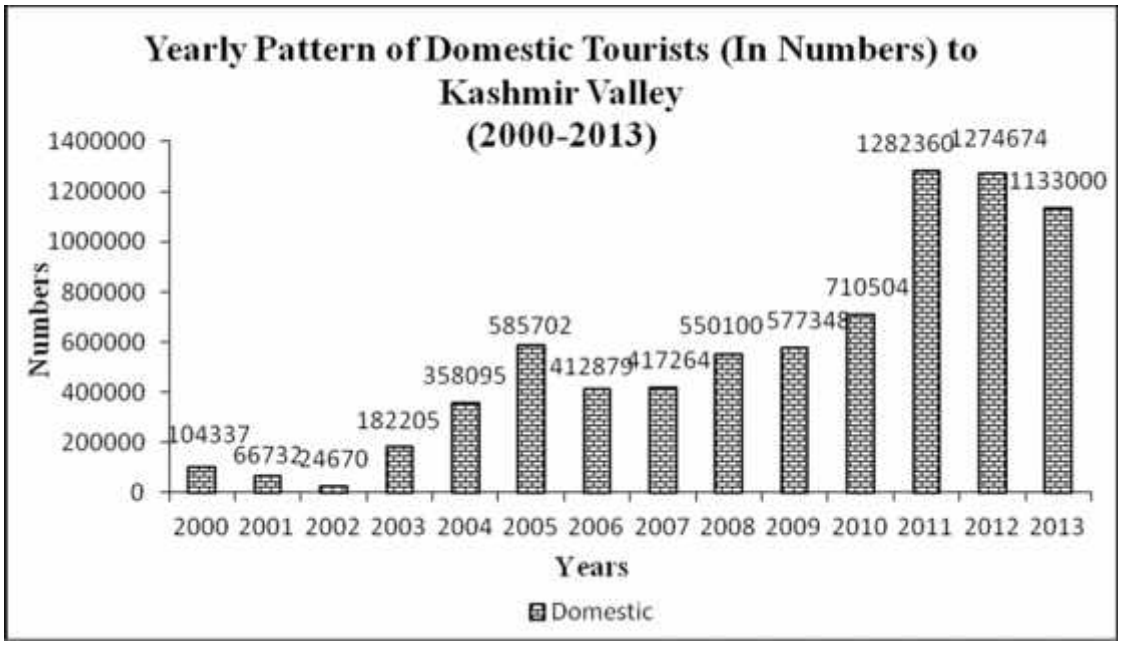

Figure 3.3

However, there is no doubt that tourism industry is playing an important role in the development of the economy of the state as a whole. Hence, the economic activities are generated in the primary, secondary and tertiary sectors of the valley as a consequence of which tourism generated employment is now classified into three major heads viz direct employment that sells goods and services directly e.g. hotels, restaurants, shops etc., the indirect employment, which generally supplies goods and services to the tourism business and thirdly the investment related employment in construction and other capital goods industries. Besides hundreds of hotels and restaurants in the Valley, there are about 1,800 houseboats owners offering about 6,600 beds for occupancy by tourists[39]. The Hotel and Tourism related industry has been declared as a high priority industry for foreign investment. It is now eligible for approval of direct investment up to 31 per cent of foreign equity and Non Resident Indian Investment is allowed up to 100 per cent in such ventures.[40]

3.3.5 Growth of Tourist Economy in Jammu and Kashmir

Tourism is an important sector of Indian economy and contributes substantially in the country's Foreign exchange Earning's (FEE"s). Foreign Exchange Earnings from

39 *Final Report of Twenty Year Perspective Plan for Sustainable Development of Tourism in Jammu and Kashmir.* Santek Consultants Pvt. Ltd: Delhi. Retrieved from incredibleindia.org/lang/images/docs/.../perspective-plans.../jammu%20kashmir.pdf

40 Ibid.,p.288

tourism during 2011 were Rs. 1,23,320 crore with a growth of 14.53 per cent over the FEE's of Rs. 1,07,671 by 2013. The world Travel and Tourism Council calculated that Indian tourism has generated Rs. 8.31 lakh crores (US $ 120 billion) or 6.3 per cent of the national GDP in 2015. It supplied 37.3 million jobs which is 8.7 per cent of the total employment of the country.

The tourism sector is expected to grow up to Rs. 18.36 lakh crore by 2025. In 2014, about 22.57 million foreign tourists arrived in Indi as compared to 19.95 million in 2013. In Tourism Today, India ranks 38th among the counting of nations in tourism. In 2012, about 1036.35 million domestic tourists visited different states. In 2014, the leading tourist destination states were Tamil Nadu, Maharashtra and Uttar Pradesh respectively. The most foreign tourist visited cities have been Chennai, Delhi. Mumbai and Agra in that order. According to the Travel and Tourism competitive Report, 2015, India ranks 52nd out of 141 countries.

Tourism is an integral part of Jammu and Kashmir economy. The Hindu, Amarnath shrine is annually visited by 4 lakh or 0.4 million Hindu pilgrim tourists. The Vaishno Devi shrine is visited by even larger number of over 10 million pilgrim tourists every year. Vaishno Devi Pilgrim Tourism earns Rs. 475 crore annually to the economy. In 2010, 7.36 lakh tourists visited Kashmir. This number rose to 13 lakh in 2012. Jammu and Kashmir earns a foreign exchange of Rs. 850 million largely by tourism. In 2005-2006, the export economy of the state was Rs. 11.5 billion and the net profit earning was of Rs. 598 million by 2008.

Tourism has undoubtedly been one of the major sources of employment and income for the people of Kashmir. It roughly contributes to 12 per cent of the State Gross Domestic Product. The state of Jammu and Kashmir offers a very large number of marketable products which can be utilized by means of a well-developed tourism policy. In Kashmir, Tourism has been identified as an industry with potential of development next to agriculture and horticulture. The employment opportunities provided by this industry are comparatively higher than other industries.

Tourism is regarded as a multi segmented industry. Therefore, it provides different types of jobs like Hotel Managers, Accountants, Receptionists, Clerks, Travel Agents, Guides, Chefs and Transport operators. The positive economic benefits of tourism in Kashmir Valley include contribution to state's income generation, expansion of

employment opportunities in the region, tax revenues, generation of foreign exchange, up-gradation and expansion of basic infrastructure, social and cultural effect and transformation of regional economy[41].

Table 3.5- Foreign Exchange Earnings through Tourism in Jammu and Kashmir (1970-2000)

Year	FEE's (Rs. Crores)	Year	FEE's (Rs. Crores)
1971	1.27	1986	20.81
1972	1.49	1987	23.81
1973	1.69	1988	26.96
1974	1.61	1989	30.56
1975	2.16	1990	2.29
1976	3.70	1991	2.42
1977	5.27	1992	5.05
1978	5.77	1993	4.66
1979	5.41	1994	5.66
1980	4.47	1995	5.21
1981	11.27	1996	4.32
1982	11.04	1997	4.10
1983	10.59	1998	7.68
1984	9.39	1999	12.84
1985	9.79	2000	5.68

Source: Mirza, N.A. (2000). *Management of Tourism in Jammu and Kashmir*. Dilpreet Publishing House, p.97

Over the years, foreign exchange earnings from the state of Jammu and Kashmir marked an increase up to 1989. The FEE's increased from Rs. 1.31 crore in 1970 to 4.47 crore in 1980 and reached up to the mark of 10.59 crore in 1983. However, it was in 1984 that the FEE's saw a downfall to 9.39 crore on account of the insurgency in the neighboring state of Punjab which decreased the foreign tourist flow to Kashmir significantly.

After 1984, the FEE's begun to show signs of increasing trend once again and touched the maximum of 30.56 crore in 1989. However, the decade of 1990 gave rise to the

41 Bhat, Z. A. (2013). Assessment of opportunities and challenges of tourism industry in Jammu and Kashmir. *International Journal of Research in Commerce & Management, 4* (4), 134-137.

militancy in Kashmir Valley which shattered its economy drastically. As a result of which FEE's remained stagnant at 2 to 5 crore only. This is shown in the table 3.6 as:

Out of the 12 per cent contribution of the Jammu and Kashmir's tourism, 8 per cent of economy hinges on pilgrimage tourism and the remaining 4 per cent hinges on recreation tourism. Jammu region has seen a steady rise in religious tourism with pilgrims to Mata Vaishno Devi increasing from around 65.7 lakhs in 2008 to 1.01 crore in 2012. Similarly, Kashmir Valley has witnessed Hindu tourists flow to Amarnath Cave from 4.98 lakhs in 2008 to 6.21 lakhs in 2012. Though the total tourist arrivals in Ladakh are lower than in the other two regions, it attracted the largest number of foreign visitors whose number varied from 72,000 in 2008 to 1, 78, 750 tourists in 2012. Thus, on the one hand pilgrimage tourism has experienced tremendous rise in geometric progression. On the other hand, recreation tourism is on the decline.

Table 3.7 gives estimates of the revenue generated from various organizations of the tourism department of Jammu and Kashmir.

Table 3.6-Revenue Generation from Tourism Department of Jammu and Kashmir (in Lakh Rupees)

Name of the Department/ Organization	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
Directorate of Tourism, Govt. of Jammu and Kashmir.	11.46	14.83	35.25	62.06	54	56.65
Gulmarg Development Authority	19.07	21.86	32.46	48.50	51.17	34.35
Pahalgam Development Authority	5.12	9.16	9.95	19	12.73	6.68
Patnitop Development Authority	11	10.15	15.62	79	20	19.54
Royal Spring Golf Course	57.26	35.09	34.73	50.06	45.66	44.25
Sher-e-Kashmiri International Convention Centre (SKICC)	46	49.34	52	64	71.20	65
Cable Car Corporation	289	754.41	676	798.81	839.14	1116
Jammu and Kashmir, Tourism Development Corporation (JKTDC)	1642.41	1796.44	1763	1963	1963	1894
Total	**2081.95**	**2705.06**	**657.75**	**2916.93**	**2916.93**	**3275.47**

Source: Economic Survey of Jammu and Kashmir.

To boost up tourism sector in the Valley, Jammu and Kashmir Government has taken lot of positive and developmental steps recently like:

a) In 1998, Gulmarg hosted the first National Winter Games of India and the first phase of the Gulmarg Gondola Cable Car was developed during this period also which has got completed up to its three phases.

b) The declaration of 2011 as Adventure Tourism Year for Jammu & Kashmir. Since then adventure tourism is going to be our buzzword. We have hundreds of mountain locations beyond Gulmarg in the Pirpanjal and Himalayan mountain ranges which could attract thousands of adventure tourists in winter months to explore what remains hitherto unexplored.

c) The opening up of picturesque Lolab valley in north Kashmir's Kupwara district for visitors on 30 sept 2012. Blessed with lush green forests and gushing streams, Lolab valley is also famous for centuries old Kalaroos caves and Satbaran monument. The Government has decided to market these caves for attracting tourists to the scenic spot.

d) Tourism department is organizing four festivals in a year to celebrate spring, summer, autumn and winter seasons which would result in more tourist influx in the state. Recently, summer festival was organized from 21 June to 29 June, 2014 in the Valley.

e) Besides, '*Kashmir Snow Festival'* is held in the month of December in Gulmarg and various winter sports for sports lovers are organized. Cultural events conducted by artists add more delight to this festival.

f) The rural tourism has been introduced in the State and tourist related infrastructure is being created at identified rural tourist destinations out of which tourist related infrastructure in 29 villages of the State has been created.

g) Budget 2014-15 presented by Finance Minister, Abdul Rahim Rather contained a provision of Rs 106.20 crore for Tourism Sector. This will give further fillip to this sector. (www.greaterkashmir.com)[42]

h) In a warm up for the 2014 tourist season, four sets of calendars depicting Kashmir in different colors were released on 4 January, 2014. Minister for Tourism, Ghulam Ahmad Mir released the calendars separately launched by Tourism Department, Royal Spring Golf Course (RSGC), J&K Cable Car Corporation and SKICC. "The main objective of projecting the features of tourism activities in the calendars is to multiply the employment avenues for unemployed youth of the state" (http://www.greaterkashmir.com)

Thus, various initiatives are being taken for showcasing the beauty of Kashmir and its diversified culture. In nutshell, Kashmir valley's enchanting beauty has won praise from wide range of visitors since time immemorial. Apart from its natural beauty, the valley is a unique place in the world where various people contributed their craftsmanship exhibiting their skills and add further beauty to this lake dotted valley.

Summary

This chapter has tried to make an attempt to understand the concept and phenomena of tourism as well as its evolution in a systematic manner in the Valley of Kashmir under different dynasties and rulers from ancient times.

The chapter begins with the concept of tourism that is understood to arise from the movement of people to and their stay in different destinations. The tourist, as it maintains, is a person who visits an area other than he/she usually resides for a period of at least 24 hours. Thus, tourism is essentially a recreational activity that involves a mobile population of travelers whose stay isn't connected with any remunerative activity. So for as geographers are concerned, they study the spatial expression of tourism as a human activity, focusing on the 'tourism generating' and 'tourism receiving' areas.

42 Budget 2014-15 leaves traders, industrialists disappointed: Tourism players optimistic (2014, 14 February). *Greater Kashmir*, Retrieved from http://www.greaterkashmir.com/news/2014/Feb/14/budget-2014-15-leaves-traders-industrialists-disappointed-tourism-players-optimistic-22.asp

After peeping deep into the idea of tourism, its evolution has been assessed by mentioning that man has been travelling since time immemorial and he has a fascination for travel from the early historical ages despite the fact that travel in ancient times was not undertaken for the sake of pleasure but for trade , commerce and seeking knowledge.

Kashmir Valley has witnessed the arrival of people in different time periods from almost every sphere of life including traders, missionaries, pilgrims and invaders. The works of Hieun Tsang, Kalhana, Al- Biruni, Jehangir, Francois Bernier, William Moorcroft and Charles Hugel bear a testimony for the Kashmir Valley's alluring natural beauty which has been a prime motivating factor for tourists.

Kashmir Valley has been the main route of cultural and commercial intercourse between India and Central Asia. In fact, it was the meeting ground for trade and ideas in old world which is confirmed by the fact that the references to Kashmir and its people are found in the literature of Greeks, Chinese and the Arabs as well as Indian literature.

Kashmir has been ruled by many dynasties in ancient times like Karakota dynasty, Utpal dynasty, Lohara dynasty as well as Sultans of Sultanate Period in which many sarai, vihars, and rest houses were built for foreign pilgrims and students besides the foundations of many ancient cities like 'Pandrethan' and 'Avantipur'.This period witnessed the immense development of cultural and academic tourism.

The medieval period began with the conquest of Kashmir Valley Akbar in 1587 who built a new town of Nagar- Magar near Hariparbat mountain. It was in the time of Jehangir that the fame of the Valley spread throughout the country and beauty of the Valley attracted thousands of visitors. The famous gardens of Nishat, Shalimar, Cheshme-shahi , Harwan, Verinag and Achabal are the creation of Mughals.

Kashmir Valley Tourism was jolted severely during the tyrant rule of Afghans and Sikhs. However, it was in British period that the whole administrative machinery was completely overhauled and tourism was again paid attention upon when the history, manners, customs and the beauty of the Valley was praised by the Europeans. The Britishers not only praised the beauty of Kashmir valley but also boosted infrastructural development for tourism.

In post-independence era, Tourism in Kashmir valley continued to fluctuate with highs and lows because of partition of the country (India) and subsequent war with Pakistan. This trend continued almost up to 90s when the graph of tourist arrivals reached lowest ever mark. However, it started to show some positive signs of development after the decline of militancy in Kashmir valley after a decade. Since 2003 onwards, tourism sector of Kashmir Valley has again come on track of development and the arrivals of both the foreign as well as domestic tourists have been witnessed in large numbers.

CHAPTER IV

MOTIVATION DYNAMICS OF TOURISM IN KASHMIR VALLEY

This chapter deals with the tourism motivation as the driving force of tourism dynamics**.** These comprise the infrastructural adequacy, sense of security in a new place or country as well as glamourizing the tourist venues through publicity and advertisement. The purchasing power of the people as well as the aesthetic sense are other motivational factors of tourism.

4.1 Tourism Motivation- Conceptual Framework

In a very broad perspective, motive can be defined as a person's predisposition to reach for or to strive towards a general class of goals. Motivated striving may be based upon biological needs and desires acquired through an extended period of past experience[1].

The question of motivation is basically the question of 'Why'. Why do some people travel and not others? Why in a particular country do more people engage in tourism than in another? Or for that matter, why one member in a family undertakes travel and others do not?

In any account of the behaviors of the people, we start our description with reference to some kind of active driving force: the individual seeks, the individual wants, the individual fears etc. In addition, we specify an object or condition towards which that force is directed. Thus, the study of relationships between these two variables- the driving force and the object or condition towards which that driving force is directed is the study of the dynamics of behavior or motivation.

Various studies of tourism psychology and motivation show that individuals normally travel for more than one reason and for many; tourism is the outcome of a combination of motivations.

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1 Bhatia, A. K. (1982). *Tourism Development: Principles and Practices.* Sterling Publishers Private Ltd.: New Delhi.

Prior to the emergence of mass tourism, particularly since the emergence of First World War, the growth of tourism was the result of the three major developments- increase in the wealth of industrial society, development of the means of transport and the organization of travel- which were first witnessed on some scale in England and America. However, their influence soon spread across into other countries in Europe and elsewhere. The basic motives to engage in tourism which had been apparent even much before the middle of the 19th century can be said to be: curiosity, seeking material gains by engaging in trade and commerce and education and health. To this another motive, recreation, can be added which certainly is a result of industrialization. As no scientific studies were made in that period to determine the motives for travel, it can be safely said that there could have been many more motives besides the basic motives of curiosity, trade and commerce, education, health and recreation.

4.1.1 Basic Tourism Motivators

With the advent of mass tourism, especially after the First World War, various attempts have been made to study as to why people wish to become tourists. Thus, as per the mental fecundities of the scholars and their understanding of the phenomenon, various motivators have been put forth in different times; However, McIntosh has grouped the basic travel or tourism motivators into the four categories as (1) Physical Motivators- related to physical relaxation and rest, sporting activities and specific medical treatment. All these motivators are connected with the individual's bodily health and well-being (2) Cultural Motivators- related with the individual's desire to travel in order to learn about other countries, their people and their cultural heritage expressed in art, music, literature and folklore etc. (3) Interpersonal Motivators- related to a desire to visit relatives, friends or to escape from one's family, workmates or neighbors or to meet new people and forge new friendships or simply to escape from the routine of everyday life, and (4) Status and Prestige Motivators which are identified with the needs of personal esteem and personal development and are related to travel for business or professional interests and for the purpose of education on the pursuit of hobbies. After an intensive analysis these can be broken down into numerous motivators or reasons as to why more and more people engage themselves in tourism and related activities. These can be elaborated as under:

4.1.1.1 Pleasure

Getting away from all the routine of everyday life is perhaps the most important motive of all in recent times. The individual's desire and need for pleasure is very strong indeed. An individual likes to have fun, excitement and good time whenever possible. The significance of the pleasure factor is widely utilized by travel agents and tour operators who are astute psychologists when it comes to selling the tours. Various brochures and folders particularly emphasize the pleasure aspects of the holidays and travel.

4.1.1.2 Relaxation, Rest and Recreation

Industrialization and urbanization have created great pressure on the modern living. The stress and strain of modern city life has made it still more necessary than ever before for people to get away from all this and relax in an atmosphere which is more peaceful and healthy. There may be various forms of relaxation and rest. To some, it is secured by a change in the environment. Others seek sunshine and excitement at seaside or other resorts. Some seek relaxation in seeing new places, meeting strangers and seeking new experiences. Whatever form the holiday takes, relaxation is always sought in a certain measure by the holiday maker.

4.1.1.3 Health

The benefits to be gained from fresh air and sunshine have long been recognized. The development of "Spas" during the Roman Empire was the result of people's desire to seek good health. The subsequent establishment of many Sanatoria in Switzerland was the result of awareness on the part of the people of the various benefits of good health. These Sanatoria laid the foundations for future resort developments.

4.1.1.4 Participation in Sports

There has been an increasing participation in a wide variety of sporting activities such as mountaineering, skiing, sailing, fishing, trekking, boating and surf riding etc. More and more people these days are taking holidays involving physical activities. In recent years, there has been a large increase in sporting holidays. The visitors go to places primarily to indulge in a sporting activity to which all their energies are directed.

4.1.1.5 Curiosity and Culture

Curiosity has been one of the major reasons for tourism. Large number of people are visiting different lands especially those places which are having important historical or cultural associations with the ancient past or those which hold special art festivals, music concerts, theatre and other cultural events of importance. Above all, there has always been curiosity in man about foreign people and places. In the present day world, technological developments in the area of mass media have made it possible for people to read, see and hear about different destinations. This curiosity has been stimulated by advancing education. Thus, international events like Olympic Games, Asian Games, National Celebrations, Exhibitions and special festivals etc. attract thousands of tourists.

4.1.1.6 Ethnicity and Family

This includes visiting one's relatives and friends, meeting new people and seeking new friendships. A large number of people make travel for interpersonal reasons. There is a considerable travel by people desirous of visiting friends and relatives. A large number of American's visit European countries to see their families or because they feel like they are visiting their homeland. Likewise, every year thousands of people visit India for ethnic reasons. Many friendships have been made as a result of holiday acquaintances.

4.1.1.7 Spirituality and Religion

Travel for spiritual reasons has been taking place since long time. Visiting religious places has been one of the earliest motivators of travel. A large number of people have been making pilgrimages to sacred religious places or holy places and this practice is widespread in many parts of the world. In Christian world, for instance, a visit to Jerusalem or the Vatican is considered to be very auspicious. In Arab- Muslim world, pilgrimage to Mecca or Medina or some other holy centers is considered to be a great act of faith. Similarly, in India, there are many pilgrimage centers and holy places of all the major religions of the world like Ayodhya, Allahabad, Amarnath, Amritsar, Badrinath, Banaras, Chararisharef, Chidambaram, Dharamasthala, Gaya, Goa, Haridwar, Hazratbal, Konark, Ladakh, Mumbai And Yamunotri etc. where every year a large number of pilgrims from all over the world come to pay homage.

4.1.1.8 Status and Prestige

This is concerned with the personal development and some sort of ego. Many people undertake travel with a view to talk about it to their relatives and friends. They like to impress them by relating their experiences of the various places visited. They also travel because they think it is fashionable to do so and perhaps show that they can afford to do it. Foreign tour is a magic word and people like to mention it their acquaintances with pride.

4.1.1.9 Profession or Business

Attending conferences and conventions related to one's profession, industry or commerce or to some organization to which the individual belongs has become very popular nowadays. The conventional travel has made great strides in recent times. Many countries, in order to attract more tourists have established grand convention complexes where all kinds of modern facilities are provided for business meetings, seminars and conventions. Besides, large hotels also provide facilities for conventions as a large number of people travel for business and professional reasons. Conferences, workshops, conventions and seminars associated with education, commerce, industry, politics and various other professions are increasingly being held in different parts of the world. Although some people travel strictly for business purposes, the majority link business travel with pleasure.

4.1.2 Motivation of Tourism to Kashmir Valley: An Analysis

Traditionally, Kashmir Valley was the center of attraction on account of its natural as well as human beauty. With the passage of time, natural beauty remained intact but the human beauty saw its downfall. A number of factors are responsible for this declining human beauty that include (1) Poor standard of living of Kashmiris (2) Nutritional deficiency (3) Improper hygienic conditions (4) Lack of peace and prosperity and (5) Unnecessary encroachment of men in uniform into the residential areas of the inhabitants.

All these factors have impacted negatively and tremendously on the lives of people and, thus, have taken away the 'Sheen' and glory of their faces. Thus, it can be said that there is reversal of human beauty with the passage of time in Kashmir Valley which has demotivated the outsiders or the tourists to visit the Valley. People now think twice before making their plans to visit Kashmir. Whether the age old beauty of

Kashmir strikes their minds or not but one thing definitely comes in their mind while thinking about Kashmir and that is Terrorism and the associated insecurity. Despite all these odds, still a good number of tourists get motivated to visit Kashmir Valley. In this direction, the researcher has tried to analyze the visiting tourist's profile and their motivating factors and has categorized them into two sections as:

4.1.2.1 Tourist Profile Analysis

This section includes Sex and Age wise distribution of tourists, their Nationality wise distribution, educational qualifications, occupational structure, number of visits made by the tourists, modes of transportation and levels of comfort etc. and can be analyzed as follows:

4.1.2.1.1 Distribution of Tourists

The total number of tourists interviewed by the author during the survey was 450. Out of this number, 150 (33.33 per cent) were foreign and exactly double the number of it i.e. 300 (66.67 per cent) were domestic. By domestic tourists, it means the tourists from outside the valley of Kashmir or from rest of the states of India. Out of 450 tourists, 310 (68.89 per cent) were males and 140 (31.10 per cent) were females. The distribution of tourists is given in Table 4.1 and represented by figure 4.1 and 4.2 as follows:

Table 4.1- Sex wise and Nationality wise distribution of Sampled Tourists (2014)

Nationality	Frequency	Percentage	Male	Percentage	Female	Percentage
Foreign	150	33.33	112	74.67	38	25.33
Domestic	300	66.67	198	66	102	34
Total	**450**	**100**	**310**	**68.89**	**140**	**31.11**

Source: Based on Field Survey by the Researcher, 2014

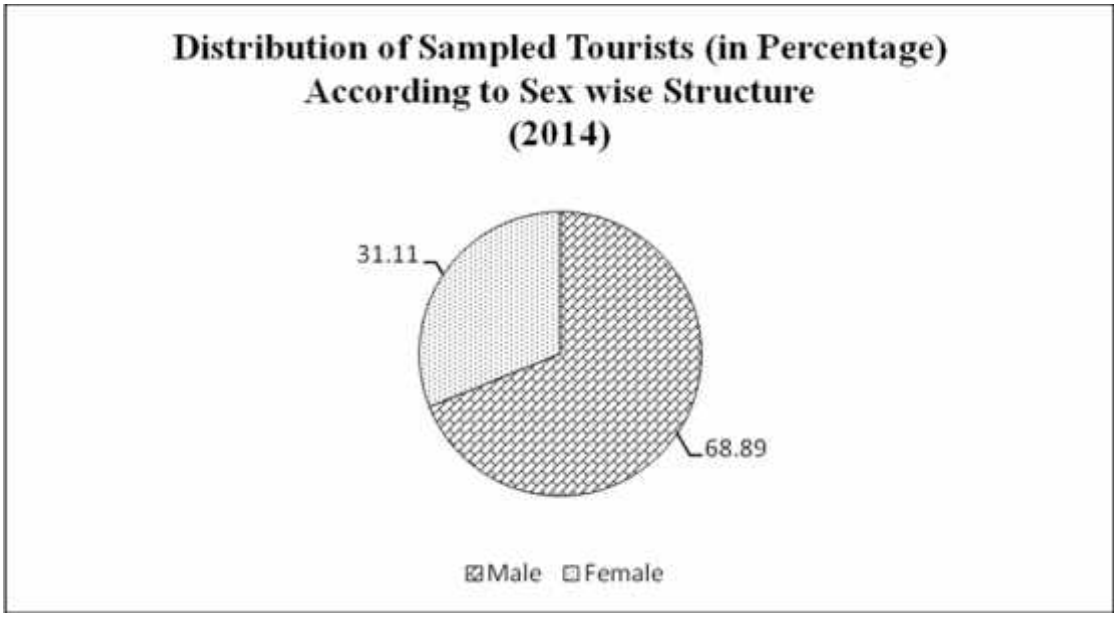

Figure 4.1

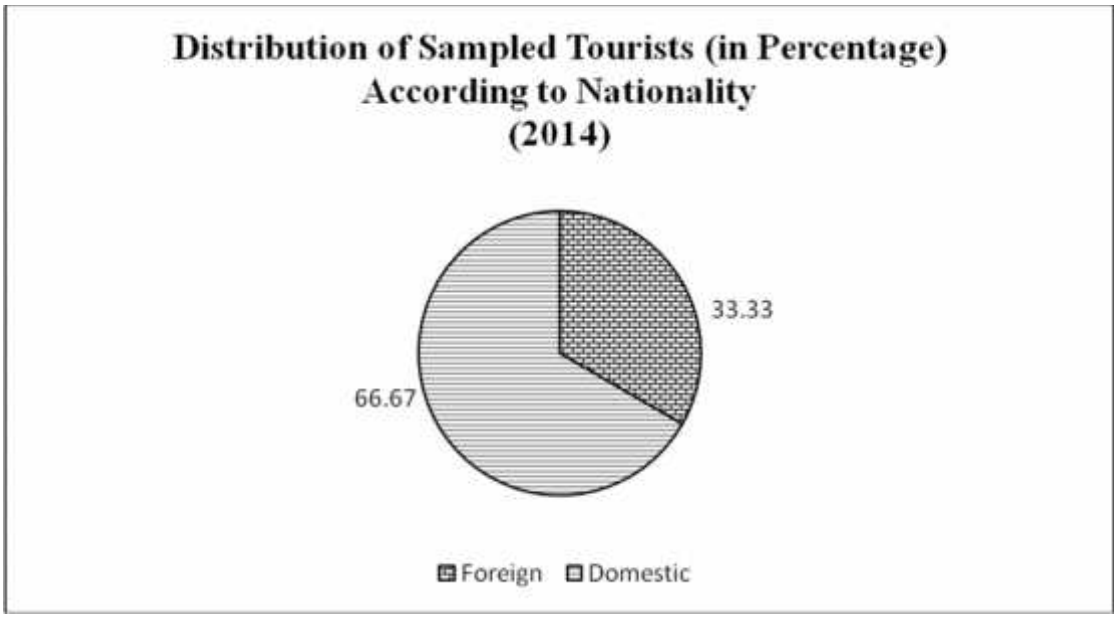

Figure 4.2

4.1.2.1.2 Age Structure of Tourists

Tourists who visited Kashmir Valley during the present survey period have been categorized into five age groups with the class interval of 10 years. Starting from 15-25, 25- 35, 35-45, 45-55 and Above 55 years, the whole tourist sample has been categorized and the respective frequencies and percentages have been obtained.

So far as the foreign tourists are concerned, the highest age group is of 35-45 years which comprises 34.66 per cent of tourists followed by 45-55 (26 per cent), 25-35 (15.33 per cent), and above 55 years (14 per cent). The lowest age group is of 15-25 years that constitutes only 10 per cent of the sampled tourists. Similarly, the highest age group for the domestic tourists lies under class interval of 45-55 (40 per cent) followed by 15- 25 (21 per cent), 25 to 35 (18 per cent) and 35 to 45 (11 per cent). The least number of domestic tourists belong to the age group of above 55 (10.33 per cent).

Since tourism is a phenomenon that is mostly undertaken by the youth. Same is the case with the tourists visiting the Kashmir Valley where most of the tourists belong to the young generation. Age structure of the sampled tourists to Kashmir Valley is given under table 4.3 and figure 4.3 as follows:

Table 4.2- Distribution of Tourists (in Percentage) According to Age Wise Structure (2014)

Age Group (in Years)	Foreign		Domestic	
	Frequency	Percentage	Frequency	Percentage
15- 25	15	10.00	62	20.66
25- 35	23	15.33	48	16.00
35- 45	49	32.66	59	19.66
45- 55	42	28.00	100	33.33
Above 55	21	14.00	31	10.33
Total	**150**	**100**	**300**	**100**

Source: Based on Field Survey by the Researcher, 2014

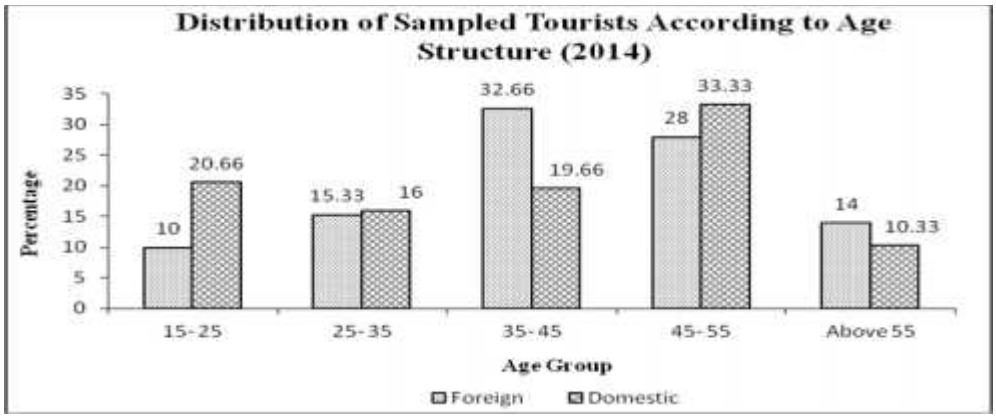

Figure 4.3

4.1.2.1.3 Educational Structure

The structure of education has been classified into six categories comprising of illiterates, matriculates, higher secondary level, graduates, post graduates and other levels of education like professionals and diploma holders etc. Foreign tourists depicted the lowest percentage in illiterate group (4 per cent) and highest percentage in postgraduate group (36 per cent). Similarly, the lowest percentage of domestic tourists was noticed under illiterate category as 10 per cent and the highest percentage was seen under post graduate level (25.67 per cent). However, one important point needs to be noted down here that the percentage of illiterates varies significantly among the two categories of tourists- domestic and foreign- which is shown under table 4.3 and figure 4.4 as:

Table 4.3- Distribution of Sampled Tourists (In Percentage) According to Educational Structure (2014)

Educational Structure	Foreign		Domestic	
	Frequency	Percentage	Frequency	Percentage
Illiterate	06	4.00	30	10.00
Matriculate	05	3.33	51	17.00
Higher Secondary	14	9.34	43	14.33
Graduate	45	30.00	68	22.67
Post Graduate	54	36.00	77	25.67
Others*	26	17.33	31	10.33
Total	**150**	**100**	**300**	**100**

Source: Based on Field Survey by the Reseacher, 2014
**Others- Include professional students and diploma holders etc.*

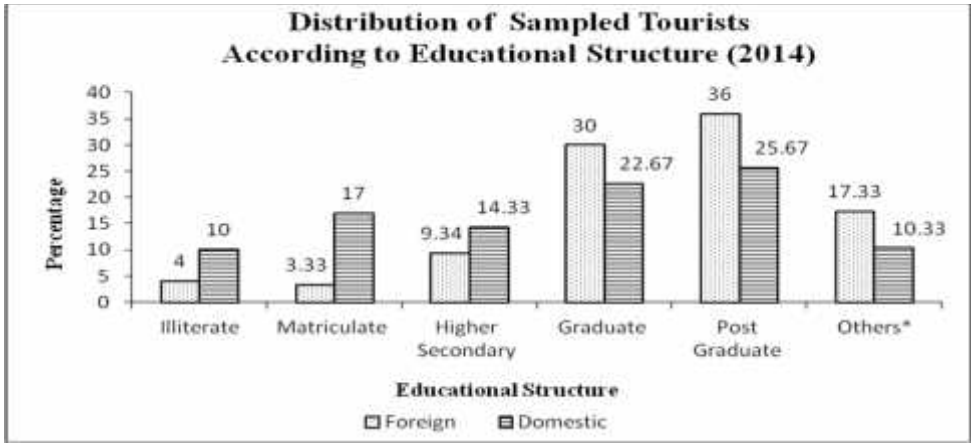

Figure 4.4

4.1.2.1.4 Occupational Structure

Occupational structure of the sampled tourists visiting Kashmir Valley has been divided into five group's viz. Employed, Unemployed, Retired, Students and others. Among the foreign tourists, largest percentage of visitors belongs to employed group (54 per cent) meaning thereby that more than half of the foreign tourists visiting Kashmir valley in 2014 were employed and the lowest percentage of visitors was noticed in unemployed group (3.33 per cent), indicating thereby that the movement of unemployed foreign tourists is comparatively lesser or in other sense, the employed people are in a better position to afford foreign trips or tours. Similarly, from the domestic lot, largest percentage of tourists belonged to employed group (26.67 per cent) while as the least percentage of domestic tourists was noticed under retired group of occupational structure (7 per cent). This is shown under table 4.4 and figure 4.5 as follows:

Table 4.4- Distribution of Sampled Tourists (in Percentage) According to Occupational-Structure (2014)

Occupational Structure	Foreign		Domestic	
	Frequency	Percentage	Frequency	Percentage
Employed	81	54.00	104	34.67
Unemployed	05	3.33	80	26.67
Retired	16	10.67	21	7.00
Student	21	14.00	65	21.66
Others	27	18.00	30	10.00
Total	**150**	**100**	**300**	**100**

Source: Based on Field Survey by the Researcher, 2014

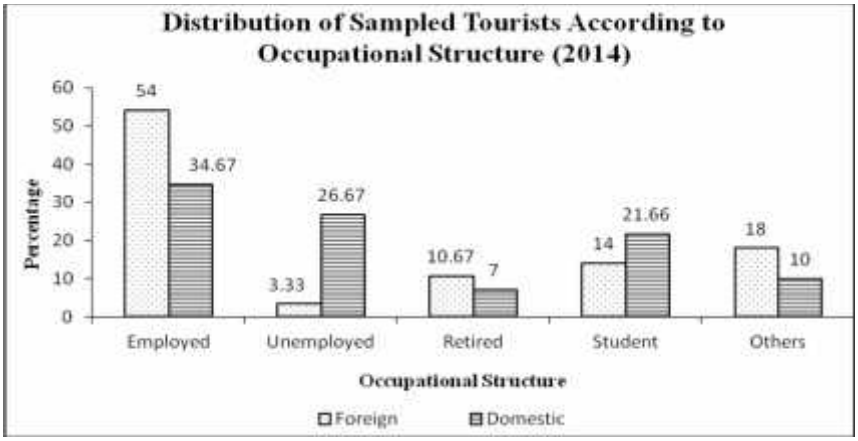

Figure 4.5

4.1.2.1.5 Frequency of Tourist Visits

A significant number of the tourists interviewed by the researcher were the first time visitors. Among the foreign tourists, 73.33 per cent were first time visitors followed by 14.67 per cent as second time visitors, 8 per cent as third time visitors and 4 per cent as the visitors who visited the Valley more than three times. Similarly, more than half of the domestic tourists (52.33 per cent) were first time visitors followed by second time visitors with 23.33 per cent, third time visitors as 12.67 per cent and more than third time visitors as 11.67 per cent. It was noted down that around 95 per cent of the tourists wished to revisit the Valley of Kashmir. This is shown in table 4.5 and figure 4.6 as under:

Table 4.5- Distribution of Sampled Tourists (in Percentage) According to Frequency of Tourist Visits (2014)

Frequency of Tourist Visits	Foreign		Domestic	
	Frequency	Percentage	Frequency	Percentage
First Visit	110	73.33	157	52.33
Second Visit	22	14.67	70	23.33
Third Visit	12	8.00	38	12.67
Above Three Visits	06	4.00	35	11.67
Total	**150**	**100**	**300**	**100**

Source: Based on field Survey by the Researcher, 2014

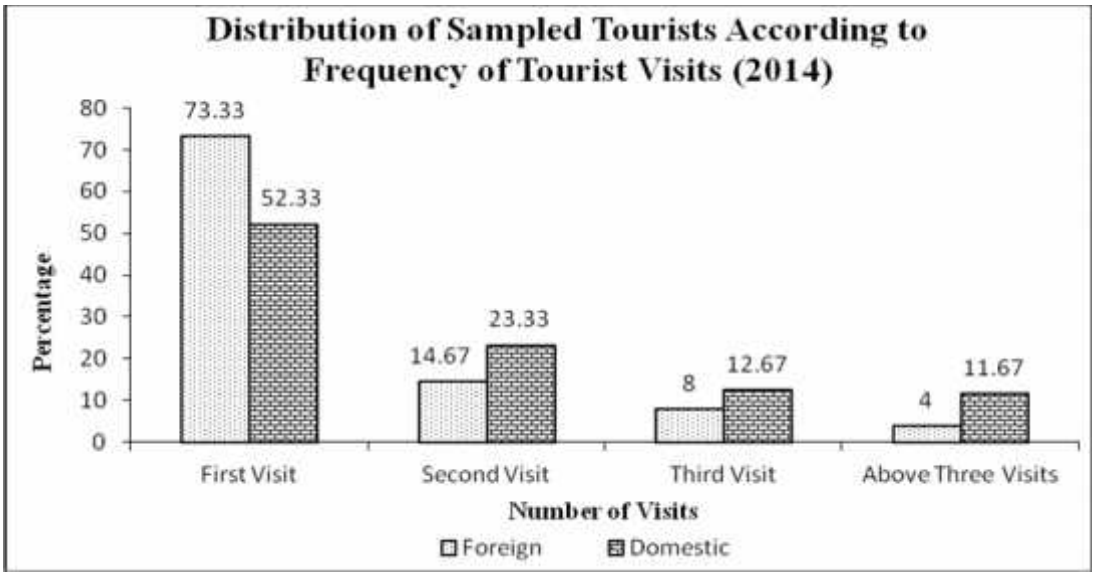

Figure 4.6

4.1.2.1.6 Modes of Transportation

It was observed that 48.67 per cent of the foreign tourists visiting Kashmir Valley come by airplane followed by those who come by bus (19.33 per cent) and car (14.67 per cent). Besides, Tourists who used other means of transportation like Tata Sumos and Taveras etc. to travel to Kashmir Valley from Jammu or Delhi comprised a significant proportion of 17.33 per cent. Similarly, 25 per cent of the domestic tourists travelled by aeroplane for Kashmir Valley and 11 per cent made use of car. However, a significant percentage (36 per cent) of domestic tourists travelled by bus from Jammu or Delhi for Kashmir Valley and 28 per cent of these tourists made mini cars and other similar vehicles as their modes of transportation for the Valley. One important point to note down here is that despite huge flow of domestic tourists to the Valley of Kashmir, only 1/4th use airplane as their means of transportation which is a matter of great concern and needs to be addressed. This is shown in Table 4.6 and figure 4.7 as follows:

Table 4.6-Distribution of Sampled Tourists (In Percentage) According to Modes of Transportation (2014)

Modes of Transportation	Foreign		Domestic	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Aeroplane	73	48.67	75	25.00
Bus	29	19.33	108	36.00
Car	22	14.67	33	11.00
Any Other*	26	17.33	84	28.00
Total	**150**	**100**	**300**	**100**

Source: Based on Field Survey, by the Researcher 2014
**Any Other- Tata Sumo, Tavera, Innova etc.*

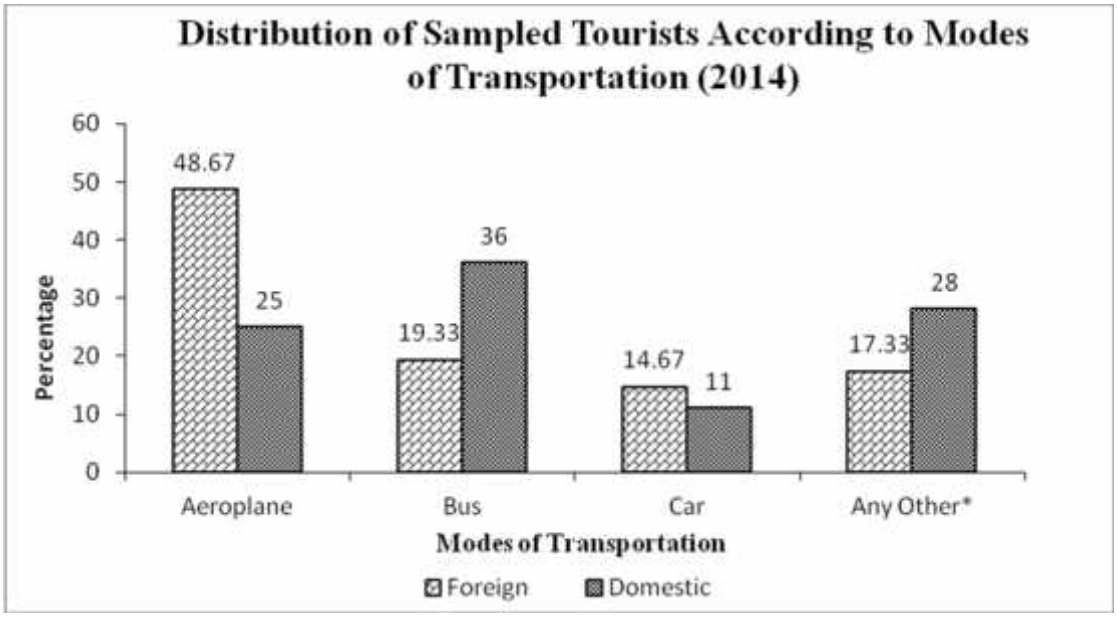

Figure 4.7

4.1.2.1.7 Comfort Level of Tourists

So far as the level of comfort of foreign tourists is concerned, around 70.67 per cent of them felt that the modes of transportation are good, 16 per cent marked them as poor and around 13.33 per cent responded to the level of comfort as average. However, this percentage varied considerably among domestic tourists wherein more than half (54.33 per cent) marked these levels of comfort as good and 15 per cent as average. But the main point to note down here is that almost 30.67 per cent of the domestic tourists felt that the means of transportation are poor and this is because of their respective proportion of travel through buses which is in itself again a matter of great concern. This can be illustrated in Table 4.7 and figure 4.8 as follows:

Table 4.7- Distribution of Sampled Tourists (in Percentage) According to the Levels of Comfort (2014)

Comfort Levels of Tourists	Foreign		Domestic	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Good	106	70.67	163	54.33
Average	20	13.33	45	15.00
Poor	24	16.00	92	30.67
Total	**150**	**100**	**300**	**100**

Source: Based on Field Survey by the Researcher, 2014

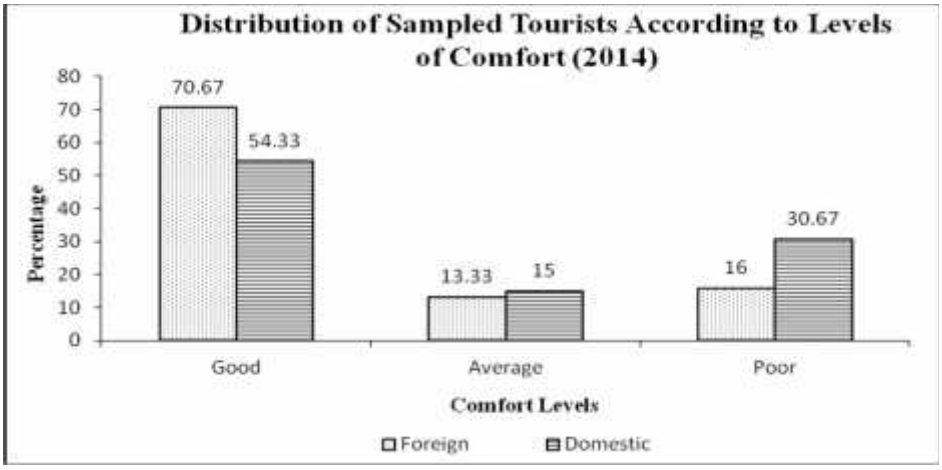

Figure 4.8

4.1.2.2 Tourism Motivation Analysis

This includes analysis of those factors which play an essential role and are quite indispensable in motivating the tourists, whether domestic or foreign, to visit Kashmir Valley. It can be studied under 'purpose of tourist visit', 'sources of information about Kashmir Valley Tourism', 'most beautiful tourist place to visit' and 'daily expenditure of tourists' in Kashmir Valley. This can be illustrated in the following paragraphs as:

4.1.2.2.1 Purpose of Tourist Visit

Purpose of tourist visit has been divided into seven categories. Both foreign as well as domestic tourists gave first priority to Rest and relaxation as their main purpose of

Table 4.8- Distribution of Sampled Tourists (In Percentage) According to Purpose of Visit (2014)

Purpose of Tourist Visit	Foreign		Domestic	
	Frequency	Percentage	Frequency	Percentage
Rest and Relaxation	46	30.67	99	33.00
Culture and Curiosity	30	20.00	25	8.33
Sports and Recreation	26	17.34	22	7.33
Academic Purpose	19	12.67	29	11.67
Health Reasons	13	8.66	77	9.67
Religious Motives	11	7.33	35	25.67
Any Other	5	3.33	13	4.33
Total	**150**	**100**	**300**	**100**

Source: Based on Field Survey by the Researcher, 2014

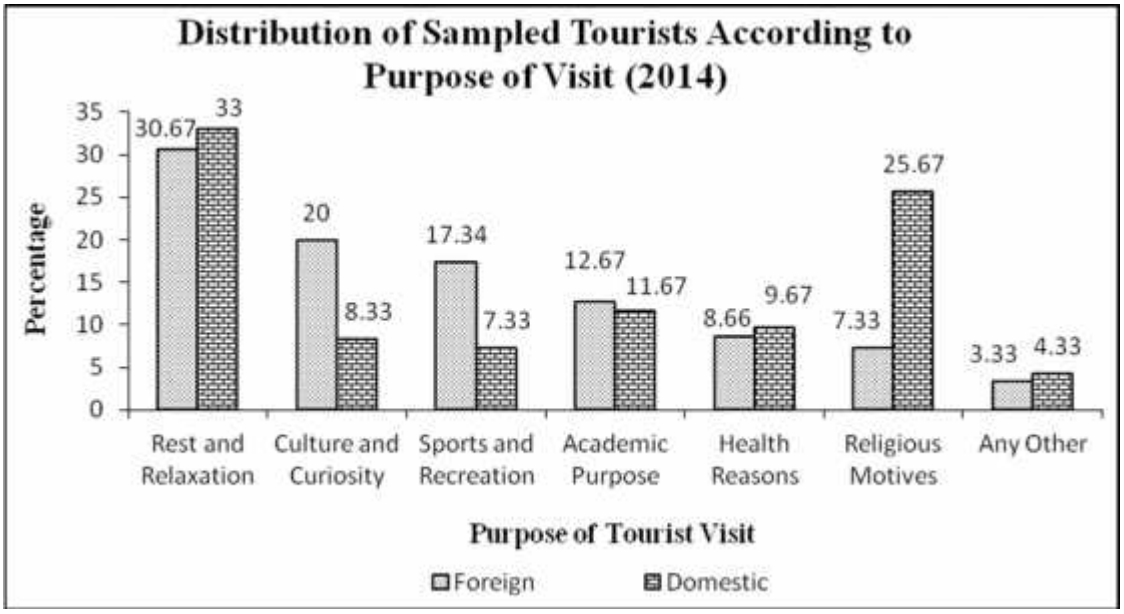

Figure 4.9

visit to Kashmir Valley with 30.67 per cent and 33 per cent respectively. However, their other preferences varied considerably. Almost 20 per cent of the foreign tourists preferred culture and curiosity as their second choice of visit, while the second choice of visit for domestic tourists was Religious motives with around 25.67 per cent in this category. This was mainly because of the presence of few religious places and shrines like Amarnath cave and Kheir Bhavani temple etc. in Kashmir Valley which used to be flooded with these pilgrims in different parts of year. Thirdly, the other purpose of foreign tourists included Sports and Recreation (17.34 per cent), Academics (12.67 per cent) and Health reasons (8.66 per cent) etc. Similarly, Academic purpose, Health reasons, Culture and Curiosity and Sports and Recreation comprised of 11.67 per cent, 9.67 per cent, 8.33 per cent and 7.33 per cent of domestic tourists respectively. Various other personal reasons like business, family ties and friendships etc. were there to visit Kashmir Valley which included 3.33% of foreign and 4.33 per cent of domestic tourist's. This is shown under Table 4.8 and figure 4.9.

4.1.2.2.2 Source of Information

Sources of information regarding Kashmir Valley Tourism have been studied under five classes by the researcher. Among the sampled foreign tourists, internet was the

Table 4.9- Distribution of Sampled Tourists (In Percentage) According to Source of Information (2014)

Source of Information	Foreign		Domestic	
	Frequency	Percentage	Frequency	Percentage
Internet	66	44.00	64	21.33
Books and Guides	28	18.66	36	12.00
Friends and Relatives	25	16.67	96	32.00
Travel agencies	18	12.00	61	20.34
Part of Travel Package	13	8.67	43	14.33
Total	150	100	300	100

Source: Based on Field Survey by the Researcher, 2014

main source of information for about 44 per cent of visitors followed by Books and Guides (18.67 per cent), Friends and Relatives (16.66 per cent), Travel Agencies (12 per cent) and Part of travel Packages (8.67 per cent). However, the major source of information for the domestic tourists comprised of Friends and Relatives (32 per cent), followed by internet (21.33 per cent), travel agencies (20.24 per cent), Part of Travel Packages (14.33 per cent) and Books and Guides (12 per cent). The analysis reveals the fact that because of the respective level of development of the developed (Foreign) and developing (Domestic) societies and their consequent Social Setup, the degree of dissemination of tourism information, exposure and awareness levels vary. This is shown by table 4.9 and figure 4.10.

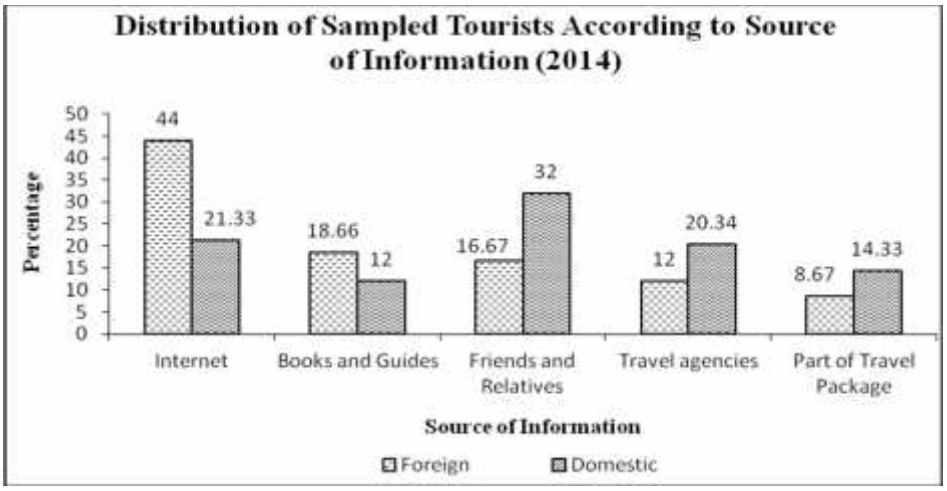

Figure 4.10

4.1.2.2.3 Most Beautiful Tourist Spot

Kashmir Valley has been entitled as "Paradise on Earth". Each and every part of this beautiful Valley is absolutely an epitome of beauty in itself. However, Mughal Gardens, Pahalgam, Gulmarg, Sonamarg, Yusmarg, Tangmarg, Verinag, Kokernag, Daksum, Achabal and Aharbal etc are few important and commonly known spots. Most of the sampled foreign as well as domestic tourists (Foreign-36 per cent, Domestic- 32.33 per cent) marked Mughal gardens as the most beautiful spot of Kashmir Valley primarily because of their historical importance for being the handiwork of the minds of the Great Mughals and their nearness to Srinagar, the Summer capital of Jammu and Kashmir, which makes it possible for every visitor to reach there easily and comfortably. However, so far as the second preference of foreign and domestic tourists is concerned, it varies as per their respective taste and experience. Gulmarg, because of its winter glamor, has been marked as second beautiful tourist spot by 31.33 per cent of foreign tourists and Pahalgam, because of its religious importance, has been marked as second preference by 30 per cent of domestic tourists. Similarly, Pahalgam, Sonamarg and other tourist spots have been marked as beautiful by 19.33 per cent, 7.34 per cent and 6 per cent of foreign tourists respectively and likewise 27 per cent, 6.67 per cent and 4 per cent of the Sampled domestic tourists have preferred to give third, fourth and fifth places to Gulmarg, Sonamarg and other tourist spots. One important point to note down here is that Sonamarg being far away from Srinagar is not visited most frequently by the tourists, except few, despite having a huge tourism potential which is a matter of great concern and needs to be addressed. This is shown in Table 4.10 and figure 4.11 as follows:

Table 4.10- Distribution of Sampled Tourists (In Percentage) According to Most Beautiful Tourist Spot Preference (2014)

Most Beautiful Tourist Spot	Foreign		Domestic	
	Frequency	Percentage	Frequency	Percentage
Mughal Gardens	54	36.00	97	32.33
Gulmarg	47	31.33	81	27.00
Pahalgam	29	19.33	90	30.00
Sonamarg	11	7.34	20	6.67
Others*	09	6.00	12	4.00
Total	**150**	**100**	**300**	**100**

Source: Based on Field Surveyby the Researcher, 2014
**Others- Include Verinag, Kokernag, Aharbal, Achabal, Duksum etc*

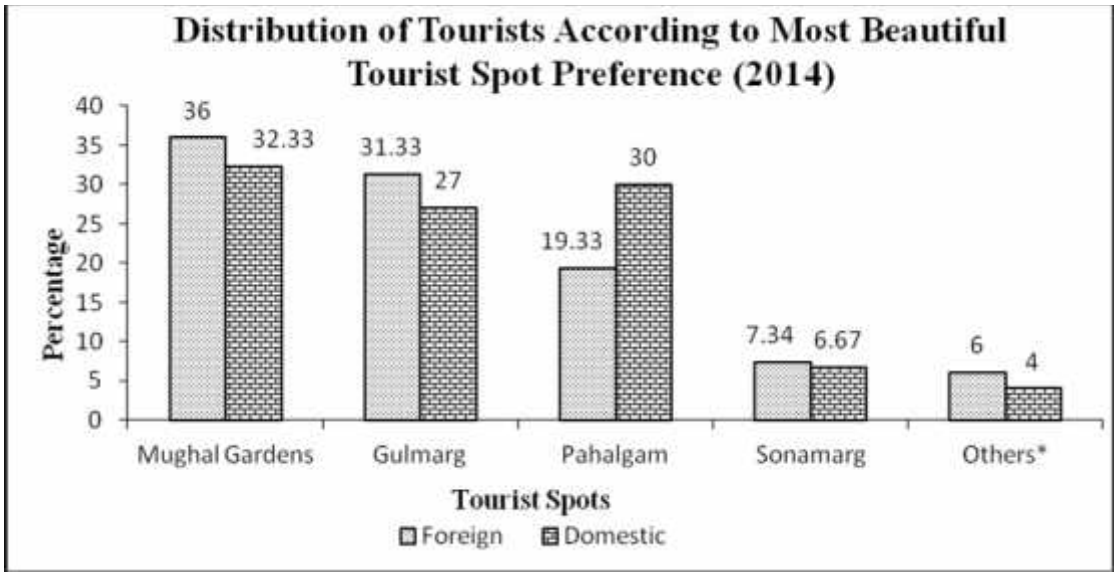

Figure 4.11

4.1.2.2.4 Daily Expenditure

Daily expenditure of tourists during their stay in Kashmir Valley constitutes one of the significant motives that can enhance or reduce their duration of stay at a particular tourist spot.

Table 4.11- Distribution of Sampled Tourists (In Percentage) According to the Daily Expenditure (2014)

Daily Expenditure (In Rupees)	Foreign		Domestic	
	Frequency	**Percentage**	**Frequency**	**Percentage**
2000 – 2500	29	19.33	156	52.00
2501 – 3000	45	30.00	75	25.00
3001 – 3500	39	26.00	33	11.00
3501 – 4000	25	16.67	27	9.00
Above 4001	12	8.00	09	3.00
Total	**150**	**100**	**300**	**100**

Source: Based on Field Survey by the Researcher, 2014

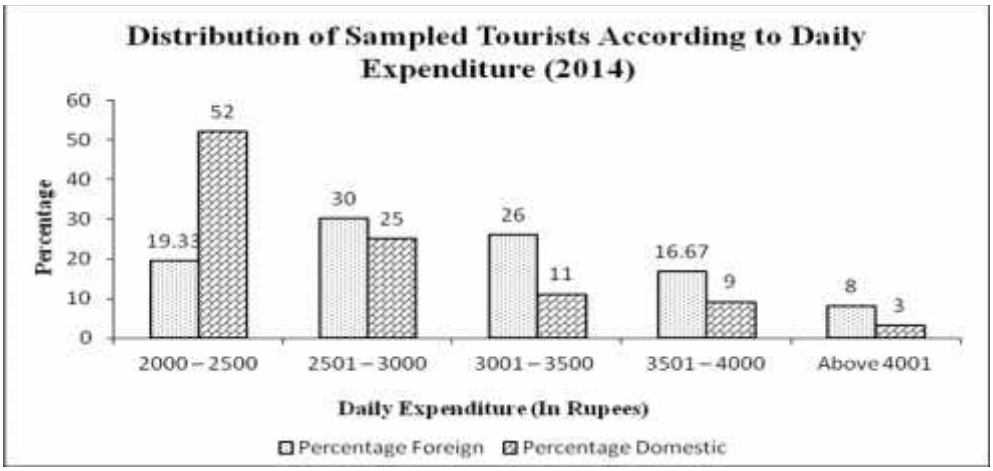

Figure 4.12

While interviewing the foreign tourists, it was found by the researcher that almost 30 per cent of them spend Rs 2,501 to 3,000 per day followed by Rs 3,001 to 3,500 by 26 per cent, Rs 2,000 to 2,500 by 19.33 per cent, Rs 3,501 to 4,000 by 16.67 per cent and above Rs 4,001 by 8 per cent of the tourists. However, the case was somehow different while considering the domestic tourists as 52 per cent of these visitors spend Rs 2,000 to 2,500 followed by Rs 2,501 to 3,000 by 25 per cent, Rs 3,001 to Rs 3,500 by 11 per cent, Rs 3,501 to Rs 4,000 by 9 per cent and above Rs 4,001 by 3 per cent of the tourists. From this data, the trend and pattern of expenditure of foreign as well as domestic tourists gets clearly visible for which again their respective levels of economic and social development are responsible. Foreign tourists prefer to live in star-hotels while domestic tourist adjusts in local hotels and restaurants. Foreigners use to book luxurious cars for different tourist spots, while domestic ones manage to travel through local and cheap transport. Hence, it is the level of comfort that makes foreigners to spend quite a more money than domestic tourists during their stay in Kashmir. This is illustrated in table 4.11 and figure 4.12 above.

4.2 Doldrums in Kashmir Valley Tourism

Kashmir Valley has remained an epicenter of tourism since time immemorial. It has been continuously visited by Great emperors, travelers, academicians, scholars and intellectuals of versatile genius. It’s mesmerizing and breath taking beauty has brought and is continuously bringing the visitors to it from different corners of the world. However, this inflow of tourists has witnessed various doldrums and its graph has continuously varied with the passage of time.

Besides being governed by the physical and geographical aspects of the region, tourism in Kashmir Valley is the victim of socio-political circumstances existing therein. For the sake of convenience, the author has tried to study these variations of tourist arrivals to Kashmir Valley under Seasonal and Decadal variations as:

4.2.1 Seasonal Pattern of Tourist Arrival

Kashmir Valley has been divided into five different seasons as per the climatic conditions of the year such as Spring (Mid-March to Mid-May), Summer (Mid-May to Mid-July), Rainy (Mid –July to Mid -September), Autumn (Mid- September to Mid- December) and Ice Cold (Mid- December to Mid-March). Around 75 to 85 per cent of the tourists visit Kashmir Valley during the five months of May, June, July, August and September. After analyzing the seasonal variations of tourists, it was found by the author that 70 per cent of the foreign tourists and 51 per cent of the domestic tourists use to visit the valley in summer. However, the percentage of foreign and domestic tourists varied considerably in rainy and ice cold seasons. Around 40 per cent of domestic tourists and only about 8.67 per cent of foreign tourists prefer to visit Kashmir Valley in Rainy season. The higher percentage of domestic tourists in rainy season is primarily because of the annual pilgrimage of tourists to Shri Amarnath Cave of Pahalgam (District Anantnag) which begins in the month of july and lasts for about 40 days. Similarly, foreign tourists burst in huge numbers in Gulmarg for the winter games in ice cold season, thereby increase their respective percentage than the domestic ones. Besides, 7 per cent of foreign and 5 per cent of domestic tourists wish to visit the Valley in the Spring and autumn seasons respectively. This is illustrated in table 4.12 and figure 4.13 as follows:

Table 4.12- Distribution of Sampled Tourists (In Percentage) According to Seasonal Variation of the Year (2014)

Season	Foreign		Domestic	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Spring	8	5.33	9	3.00
Summer	105	70.00	153	51.00
Rainy	13	8.67	120	40.00
Autumn	3	2.00	3	1.00
Ice Cold	21	14.00	15	5.00
Total	**150**	**100**	**300**	**100**

Source: Based on Field Survey by the Researcher, 2014

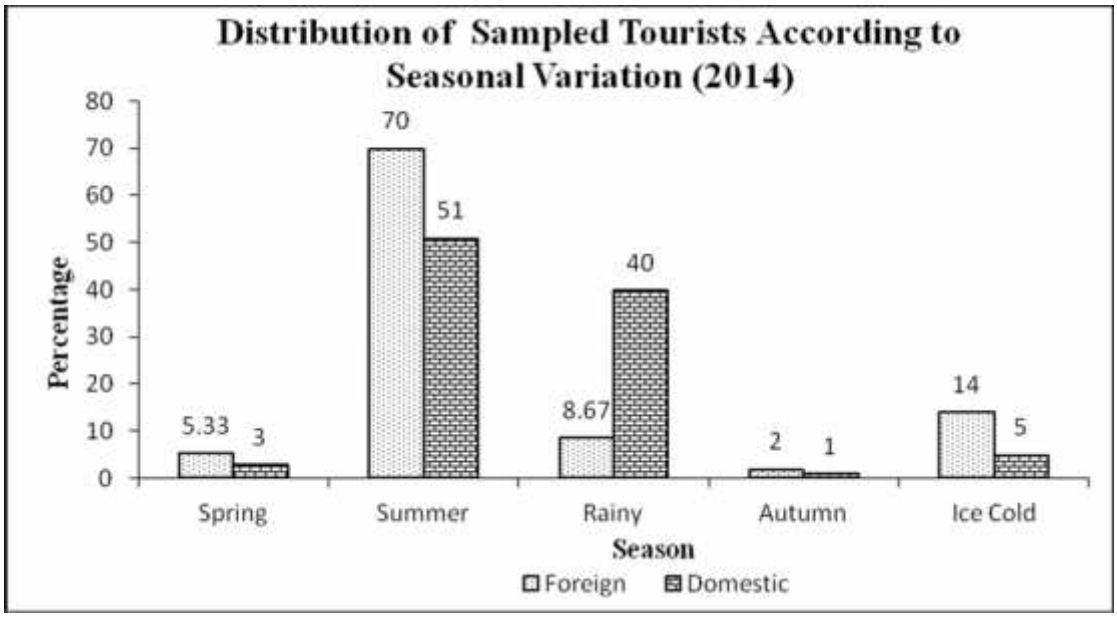

Figure 4.13

4.2.2 Decadal Pattern of Tourist Arrival

The decadal pattern of tourists to the Valley of Kashmir, both foreign as well as domestic, shows a tremendous increase for the first three decades after independence (1950 to 1980) with almost 126 per cent increase (4, 44,402 to 10, 05,177 tourists) during 1961 to 1971 over the previous decade of 1951- 1961 and around 216% increase (10, 05,177 to 31, 84,952) during 1971-1980 over the decade of 1961-1970. This pace of growing pattern of tourists to the valley continued in next decade of 1981 to 1990 also. However, its rate of growth was slow, only 57.66 per cent, because of numerous political disturbances prevalent that time in the country as well as in Kashmir Valley.

Table 4.13- Decadal Pattern of Tourist Arrival to Kashmir Valley (1951-2010)

Decades	Foreign	Growth Percentage	Domestic	Growth Percentage	Total	Growth Percentage
1951-1960	50,783	-----	3,93,619	-----	4,44,402	-----
1961-1970	1,10,914	118.40	8,94,263	127.18	10,05,177	126.18
1971-1980	3,47,941	213.70	2,83,7011	217.24	31,84,952	216.85
1981-1990	4,45,653	28.08	4,57,5935	61.29	50,2,1588	57.66
1991-2000	93,229	-378.01	4,15,429	-1001.49	5,08,658	-887.22
2001-2010	1,71,891	84.37	38,86,106	835.44	40,57,997	697.78

Source: Directorate of Tourism, Srinagar, J&K

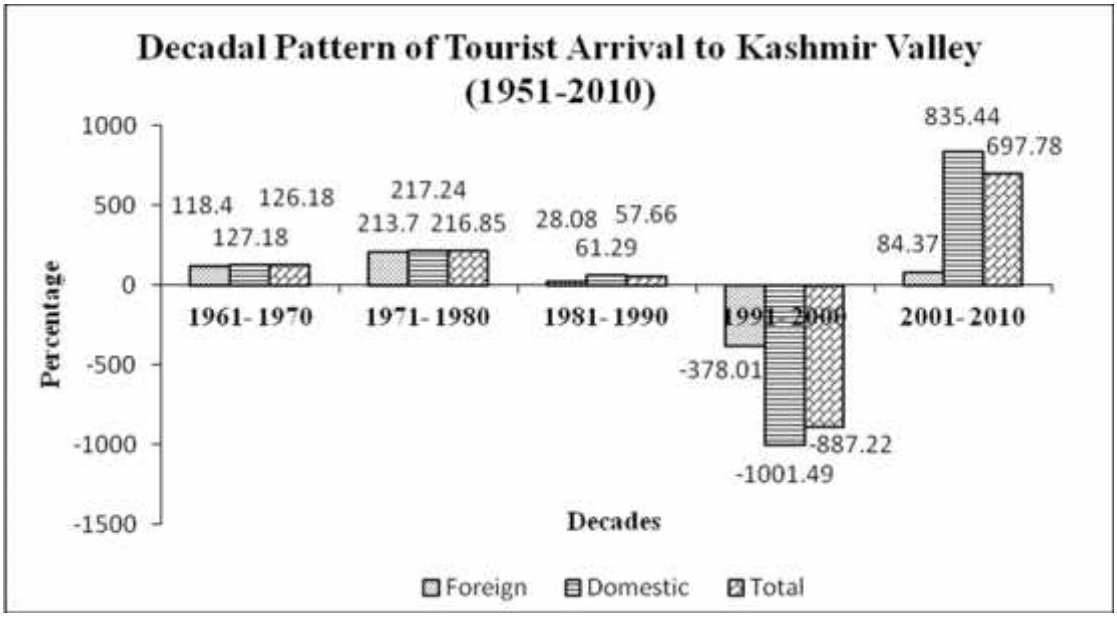

Figure 4.14

The year 1992-1993 saw militancy in neighboring state of Punjab which resulted in the murder of the then Prime Minister of India followed by mass murder of 3,000 Sikhs in the capital city of New Delhi. Similarly, the dismissal of Sheikh Abdullah's government by the then Governor (Jagmohan) and the mass rigging of elections of 1987 were enough to give a setback to the stability of the state government and, thereby, to the growing tourism and other sectors of economy. Thus, the tourism of the State increased slightly from 31, 84, 952 tourists to 50,21,588 tourists in this decade. The decade of 1991 to 2000 showed negative growth of -887 per cent tourists from 50,21,588 to 5,08,658 arrivals in Kashmir Valley. This was mainly on account of the beginning of the armed militancy in Kashmir Valley in 1989 and its subsequent intensification thereafter in the succeeding years. Moreover, Kargil war of 1999 acted as the last nail in the coffin of negative growth of tourism sector of Kashmir Valley.

However, the last decade saw a quick decline in the number of militant attacks in the Valley on account of stable coalition government of Congress and Peoples Democratic Party and the active involvement of men in uniform to curb this menace from the resourceful region of Kashmir. This resulted in the prevalence of stability and a feeling of security in the minds of visitors, both inside and outside of the Valley. Thus, the state started to rise on the line of progress and development of economy. Hence, the hitherto neglected tourism sector, the main sector of Kashmir's economy, received its due share of funds from the government's purse which led to a massive

increase of around 697.78 per cent (5,08,658 to 40,57,997) of tourist inflow during the decade of 2001 to 2010. This is shown in the table 4.13 and figure 4.14.

4.3 Prospects, Problems and Remedial Measures for Development of the Kashmir Valley Tourism

Kashmir Valley is an important tourist destination and has been a place of attraction since centuries. It has a vast potential of tourism because of its natural beauty dotted with numerous lakes and waterfalls, lush green hills and valleys, pilgrimage sites and historical Gardens, torrential rivers and pine trees and vast grasslands that have remained untouched by the man. However, because of a multitude of factors like the lack of interest of government and other authorities, lack of required technology and funds, unawareness of tourists and to some extent isolation of the region, this vast potential is still shrouded behind the scene. Thus, besides few tourist destinations like Mughal gardens, Gulmarg, and Pahalgam, rest of the huge potential of Kashmir Tourism remains untapped.

4.3.1 Prospects of Kashmir Valley Tourism Development

The main prospects of Tourism in Kashmir Valley can be elaborated as follows:

4.3.1.1 Adventure Tourism

"Adventure is an evocative term that speaks of beginning, boldness and power. It connotes participation and active involvement in the life. An adventure, a quest, begins because of a human desire, a drive to experience which is hidden and unknown" (Quinn, 2003)[2]. Adventure Tourism is an outdoor leisure activity that generally takes place in an unusual or remote geographical setting, involving sometimes unconventional means of transportation and tending to be associated with low or high levels of physical activity (Lala and Bhat, 2008)[3].

It has been a part of a spectrum of new tourist practices claiming different ethics to those of traditional mass-tourism. It is a special form of tourism that involves risk and excitement and is taken in conjugation with nature. Most of the existing literature on

2 Quinn, W. (2003). *The essence of Adventure, Adventure Programming.* Venture Publishing Inc: Pennsylvania.

3 Lala, M. F and Bhat, A. M. (2008). The Prospects of Developing Kashmir as an Adventure Tourism Destination. *South Asian journal of Tourism and Heritage, 1* (1), 75-79.

adventurous activities suggests that the pursuit of risk is central to their attraction (Carl, 2004)[4].

As a result of scenic splendor, Kashmir Valley has got a vast potential to prove as a successful destination in tapping into the increased interest in adventure tourism which can be represented by a plethora of activities like trekking, rafting, mountaineering, climbing, golfing, skiing, paragliding, aero sports, camping and zorbing etc. Being surrounded by towering mountains like the mighty Pir-Panjal, Zaskar and Greater Himalayan Ranges, the Valley of Kashmir can provide joyful experiences and enjoyment to the tourists. Climbing and trekking to these virgin mountain peaks can prove stimulating, breathtaking and worthwhile.

Recently trekking routes have been opened from Doodpathri to Yousmarg and from Dangwathi to Aharbal in addition to the already existing ones from sonmarg to Narang and Gurez in Kashmir Valley. In case, the tourist is more adventurous, he may go for angling in high altitude lakes which are reached by trek. e.g., one of the trek starts from Sonmarg and goes on to high altitude alpine lakes of Vishansar, Kishansar, Gadsar and Gangabal.

Secondly, river rafting in Kashmir on Lidder, Sind, Kishan Ganga and Jhelum rivers provides the best opportunity to enjoy and experience the natural beauty of the spectacular landscape with deep gorges, towering snowcapped peaks, hill side villages and glimpses of unique wildlife. Despite having all these potentials and prospects for adventure tourism, Kashmir Valley is getting only a small portion of adventure tourists on national as well as international lines.

4.3.1.2 Pilgrim Tourism

Kashmir is an epitome of harmonious blend of art, religion and philosophy. Religions like Christianity, Buddhism, Islam, Hinduism, and Sikhism have co-existed in J&K since hundreds of years especially in Kashmir Valley that is saturated with various mosques and temples which are just marvel creations. The state stands as an example of religious tolerance. Visiting Hari Parbat Pilgrim Center where a temple, a

4 Cater, C. I. (2004). Playing with Risk? Participant Perceptions of Risk and Management Implications in Adventure Tourism, *Elsevier, 26*, 317-325.

Gurudwara and a mosque stand side by side gives a feeling of pure brotherhood in between the major religions of the Region (Bhat,2013)[5].

Jammu & Kashmir has various pilgrim destinations for Muslims, Sikhs, Hindus and Buddhists. The very famous Mata Vaishno Devi Shrine and the Amarnath Cave are located in this state. These sites are the most valued and sanctified Hindu pilgrimage sites where thousands of devotees pay homage every year. For Muslims, there is the Hazratbal Shrine in Srinagar where the sacred hair (Moi-e-Muqqadas) of Prophet Mohammad (S.A.W) is preserved and the truthful come to pay homage. The Shahdara Sharief located in Rajouri District of the State is like an emblem of communal harmony.

Besides all the above destinations, a number of other religious places that the Valley of Kashmir has been bestowed with include shrine of Baba Rishi (District Baramullah), Kheir Bhawani (Tulamula, Baramula), Charar-e-Sharif (District Budgam), shrine of Noor shah sahib and sheikh Noorudin-wali (District Kulgam), Martand temple, shrine of Baba Naseeb din Gazzi (District Anantnag), Khankah Moalla and Old Jamia Masjid (District Srinagar). Thus, looking at the huge untapped potential of Pilgrim Tourism of Kashmir Valley, number of tourist circuits can be developed like (a) Srinagar – Hazratbal Shrine- Khankah Moalla- Baba Rishi's shrine (b) Srinagar- Avantipora- Martand Temple- Holy Amarnath Cave (c) Srinagar- Sheikh Noorudin Wali Shrine- Pir ki Galli shrine (d) Srinagar- Shrine of Avantipora- Baba Naseeb din Gazi shrine- Shrine of Rishi Baba- Shrine of Zainshah Sahab.

4.3.1.3 Rural Tourism

Rural tourism has long been considered a means of achieving economic and social development and regeneration. More specifically, it has been widely promoted as an effective source of income and employment, particularly in peripheral rural areas where traditional agrarian industries have declined. More recently, however, a number of established tourism destinations have also turned to rural tourism in order to diversify their tourism products and markets and to spread the benefits of tourism

5 Bhat, Z. A. (2013).Tourism industry and Pilgrimage Tourism in Jammu & Kashmir: Prospects and challenges, *Abhinav-International Monthly Refereed Journal of Research in Management & Technology*, 2, 105-113

away from the resorts into the hinterland (Sharpley,2002)[6].Generally, rural tourism is seen as a valuable and growing sector of the overall tourism market, representing a significant source of income to rural economies.

Kashmir is known throughout the world as much for its arts and crafts as for its scenic beauty and bracing climate which are mainly the production of rural Kashmir. Its crafts range from woolen textiles of fleecy soft texture of matchless excellence in weaving, hand-woven carpets of the finest warp and weft, to the exquisite designs worked on papier-mâché, wood work, silverware, etc. They are products of unique craftsmanship. The skill of the craftsmen and their capacity for intricate workmanship are assets, which can help development on a much larger scale.

Like handicrafts, the handloom industry is also the oldest traditional cottage industry in the state. The importance of this sector lies in the fact that it has enormous employment potential; it does not consume scarce resources, does not cause pollution and is environment friendly. The social cost benefit ratio, therefore of all investment in this sector goes up several fold.

Kashmir Valley is famous for the weaving of specialized fabrics like pashmina and kani shawls, silken, woolen and cotton fabrics. The elaborate kanishawl which was introduced by Zain-ul-Abed in and spanned through the Moghul, Afghan and Sikh rule are primarily found in the tiny village of Kanihama near Magam. Similarly, Main production centers of woolen articles in Kashmir are Gurez, Tillel, Bandipur. Nadihal, Kazipora and Papchal (well known for kandidaror bordered chadars), Lolab valley, Badgam, Beerwah, Chadoora, Inder Gadodar, Pulwama, Tral, Shopian, Sophare, Handwara, Magam and Tarzoo.

In the areas surrounding Anantnag in Kashmir, many people are engaged in embroidering raffal and pashmina shawls, pherans (a loose over gown worn by men and women). Besides, the Kashmir Carpet, introduced to Kashmir by Sultan Zain-ul-Abedin in the 15th century ranks amongst the finest in the world today. The weaver takes special pride in his ability to accurately reproduce Persian, Turkish, Turkman, Caucasian, antique Kashmir Moghul and Jaipur Moghul patterns.

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6 Sharpley, R. (2002*).* Rural tourism and the challenge of tourism diversification: the case of Cyprus. *Elsevier: Tourism Management, 23* (3), 233–244.

Moreover, the silver work of Kashmir is extremely beautiful and some of the indigenous patterns, like the chinar and lotus leaf, are of exquisite design. Handmade pieces of high quality workmanship are available in Srinagar. Articles include cups, bowls, plates, tumblers, trays, tea and coffee pots, dinner sets, goblets, boxes, vases, trinket boxes and cigarette cases.

In the rural areas of Kashmir, utilitarian earthenware is still in demand for domestic use. Low priced and colorful clay containers are used to store water, set curds and cook vegetable and meat. The Kashmir potter also makes symbolic objects linked with the Shivratri festival, clay-containers for the Kangri bowls and Chillums containing smoldering embers for the Hukka. Rural pottery found in Charar-e-Sharif is painted red and blue and is occasionally decorated with white and green flowers. Mud-pots for storing water and cooking continue to be widely used in every village home.

Above all, beautiful temples, idols and monuments testify to stone carving being an ancient craft in Kashmir. Athwajan, close to Srinagar is known for its stone work, chiseled stone for paths, pillars, grinding stones and gravestones. Despite having the huge potential for this type of tourism the rural Kashmir is still in a state of underdevelopment which if utilized properly can prove as a boosting factor for the generation of employment and various other skills.

4.3.1.4 Wetland Tourism

Wetlands represent the interface between land and water. These are areas of land that are either temporarily or permanently covered by water. The Millennium Ecosystem Assessment estimates conservatively that wetlands cover seven per cent of the earth's surface and deliver 45 per cent of the world's natural productivity and ecosystem services of which the benefits are estimated at $20 trillion a year.

Kashmir valley nestled in northwestern folds of the Himalayas is replete with diverse types of freshwater bodies (Khan, 2000)[7] which have a tremendous potential for the development of tourism. These consist of both high altitude and low altitude wetlands

7 Khan, M. A. (2000). Wetland Biodiversity in the Kashmir Himalaya: Assessment and Conservation Strategies. In (Eds.) 221 *Environment, Biodiversity and Conservation.* A.P.H. Publishing Corporation: New Delhi.

and Natural as well as man-made ones. Some of these wetlands include the world famous Dal Lake which lies in the heart of Srinagar city. Wular, the largest fresh water lake of India about 16 kms long and 9.6 kms wide at a distance of 75 kms from Srinagar in Bandipora district, Anchar lake, a swampy area of about 8km length and 3kms width, Manasbal lake at a distance of 29 kms from Srinagar with 5kms length and 1km width and Hokarsar lake on the Baramulla road, about 13kms from Srinagar with 5kms length and 1.5kms width.

All these are the low altitude wetlands (below 3,000mtrs) and the high altitude wetlands (above 3,000 mtrs) having crystal clear and deep blue waters include Sheeshnag lake near vavjan, enroute to Shri Amarnath cave, at a distance of 28kms from Pahalgam, the Neelnag lake in Budgam district at a distance of 10kms from Nagam and Tulian lake etc.

Almost every part of the Valley of Kashmir is abounds in larger or smaller water bodies including rivers, streams, ponds, springs, waterfalls, and lakes. e.g., District Srinagar alone consists of 99 wetlands (lakes-14, streams-7, high altitude waterbodies-29, riverine wetlands-25 and smaller wetlands with area of less than 2 hectares-24) with an area of 10,081 hectares. Baramula district consists of 97 wetlands with an area of 16,360 hectares (lakes-2, streams-13, riverine- 29, high altitude waterbodies-38 and smaller ones-15), Pulwama district comprises of 266 wetlands with an area of 3,561 hectares (streams-5, riverine-7, high altitude wetlands-2, smaller-252), Kupwara district is abound with 95 wetlands with an area of 2,384 hectares (lakes-18, streams- 5, Riverine wetlands-2, smaller wetlands-70), Budgam district consists of 80 wetlands with an area of 3,402 hectares (high altitude wetlands-11, Riverine wetlands-9, streams-12, smaller wetlands-48), Anantnag district comprises of 118 wetlands with an area of 6,875 hectares (high altitude wetlands- 69, riverine-15, streams-11 and smaller wetlands-23)[8]. Rest of the districts of the Valley are similarly rich in the wetland potential tremendously.

Despite these benefits, wetlands in Kashmir Valley are the first target of human interference and are among the most threatened of all natural resources primarily because of increased siltation, eutrophication due to run-off from catchments,

8 *National Wetland Atlas: Jammu & Kashmir*(2006), Space Application Centre, ISRO, Ahmedabad , Sponsored by Ministry of Environment and Forests, GOI

agricultural conversion, receding open water areas as a result of expanding reed beds, construction of canals, weirs, levees and over-grazing (Bacha, 2002)[9].Thus, if these wetlands are managed and brought to the tourist map of Jammu & Kashmir, new prospects and possibilities of tourism which will enhance the vistas of tourism in Kashmir Valley will emerge.

4.3.1.4 Heritage Tourism

The State of Jammu and Kashmir has its own long and glorious history. Under the Antiques Act, any article that is more than 75 years old is to be declared heritage property. Jammu and Kashmir is a land with more enormous potential for heritage tourism. The land is full of natural beauty that is unique to the state. It is also bestowed with a variety of cultural forms and manifestations that have their distinct flavor. It has diverse practices in religion, rites and rituals, fairs and festivals, landscape and people, language and culture.

Kashmir Valley is blessed with both tangible and the intangible heritage which should be incorporated into the wider tourism circuit. The need is to treat heritage tourism in this region as the function of the tourism. Only then it can thrive in the true tourism sense. First, the heritage tourism assets of the region should be identified and then a proper documentation mechanism has to be devised so that a proper inventory is developed which can be integrated into a well-defined tourism product by employing the proper marketing strategy with the help of the multidisciplinary approach of the varied professionals, who can constitute task force for the application of the mechanism developed from this integrated process. Once this procedure is brought into action it will lead to the heritage tourism development model that will lead to the bright prospects of the overall tourism business in the region.

4.3.2 Problems of Kashmir Valley Tourism Development

Looking at the prospects of Tourism in Kashmir, it becomes quite evident that tourism in Kashmir can play an utmost important and significant role in the overall development of Kashmir Valley. With its backward and forward linkages with other sectors of the economy like transport, telecommunication & handicrafts etc., tourism

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9 Bacha, M.S. (2002*).*Central Assistance for Hokera Critical Wetland, *A Report: Department of Wildlife Protection, Jammu and Kashmir Government, Srinagar*.

has the potential to not only prove as the economy driver but also as an effective tool for poverty alleviation and ensuring growth with equity.

However, the tourists are attracted to the destination not only because of the natural resource or natural beauty of the place, but because of the returns they get on the expenditure they do in the tourist place. These could be satisfaction of psychological needs like proper, safe, hassle free and affordable accommodation, good transport facilities, in and around the tourist place, good water, and hygiene and sanitation facilities. Thus, this sector of Kashmir Economy is ridden with some of the inherent problems and limitations that can be noted down in the following paragraphs as:

4.3.2.1 Tourism Infrastructure

The tourist infrastructure is poor in Jammu & Kashmir which impedes the expansion to tourism in two ways. First, the absence of some types of infrastructure such as roads provides an effective block to tourist development. Second, the absence of other types of infrastructure does not preclude tourism, but makes achieving and maintaining service standards more difficult and expensive. Thus, the failure to provide adequate bulk services to the tourist sector is alarming. The Jammu & Kashmir government has tried to invest in building basic infrastructure such as railways, highways, roads, electric power plants, water supplies, and other related facilities. With the support of central financial assistance some basic physical infrastructure has been constructed but this is still at a very low level. For example, the total number of Hotels in Kashmir Valley are 386, Restaurants-104, Paying Guest Houses-75, Registered Guest Houses-406, House boats-910 and Shikaras-4,656 (Department of Tourism, J&K) which is very insignificant so far as the tourist flow- both domestic as well as foreign- especially in peak seasons is concerned. Similarly, the road length has increased from 18,368 kilometers in 2007-08 to 26,700 kms (surfaced-23,600kms and unsurfaced-3,100 kms) in 2013-14. A large number of 10,20, 786 public and private vehicles use to ply over this much of road length the situation of which is further aggravated with the loopholes and bottlenecks during most of the times of the year. Similar is the case with the 119km single rail route of valley from Qazigund to Baramulla. Only 2 trains run over it that too after 4-5 hours of gap. Aviation sector which has created havoc for Kashmir Valley Tourism should necessarily be mentioned here. The air tickets to Kashmir from New Delhi become

more costly than the tickets from Delhi to Bangkok or Switzerland in peak tourist season. Besides, lack of entertainment facilities like cinema Halls, Swimming pools and cyber cafes at major tourist destinations also spoils the taste of tourists in the Valley.

4.3.2.2 Political Instability

The challenges faced by the Tourism sector particularly in Kashmir Valley are many as the continuous militant activities have led to the decline of tourism industry in the state of Jammu and Kashmir. In order to fight the militant activities, the army and police have been taking several measures. For instance, police routinely stop and search passengers of overcrowded buses. Armed security forces line the roads with sand bagged bunkers at strategic points. Heavy military vehicles are on constant patrol. Moreover, since 1989-90 to 2002-03 over 1151 government buildings, 643-educational institutions, 11-hospitals, 337-Bridges, 10,729-Local Houses and 1,953 shops have been gutted down.(Itoo,2011)[10].The Already 24 years of armed militancy in Kashmir is destroying not only Kashmir Tourism but also its forests, lakes and wildlife. Endangered wildlife is freely poached and human habitation is destroying the area's ecosystem, leaving its fate hanging in the balance environmentally as well as politically. This has caused a fear psychosis both in the minds of domestic as well as foreign tourists. In such a suspicious climate it is natural that the tourist flows have declined.

4.3.2.3 Social ,Cultural and Behavioral Aspects

Kashmir Valley is a land of quite distinctive culture, traditions, language and taste because of which people of the Valley are quite reluctant to adhere to it. e.g., the pony-wallas or horse-men in tourist destinations like Pahalgam, Sonmarg and Gulmarg etc look like poor and dirty people in their quite untidy clothing ready to carry tourists for some ride which gives quite bad impression. Similarly, the bad and rude behavior of drivers is also noteworthy to hinder in the progress of tourism development.

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10 Itoo, M. A., & Nengroo , A. H. (2011). Impact of Turmoil on Tourism of Kashmir. *Journal of Economics and Sustainable Development, 2* (7), 1-7.

Being a Muslim dominated region, tourists feel unsatisfied in not getting things like wine etc. with ease or after long searches that too through illegal means quite unpopular and religiously treated as taboo in the Valley which spoils their taste and acts as an obstacle for tourism success.

4.3.2.4 Lack of proper Management and Utilization of Tourist Spots

Tourist spots especially the world famous Dal lake are not being managed properly because of political and personal reasons quite unknown to public which has rendered it devoid of its Sheen. Similar is the case with the largest fresh water lake, Wular, of India. It has turned into a callous water body with undefined shorelines filled with huge masses of mud and willow trees and has been left quite unattended and under developed. The authorities are so negligent towards the management of water bodies that these have turned into marshy lands giving bad smell and acting as the epicenters of diseases which has not only affected the health and hygiene of the local people but has also given a setback to the Valley's Tourism. Furthermore, the somehow developed parks and gardens like Kokernag garden, Achabal garden and Verinag etc., lack in the proper facilities of hotels, stalls and toilets etc. which spoil the enjoyment of tourists therein. Besides, an unregulated inflow of visitors to tourist places in the vicinity are so affected by such conditions that they may decide to keep away from them the next time. The debris kept lying for long as a result of any developmental activity, kitchen sewerage unless treated, garbage dumps, landfills and fuel spills distract the tourists. How sensitive is the tourist industry to all the adverse changes in environment if it is not properly conserved are a moot question.

It is aptly described that tourism= nature's beauty + wild life + cultural attractions + ecology. All these are the components of one single and indivisible system. They need to be conserved in order to protect the very resource base of tourism from destruction. Thus, Kashmir Valley, despite being the hub of tourism potential is ridden with innumerable problems that if attended and worked upon could regain its age old epitaph –"The Paradise on Earth". To solve these problems and to give tourism industry a fillip in the valley, few suggestions become noteworthy to be mentioned here.

4.3.3 Suggestions for the Development of Tourism in Kashmir Valley

(a) Better connection should be developed with the local communities of tourist destinations and suitable opportunities should be provided to the local stakeholders in tourism ventures to work with governments and other stakeholders to improve the overall environmental quality of destinations.

(b) Emphasis must be placed on the security of the entire tourism network. Making tourists feel secure and safe before and after vacations is essential to the international competitiveness of destination.

(c) A close look at the ways and means of improving the existing infrastructure and hygienic conditions at the places of tourist interest and public places is the need of the hour.

(d) Banks and insurance companies can play an important role in the development of tourism by incorporating environmental and social criteria into assessment procedures for loans, investments, and insurance. They can help to finance environmentally sound technologies and provide incentives for sustainable tourism.

(e) The marketing strategies at tourist destinations are not in line with the principles of sustainable tourism. The need of the hour is the better involvement of tourism boards in sustainable tourism efforts so that the market sales and purchases can be checked and enhanced.

(f) The number of tourist arrivals to different tourist destinations should be maintained strictly in accordance with the Carrying Capacity of the area.

(g) National and International tourism fairs and festivals like Gulmarg Snow Festival at Gulmarg, Shikara Festival at Srinagar, Mughal Rally, Rafting Championship, Golf Championships and Trekking Expeditions etc. should be arranged and participations of tourists in large numbers should be made possible.

(h) An attractive website to provide the required information to the potential tourists should be developed and updated consistently.

(i) Use Social media for tourism promotion and Produce/broadcast quality short films and promos and telecast the same on leading satellite/cable TV channels.

(j) Include Archeological sites in the Tourist Circuit and set up Heritage Conservation and Preservation Authority.

(k) Quality assurance is important to attract customers and encourage repeated visits.

(l) Promote new Trekking Routes and conduct basic and advanced courses in mountaineering expedition, adventure, rescue and skiing.

(m) Organize Familiarization trips of tour operators, travel agents and media persons from time to time.

(n) Fix rates of accommodation and services and penalties on malpractices.

Summary

This chapter has tried to analyze the concept of tourism motivation and has made an exhaustive evaluation of basic tourism motivators. It has also made an attempt to highlight the prospects and problems of Kashmir Valley tourism as well as provided some necessary suggestions for its sustainable growth.

In a very broad perspective, it has been tried to understand as to why a person travels and what are the driving forces that make him or her to travel from one region or place to another. After this, an analysis of 450 tourists (300 Domestic, 150 Foreign) who visited Kashmir Valley during 2014 was undertaken which comprised of 310 males and 140 females. Their age structure, educational structure and occupational structure was analyzed. Similarly, the analysis of their motives of visits, frequency of visits, Source of information, mode of transportation, most beautiful tourist spot preferences and their daily expenditure was made.

In the part dealing with doldrums of Kashmir valley tourism, the seasonal and decadal variations of tourist arrivals were dealt with. Likewise, the part dealing with prospects and problems of Kashmir valley Tourism highlighted the growing scope for the development of Adventure tourism, pilgrim tourism, rural tourism, heritage tourism and wetland tourism. It also brought to the forefront the problems of infrastructural

development, political instability, improper management of existing tourist spots and some societal constraints that act as an obstacle in the way of smooth functioning and growth of tourism in Kashmir valley.

In the concluding paragraph of this chapter a brief mention of some suitable suggestions for boosting up the tourism of Kashmir Valley region has also been given and it has been highlighted that the smooth development of Kashmir valley tourism is the responsibility of everyone concerned and people from all sections of society should be consulted and given due cognizance for development and sustainable management of Tourism.

CHAPTER V

NATURE, CLASSIFICATION AND DISTRIBUTION OF WETLANDS

5.1 Wetlands- Meaning, Definitions, Characteristics and Classifications

In the existing scientific literature, wetlands and waterbodies are acknowledged and accepted as separate ecological entities. The line of argument here is that whether waterbodies also have some features similar to those of the wetlands and can waterbodies be also acknowledged as the "wetlands in making", e.g., whether the massive botanical succession in Dal Lake renders it closer to the wetland characteristics. In this regard, it is imperative to make an in depth enquiry into the meaning, definition and concept of wetlands.

After having obtained a close understanding of the character and characteristics of the wetlands, there is a need to enquire into the meaning, definition and concept of waterbodies such as Dal Lake, Nageen Lake and Wular Lake which are now surrounded by the urban settlements and rural land use. To enquire whether these waterbodies in response to urban settlements and surrounding rural land use are also evolving into wetlands.

5.1.1 Meaning and Definitions of Wetlands

The word "wetland" is derived from the combination of two independent words -'wet' and 'land' which primarily gives the idea of a land saturated with water, that may house certain plants and "animals.[1]

According to Article-1 of the Convention on wetlands of international importance especially as waterfowl Habitat (1971), "wetlands are areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide doesn't exceed 6-metres.[2]

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1. Ansari, A. H., Oseni, U. A. (2012). *Wetlands and Global Warming: Impacts, Adaptation and Mitigation- Developing Countries Perspective*. Serial Publications: New Delhi.
2. Ibid, p. 3

These are habitats where water saturation determines the nature of plants and animals, whether aquatic or terrestrial, that are found in such areas.[3] The clean water act of the United States of America also gives a quite comprehensive definition for wetlands. According to this Act, "wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

Going by this definition, it is clear that wetlands form an uncommon link between the land and water where some activities take place that ultimately benefit the ecosystem.

International Union for the Conservation of Nature and Natural Resources (IUCN,1989) defines wetlands as "All sub-merged or water-saturated lands, natural or manmade, inland or coastal, permanent or temporary, static or dynamic, vegetated or non-vegetated, which necessarily have a land-water interface are defined as wetlands."

5.1.2 Characteristics of Wetlands

Wetlands are features transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For the purpose of this classification, wetlands must have one or more of the following three characteristics: (a) At least periodically the land supports predominantly hydrophytes. (b) The substrate is predominantly un-drained hydric soils; and (c) The substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season each year.[4]

Wetlands are transitional habitats in the sense that they are neither terrestrial nor aquatic, but exhibit characteristics of both. Their boundaries are part of a continuum of physical and functional characters, and may expand or contract over time depending upon factors such as average annual precipitation, evapotranspiration and modifications to the watershed. The transitional nature of wetland characteristics and

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3. Cowardin, L. M., Carter, V., Golet, F. C., & LaRoe, E. T. (1979). Classification of wetlands and deepwater habitats of the United States. *U.S. Department of the Interior, Fish and Wildlife Service, Office of Biological Services, Washington, D.C*, FWS/OBS-79/31.
4. Ibid.,p. 35

the shifting of wetland boundaries render precise identification of wetland boundaries, if not possible.[5]

The National Research Council (1995), a Committee representing the academic community, industry, environmental community and the legal profession, drafted a definition and defined a wetland as an ecosystem that depends on constant or recurrent shallow inundation or saturation at or near the surface of the substrate. The minimum essential characteristics of a wetland are recurrent, sustained inundation or saturation. Common diagnostic features of wetlands are hydric soils and hydrophytic vegetation. These features are present except where specific physiochemical, biotic or anthropogenic factors remove them or prevent their development.

The Ramsar Convention, an international body of more than 90-countries held in Switzerland (1990), defined wetlands in their broad perspective, extending the water depth of wetlands to 6-meters, thereby including many 'deep water habitats' in the concept of wetlands. It, thus, recognizes that wetland ecosystems may contain other habitats, e.g. Riparian habitats and deep open water areas -as vital components that as virtually inseparable from the wetland itself. Although not explicit in the definition, it also includes manmade wetlands. Thus, fish and shrimp ponds, farm-ponds, irrigated agricultural lands, salt pans, reservoirs, gravel, pits, sewage farms and canals are included under the ambit of this convention.

Thus, a wetland is characterized by as a broad water-based ecosystem where a peculiar nexus between land and water is formed with the presence of hydrophyte plants, hydric soils, bacteria and animals in static or flowing water. These can either be formed through the saturation of dry lands or a shallow water habitat with the usual hydrologic features for a period of time.

5.2 Classification of Wetlands

Wetlands vary according to their origin, geographical location, water-regime, chemistry, dominant plants and soil or sediment characteristics.[6] Varying water patterns, frequency, length of flooding and location in relation to upland areas and

5. Moirangleima, K. (2010). *Sustainable management of wetlands- Central Valley of Manipur*. B.R Publishing Corporation: Delhi.
6. Maltby, E. (1986). Waterlogged wealth, why waste the world's wet places. International Institute Environment and Development: London and Washington D.C.

water bodies give rise to different types of wetlands. Other contributing factors are regional and local differences in soil, climate, topography, hydrology and water-chemistry etc.

The classifications of wetlands have been suggested from time to time. Earlier classification describes wetland types on the basis of flooding, depth, dominant forms of vegetation and salinity regimes.

Many classification schemes of wetlands have been developed by Martin, M.C. et al., 1953; Stewart, R.E. and Kantrud, H.A., 1971; Golet, F. and Larson, J.S., 1974). However, the classification system developed by Cowardin, L.M. et al. (1979) and Brinson, M.M. (1993) have received wide acceptance by Scientists, Policy-makers and planners.

The classification of wetlands and deep water habitats of the U.S. has included a hierarchical approach that uses systems, sub-systems, classes, sub-classes, dominance types and special modifiers to define wetlands and deep water habitats more precisely. The classification can be applied across broad geographic areas and in large part encompass many other classification schemes.

5.2.1 Classification at Global level

At international level, wetlands have been classified by many scholars and academicians. However, for the sake of convenience only two classification schemes have been mentioned in the present study.

5.2.1.1 Classification of Wetlands by Dugan (1990)

Dugan, P.J. (1990)[7] suggested a classification scheme which is very similar to the Cowardin system. It groups wetlands first into salt-water and man-made wetlands and further sub-divides them into categories based on their hydrological characteristics. This scheme is relatively simple and practical. At the same time, it accords recognition, the hydrological attributes and distinguishes between natural and man-made wetlands.

7. Dugan, P. J. (1990). *Wetland Conservation: A Review of Current Issues and Required Action.* Gland, Switzerland: IUCN, The World Conservation Union.

Table 5.1- Classification of Wetlands by Dugan (1990)

(1) Salt water wetlands	(a) Marine	(i) Sub-tidal	Permanent un-vegetated shall water less than 6 m depth at low tide including sea bays and straits.
			Sub-tidal aquatic vegetation including kelp beds, sea-grass and tropical marine meadow
			Coral Reefs
		(ii) Inter-tidal	Rocky marine shores
			Shores of mobile stones and shingles
			Mobile un-vegetated mud, sand or salt flats.
			Vegetated-sediments
	(b) Estuarine	(i) Sub-tidal	Estuarine waters, permanent waters of estuaries and estuarine systems of Deltas.
		(ii) Inter-tidal	Mud, sand/salt flats with limited vegetation
	(c) Lagoonar	Brackish to saline lagoons with one/ more relatively narrow connections with the sea.	
	(d) Salt Lake	Permanent and seasonal, Brackish saline or alkaline lakes, flat and marshes	
(2)Fresh Water Wetlands	(a) Riverine	(i) Perennial	Permanent rivers and streams including waterfalls
			Inland Deltas
		(ii) Temporary	Seasonal & irregular rivers and streams
			Riverine floodplains
	(b) Lacustrine	(i) Permanent	Permanent freshwater lakes with area >8 hectares
			Permanent freshwater ponds with area <8 hectares
		(ii) Seasonal	Seasonal freshwater lake with

			area >8 hectares including flood plain lakes
	(c) Palustrine	(i) Emergent	Permanent freshwater marsh and swamps on inorganic soils.
			Permanent Peat forming freshwater swamps
			Seasonal freshwater marsh or inorganic soil
			Peat lands
			Alpine and polar wetlands
			Freshwater springs and base with surrounding vegetation
			Volcanic fumaroles continuous moistened by emerging and condensing water vapors.
		(ii) Forested	Shrub swamps
			Freshwater swamp forest
			Forested peat lands
(3) Man Made Wetlands	(a) Aquaculture	Fish ponds/shrimp ponds	
	(b) Agriculture	Farm Ponds/Small Tanks	
		Irrigated lands/channels	
		Seasonally flooded arable low	
	(c)Salt Exploitation	Salt Pans and Salines	
	(d) Urban or Industrial	Excavations - Gravel Pits/Borrow pits and Mining pools	
		Sewage farms, settling pond and oxidation basins	
	(e) Water Storage areas	Reservoirs	
		Hydro-Dams	

Source: Dugan, P.J. (1990). Wetland Conservation: A Review of Current Issues and Required Action, Gland, Switzerland: IUCN, The World Conservation Union.

Ramsar Conservation also adopted the simple classification system of Davis (1994) for description of Ramsar sites which is given as:

Table 5.2- Classification of Wetlands by Davis (1994)

WETLANDS		
Marine/Coastal Wetlands	**Inland Wetland**	**Man-made Wetlands**
• Marine water • Sub-tidal aquatic beds • Coral Reefs • Rocky Marine Shores • Sand, Shingles/Pebble beaches • Estuarine waters • Inter-tidal mud, sand/ salt flats • Inter-Tidal Marshes • Inter-Tidal Forested lands • Brackish lagoons • Freshwater lagoons and marshes in the coastal zone	• Permanent rivers and streams, includes water falls • Seasonal and irregular rivers and streams • Inland deltas (permanent) • Riverine flood-plains • Permanent freshwater lakes (over 8-hectares) • Seasonal freshwater ponds and marshes on inorganic soils • Shrub swamps or shrub dominated freshwater marsh or shrub call • Freshwater swamp forest • Peat lands/open bags/ fens • Forested peat lands/ peat swamp forest • Alpine and Tundra wetlands • Freshwater springs • Geo-thermal wetlands	• Water storage areas/ Reservoirs/Barrages/ Hydroelectric dams and impoundments • Ponds • Aquaculture ponds • Salt pans/salines for salt exploitation • Excavations/Gravel pits, Burrow pits/mining pits, mining pools. • Waste water treatment sewage farms/settling and oxidation basins • Irrigated land and irrigation channels

Source: Davis, T.J. (Compiler) (1994). The Ramsar Cnvention Manual: A Guide to the Convention on Wetlands of International Importance especially waterfowl Habitat, Ramsar Convention Bureau, Gland, Switzerland.

5.2.2 Classification of Wetlands at National Level

At national level, a different classification system using remotely sensed data based on 'Nation Wide Wetland mapping project has been given in 1998 to incorporate all deep water habitats and impoundments such as reservoirs, ash/cooling and abandoned ponds. The man-made classification includes wetlands such as ponds, salt pans etc. which are delineated by satellite imagery using various interpretation keys. The main criteria of Wetland Hydrology (Manifestation of water on the satellite imagery) and Wetland vegetation (Mainly hydrophytes and other aquatic vegetation in a pact or whole of the water-body as seen through satellite data) were followed in this classification.

The salient features of this classification system are (a) It takes into account all wetlands whether inland or coastal, natural or man-made (b) It provides qualitative information on the turbidity status of all water-bodies including inland and coastal (c) It provides information on the extent of vegetation present in the wetlands, both in pre-monsoon and post-monsoon seasons, where discernible on satellite imagery.

Table 5.3- Classification of Wetlands in India (1998)

WETLANDS			
Inland Wetlands		**Coastal Wetlands**	
(NATURAL)	(MAN-MADE)	(NATURAL)	(MAN-MADE)
• Lakes/Ponds • Ox-bow lakes/ cut-off meanders • Water logged (seasonal) • Playas • Swamp/Marsh	• Reservoirs • Tanks • Waterlogged abandoned quarries • Ash-Pond/ Cooling Pond	• Estuary • Lagoon • Creek • Back water • Bay • Tidal flat/mud flat • Coral Reef • Sand/Beach/Spit/ Bar • Rocky Coast • Mangrove Forest	• Salt Pans • Aqua-culture ponds

Source: Nation Wide Wetlands Mapping Project (1998). Space Application Center, Ahmedabad

5.2.3 Classification of Wetlands in Kashmir Valley

The valley of Kashmir is endowed with an innumerable wealth of wetlands which are bounded on all sides by Himalayan Mountains receiving heavy rainfall and snowfall that add to their beauty and make their life long-lasting. These wetlands are irreparable Natural Water bodies' aboding a rich and diverse gene pool.[8]

The wetlands of Kashmir valley came into existence through a number of Natural Processes like the advancement and retreat of glaciers which scraped depressions in the surface where water accumulates. e.g. Kousarnag, Tarsar and Marsar formation. Secondly, small, crescent-shaped lakes called ox-bow lakes can form in river-valleys as a result of meandering e.g. Formation of Ahansar, Gilsar, Waskur, Khushalsar etc. Thirdly, wetlands can also form by means of landslides or by Glacial blockades, such as Vishansar, Gangbal, Kishansar and Nagputan lakes of Ganderbal district. Fourthly, crater lakes are formed in volcanic craters and calderas which fill up with precipitation more rapidly than they empty via evaporation. e.g. Dal lake in Srinagar district and Wular lake in Bandipora district. Fifthly, saline lakes can form where there is no natural outlet or where the water evaporates rapidly and has a higher than normal salt content. e.g. Pangong lake in Ladakh. Lastly, a recent tectonic uplift of a mountain range can create bowl-shaped depressions that accumulate water and form wetlands.[9]

The Indian Himalayas cover approximately 5,69,000 km^2 (18 per cent) of Indian land-surface and spread over six Himalayan, States viz. J&K, Himachal Pradesh, Uttrakhand, Sikkim, Arunachal Pradesh and West Bengal. Out of these states, J&K has the highest share of lakes, 2,104 lakes (44.7 per cent) with 87.2 per cent share of total area.[10]

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8. Directory of Lakes and water-bodies of J&K State. (2012). *Department of Ecology, Environment and Remote Sensing, Jammu and Kashmir.*
9. ENVIS News Letter. (2014). Water bodies of Jammu & Kashmir, Department of Ecology, Environment and Remote Sensing, Government of Jammu and Kashmir.
10. National Wetland Inventory and Assessment: High Attitude Himalayan Lakes (2011).Ministry of Environment & Forests, Government of India..

These wetlands have always served as enchanting recreational areas and have played an important role in the socio-economic set up of the valley.[11] These have been classified in different periods of time.

5.2.3.1 Classification of Jammu and Kashmir Wetlands by Zutshi (1989)

Zutshi has classified wetlands according to altitudes, River Basin, Districts and Size as:

(A) According to Altitude

On the basis of altitude, wetlands of Kashmir Valley have been classified into low, moderate and higher altitude wetlands.

(i) Wetlands at Low Altitude (Below 1,000 meters elevation)

These wetlands are found in the strike valleys of lower Sivaliks of the main sivaliks belt in between the longitudinal ridges in the central range e.g. two natural freshwater lakes, Surinser & Mansar situated to the south of Udhampur which are 12 kms apart and are believed to have originated by the damming of a river which was flowing along the strike. These lakes are oval to sub-oval in shape and are classified as fault basin non-drainage types having no regular inflow and outflow channels.

(ii) Wetlands at Moderate altitude (1,000-3,000 meters elevation)

These wetlands are mainly found in Kashmir Valley at an average altitude of 1,580 meters above m.s.l. These are either ox-bow or flood-plain types. During the pre-monsoon, most of these wetlands at high altitude in this region are either partly or fully covered with the snow.

(iii) Wetlands at Higher altitudes (Above 3,000 meters elevation)

These are located above 3000 meters in South of Srinagar within Pir-Panjal Himalayas and Leh and Ladakh region. More of these water-bodies have Glacial origin with little seasonal fluctuation in terms of water spread and are situated in Baramula and Leh districts of J&K.

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11. ENVIS Newsletter. (2003, January- March). State Environment Related Issues, J&K. Department of Ecology, Environment and Remote Sensing, Government of Jammu and Kashmir.

High altitudinal Lakes include Gangabal, Sheesh Nag, Vishansar, Nilnag, Kishansar and Kausarnag and the Valley lakes include Wular, Dal, Hokersar, Manasbal, Haigam, Anchar, Ahansar, Shalbugh and Chatlam etc.

(B) According to River Basin

The delineated wetlands are found to be falling under three river basins of Chenab, Jhelum and Indus. Largest number of Waterbodies are found in Jhelum Basin followed by Indus Basin and then Chenab basin.

(C) District Wise

The state of J&K has 22-districts (10 districts in Jammu Region, 10 in Kashmir valley and 02 districts in Ladakh Region). Almost every district in the valley of Kashmir is rich in wetlands. Baramula and Leh districts constitute the majority of water bodies in the state.

(D) According to Size

Jammu and Kashmir State comprises of wetlands of different sizes. The three largest lakes are located in the Leh district; Pang Tso (296 km^2) being the largest, followed by Amto Gor (174 km^2) and Tso Morari (141$km^{2)..}$ Wular Lake (76 sq. kms) is the largest fresh water lake of Kashmir valley.

Wetlands are one of the most important natural resources of the state of J&K. As per the data prepared by Department of Ecology, Environment and Remote Sensing, J&K – There are 1,230 lakes and waterbodies in J&K with 150 in Jammu Region, 415 in Kashmir Region and 665 in Ladakh Region.

5.2.3.2 Classification of Wetlands of Jammu and Kashmir as per Wetland Rules (2010) of Ministry of Environment and Forests

This classification system incorporates ash ponds, cooling ponds and abandoned Quarries, besides all other wetlands. This classification has divided the wetlands of J&K altitude wise and area-wise as:

Table 5.4 Classification of wetlands of J&K According to Ministry of Environment and Forests (2010)

Wetlands	J&K (No.)	Kashmir (No.)	Jammu (No.)	Ladakh (No.)
Above 2500 m (m.s.l.)	1023	240	110	664
Below 2500 m (m.s.l.)	207	175	31	1
Having area 75 hectares	330	137	29	164
Having area less than 5 hectares	900	278	121	501
Having area 7500 hectares and below 2500 m (m.s.l.)	4	4	Nill	Nill
Within Forest Boundary	381	233	116	Nill
Outside Forest Boundary	881	182	34	Nill
Total	**1230**	**415**	**150**	**665**

Source: Directory of Lakes and water-bodies of J&K State, Department of Ecology, Environment and Remote Sensing, J&K.

5.2.3.3 Classification of Wetlands of Kashmir Valley (Based on Field Survey, 2014-2015 and Survey of Literature by the Researcher)

The wetlands of Kashmir valley can also be classified in a comparatively easier way on the basis of various characteristics like altitude, size (water-spread area) status of wetland, location, and source of water as:

(A) Altitude

The altitude of Kashmir valley varies from 1,580 meters to 4,600 meters above mean sea level. Almost each district of Kashmir valley abounds in wetlands at higher or lower elevations. However, most of the wetlands are found along the Jhelum Basin at lower altitudes.

The Higher altitude wetlands are fed by snow melt waters, precipitation and springs. Whereas, lakes of lower altitudes receive water from local rains, through streams, Nullas and springs. Secondly, the high altitude lakes are mostly oligotrophic unlike the low altitude lakes, which are in various stages of trophic state due to strong

anthropogenic influence. Thus, on the basis of altitude, wetlands of Kashmir valley can be divided into three-classes.

(i) Low Altitude Wetlands

This includes wetlands along the Jhelum basin of the Kashmir valley within the elevation of 1,500-2,500 meters above m.s.l. Examples include Dal lake (1,585 m); Nagin lake (1,585 m), Rakh-i-Shalbugh (1,583 m); Ajas Nambal (1,583); Babademb (1,583 m), Khanpur lake (1,583); Waskur Sar (1,584 m); Gil Sar lake (1,586 m); Khushalsar (1,586 m); Ahan Sar lake (1,600 m); Manasbal lake (1,603 m); Anchar lake (1,606 m) and Kharpora Sar (1,583 m).

(ii) Medium Altitude Wetlands

This includes wetlands at the elevation of 2,500 meters – 4,000 meters above m.s.l. These wetlands lie between the flat valley zone and the top-most upper mountainous zone of the valley. Few examples include Lokut Sar (3,720 m); Dandloo Sar (3,760 m); Mengandoob Sar (3,760 m); Salma Sar (3,840 m); Sona Sar (3,967 m); Nund Kol (3,480 m); Gangabal lake (3,600 m); Marsar lake (3,849 m); Lolgul Sar (4,000 m) and Kilchol Sar (3,667 m).

(ii) High Altitude Wetlands

The wetlands above the elevation of 4,000 meters are included in this category. These are the wetlands that remain covered by snow for most part of the year. They qualify to be wetlands only during a short summer at higher altitudes. These are quite inaccessible and hence out of the influence of the anthropogenic pressures. Few examples include Nila Nag (4,240 m); Tulian lake (4,077 m); Krin Sar (4,120 m); Doth-Sar (4,271 m); and Kana Sar (4,080 m), Darin Sar (4,180m) and Baribal Sar (4,200m).

(B) Size

The valley of Kashmir is dotted with the wetlands of various size ranging from few metres to the 75.28 sq.km^2 (Wular lake, Largest). Generally, ‘Sars’ and ‘Nambals’ are of smaller sizes while the lakes are of larger sizes. On the basis of size, wetlands of Kashmir valley are categorized into 5 types as:

(i) Very Small Wetlands (Area Less than 2 Hectares)

This includes a number of wetlands like Braham Sar (0.5 Hectares); Lokut Sar (0.9 Hectares); Zadipura Nambal (0.2 Hectares); Pahilpura nambal (0.8 Hectares); Nagaberan Sar (1.1 Hectares); Sona Sar (1.1 Hectares); Krim Sar (1.3 Hectares); Darin Sar (1.5 Hectares) etc

(ii) Small Wetlands (Area 2 -10 Hectares)

The wetlands lying in this category include Nila Nag (6.8 Hectares); Yamhar Sar (9.9 Hectares); Kilchol Sar (6.4 Hectares); Ahan Sar (9.9 Hectares); Gil Sar (3 Hectares); Shalnar Sar (8 Hectares); Khanpur lake (5.1 Hectares); Kana Sar (5 Hectares); Gumbur Sar (4.3 Hectares) and Kharpora Sar (3.4 Hectares).

(iii) Medium Size Wetlands (Area 10 - 100 Hectares)

The includes wetlands like Ajas (26.7 Hectares); Rakh Malgom (48.2 Hectares); Waskur Sar (21 Hectares); Nagin lake (77 Hectares); Khushalsar (92 Hectares); Sudarkut Bala Nambal (61.7 Hectares) and Mansar lake (44.2 hectares) etc.

(iv) Large Wetlands (Area 100-1,000 Hectares)

The main wetlands under this category include Manasbal lake (177.2 Hectares); Gangabal lake (160 Hectares) and Rakh-i-Rabitar (174.5 Hectares).

(v) Very Large Wetlands (Area > 1000 Hectares)

This includes Dal lake (1,317 Hectares); Rakh-i-Shalbugh (1,508.2 Hectares); Rakh-i-Kujar (1,482.4 Hectares) and Wular lake (7,528 Hectares).

(C) Status of Wetland

This categorizes the wetlands of Kashmir valley on the basis of their present appearance and outlook and describes whether the wetlands are fresh, marshy, agricultural habitational, seasonal, permanent or shrunken. Most of the low altitudinal wetlands of Kashmir valley have become marshy and eutrophic because of the various

Table 5.5- Present Status of Wetlands of Kashmir Valley

S. No.	Name of Wetland	District	Present Status
1.	Khushal Sar	Srinagar	Marshy
2.	Gilsar	Srinagar	Habitation/Marshy
3.	Ahansar	Srinagar	Marshy/Agriculture
4.	Anchar lake	Srinagar	Plantation/Habitation/agriculture
5.	Nagin lake	Srinagar	Marshy/Habitation
6.	Dale lake	Srinagar	Marshy/Habitation/Agriculture
7.	Rampur Taloo	Anantnag	Playground
8.	Chakla Nambal	Anangnag	Agriculture land
9.	Munshahun Taloo	Anantnag	Agriculture
10.	Kiel Khanun Taloo	Anantnag	Agriculture
11.	Buta Sar	Kupwara	Seasonal
12.	Tekipur	Kupwara	Seasonal
13.	Nonn Khan Chak	Kupwara	Seasonal
14.	Wudina Sar	Baramulla	Agriculture
15.	Tsore Teng	Baramulla	Seasonal
16.	Malipur	Baramulla	Marshy
17.	Wullar Lake	Bandipora	Marshy/Plantation/Agriculture
18.	Haighan Jhil	Baramulla	Agriculture/Marshy
19.	Gadsar	Baramulla	Agriculture
20.	Rakhi Malanpur	Pulwama	Agriculture
21.	Chowkidar Sar	Pulwama	Agriculture
22.	Baner Nambal	Pulwama	Horticulture
23.	Bod Sar	Pulwama	Marshy/Agriculture
24.	Rakhi-Arth	Budgam	Land/Agriculture
25.	Nambli Narkur	Budgam	Plantation/Agri/Marshy/Habitation
26.	Hokar Sar	Budgam	Plantation/Marshy/Habitation
27.	Danda Rokhaw	Budgam	Marshy/Agriculture

Source: Directory of Lakes and Water Bodies. (2012). J&K.

natural and anthropogenic pressures. Whereas, the wetlands on relatively higher altitudes are oligotrophic and still fresh. Present status of various wetlands of Kashmir valley is given in table 5.5.

(D) Location

This categorizes the wetlands on the basis of their urban, semi-urban and rural landscapes. The wetlands of Srinagar and adjacent areas are urban whereas most of the wetlands of the countryside are rural in their location e.g. Dal lake (Urban). Wular Lake (Semi-Urban); Ahansar (Rural); Anchar lake (Sub-Urban), Sheikhsar lake (Rural), Waskursar lake (Rural), Manasbal lake (Rural), Chandansar lake (Rural), Demansar lake (Rural), Gadsar lake (Rural), Gangabal lake (Rural), Hokersar (Sub-Urban), Naranbagh (Rural), Kausar Nag (Rural), Shalbugh Rakh (Semi-Urban) etc

Table 5.6: Classification of the Wetlands of Kashmir Valley (Based on Field Survey, 2014-15 and Review of Literature by the Researcher)

Parameters	**Characteristics**
Altitude (meters)	(1) Low altitude wetland (1500-2500) mtr.
	(2) Medium altitude wetlands (2500-4000) mtr.
	(3) High altitude wetlands (Above 4000)
Size (Hectares)	(1) Very small (<2 Hectares)
	(2) Small (2-10 Hectares)
	(3) Medium (10-100 Hectares)
	(4) Large (100-1,000 Hectares)
	(5) Very large (> 1,000 Hectares)
Status	(1) Marshy
	(2) Plantation
	(3) Habitation
	(4) Agriculture
Location	(1) Rural
	(2) Semi-Urban
	(3) Urban
Source of Water	(1) Rivers
	(2) Streams/Nallahas
	(3) Springs
	(4) Glaciers

Source: Based on Field Survey, 2014-*15 and Survey of literature.*

(E) Source of Water

A considerable number of wetlands of Kashmir valley are fed with one or the other source of water. Mostly, the wetlands here derive their waters from rivers, streams, springs and glaciers etc. Few examples include Wular lake (River, Jhelum, Erin and Madhumati rivers); Ahansar (Jhelum); Anchar lake (Sind River); Waskursar Lake (Springs); Manasbal lake (Springs); Hokersar (Doodhganga River); Haigam Jhil (Ningli Nullah and Babakul), Shalbugh (Sind River) etc.

5.3 Distribution of Wetlands

This part deals with the global, national and regional distribution of wetlands.

5.3.1 Global Distribution

Wetlands are one of the earth's most diverse and productive eco-systems (Ghermandhi et al., 2008).[12] These are distributed over the whole globe and are found on every continent except Antarctica in every climate from tropics to tundra (Mitsch, W.J. and Wu, X., 1995).[13]

Due to their basic ability to retain, store, clean and evenly provide water, wetlands constitute essential components of the hydrological and biogeochemical water cycles and influence many aspects of ecology, economy and human welfare (Bernhard and Petra, 2004).[14] According to an estimate, wetlands cover about 6 per cent of earth's land surface of which 2 per cent is occupied by lakes, 30 per cent by bogs, 26 per cent by swamps, 25 per cent by flood-plains, 2,40,000 sq.km. by Mangrooves and 60,000,00 sq.km. by Coral reefs (Bazilevich et al., 1971).[15]

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12. Ghermandhi, A., Van den Bergh, J. C. J. M., Brander, L.M., & Nunes, P. A. L. D. (2008). The Economic value of wetland Conservation and Creation: A Meta-Analysis (Working Paper 79). *Fondazione Eni Enrico Mattei, Milan,* Italy.
13. Mitsch, W. J., & Wu, X. (1995). Wetlands and Global Climate Change. In R. Lal, J. Kimble, E. Levine and B.A. Stewart (Eds.). Advances in Social Science: Soil Management and Greenhouse Effect, CRC Press/Lewis Publishers: Boca Raton.
14. Lehner, B., & D. Petra. (2004). Development and Validation of a Global database of lakes, reservoirs and wetlands. *ELSEVIER, Journal of Hydrology, 296*,1-22.
15. Bazilevich, N. I., Rodin, L, Ye., & Rozov, N. N. (1971). Geophysical aspects of Biological Productivity. *Soviet Geography 12*:, 293-317.

5.3.2 Distribution of Wetlands in India

Wetlands in India are distributed in different geographical regions (figure 5.2) ranging from cold arid zone of Ladakh to wet Imphal, from the warm and arid zone of Gujarat, Rajasthan to the tropical monsoon based regions of Central India and the wet and humid regions of Southern Peninsula. Distribution of wetlands in India can be categorized along the following lines (Jyoti, P. and Hemant, D., 2003).[16]

5.3.2.1 Himalayan Wetlands

The Himalayan Region is endowed with a series of diverse wetlands and can be divided into three sub-regions; (a) Western Himalayas (b) Central Himalayas and (c) Eastern Himalayas. In the Western Himalayas, the Ladakh and Zanskar regions (4,000 meters above m.s.l) harbour a large number of high altitude wetlands. Both saline and fresh water wetlands are found in this region. The important ones are Pangong, Tso Morari, Chantau Noorichan, Chushul and Honlay Marshes. The wetlands situated in Kashmir valley include mainly Wular Dal, Manasbal, Aanchar, Nageen, Haigan and Hokersar etc. The wetlands situated in the Central Himalayas are located mostly in the Kumaon region, Nainital, Bhimtal, Naukuchital and a number of other small lakes are situated within this region. In the eastern Himalayas, many wetlands are situated in Sikkim, Assam, Arunachal Pradesh, Meghalaya, Nagaland and Manipur. These wetlands together with the sanctuaries in Brahmaputra valley are internationally renowned for a number of bird-species and other animals.

5.3.2.2 Indo- Gangetic Wetlands

Most of the wetlands in India are directly or indirectly associated with river systems like Ganga, Brahmaputra, Narmada, Tapi, Godavari, Krishna and Cauvery. The largest wetland ecosystem in India is the Indo-Gangetic Flood Plain. The alluvial plains of the Ganga comprise vast crescentic lowlands about 250-300 kms wide, between the Deccan Peninsula and the Himalayas. The wetlands of the Himalayan terrain and the Indo-Gangetic Plain provide winter refuge for millions of water-birds. Besides, mangroves, salt marshes and lagoons dominate the wetlands in the coastal

16. Jyoti, P., & Hemant, D. (2003). *Sustainable Management of Wetlands.* Sage Publications Pvt. Ltd: Thou and Oak, London.

areas and major wetlands like Pulicat, Periyar, Chilka and Kolleru lake are situated within the coastal belt.

There are very few natural wetlands in the Deccan, the southernmost section of the Indian Peninsula. However, there are innumerable small water storage reservoirs which have been constructed near almost every village and which provide important feeding and nesting sites for a variety of water birds.

According to International Union for Conservation of Natural Resources, (IUCN,1989), in India, wetlands occupy 58.2 million hectares (18.4 per cent) of the country's area (excluding rivers) of which 40.90 million hectares (70.26 per cent) are under Paddy cultivation, 3.60 million hectares are suitable for fish culture, 3.90 million hectares comprise estuaries, 3.50 million hectares as backwaters, 3 million hectares under man-made impoundments, 2.90 million hectares under captive fisheries (brackish & freshwater, and 0.40 million Hectares as Mangroves Estuaries (Table 5.7).

Table 5.7- Extent of Wetlands in India (1989)

S. No.	Wetland Type	Area (Million ha.)	Percent to the Total area
1.	Area under Paddy Cultivation	40.90	70.26
2.	Area suitable for Fish Culture	3.60	6.17
3.	Area under captive fisheries (Brackish and Freshwater)	2.90	4.96
4.	Mangroves Estuaries	0.40	0.67
5.	Estuaries	3.90	6.70
6.	Backwaters	3.50	6.10
7.	Human made Impoundments	3.0	5.14
	Total	58.20	100

Source: International Union for Conservation of Natural Resources (1989). Directory of Asian Wetlands.

The Ministry of Environment and Forests conducted a questionnaire survey and published a wetland directory in 1990. As per the survey, the total wetland area of the country is about 4.4 million hectares (Table 5.8) of which 1.5 million hectares (2,170 wetlands) and 2.6 million hectares (65,254 wetlands) are natural and man-made respectively.

Table 5.8- Distribution of Wetlands in India (1990)

Sl. No.	States	Natural wetlands		Rank	Man-made wetlands		Rank
		Number	Area (hectares)		Number	Area (hectares)	
1.	Andhra Pradesh	219	1,00,457	5	19,020	4,25,892	2
2.	Arunachal Pradesh	2	20,200	11	NA	NA	-
3	Assam	1,394	86,355	6	NA	NA	-
4	Bihar	62	2,24,788	3	33	48,607	12
5	Goa	3	12,360	15	NA	NA	-
6	Gujarat	22	3,94,627	1	57	1,29,660	9
7	Haryana	14	2,601	18	4	1,079	18
8	Himachal Pradesh	5	702	21	3	19,165	14
9	J&K	18	7,227	16	NA	21,880	13
10	Karnataka	10	3,320	17	23,758	5,39,195	1
11	Kerala	32	24,320	9	2,121	2,10,579	5
12	M.P.	8	324	24	53	1,87,818	7
13	Maharashtra	49	21,675	10	1,004	2,79,025	3
14	Manipur	5	26,600	8	NA	NA	-
15	Meghalaya	2	NA	-	NA	NA	-
16	Mizoram	3	36	25	1	1	21
17	Nagaland	2	210	24	NA	N1,48,454A	-
18	Orissa	20	1,37,022	4	36	5,391	8
19	Punjab	33	17,085	12	6	1,00,217	15
20	Rajasthan	9	14,027	13	85	3	10
21	Sikkim	42	1,101	20	2	2,01,132	20
22	Tamil Nadu	31	58,068	7	20,030	4,833	6
23	Tripura	3	575	22	1	2,12,470	16
24	Uttar Pradesh	125	12,832	14	28	52,564	4
25	West Bengal	54	2,91,963	2	9	25,87,965	11
Sub-Total		2,167	14,58,574		65,251		
UNION TERRITORIES							
1.	Chandigarh	NA	NA	-	1	170	10
2.	Pondicherry	3	1,533	10	2	1,131	17
Sub-Total		3			65,254	25,89,266	

Source: Directory of Wetlands (1990). Ministry of Environment and Forests, Government of India.

Table 5.9- Distribution of Mangroves in India (1990)

S.No.	States/Union Territories	Area (sq.km)	Percentage to the Total Area
1.	Andaman & Nicobar Islands	1,190	17.65
2.	West Bengal	4,200	62.31
3.	Orissa	150	2.23
4.	Andhra Pradesh	200	2.97
5.	Tamil Nadu	150	2.23
6.	Karnataka	60	0.89
7.	Goa	200	2.96
8.	Gujarat	260	3.86
9.	Maharashtra	330	4.89
Total		6,740	100

Source: Directory of Wetlands (1990). Ministry of Environment and Forests, Government of India.

A perusal of Table 5.8 shows that Gujarat has the largest area under natural wetlands covering an area of about 0.3 million hectares. Mizoram has the smallest area of only 36 hectares under wetlands. While, among the man-made wetlands, Karnataka has the largest area under it covering about 0.5 million hectares and Mizoram has the least of about 01 hectares.

Table 5.9 shows the distribution of mangroves in India (1990). West-Bengal comprises the largest area under mangroves covering about 62.31 per cent of the total mangroves area of the country. While as Karnataka has the smallest area covering about 0.89 per cent of the total mangrove area.

5.3.3 Distribution of Wetlands in Kashmir Valley

Kashmir valley lies in the womb of Himalayas. Traversed mainly by river Jhelum that arises within the Pir Panjal Ranges from Verinag Spring near Qazigund (District Anantnag). Flowing towards Nortth and North-West for 992 kms. before merging with the Chenab and subsequently into Indus river, it finally drains into Arabian Sea.[17] Most of the wetlands are found in and around the Jhelum basin in the heart of Kashmir valley (Figure 5.4).

17. Comprehensive Management Action Plan for Wular Lake, Kashmir. (2007). Final Report prepared for the Department of Wildlife Protection, Govt. of J&K, *Wetlands International, South Asia*. Retrieved from http://www.wetlands.org

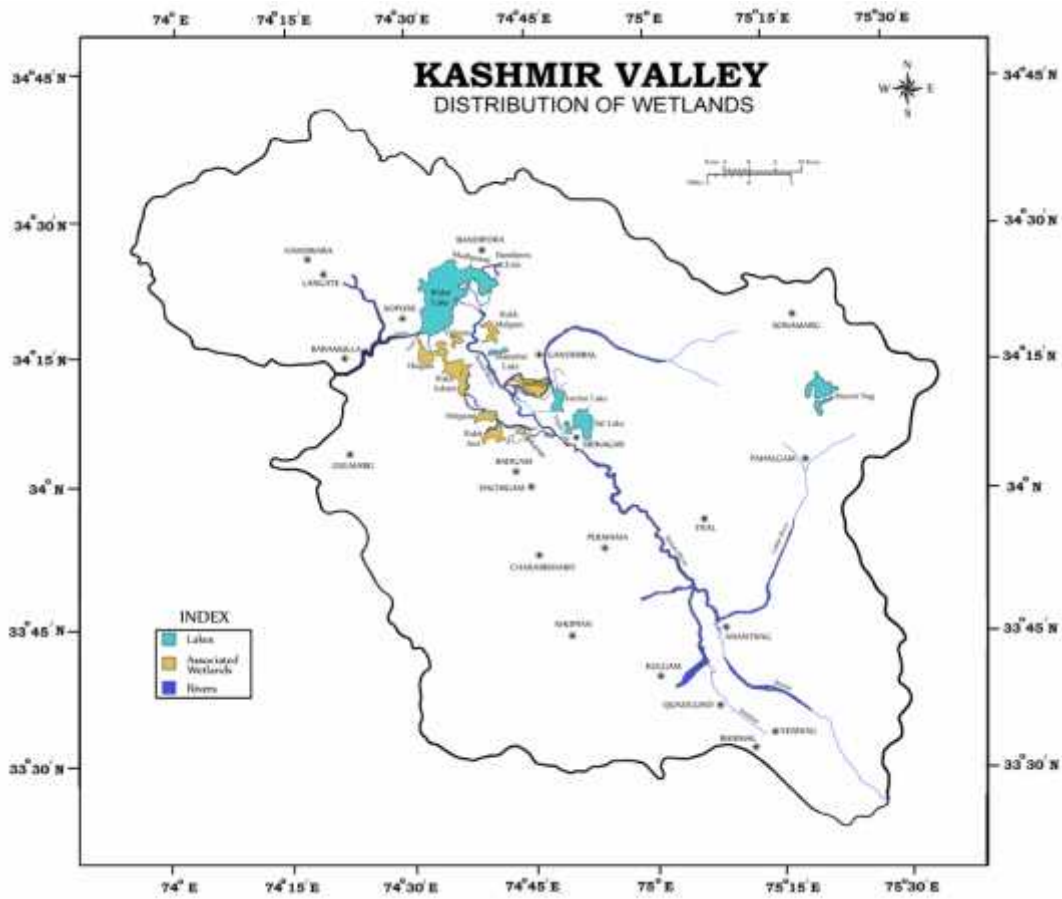
The state of J&K has two types of wetlands - Inland (Natural) and Inland (man-made). However, the former is the dominant category. Under the inland-Natural wetlands, riverine wetlands and the lakes are of utmost significance. The high altitude wetlands mainly occur in the elevation range of 3,000m to 6,500 meters. These lakes are in general devoid of any aquatic vegetation and the wetland boundary and open spread of water is almost same.

Maximum number of high altitude lakes are observed in the elevation range of 4,000 meters to 5,000 meters. The riverine wetlands are found in comparatively lower elevation areas and many of these wetlands harbor vegetation. Often these wetlands are frequented by avifauna. The districts of Baramulla, Srinagar and Anantnag are some of the major districts having prominence of riverine wetlands.

In Kashmir valley, the natural lakes (Altitude <3000 meters) are another major type of wetlands. The Wular, Dal, Nageen and Manasbal are some of the well-known lakes of this category. These lakes are dominated in the districts of Srinagar and Bandipora.

According to the National Wetland Atlas of J&K, Ministry of Environment and Forests, 2010, a variety of wetland types are observed in J&K state and most of them are of glacial origin and mainly associated with riverine system (Table 5.6). As per the estimates of this project report, the total number of wetlands mapped in the state were 1411 with an area of 3,89,261 hectares. In addition, 2240 small wetlands (Area <225 hectares) were demarcated as point features which are mainly high altitude wetlands. The natural wetlands are in dominance in the state occupying around 93 per cent area. Apart from Rivers and streams, 1,143 high altitude wetlands with an area of 1,09,170 hectares were mapped. Besides, there are 36 ponds/lakes (3.5 per cent). The major man- made wetland types are the reservoirs. In the whole state, there are only 4 of this type with an area of 25,132 hectares (6.4 per cent).

Moreover, an area under aquatic vegetation varied from 19,826 hectares to 15, 434 hectares during post and pre-monsoon periods respectively. Besides, vegetation is mainly found in ponds/ lakes and rivers. The open water area of these wetlands doesn’t show significant variation and most of these wetlands are oligotrophic in nature having low amount of particulate matter.



1

Source: Cartographed by the Researcher from Topographic Maps of Kashmir Valley

Figure 5.1

Table 5.10- Wetlands in Jammu and Kashmir (2010)

Wetland Category	No. of Wetlands	Total Wetland Area (Hectares)	Per cent of Wetland Area	Open Water	
				Post Monsoon (ha)	Pre Monsoon (ha)
Inland Wetlands (Natural)					
Lakes/Ponds	36	13,762	3.52	3,371	6,821
High altitude wetlands	1,143	1,09,170	27.86	1,05,110	1,05,072
Riverine wetlands	88	9,594	2.45	153	1,639
River/Stream	138	2,31,597	59.16	1,70,063	1,75,560
Inland wetlands (Man-made)					
Reservoirs/Barrages	4	25,132	6.42	23,115	25,21
Tanks/Ponds	2	6	0.00	6	6
Sub-Total	1,411	3,89,261	99.43	3,01,816	3,14,209
Wetlands (<2.25m)	2,240	2,240	0.57	-	-
Total	3,651	3,91,501	100.00	3,01,818	3,14,209

Source: National Wetland Atlas: Jammu and Kashmir (2010), Ministry of Environment and Forests, Govt. of India.

5.3.3.1 District-Wise Distribution of Wetlands in Kashmir Valley

The district-wise distribution of wetlands in Kashmir Valley (6 districts) is shown in table 5.11 to table 5.16.

Table 5.11- Wetlands in District Srinagar (2010)

(Area in Hectares)

S. No.	Wetland Category	Number of Wetlands	Total Wetland Area	Per cent of Wetland Area	Open Water	
					Post Monsoon Area	pre Monsoon Area
Inland Wetlands – Natural						
1.	Lakes/Ponds	14	2,194	21.76	1,429	1,603
2.	Ox-bow lakes/Meanders	-	-	-	-	-
3.	High altitude wetlands	29	392	3.89	392	392
4.	Riverine wetlands	25	5,457	54.13	14	1,001
5.	Waterlogged	-	-	-	-	-
6.	River stream	7	2,012	19.96	1,810	1,679
Inland Wetlands – Manmade						
7.	Reservoirs/Barrages	-	-	-	-	-
8.	Tanks/Ponds	1	3	0.03	3	3
9.	Waterlogged	-	-	-	-	-
10.	Salt Pans	-	-	-	-	-
Sub-total		76	10,058	99.77	3,748	4,6768
Wetlands (<2.25 ha)		23	23	0.23	-	-
Total		**99**	**10,081**	**100.00**	**3,748**	**4,678**

Area under aquatic vegetation	6,254	4,999

Area under turbidity levels		
Low	2,523	2,283
Moderate	1,207	1,388
High	18	1,007

Source: National Wetland Atlas: Jammu and Kashmir (2010), Ministry of Environment and Forests, Government of India.

Table 5.12- Area of Wetlands in District Anantnag

(Area in Hectares)

S. No.	Wetland Category	Number of Wetlands	Total Wetland Area	Per cent of Wetland Area	Open Water	
					Post Monsoon Area	pre Monsoon Area
Inland Wetlands – Natural						
1.	Lakes/Ponds	14	2,194	21.76	1,429	1,603
2.	Ox-bow lakes/Meanders	-	-	-	-	-
3.	High altitude wetlands	-	-	-	-	-
4.	Riverine wetlands	69	1,026	14.92	1,026	1,026
5.	Waterlogged	15	273	3.97	-	56
6.	Salt Pans	11	5,553	80.77	3,310	3,428
Inland Wetlands – Manmade						
7.	Reservoirs/Barrages	-	-	-	-	-
8.	Tanks/Ponds	-	-	-	-	-
9.	Waterlogged	-	-	-	-	-
10.	Salt Pans	-	-	-	-	-
Sub-total		95	6,852	99.67	4,336	4,510
Wetlands (<2.25 ha)		23	23	0.33	-	-
Total		**118**	**6,875**	**100.00**	**4,336**	**4,510**

Area under aquatic vegetation	273	217

Area under turbidity levels		
Low	4,297	4,402
Moderate	39	108
High	-	-

Source: National Wetland Atlas: Jammu and Kashmir (2010), Ministry of Environment and Forests, Govt. of India.

Table 5.13- Wetlands in District Baramulla

(Area in Hectares)

S. No.	Wetland Category	Number of Wetlands	Total Wetland Area	Per cent of Wetland Area	Open Water	
					Post Monsoon Area	pre Monsoon Area
Inland Wetlands – Natural						
1.	Lakes/Ponds	2	11,273	68.91	1,710	4,966
2.	Ox-bow lakes/Meanders	-	-	-	-	-
3.	High altitude wetlands	38	448	2.74	448	448
4.	Riverine wetlands	29	1,478	9.03	41	334
5.	Waterlogged	-	-	-	-	-
6.	Salt Pans	13	3,146	19.23	2,883	3,059
Inland Wetlands – Manmade						
7.	Reservoirs/Barrages	-	-	-	-	-
8.	Tanks/Ponds	-	-	-	-	-
9.	Waterlogged	-	-	-	-	-
10.	Salt Pans	-	-	-	-	-
Sub-total		82	16,3435	99.91	5,082	8,809
Wetlands (<2.25 ha)		15	15	009	-	0
Total		**97**	**16,360**	**100.00**	**5,082**	**8,807**

Area under aquatic vegetation	10,922	7,532

Area under turbidity levels		
Low	5,058	3,523
Moderate	8	15
High	16	5,269

Source: National Wetland Atlas: Jammu and Kashmir (2010), Ministry of Environment and Forests, Govt. of India.

5.14- Wetlands in District Budgam

(Area in Hectares)

S. No.	Wetland Category	Number of Wetlands	Total Wetland Area	Per cent of Wetland Area	Open Water	
					Post Monsoon Area	pre Monsoon Area
Inland Wetlands – Natural						
1.	Lakes/Ponds	-	-	-	-	-
2.	Ox-bow lakes/Meanders	-	-	-	-	-
3.	High altitude wetlands	11	150	4.41	150	150
4.	Riverine wetlands	8	1,932	56.79	26	99
5.	Waterlogged	-	-	-	-	-
6.	Salt Pans	12	1,272	37.39	1,244	1,244
Inland Wetlands – Manmade						
7.	Reservoirs/Barrages	-	-	-	-	-
8.	Tanks/Ponds	-	-	-	-	-
9.	Waterlogged	-	-	-	-	-
10.	Salt Pans	-	-	-	-	-
Sub-total		32	3,354	98.59	1,420	1,493
Wetlands (<2.25 ha)		48	48	141	-	-
Total		**80**	**3,402**	**100.00**	**1,420**	**1,493**

Area under aquatic vegetation	1,929	1,914

Area under turbidity levels		
Low	1,400	1,400
Moderate	20	93
High	-	-

Source: National Wetland Atlas: Jammu and Kashmir (2010), Ministry of Environment and Forests, Govt. of India.

Table 5.15- Wetlands in District Kupwara

(Area in Hectares)

S. No.	Wetland Category	Number of Wetlands	Total Wetland Area	Per cent of Wetland Area	Open Water	
					Post Monsoon Area	pre Monsoon Area
Inland Wetlands – Natural						
1.	Lakes/Ponds	18	96	4.03	33	53
2.	Ox-bow lakes/Meanders	-	-	-	-	-
3.	High altitude wetlands	-	-	-	-	-
4.	Riverine wetlands	2	6	0.25	6	5
5.	Waterlogged	-	-	-	-	-
6.	River / stream	5	2,212	99.79	1,721	2,052
Inland Wetlands – Manmade						
7.	Reservoirs/Barrages	-	-	-	-	-
8.	Tanks/Ponds	-	-	-	-	-
9.	Waterlogged	-	-	-	-	-
10.	Salt Pans	-	-	-	-	-
Sub-total		125	2,314	97.06	1,760	2,110
Wetlands (<2.25 ha)		070	070	2.94141	-	-
Total		**95**	**2,384**	**100.00**	**1,760**	**2110**

Area under aquatic vegetation	67	44

Area under turbidity levels		
Low	1,743	2,074
Moderate	17	36
High	-	-

Source: National Wetland Atlas: Jammu and Kashmir (2010), Ministry of Environment and Forests, Govt. of India.

Table 5.16- Area of Wetlands in District Pulwama

(Area in Hectares)

S. No.	Wetland Category	Number of Wetlands	Total Wetland Area	Per cent of Wetland Area	Open Water	
					Post Monsoon Area	pre Monsoon Area
Inland Wetlands – Natural						
1.	Lakes/Ponds	-	-	-	-	-
2.	Ox-bow lakes/Meanders	-	-	-	-	-
3.	High altitude wetlands	2	4	0.11	4	4
4.	Riverine wetlands	7	349	9.74	10	88
5.	Waterlogged	-	-	-	-	-
6.	River / stream	5	2,956	83.01	1,728	1,709
Inland Wetlands – Manmade						
7.	Reservoirs/Barrages	-	-	-	-	-
8.	Tanks/Ponds	1	3	0.08	3	3
9.	Waterlogged	-	-	-	-	-
10.	Salt Pans	-	-	-	-	-
Sub-total		15	3,310	92.95	1,745	1,804
Wetlands (<2.25 ha)		25	251	7.05	-	-
Total		**266**	**3,561**	**100.00**	**1745**	**1,804**

Area under aquatic vegetation	388	259

Area under turbidity levels		
Low	1,732	1,712
Moderate	4	4
High	9	88

Source: National Wetland Atlas: Jammu and Kashmir (2010), Ministry of Environment and Forests, Govt. of India.

A perusal of above tables (table 5.11 to 5.16) shows that highest area under Natural lakes and ponds is in district Baramula accounting to 11,273 hectares which constitutes 68.91 per cent of the district's wetland area. This is mainly because of the presence of Wular Lake in Baramulla district (now in Bandipora district). This district is also the leading district in the area under aquatic vegetation. It has 10,922 hectares of area under aquatic vegetation in post-monsoon period and 7,532 hectares in pre-monsoon period.

So far as high altitude wetlands are concerned, these are dominant in the district of Anantnag with the highest wetland area of 1,026 hectares (14.92 per cent) of the district under them. This district also possesses the highest area under rivers/streams accounting to 5,553 hectares (80.77 per cent) of the district wetland area.

However, Srinagar district dominates in the category of riverine wetlands with an area of 5,457 hectares accounting to 54.13 percent of the district total wetland area. So for as the district of Pulwama is concerned, it out numbers in the list of wetlands with an average area less than 2.25 hectares. The district contains 251 such wetlands covering about 251 hectares of land under them. Besides, aquatic vegetation has occupied a significant area in the wetlands of all the districts. However, its area increases considerably from pre monsoon to post monsoon season.

Summary

In this chapter, an overview of wetlands in the context of their meaning and definitions as well as their characteristics and classifications has been highlighted. Besides, an overview of the global, national and regional level distribution of wetlands has also been worked out.

The chapter opens with the argument on wetlands and water bodies followed by an in-depth understanding of the wetlands wherein it has been propounded that wetlands consist of the areas of marsh, fen, peat land or water, that is static or flowing, the depth of which doesn't exceed to 6 meters at low tide. These are characterized by a broad water based ecosystem where a peculiar nexus between land and water is formed with the presence of hydrophytes, hydric soils, bacteria and animals in a state of flowing water.

This chapter has also tried to make an in-depth account of the various classifications propounded by different scholars and academicians at different levels in different periods of time wherein the wetlands have been broadly categorized into Natural and Man-made, Coastal and Inland, Fresh water and Salt water types based on different criteria like wetland hydrology, vegetation cover, altitude, location and size of wetlands.

Lastly, the distribution of wetlands has also been provided in India and especially in Kashmir Valley. It has come to our notice that wetlands are distributed almost in every state of India in the form of rivers, lakes, ponds, marshes, salt pans, reservoirs and tanks. However, the majority of the wetlands of Kashmir Valley belong to the lakes, ponds, salt pans and rivers only.

CHAPTER VI

DAL LAKE: A MICRO LEVEL ENVIRONMENTAL AND SOCIO-ECONOMIC ANALYSIS

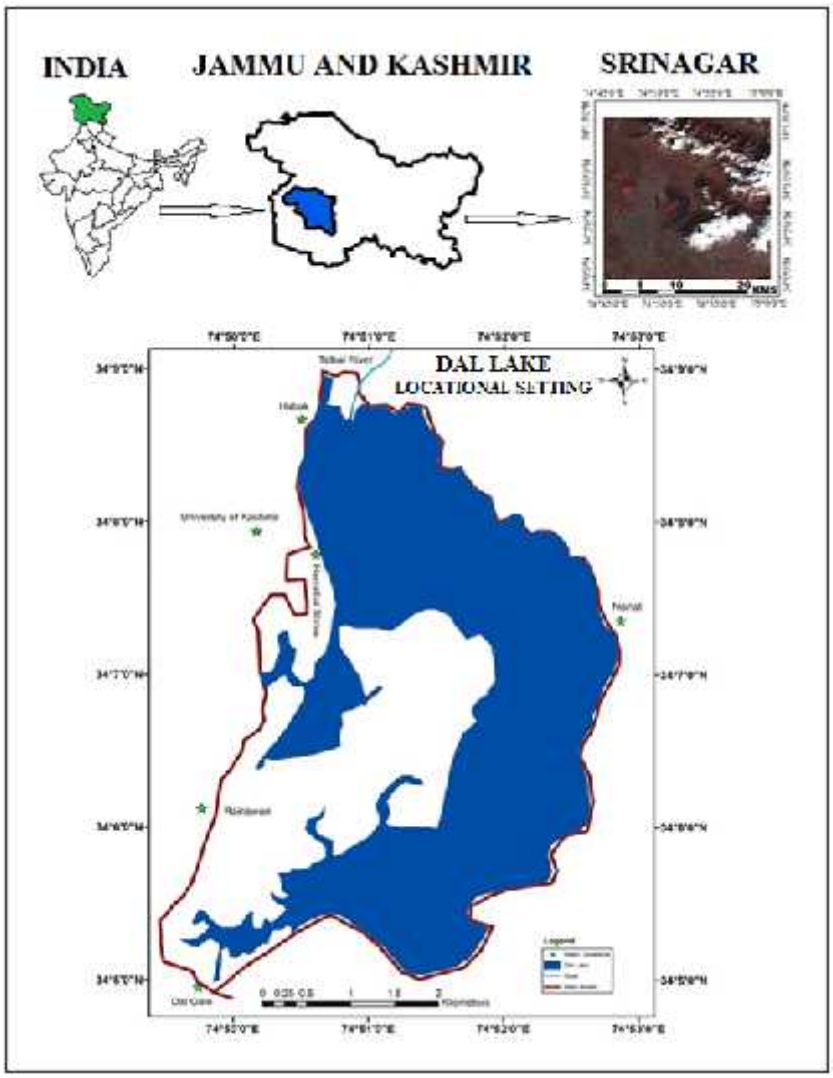
This chapter undertakes an in-depth analysis of environmental and socio-economic parameters around a major wetland, the Dal Lake, in Jammu and Kashmir. Considering the importance of wetlands their nature, distribution, characteristics and classification, intensive inquiry was required to assess the present status for their future planning and sustainable management.

This chapter is devoted to an intensive assessment of world famous Dal Lake, the most important wetland of Kashmir Valley. It has been divided into two parts, the first part deals with the general characteristics of Dal Lake, its origin, catchment area, morphometry, hydrological regimes, water quality, land use/ land cover dynamics and biodiversity. This part is based on secondary sources of data. The second part deals with the socio-economic conditions of the settlements located in and around and dependent on the Dal Lake. This part is mainly based on primary sources of data. On the basis of nearness and dependency on the lake resources, five basins namely Nishat Basin, Dal Gate Basin, Hazratbal Basin, Bud Dal Basin and Locut Dal Basin were selected for sampling purpose. Since Dal Lake is located in the heart of Srinagar city and is surrounded by urban landscape, it is highly populated and dense. Therefore, only 5 per cent of the total households of the five basins located around it were taken as a sample size in spite of the 10 per cent sample size of the households located around all the other wetlands of study area which are primarily rural in their locational settings with relatively lesser population and household number.

The field work was conducted during the years 2014- 2015 and data was collected through Questionnaire Interviews. The total sample size comprised of 737 households with a population of 4,663 consisting 51.15 per cent males and 48.85 per cent females.

6.1 General Characteristics of Dal Lake

Dal Lake, a shallow eutrophic lake, (Dar and Romshoo,2008)[1], located on the North Eastern side of Srinagar city- the summer capital of Jammu & Kashmir - on the right side of River Jhelum is the largest fresh water wetland of Kashmir Valley, after Wular Lake, with a large mountainous catchment area of 316 square kilometers. The main receiving body of the watershed is situated between 74° 48'N- 75° 08'N latitude and 34°03 'E- 34°13 'E longitude at an altitude of 1,583 meters above msl.



Source: Based on Survey of India Topographic Maps of Kashmir Valley, 1969

Figure 6.1

1 Dar, A. A., & Romshoo, S. A. (2008). Assessing the Hydrological characteristics of Dal Lake catchment using GIS. (Eds) Sengupta, M., & Dalwani, R, *Proceedings of Taal 2007: The 12th World Lake Conference* , 659-667

Dal occupies an important position because of its physical and locational settings. The lake is fed by 'Arrah' river that flows in a northern extremity through a dark and deep channel called 'Tel-Bal' (Fazal and Amin, 2012)[2]. Around 1200 A.D, this lake spread over an area of 7,500 hectares (75 Sq. km) in the Gazetter of Kashmir (1870-1872), Captain Bates calculated the extension of Dal Lake to be 9.6 Km from north to south and 4.8 km from east to west with an average depth of 2.3 meters that reached 8m of depth in some places. Its area was 3,600 hectares at that time which reduced to 2,100 hectares by 1950. Presently, the lake is spread over only 1,620 hectares consisting of 1305 hectares of water body and 315 ha of marshy area. (Fazal and Amin, 2010)[3]. It means that now over 315 hectares of the lake area is highly endangered.

A special feature of Dal Lake is the abundance of floating gardens and demb-lands. Besides, this lake is famous not only for its beauty but also for its vibrancy as it sustains within its periphery a life that is unique. The lake supports a floating population of some 7,000 people permanently, besides being an important floating market garden. It also supports important fishery and tourist industry. Many spots of tourist attraction have been developed along its periphery like the famous Mughal gardens of Nishtat, Shalimar, Cheshm-e--Shahi, Naseem Bagh, Pari-Mahal, Hazratbal and Shankar Acharya. However, the waters of its inter- connected channels, once described by Captain Bates as "Clear and soft as silk", are polluted nowadays beyond limits because of man's greed to encroach into natural environment for his own short term prosperity.

6.1.1 Origin of Dal Lake

Dal is a Tibetan word, which means "Still" (Amin, et. al., 2014)[4]. It is believed that in ancient times, there was a large meadow known as "Vitalanimarg" at this place. Later, due to a massive earthquake, water gushed into the meadows and took the shape of a lake. However, its position and morphometry reveals that the lake has been derived from an enlarged ox-box in flood plains of river Jhelum than from progressive shrinkage of a glacial lake.

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2 Fazal, S., & Amin, A. (2012). Hanjis activities and its Impact on Dal Lake and its Environs: A Case Study of Srinagar City, India. *Journal of Environmental and Earth Sciences,* 4(5), 511-524

3 Ibid., pp.512

4 Amin, A., Fazal, S., Mujtaba, A., & Singh, S. K. (2014). Effects of land transformation on water quality of dal lake, Srinagar, India. *J. Indian Soc. Remote Sens., 42* (1), 119-128.

Wadia considered the Valley of Kashmir as a flat plain of Pleistocene fluvio-lacustrine alluvium. He maintains that the lakes of Kashmir are formed from the inundated parts of the river Jhelum having alluvial dams and marshy borders. (Wadia, 1947)[5]

However, Dal Lake is surrounded by mountains on all the three sides. To its eastern side by Zabarwan hills, to its southern side by Shankar-Achariya mountains and to its west by hills of Kohi-Maran. This type of geographical location of Dal probably indicates a meteor impact that might have struck the earth's surface from northern side of lake and have given rise to the formation of these mountainous ranges (Iqbal et. al., 2008)[6]. Besides, the bean like shape of Dal has deformed from its actual basin type due to both natural and anthropogenic causes.

Naseer Iqbal and his colleagues (2008) compared Dal Lake with Lonar Lake in their study wherein they found that Dal Lake is probably a basin like structure that has deformed since its formation through erosion. Secondly, Coulomb excitation measures of the different samples of the Dal Lake indicate the presence of same elements as were found in the Lonar Lake (Maharashtra) which is known to be associated with a meteorite impact (Chowdhary and Handa, 1978),[7] and about 70 per cent of the results matched the elemental abundance level obtained at the Lonar Lake. Thirdly, evidences of shock metamorphism in the vicinity of the Dal Lake have also been confirmed (Wadia, 1953)[8] and presence of Basalts and Breccia in the vicinity of Dal Lake is another evidence that strengthens the assumption of meteor impact (Jeelani and Shah, 2006)[9]

From the above evidences and similarities it can be said that there is a probable meteor impact in Kashmir which had led to the formation of Dal Lake. Thus, Dal Lake is not an ordinary lake, nor is it any stream and may not also be of volcanic origin. But in all probability, it seems to be a very old and eroded meteor impacted

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5 Wadia, D. N. (1947). Pleistocene ice age deposits of Kashmir. *Proc. Nat. Inst. Sci*, India.

6 Iqbal, N., Vahia, M. N., Masood, T., & Ahmad, A. (2008). A probable meteor impact crater in Kashmir valley, India. *NRIAG Jour. of Astronomy and Astrophysics*, 469-475.

7 Chowdhary, A. N., & Handa, B. K. (1978). Some aspects of the geochemistry of Lonar Lake water. *Indian journal of Earth Sciences, 5,* 111-118

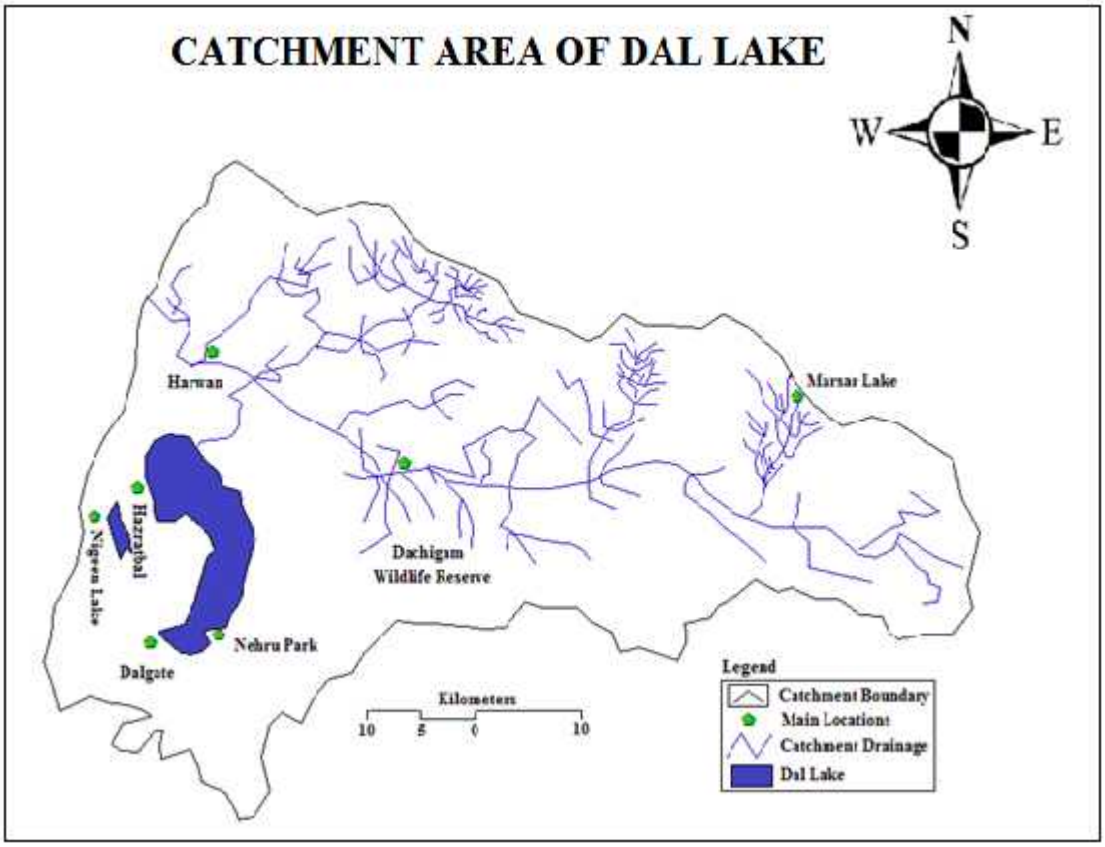
8 Wadia, D. N. (1953). *Geology of India, carboniferous and Permian systems.* Tata MC. Graw Hill: New Delhi.

9 Jeelani, G., & Shah, A. Q. (2006). Geochemical characteristics of water and sediment from the Dal Lake, Kashmir Himalayas: constraints on weathering and anthropogenic activity. *Environ. Geol., 50,* 12-23

crater. However, there are number of scientific ideas which need to be confirmed in future as well.

6.1.2 Catchment Area of Dal Lake

The Dal Lake catchment located in Kashmir Himalayas between the geographical coordinates of 34°02'-34°13' North latitude and 74°50'E to 75°E' longitude is not only highly diverse but also covers a large area of 337 Sq kms, nearly 18-times more than the lake area; surrounded by said basin in the north and Jhelum basin in the south. The general relief of the lake catchment is a basin which comprises the Dal Lake at 1,580 m above m.s.l and a steep escarpment at an elevation of 4,390m located along eastern watershed. (Badar et.al., 2012)[10]



Source: Adapted from Shah, A. H., Nengroo, Z. A., Kuchay, N. A., & Bhat, M. S. (2014). Morphometric analysis and watershed prioritization for hydrological studies in Dal Lake watershed of J&K: A remote sensing and GIS approach. *International Journal of Recent Scientific Research*, *5* (1), 82-94.

Figure 6.2

10 Badar, B., Romshoo, S. A., & Khan, M. A. (2013). Modelling catchment hydrological responses in a Himalayan Lake as a function of changing Land use and Land cover. *J. Earth syst. Sci. 122* (2), 433-449.

The Dal Catchment consists of mountain ranges on its North and North-East and on the other sides it is enclosed by flat arable land (Khan, 2015)[11] .The flat areas of the catchment are mostly used as cropland, horticulture and build up where human activities have intensified during the last few decades. The mountainous areas are covered by forest, grasslands, scrublands and the hilly regions consist of natural vegetation and barren-land from which most of the surface run off, carrying eroded soil and sediments, takes place.

The geological formations of the catchment are dominated by alluvium, Panjal traps, and agglomerate slates. (Wadia, 1953, Bhat,1989)[12,13].The Dal lake is a multi-basined lake with the dendritic and trellis drainage pattern of its catchment, flowing generally from east to southwest. The main feeding channel of Dal, besides being fed by a number of underground springs, is the Dachigam creek that originates from the alpine Marsar Lake and enters into the Dal on its Northern side after draining the Dachigam Wildlife Reserve enroute.

Physically, Dal catchment is fan-shaped broadening westwards (Mir et.al.,2011)[14]and belongs to a Sub-Mediterranean type of climate with four seasons based on mean temperature and precipitation (Bagnotus and Meher Homji, 1959)[15]. The catchment receives an average rainfall of 650 mm at Srinagar station and 870 mm at Dachigam station. The temperature varies between -4° c to 31°c and the overall catchment of Dal is highly urbanized.

6.1.3 Morphometry of Dal Lake

Morphometry is the measurement and mathematical analysis of the configuration of the earth's surface, shape and dimension of its landforms (Agarwal, 1998)[16]. One of the significant features of Dal Lake is its vast and diverse watershed spreading over an

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11 Khan, M. A. (2015). Dal Lake of Kashmir: Problems, Prospects and perspectives. *International Journal of Multidisciplinary Research and Development, 2* (2): 462-469

12 Wadia, D. N. (1953). *Geology of India, carboniferous and Permian systems.* Tata MC. Graw Hill: New Delhi.

13 Bhat, D. K. (1989). Geology of Karewa Basin, Kashmir. *Geol. Survey India Rec.*, 122.

14 Mir, B. A., Pal, A., & Solin, S. U. (2011). Characterization of sludge drawn from sewage treatment plants based on tertiary treatment process at Dal, Srinagar, J&K- India. *Journal of Exp. Sci., 2* (2), 61-64.

15 Bagnolus, F., & Meher, H., V. M. (1959). Bioclimatic types of south East Asia. *Travaux de la section scientific at technique inst*. Francis de Pondicherry, p.227

16 Agarwal, C. S. (1998). Study of drainage pattern through aerial data in Naugarh area of Varanasi, U.P. *Journal of Indian Society of Remote* Sensing, *26*, 169-175.

area of about 331Sq.kms. Dachigam-Telbal in the north east comprise nearly 70 per cent of its watershed, the other segments being Zabarwan mountains and parts of Srinagar city (Shah et.al., 2014)[17]. Telbal-Dachigam is Dal lake's largest sub-watershed (230 Km^2) which is further divided into the Telbal-Dara (87 Km^2) and Dachigam National wild life reserve (143 Km^2) sub watersheds. The stretch of this fan-shaped watershed extends diagonally from NE to SW.

Shah Arif and others (2014)[18] have conducted their study on watershed level of Dal Lake by making use of SOI topo-sheets of 1969 on 1:50,000 scale. In this study, Strathler's scheme of stream analysis (1964) have been adopted, wherein the smallest fingertip tributaries are designated as order 1, where two first order channels join, a channel segment of order 2 forms and where two channels of order 2 join, a segment of order 3 is formed and so on. The trunk stream through which all discharge of water and sediment takes place is therefore the stream segment of highest order.

The morphometry of Dal Lake has been analyzed under the following parameters:

6.1.3.1 Linear parameters

This includes steam order, bifurcation ratio, drainage density, drainage texture, stream frequency and length of overland flow.

(a) Stream Order (Nu)

It is defined as a measure of the position of a stream in the hierarchy of tributaries. The mean stream length is the characteristic property related to the drainage network and its associated surfaces. Generally, higher the order, longer the length of streams noticed in nature. Dal Lake is a 5th order drainage basin with the total number of 848 streams of which 677 are of 1st order, 137 are of 2nd order, 30 are of 3rd order, 3 are of 4th order and 1 is of 5th order.

17 Shah, A. H., Nengroo, Z. A., Kuchay, N. A., & Bhat, M. S. (2014). Morphometric analysis and watershed prioritization for hydrological studies in Dal Lake watershed of J&K: A remote sensing and GIS approach. *International Journal of Recent Scientific Research, 5* (1), 82-94.

18 Ibid.,P.83

(b) Bifurcation Ratio (Rb)

This term expresses the ratio of the number of streams of any given order to the number of streams in next higher order (Schumn, 1956)[19]. If the Rb is not same from one order to its next order, then these irregularities are dependent upon the geological and lithological development of the drainage basin. In the study area, mean bifurcation ratio varies from 2.39 to 9. Lower values suggest less structural disturbance. Whereas, higher values indicate that it has structurally controlled drainage pattern. The mean Rb of 5.63 for Dal indicates that there are fewer disturbances of geological structures to the drainage pattern.

(c) Drainage Density (D)

It is the ratio of total channel segment lengths cumulated for all orders within a basin to the basin area. It indicates the closeness of spacing of channels and provides a quantitative measure of the average length of stream channel for the whole basin. Low Drainage density leads to course drainage texture. While high drainage density leads to fine drainage texture (Strathler, 1964)[20]. In the present study, the drainage density ranges from 0.28→ 3.68Km/Km^2 which suggests that the Dal Lake watershed is underlain by highly permeable materials.

(d) Drainage Texture (Rt)

It is defined as the total number of stream segments of all orders divided by the perimeter of the watershed (Horton, 1945)[21]. It depends on the underlying lithology, infiltration capacity, relief and aspect of the terrain. Drainage density >2 indicates very coarse texture, between 2 and 4 is coarse, between 4 and 6 is moderate, between 6 and 8 is fine and above 8 is very fine drainage texture. The ratio of texture of Dal drainage watershed is 6.78 which is an indication of fine texture of drainage.

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19 Schumn, S. A. (1956). Evolution of drainage system and slope in badlands at Perth Amboy, New Jersey. *Bulletin. Geological Survey of America, 67,* 597-646.

20 Strahler, A. N. (1964). Quantitative geomorphology of drainage basins and channel networks. In chow, V.T. (eds.), *Hand book of applied hydrology.* MC Graw Hill Book Company: New York.

21 Horton, R. E. (1945). Erosion Development of Streams and their Drainage Basins: Hydrological Approach to Quantitative Geomorphology. *Bulletin of the Geological society of America, 56,* 275-370.

(e) Stream frequency (Fs)

Stream frequency or channel frequency is the total number of stream segments of all orders per unit area. (Horton, 1932)[22]. Low values of stream frequency indicate presence of a permeable subsurface material and low relief and higher values show resistant sub- surface material, sparse vegetation and high relief. The stream frequency value of Dal watershed is 2.56 which signify its permeable sub surface character.

(f) Length of Overland flow (Lo)

Length of overland flow is referred to as the distance of flow of the precipitated water over the land surface to reach the stream. This is one of the most important independent variables affecting hydrologic and physiographic development of drainage basin.

Table: 6.1 Morphometric Analysis of Dal Lake Watershed

MORPHMETIRC ANALYSIS OF DAL LAKE WATERSHED (2014)		
PARAMETERS	**RANGE OF VALUES**	**AVERAGE VALUES**
Bifurcation ratio	2.38-9.0	5.63
Drainage Density	0.28-3.68	2.12
Drainage texture	0.43-2.18	0.78
Stream frequency	0.10-5.09	2.56
Length of overland flow	0.14-1.76	0.23
Basin Shape	1.99-2.58	3.79
Form factor ratio	0.39-2.50	0.26
Circularity ratio	0.28-0.73	0.40
Elongation Ratio	0.79-1.11	0.10
Compactness coefficient	1.17-1.90	1.54
Area	331 Km2	
Perimeter	99.82 Kms	
Stream Order	848 streams	
	677- 1st order	
	137 -2st order	
	30-3st order	
	03 -4st order	
	01-5st order	

Source: Shah, A. H., Nengroo, Z. A., Kuchay, N. A., & Bhat, M. S. (2014). Morphometric analysis and watershed prioritization for hydrological studies in Dal Lake watershed of J&K: A remote sensing and GIS approach. *International Journal of Recent Scientific Research*, *5* (1), 82-94.

22 Horton, R. E. (1932). Drainage Basin Characteristics. *Trans. Amer. Geophys. Union*, *13*, 350-361.

The value of overland flow is higher in the semi-arid regions than in the humid and humid temperate regions because of the absence of vegetation cover in the semi, arid regions. The length of overland flow values of Dal micro watersheds vary from 0.14 to 1.76. Its average value of 0.23 clearly indicates that the watershed has a well-developed stream network and receives heavy rainfall as well.

6.1.3.2 Shape Parameters

This includes drainage parameters like basin shape, form factor, circulatory ratio, and elongation ratio and compactness coefficient.

(a) Basin Shape (Bs)

Basin shape is the ratio of square of basin length (Lb) to the area of the basin (A). Basin shape may be indexed by simple dimension less ratio of the basic measurements of area, perimeter and length. (Singh,1998)[23]. Dal Lake watershed as a whole has a basin shape of 3.79.

(b) Form factor Ratio (Rf)

It is a dimension less ratio of basin area to the square of basin length. For a perfectly circular basin, the value of form factor would always be less than 0.7854. The basins with higher form factor are normally circular and have high peak flows for shorter duration. Whereas, elongated basin with lower values of form factor has low peak flows for longer duration. The form factor values in the Dal watershed vary from 0.39-0.5 suggesting that most of the micro watershed represent elongated shape with lower peak flows for longer duration. The average form factor value of the Dal watershed is 0.26.

(c) Circulatory Ratio (Rc)

It is the ratio area of a basin to the area of circle having the same circumference as the perimeter of the basin (Miller, 1953)[24]. The circulatory ratios of Dal micro watersheds vary from 0.28-0.73 and average circularity ratio of the basin is 0.4 which indicates the highly elongated and strongly permeable homogenous nature of the basin.

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23 Singh, S. (1998). *Physical Geography.* Prayag Pustak Bhawan :Allahabad, India.

24 Miller, V. C. (1953). A Quantitative Geomorphic Study of Drainage Basin Characteristics in the Clinch Mountain Area, Virginia and Tennesse. *Project NR-389042, Tech. Report 3,* Columbia University, Dept. of Geology, ONR, Geography Branch, New York.

(d) Elongation Ratio (Re)

It is defined as the ratio of diameter of a circle of the same area as the basin to the maximum basin length and is found generally varying from 0.6 to 1.0 depending upon vagaries of climate and geology. It gives an idea about the hydrological character of a drainage basin. Higher values show high infiltration capacity and low runoff. Whereas, lower Re values are characterized by high susceptibility to erosion and sediment load. The elongation ratio of Dal micro watershed varies from 0.79-1.11 which is an indication of high susceptibility of its catchment area to erosional processes.

(e) Compactness Coefficient (Ca)

It is used to express the relationship of a hydrologic basin to that of a circular basin having the same area as the hydrologic basin. A circular basin is the most susceptible basin from a drainage point of view because it yields shortest time of concentration before peak flow occurs in the basin. (Noka et. al., 2005)[25]. The value of Ca varies from 1.17-1.9 in Dal catchment area.

Thus, the above study has shown that the Dal Lake region is composed of impermeable sub surface materials, sparse vegetation and high mountainous relief causing higher surface run off and a higher level of erosion. Therefore, immediate attention towards soil conservation measures is required in these micro watersheds of Dal Lake to prevent the land from further degradation and to alleviate natural hazards.

6.1.4 Hydrological Regimes of Dal Lake

The Dal Lake covering an area of around 11.50 Km^2 (Khan et. al., 2012)[26] lies in the flood- plains of river Jhelum whose broad meanders have cut swampy low lands out of the Karewa terraces. (Masoodi, 2014)[27]

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25 Nooka, R., K. Srivastav., Y. K. Venkaterwara Rao., V. Amminedu., & Murthy, K. S. (2005). Check Dam Positioning by Prioritization of Micro watersheds sing SYI Model and Morphometric Analysis- Remote Sensing and GIS Perspective. *J. Indian Remote. Sens*., *3* (1), 25-38.

26 Khan, J. A., Gavali, R.S., & Shouche, Y. S. (2012). Exploring Present Status of Hydrochemistry and Sediment Chemistry of Dal Lake, Kashmir and effect of anthropogenic disturbances on it, *Indian. J. Innovations Dev*., *1* (7), 554-571.

27 Masoodi, S. (2014). Water quality assessment of Dal Lake, Kashmir, J&K. *International Journal of Engineering Research*, *3*, 191-196.

The hydrology of Dal Lake is complicated by the diversity of its catchments which range from Srinagar city with high population density to paddy fields and high mountain ranges. The water level of the Lake fluctuates appreciably as a result of varied amounts of precipitation received in the form of rain and snow and the changes in the water quality that flows into the Lake from the feeding channels. (Khan, 2015)[28].

Based on a gauging of the major streams over the past few years, the average inflow has been estimated to be 292 million m^3 of which 80 per cent is contributed by Telbal Nullah (Khan, 2015)[29], a large perennial inflow channel bringing water from the high altitude Marsar Lake (Khan et. al., 2014)[30] draining an area of about 145 Km2 (Jeelani, 2006)[31] and 20 per cent by other sources including springs within the Lake body. In the basin itself, there are number of springs (Kudanger et. al, 1995)[32] which act as permanent water sources to the Lake.

Dal Lake comprises of 5 Basins Viz., Hazratbal, Bod-Dal, Lokut Dal, Gargribal and Nageen .The total volume of water is estimated to be 9.8×10^6 m^3 (Trisal, 1978)[33]. The Telbal Nullah with other small streams like Shalimar Nullah, Peshpaw Nullah, Marakhshan Nullah and Harshi Kul etc enter the Lake at Hazratbal Basin, passing through Bod-Dal basin and finally drain into the river Jhelum from Gagribal basin side at the Dal gate. (Khan et.al, 2012)[34]. The Nagin Basin also receives water from the Hazratbal Basin and leaves through the marshy area without any prominent outlet.

The lake has 2 Main outlets, one being the Dal gate which discharges into a link channel 'Tsehunt kul' for final discharge into river Jhelum. This outlet has a lock gate provision for flow regulation and navigation purpose. The other outlet is through Nullah "Amir Khan"- A channel dug by Afghan governor Amir Khan (Masoodi,

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28 Khan, M. A. (2015). Dal Lake of Kashmir: Problems, Prospects and perspectives. *International Journal of Multidisciplinary Research and Development, 2* (2): 462-469.

29 Ibid.,P.465

30 Op. Cit., P.192

31 Jeelani, G., & Shah, A. Q. (2006). Geochemical characteristics of water and sediment from the Dal Lake, Kashmir Himalayas: constraints on weathering and anthropogenic activity. *Environ. Geol., 50,* 12-23

32 Kudanger, M. R. D., Sarwar, S. G., & Shah, M. A. (1955). Limnological characteristics of Hazratbal Basin of Dal Lake, Technical report submitted to govt. of Jammu and Kashmir.

33 Trisal, C. L. (1978). Ecology and Conservation of Dal Lake, Kashmir. *Water Resources Dev.,3,* 44-54.

34 Khan, J. A., Gavali, R.S., & Shouche, Y. S. (2012). Exploring Present Status of Hydrochemistry and Sediment Chemistry of Dal Lake, Kashmir and effect of anthropogenic disturbances on it, *Indian. J. Innovations Dev., 1* (7), 554-571.

2014)[35], Which links Dal Lake and adjacent Nageen Lake to lake Gilsar and Khushalsar (Khan, 2015)[36]. The total outflow through Dal Gate and Nullah Amir Khan is about 213× 10^6 m^3 and 27× 106 m^3 respectively. There is a marked change in watershed scenario of Dal Lake in terms of changing land use which has increased the annual water flow to 22.23 per cent from 1992-2001 (Dar,2008)[37]. This increased runoff as a result of increasing barren land, built-up and deforested area has led to the problems in lake ecology because of excessive sedimentation and floods.

6.1.5 WATER QUALITY OF DAL LAKE

The chemistry of lake water is a cumulative reflection of catchment geology, weathering and erosional processes as well as anthropogenic inputs. Since many lakes are sinks of agricultural runoff and municipal and industrial waste water discharges, they become enriched with nutrients, sediments and associated heavy metals (Koussouris and Diapoulis, 1989)[38]

The wetlands of Kashmir Valley are notable not only for their size and volume but also for providing habitats for aquatic flora and fauna especially for a number of endemic species. Unfortunately, these bodies of water have been greatly affected by both natural as well as anthropogenic causes.

Dal lake with its multi-faceted ecosystem and grandeur has historically been the center of Kashmiri Civilization and has played a major role in the economy of the state through its attraction of tourists as well as its utilization as a source of food and water. (Reddy and Char, 2004)[39] However, urban watersheds are particularly vulnerable to non-point pollution as a result of runoff from the surrounding landscape (Badar and Romshoo, 2008)[40] being an urban type of lake, municipal and domestic

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35 Masoodi, S. (2014). Water quality assessment of Dal Lake, Kashmir, J&K. *International Journal of Engineering Research, 3*, 191-196.

36 Khan, M. A. (2015). Dal Lake of Kashmir: Problems, Prospects and perspectives. *International Journal of Multidisciplinary Research and Development, 2* (2): 462-469.

37 Dar, A. A., & Romshoo, S. A. (2008). Assessing the Hydrological characteristics of Dal Lake catchment using GIS. (Eds) Sengupta, M., & Dalwani, R, *Proceedings of Taal 2007: The 12th World Lake Conference* , 659-667

38 Koussouris, T., & Diapoulis, A. (1989). Lake mikri prespa. Ecological changes from Natural and Anthropogenic causes, *Toxicol Environ Chem., 20*, 49-52.

39 Reddy, M. S., Char, N. V. V. (2004). Management of Lakes in India. Retrieved from www.worldlakes.org/uploads/management_of_lakes_in_india_10mar04.pdf

40 Badar, B., & Romshoo, S.A. (2008). Assessing the Pollution load of Dal Lake using geospatial tools. In Sengupta, M., & Dalwani, R. (eds). *Proceedins of Taal 2007: The 12th world Lake conf., 668-679*

2effluents have altered the surface water composition of Dal Lake, leading to increased eutrophication (Hutchinson, 1969)[41]. Moreover, excessive sedimentation rates enhanad by excessive soil erosion, deforestation and an encroachment by surrounding population have dramatically reduced the lake volume (Chakrapani, 2002)[42].

Surface run off and sewage discharge brings sediments and chemicals to aquatic systems which promote excessive growth of unwanted plants in the lake. Such an undesirable change affects the water quality. (Khan and Ansari, 2015)[43].

The water quality of Dal Lake has been seriously altered over a period of time because of human interventions which include agricultural activities within and on the periphery of the lake, urbanization and mushrooming of hotels besides untreated water discharges into it. A comparison of values over a period of time shows that the Dal Lake has passed through several stages of eutrophic evolution. (Masoodi, 2014)[44]

Dal Lake receives large quantities of nitrogen and phosphorus from incoming sewage drains from Non- Point sources like seepages and diffused runoff. Of the total phosphorous and inorganic nitrogen from all sources, the Quantity contributed by the drains works out to be 35 per cent . Similarly, a sizeable Quantity of total phosphates and nitrogen are added to the lake from non-point sources. Number of ephemeral water channels and surface drains enter the lake from the human settlement discharging large quantities of waste. An estimated load of 12.30×10^6 mtr^3 of liquid waste with 18.17 tons of phosphorous and 25 tons of inorganic nitrogen is enriching the lake annually. (Massodi, 2014)[45].

41 Hutchinson, G. E. (1969). Eutrophication, Past and Present, In G.A. Rohliceh Eutrophication, *National Academy of Sciences*, Washington D.C, 17-26.

42 Chakrapani, G. J. (2002). Water and sediment geochemistry of major Kumaun Himalayan Lakes, India. *Environ Geology*, *43*, 999-107.

43 Khan, F. A., & Ansari, A. A. (2005) Eutrophication: An ecological vision. *The Botanical review,71* (4),449-482.

44 Masoodi, S. (2014). Water quality assessment of Dal Lake, Kashmir, J&K. *International Journal of Engineering Research*, *3*, 191-196.

45 Ibid., P.192

Table 6.2- Types of Effluents Discharged Into Dal Lake

SITES	TYPE OF DISCHARGE	EFFLUENTS DISCHARGED
Nishat Pipe line Bund	Drain	Sewage
Sheikh Mohalla Brein	Sheikh Kul	Agricultural runoff, Soaps, Detergents and Suspended impurities
Dalgate	Drain	Sewage
Tel Bal Nallah	Nallah	Agricultural runoff, sewage, soaps, silt, clay, mud and sand
Laam Village	Laam kul	Agricultural runoff, soaps and sewage
Khwaja Mohalla	Khwaja Yarbal	Human excreta, soaps and detergents
Brari Nambal	Drain	Agricultural runoff
Hotel Heemal	Discharge pipe	Sewage
Saidakadal	Nallah	Human excreta, soaps etc.

Source: Wani, M. A., Dutta, A., Wani, M. A., & Wani, U. J. (2014). Towards conservation of World famous Dal Lake- A need of the Hour. *International Research Journal of Engineering and Technology, 1* (1), 24-30.

The organic and inorganic pollutant load in Dal has accelerated the macrophytes growth which in turn has reduced the water quality and increased Biological Oxygen Demand (B.O.D.) of the lake and, hence, have reduced the recreational and aesthetic appeal of the lake. The colour of Dal Lake is more inclined towards blue green which is an indication of plankton bloom, elevated dissolved oxygen and ph. Dal Lake is dominated by hydrogen sulphide indicating the presence of raw sewage, livestock waste and algae. Similarly, the foam found out nearby house boat area of Hazaratbal is white in color indicating presence of soaps. (Sharma et. al. 2015)[46].Above all, more than 50,000 people live within the lake itself in various hamlets besides those living in houseboats. People use this lake for personal purposes and generate huge business out of it but produce numerous polluting and toxic substances in the form of floating gardens in the lake and use fertilizers at large in the nearby paddy fields which ultimately finds its way into the lake. All these activities have deteriorated the Lake

46 Sharma, J. N., Kamakya, R. S., & Singh, S. K. (2015). Limnological Study of Water Quality Parameters of Dal Lake, India. *International Journal of Innovative Research in Science, Engineering and Technology, 4* (2), 380-386.

ecosystem in diverse ways and have caused significant impairment to the lake ecology and water quality (Ishaq and Kaul, 1988)[47].

Table 6.3-Water Chemistry of Dal Lake (2004-2014)

PARAMETERS	UNITS	2004	2014
Water Temperature	ºCelsius	19	19.2
Depth	meter	3.1	2.8
Transparency	meter	1.4	1.2
Electrical Conductivity	µs/cm	237	259
pH		8.0	7.7
Dissolved Oxygen	mg/l	6.1	5.6
Chloride	mg/l	13	17
Magnesium	mg/l	6.4	4.5
Total alkalinity	µg/l	130	192
Silicate	µg/l	4.0	1.4
Nitrate Nitrogen	µg/l	572	501
Ammonical Nitrogen	µg/l	319	199
Ortho Phosphate	µg/l	105	203
Total Phosphorus	µg/l	360	408
Iron	mg/l	268	167
Total Dissolved Salts	mg/l	130	143
Sulphate	mg/l	8.7	11
Calcium	mg/l	43.2	38.7
COD	mg/l	25	36
BOD	mg/l	10	14

Source: Lakes and Waterways Development Authority, Srinagar, Jammu and Kashmir.

Dal Lake has, thus, fallen victim to human greed as a result of which the entire ecosystem is rapidly deteriorating. (Pandit, 1993)[48]. Hence, preservation of world famous Dal Lake is the need of the hour.

47 Ishaq, M., & Kaul, V. (1978). Distribution of minerals in Himalayan Lake. *Trop. Ecol. 29*, 41-49.

48 Pandit, A. K. (1993). Dal Lake ecosystem in Kashmir Himalaya: Ecology and management. In Ecology and Pollution of Indian Lakes and Reservoirs (eds). P.C. Mishra and R.K. Trivedi, 131-202, Ashish Publishing House: New Delhi.

6.1.6 Land Use/ Land Cover Dynamics of Dal Lake

Land use/land cover refers to the thematic information about the type of features present on the surface of earth (Dar and Romshoo, 2008)[49]. It is an important characteristic of a watershed that affects its infiltration capacity, erosional potential and the rate of evapotranspiration. Although land use/land cover change is a natural phenomenon and is an outcome of intricate and complex interaction of various environment factors, yet this change is very often induced and enhanced by increased human activity that threatens the very wellbeing of a lake and reduces its health.

Srinagar city, a century earlier, had a unique ecological set up with extensive areas under wetlands (Rashid and Naseem, 2008)[50]. Though siltation brought about in the lakes and wetlands especially during floods was, but natural. It has witnessed large scale changes in land use in the last 30 years wherein the urban area has increased from 2,410 hectares (1981) to 6,224 hectares (2011) depicting an increase by 158 per cent (Fazal and Amin, 2011)[51]. More than 60 per cent of the water bodies of Srinagar have been lost during the last century which has not only affected the micro climate of the city but also has exposed it to the threat of floods. These changes have swallowed the agricultural and forest land as well as water bodies of the city.

Dal Lake is a live example of a victim of changing land use over the years. Land use changes, sedimentation, human settlements, flow of fertilizers and pesticides from the catchment and encroachment of the lake area have resulted in environmental stresses and issues which may be very difficult to resolve (Sheikh et. al., 2008)[52].

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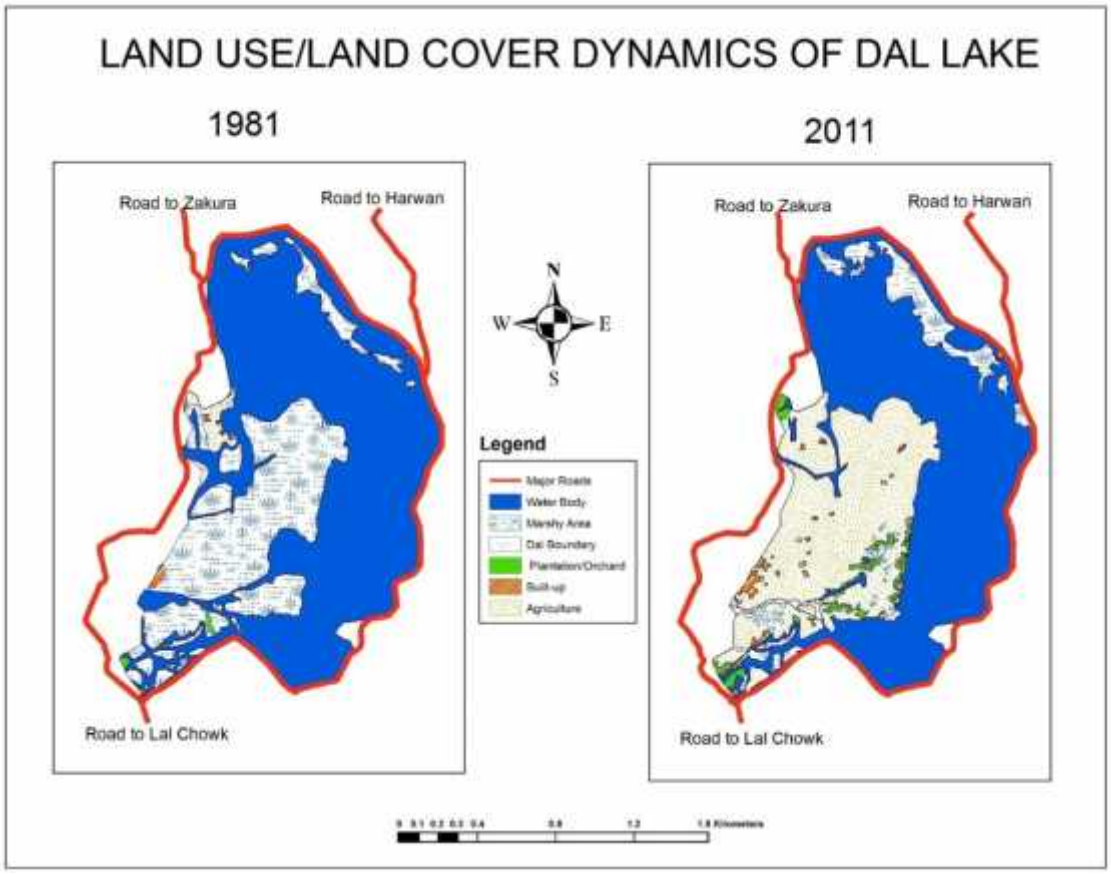
49 Dar, A. A., & Romshoo, S. A. (2008). Assessing the Hydrological characteristics of Dal Lake catchment using GIS. (Eds) Sengupta, M., & Dalwani, R, *Proceedings of Taal 2007: The 12th World Lake Conference* , 659-667

50 Rashid, H., & Naseem, G. (2008). Quantification of loss in spatial extent of Lakes and wetlands in the Suburbs of Srinagar City during last century using Geospatial Approach. In Senupta, M., & Dalwani, R. (Eds). *Proceeding of Taal 2007:* The 12th World Lake Conference, 653-658.

51 Fazal, S., & Amin, A. (2011). Impact of Urban Land Transformation on Water bodies in Srinagar City, India. *Journal of Environmental Protection*, 2, 142-153.

52 Sheikh, A. H., Alam, A., Shah, A. M., & Bhat, S.A. (2008). Land degreadation modeling in Dal Lake catchment using Geospatial Tools. *WG*, 89-169.



Source: Based on Survey of India Topographic Maps and IRS-1D LISS-III and PAN merged satellite imagery of 2011

Figure 6.3

The dynamics of land use/ land cover of the Dal Lake has been elaborated and explained by various scholars like Romshoo, Bhat, Badar, Khan, Shah etc. However, the land use/ land cover change analyzed by Amin and others (2011)[53] seem to be elaborated more lucidly. The data used by these scholars for the preparation of land use/land cover map has been collected form Town Planning Department of Srinagar City on 1:15, 000 Scale of 1981 map. Similarly, the land use/ land cover map of 2011 has been prepared by using IRS-ID-LISS-III and PAN-merged satellite imageries.

The study has been confined to an area of 2,450 hectares which comprises of Municipal ward no. 58 and 59 of the Srinagar City wherein the built-up area has increased from 5.5 ha to 53 ha during 1981-2011 and non- built-up area has decreased from 2,444.5 ha to 2,397 ha. i.e. decrease of more than 47 ha. This means there has been an increase of 863 per cent in built-up areas and a decrease of 1.9 per cent in non-builtup area. Water body includes the water area of the lake, excluding the

53 Amin, A., Fazal, S., Mujtaba, A., & Singh, S. K. (2014). Effects of land transformation on water quality of dal lake, Srinagar, India. *J. Indian Soc. Remote Sens., 42* (1), 119-128.

marshy area and floating gardens that is used for navigation, site seeing, houseboats, fishing etc. The total area under water body in 1981 was 1,538 ha that decreased to 1,305 ha (-233 ha) by 2011, i.e.a decrease of 15 per cent in its areal extent.

Marshy area includes the area which is under the cover of weeds inside the Lake where water related activities like the extraction of aquatic foods is carried out. However, this area is not used for other water activities like Shikara Riding. The area under this land use category in 1981 was 862.5 ha which decreased to 315 ha in 2011 signifying a decrease of 547.5 hectares (i.e. -173.8 per cent).

Table 6.4- Land Use/Land Cover Dynamics of Dal Lake (1981-2011)

Land Use/Land Cover Classes	**Area in Hectares (1981)**	**Area in Hectares (2011)**	**Change in Hectares**	**Percentage of Change**
Water Body	1538	1305	-233	-15.14
Agriculture	36	749	713	1980.55
Marshy	862.5	315	-547.5	-63.42
Built up	5.5	53	47.5	863.63
Plantation	8	28	20	250
Total Built up	5.5	53	47.5	863.63
Total Non-Built up	2444.5	2397	-47.5	-1.94
Grand Total	**2450**	**2450**		

Source: Amin, A., Fazal, S., Mujtaba, A., & Singh, S. K. (2014). Effects of land transformation on water quality of dal lake, Srinagar, India. *J. Indian Soc. Remote Sens., 42* (1), 119-128.

Similarly, agricultural activities are performed on the floating gardens of the lake where vegetables are grown. The total area under agricultural land use in 1981 was 36 ha which increased to 749 ha in 2011, witnessing an increase of 713 ha (+1,980 per cent). Moreover, plantation included the area where the trees like Willows and Poplar have been planted. Orchards have also been included in this class. The total area under this class in the year 1981 was 8 ha which increased to 28 ha in 2011 meaning thereby an increase of 20ha (+250 per cent) in its areal extent. Built-up class refers to the dwelling places of Hanjis on land and banks of Dal Lake. This includes the residential houses and hamlets of Hanjis. The total built-up area in the year 1981 was 5.5 ha which increased to 53 ha in 2011 showing an increase of 47.5 ha (+863 per

cent). Thus, the lake area has shrunken to 1,305 hectares depicting a decrease of 233 ha in last 30 years (1981-2011). Besides there is also substantial interchange of land among different land use/land cover classes primarily because of the growing Hanjis population and their increasing demand for their economic sustenance and settlement and the increase in tourist flow to the lake that has resulted in city residents acquiring space to establish and run their business in the form of hotels and restaurants in and around the lake.

This clearly shows that there is a pattern of land transformation, where lake water is converted to marshy lands which are subsequently converted for agriculture, orchards and built-up uses. These interchanges of land use classes have led to diverse effects on the areal extent of the lake and its water quality.

6.1.7 Biodiversity of Dal Lake

Fresh water lakes are usually rich in aquatic vegetation and constitute one of the important components of biodiversity (Masoodi, 2014)[54]. So far as Dal Lake is concerned, Qadri and Yosuf (2008)[55] have recorded a total of 31- species of plants from the Dal. Among the Emergents, Typha angustata and Phragmites australia covered vast expanses of the Lake. While among the rooted floating leaf type, Nelumbo nucifera, Nymphaea mexicana, Nymphoides peltatum & Trapa natans dominated the lake. The water zone has been colonized by submerged species, mainly Ceratophylum Demersum. Similarly, Zutshi and Vass (1982)[56] reported 84- species of Phytoplanktons from Dal Lake of which 32 species belong each to Chlorophyceae and Bacillariophyceae, 13 to Cyamphyceae, 4 to Dinophyceae and 3 forms represent Euglemophyeceae and 93 Zooplankton species out of which 37 belong to Rotifer, 27 to Cladocera, 12 forms belong to Rhizopoda, 9 to Ciliophora and 8 are from Copeda. Rotifer are the dominant group of zooplanktons. Besides, as many as 17 species of fish (Das and Subla, 1963)[57] have been reported from the Dal Lake.

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54 Masoodi, S. (2014). Water quality assessment of Dal Lake, Kashmir, J&K. *International Journal of Engineering Research, 3,* 191-196.

55 Qadri, H., & Yousuf, A. R. (2008). Dal Lake ecosystem: Conservation strategies and problems. In Sengupta, M., & Dalwani, R (Eds). *Proceedings of Taal: The 12th World Lake Conference:* 1453-1457

56 Zutshi, D. P., & Vass, K. K. (1982). Limnological Studies on Dal Lake, Srinagar (Biological features). *Proc. Indian Natn. Sci. Acad. B 48* (2):234-241.

57 Das, S. M., & Subla, B. A. (1963). The Ichthyofauna of Kashmir- History, topography, origin, ecology and general distribution. *Ichthyologica, 1,* 68-106.

Table 6.5-List of Macrophytic Species Recorded from Dal Lake (2005-2007)

MACROPHYTIC DIVERSITY OF DAL LAKE	
EMERGENTS	
1. Alisma Plantago Aquatic 2. Corex SP. 3. Cyperus Defformis 4. Lycopus Europus 5. Myriophyllum Verticilllatum 6. Nasturtium Official 7. Phyragmites Australis	8. Polygonum Amphibium 9. Saggitaria Saggitifolia 10. Scirpus Triqueter 11. Sium Lati Jugum 12. Sparganium Ramosum 13. Typha Angustats 14. Polygonum Hydropiper
ROOTED FLOATING LEAF TYPE	
1. Hydrocharis Dubia 2. Nelumbo Nucifera 3. Nymphaea Alba 4. Nymphaea Mexicana	5. Nymphoides peltatum 6. Potamogeton Natans 7. Trapa Natans 8. Eichhornia Crasssipes
SUBMERGED	
1. Ceratophyllum demessum 2. Hydrilla Verticillata 3. Myriophyllum Spicatum 4. Potamogeton Crispus	5. Nymphoides Peltatum 6. Potamogeton Natans 7. Trapa Natans 8. Eichhornia Crassipes
FREE FLOATING	
1. Azolla Pinnata 2. Lemna Spp. 3. Salvinia Natans	

Source: Qadri, H., & Yousuf, A. R. (2008). Dal Lake ecosystem: Conservation strategies and problems. In Sengupta, M., & Dalwani, R (Eds). *Proceedings of Taal: The 12th World Lake Conference:* 1453-1457

Kaul and others (1978)[58] reported that the floating macrophytes occupy about 29.2 per cent of the total area of the Lake. While as the submerged hydrophytes cover about 55-65 per cent of the Lake area. Moreover, 23 species of fungi belonging to 5-genera were recorded from the lake waters by Bandh and others (2012)[59] among which Penicillium chrysogenum was the most prevalent species. Besides, 9 species of Benthic invertebrates belonging to 3- major phyla – Annelida, Arthopada and

58 Kaul, V., Trisal, C. L., & Handoo, J. K. (1978). Distribution and Production of Macrophytes in some Water bodies of Kashmir. (In) Singh, J. S., & Gopal, B. (Eds). Glimpses of Ecology. International Scientific publications: Jaipur.

59 Bandh. S. A., Kamili, A.N., Ganai, B. A., Saleem, S., Lone, B.A., & Nissa, H. (2012). First Qualitative Survey of filamentous fungi in Dal Lake, Kashmir. *Journal of Yeast and Fungal Research. 3* (1), 7-11.

Mollusca were recorded from the Bod-Dal Basin of Dal Lake by Malik and Ali (2012)[60].

Table 6.6- List of Filamentous Fungi Present in Dal Lake (2012)

Name of Fungi	Name of Fungi
1. Penicillium caseicolum Bain	2. Aspergillus fumigatus Fresenius
3. Penicillium commune Thom.	4. Aspergillus japonicas Saito Bain
5. Penicillium chrysogenum Thom	6. Aspergillus niger van Tieghem
7. Penicillium funiculosum Thom	8. Aspergillus terreus Thorn
9. Penicillium lilacinum Thom	10. Aspergillus versicolr gr.
11. Penicillium olivicolor Pitt	12. Aspergillus wenti gr
13. Penicillium dimorphosporum Swart	14. Aspergillus sp.
15. Penicillium SP.I	16. Rhizopus sp.
17. Penicillium SP.II	18. Acremonium sp.
19. Penicillium SP.III	20. Mucor sp.
21. Penicillium SP.IV	22. Fusarium sp.
23. Aspergillus Flavus Link Fr	

Source: Bandh, S.A., Kamili, A.N., Ganai, B.A., Saleem, S., Lone, B.A., and Nissa, H. (2012). First Qualitative Survey of filamentous fungi in Dal Lake, Kashmir. Journal of Yeast and Fungal Research.3(1):7-11

Some new plant species have found their way into the Dal Lake. Kudangar and colleagues (2003)[61] have reported Azolla pinnata and Eichornia crassipes as new additions to the biodiversity of Dal lake. Azolla Pinnata which was a rare species in the Dal Lake till recently, has become widespread within a very short period of time and is posing a threat to the other life forms especially the free floating plant species. About 18- genera and 27- species of potentially hazardous bacteria including those

60 Malik, A. Y., & Ali, M. (2012). Macrozobenthos in the Bod Dal Basin of Dal Lake Kashmir, J& K. India. *Jr. of Industrial Pollution Control, 28* (2),131-135.

61 Kundanagar, M. R. D., Chasoo, B., & Naqashi, A.R. (2003) Macrophytic Taxa and their present status in Dal lake Kashmir. *Journal of Hydrobiology, 20* (6),57-62.

causing typhoid and cholera have also been recorded from Dal waters. (Shah et. al., 2003)[62]

Table 6.7- List of Aquatic Foods Grown at Dal Lake

AQUATIC FOODS FROM DAL LAKE			
S.NO	**COMMON NAMES**	**KASHMIRI NAMES**	**BOTANICAL NAMES**
1	Lotus Root	Nadru	Nelumbo nucifera Gaertn
2	Duck Potato	Kanibabi	Sagittaria latifolia
3	Lotus Fruit	Pambach	Nelumbo nucifera
4	Water Nut	Gaer	Trapa natans
5	Knol Khol	Haak	Brassica oleracea
6	Cucumber	Laer	Cucumis sativus
7	Spinach	Palak	Spinacia oleracea
8	Carrot	Gazir	Daucus carota
9	Tomato	Ruwangun	Solanum lycopersicum
10	Radish	Mujj	Raphanus sativus
11	Brinjal	Wangun	Solanum melongena
12	Onion	Gande	Allium cepa
13	Cabbage	Bandgobi	Brassica oleracea
14	Cauliflower	Phoolgobi	Brassica oleracea
15	Pumpkin	Al	Cucurbita pepo

Source: Based on Field Survey by the Researcher, 2014-15

The various basins of Dal Lake depict a certain degree of variability in so for as the dominant species of flora and fauna are concerned. According to Trisal (1977)[63], Typha angustata and Phragmites communities are the chief occupants of littoral zone of Dal and Nageen and extended all along the eastern part of the southern side of the Hazratbal basin. In the Nishat basin and Nigeen basin, the emergents are scattered towards the shorelines and form large stands in the arms of the lake basin. Furthermore, floating leaf macrophytes (Aquatic plants) occupy 29.2 per cent of total

62 Shah, T. H., Ojha, S. N., Biradar, R. S., & Ali, S. (2003) Elevating fisheres of Dal Lake in Jammu and Kashmir. *Journal of the Indian fisheries Association, 30*, 173-182.

63 Trisal, C. L. (1977). Studies on Primary Production in some Kashmir Lakes. Ph.D. Thesis: University of Kashmir, Srinagar.

area of the lake. Free floating aquatic ones are distributed throughout the lake area in sheltered pockets and submerged aquatic species due to their aggressive capacity over the maximum area of around 57.6 per cent in all the basins of the lake.

Aquatic foods grown around the Dal include lotus roots, duck potatoes, lotus fruit, water nuts and fish. Lotus root is cylindrical in shape, about 10-12 inches long and over one and half inch in diameter. It is used both as vegetable and as pickle. There are a number of fish varieties found in Dal and the commercially important species include Cyprimus carpio specularis and Cyprimus carpio communis which comprise 60-70 per cent of the total catch. Both of these are exotic forms. The endemic ones are schizothorax niger, schizothorax esocinus, schizothorax micropogan and schizothorax plagiostomus. The food of commercially important species of fish is decaying organic matter, planktons and insects. As much as 65 per cent of the present day fish catches from the lake comprise of common carp. Whereas, the endemic schizothorax contribute only about 20 per cent (Shyam Sunder, 1995)[64].

Vegetables are mostly grown by Hanjis (Dal Dwellers) on the floating gardens which include cucumber, tomatoes, spinach, raddish, carrots, onion, brinjal, cauliflower, cabbage and pumpkin etc. (Fazal and Arshad, 2012)[65]

6.2 Socio Economic Conditions of Sampled Settlements on the Dal Lake

Dal Lake has been a center of Kashmiri civilization from historical times. It has attracted domestic as well as foreign tourists from times immemorial and has been praised in different periods of time by a number of historians, travelers, nature lovers and academicians like Captain Bates, Sir Walter Lawrence and Young Husband etc. besides a plethora of intellectuals from Valley as well as from the different corners of the Nation.

This world famous lake acts as a lifeline of Srinagar city as it provides livelihood to a large population living in and around its periphery. It is also utilized as an important source of food and water for irrigation, maintenance of biodiversity, water supply and recreational purposes and so on.

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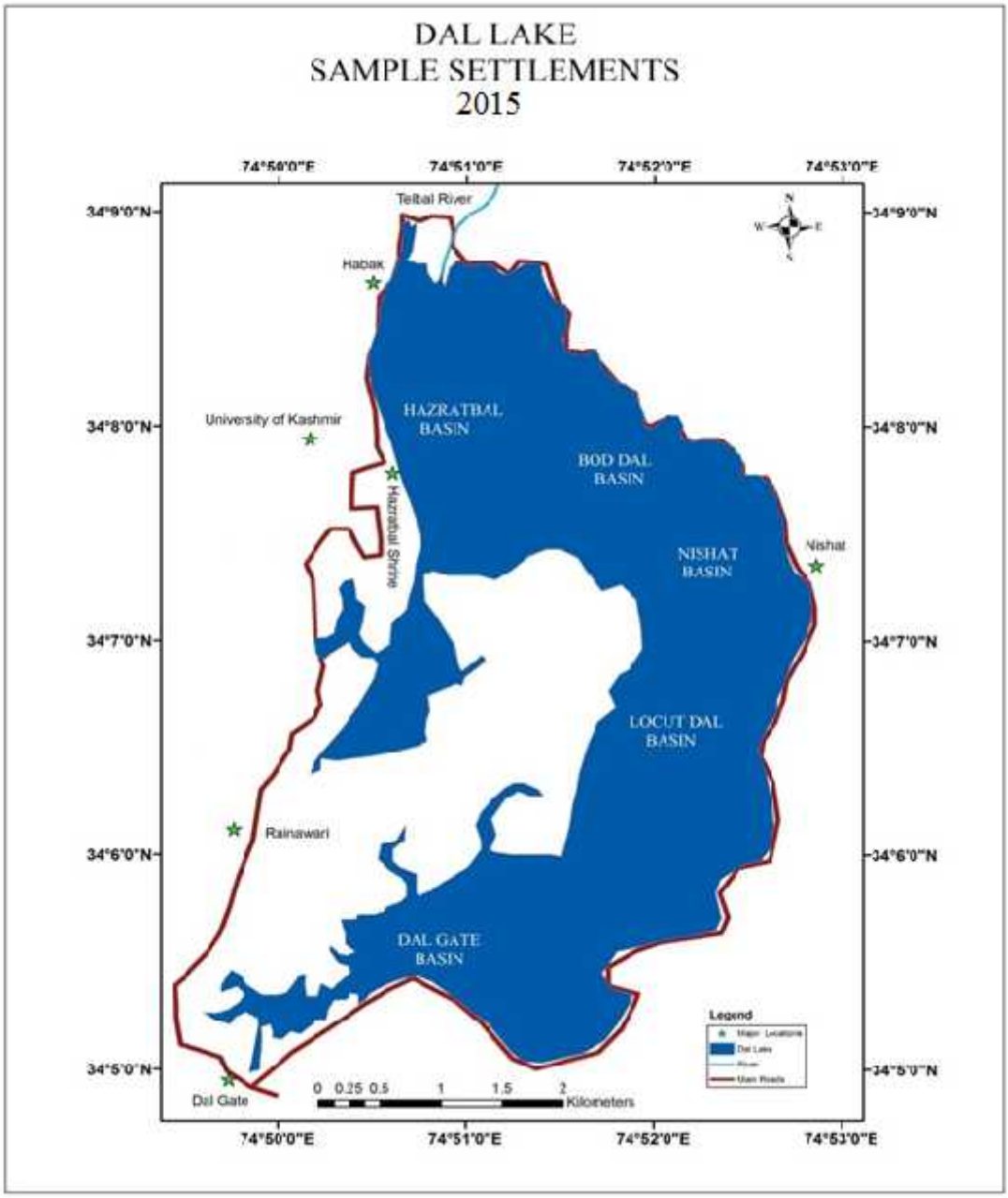
64 Shyam, S. (1995). Some Conservation and Management Strategies for Dal Lake fisheries. *Punjab fish. Bull., 19*, 53-63.

65 Fazal, S., & Amin, A. (2012). Hanjis activities and its Impact on Dal Lake and its Environs: A Case Study of Srinagar City, India. *Journal of Environmental and Earth Sciences,* 4(5), 511-524.

The Valley of Kashmir comprises about 15.63 per cent of area and 52.70 per cent of the total population of Jammu & Kashmir State with 68 per cent rural and 32 per cent urban population. The total number of households in Kashmir Valley is 9,80,278 which comprises 6,66,812 (68.02 per cent) rural and 3,13,466 (31.98 per cent) urban households. (Census of India,2011). Most of the settlements of the Valley are concentrated in and around the Jhelum Basin. Around 7.50 per cent of the total population and 7.70 per cent of the total households of Srinagar district are concentrated in and around Dal Lake alone. There are two main urban centers and 15 villages in Srinagar district. The main Dal Lake is comprised of only 2 wards- Bud Dal (ward No. 58) and Locut (Dal (ward No. 59) which account for 35.89 per cent of the total population residing around Dal Lake. Besides, Dal Lake is also surrounded by Hazratbal, Dal Gate and Nishat wards which constitute 64.11 per cent of its surrounding population. All the five wards located in and around Dal Lake comprise 1.40 per cent of the total population of Kashmir Valley.

Most of the population of Kashmir Valley belongs to General category and only 0.09 per cent of them are Scheduled Castes and 6.82 per cent are Scheduled Tribes. The district of Srinagar comprises of 0.08 per cent of Scheduled caste and 0.72 per cent of Scheduled tribe population. Around 60.52 per cent of the total population of Srinagar district is literate and this district comprises around 19.13 per cent working population of the Kashmir Valley.



Source: Prepared by the Researcher

Figure 6.4

Table 6.8- Selection of Settlements and Households on the Basis of their Location and Dependency on Dal Lake (2015)

	SELECTED SETTLEMENTS						SAMPLED SETTLEMENTS				
District	**Name**	**Total No of House holds**	**Total Popul ation**	**Average House hold Size**	**Total Workers**	**Percentage of workers to the Total population**	**Households (Number)**	**Population (Number)**	**Average House Hold Size**	**Workers (Number)**	**Percentage of workers To the Sampled population**
Srinagar	**Nishat Basin**	3208	23,325	7.27	8,996	38.57	160	1167	7.29	467	40.01
	Dalgate Basin	2724	17,185	6.30	5,896	34.30	136	857	6.30	309	36.05
	Hazratbal Basin	3191	18,942	5.93	5,861	30.94	159	946	5.94	293	30.97
	Bud Dal Basin	2277	13,290	5.83	4,776	35.93	114	665	5.83	253	38.04
	Locut Dal Basin	3375	19,998	5.92	6,598	32.99	168	998	5.94	349	34.96
	Total	**14,775**	**92,740**	**6.27**	**32,127**	**34.64**	**737**	**4,633**	**6.28**	**1,671**	**36.06**

Source: 1. Census of India (2011), Directorate of Census Operations, Srinagar, Jammu & Kashmir.
2. Based on Field Survey by the Researcher, 2014-15

6.2.1 General Characteristics of the Sampled Settlements

Dal Lake is an urban lake and surrounded by a population of around 1 lakh. Thus for the sake of convenience only 5 per cent of the total households located around it have been taken as sample size and five settlement sites have been selected for this purpose from all the possible sides of Dal (Fig. 6.4). All the five sampled settlement sites namely Hazratbal Basin, Dal Gate Basin, Nishat Basin, Bud Dal Basin and Locut Dal Basin lie in the Srinagar district.

Table 6.8 shows the selection of settlements and households on the basis of their location and dependency on the Dal Lake. A perusal of this table shows that 36.06 per cent of the total sampled population comprises of workers. Nishat Basin constitutes the highest (40.01 per cent) workers followed by Bud Dal Basin (38.04 per cent), Dal Gate Basin (36.05 per cent) and Locut Dal Basin (34.96 per cent). The lowest percentage of workers (30.97 per cent) is contributed by Hazratbal Basin.

The Bouleward Road encircles the Dal Lake along its periphery from south to north starting at Dal Gate and passing through Nishat and joins another road that leads to Ganderbal district in the north of Dal near Habak. On its western periphery, Dal Lake is encircled by another road that passes through Khanyar and Rainawari and merges with another road leading towards Soura near University of Kashmir Campus in Hazratbal.

Dal Gate Basin located on the southern flank of the Dal Lake near its outlet is only 3 kilometers away from the main city center of Srinagar (Lal Chowk).. Whereas, Hazratbal Basin located on the western side of Dal is around 9.1 kilometers and Nishat Basin located on the eastern side of the Dal is around 13 kilometers from the city center.

Locut Dal Basin with highest number of sampled households (168) comprises a population of 998 (50.50 per cent males and 49.20 per cent females), followed by Nishat Basin with 160 Households and a population size of 1167 (50.47 per cent males and 49.53 per cent females), Hazratbal Basin with 159 households and population size of 946 (51.13 per cent males and 48.87 per cent females). This is followed by Dal Gate Basin with 136 sampled households and a population size of 857 (52.51 per cent males and 47.49 per cent females). The lowest number of sampled households (114) was at Bud Dal Basin with its population size of 665 comprising 51.13 per cent males and 48.87 per cent females). The total sampled population comprises of 4,633 people with 737 households and the average household size of 6.28 members per sampled house.

6.2.2 Socio Economic Conditions

The profile of the sampled respondents from the five selected settlement basins located and dependent upon Dal Lake is presented in table 6.8. A perusal of table 6.9 which represents the age and sex structure of sampled respondents shows that of the total sampled population of 4,663 people, nearly 51.15 per cent are males and 48.85 per cent are females. The dominance of male population was observed in all the five basins with Nishat Basin comprising 50.47 per cent followed by Dal Gate Basin Basin (52.51 per cent), Hazratbal Basin (51.16 per cent), Bud Dal Basin (51.13 per cent) and Locut Dal Basin (50.80 per cent). The sampled population was further divided into three categories on the basis of age structure i.e. < 30 years, 30- 60 years and >60 years. It was observed that nearly 40.30 per cent of the sampled population was in <30 years of age. The population between 30-60 years constituted 53.70 per cent and the age group Above 60 years constituted only 6 per cent of the total sampled respondents.

The educational structure and the levels of education of the respondents have been shown in table 6.10(A) and 6.10(B). A perusal of these tables show that out of the total sampled population, 33.93 per cent were educated and 66.07 per cent were uneducated. In all the five sampled sites, the highest educated population was observed in Nishat Basin (37.01 per cent) followed by Hazratbal Basin (36.04 per cent), Dal Gate Basin (35 per cent), Bud Dal Basin (30.07 per cent) and Locut Dal Basin (29.96 per cent). Field survey revealed that around half (54.77 per cent) of the total educated people were having primary level of education and nearly 23.47 per cent were educated up to secondary level followed by 11.51 per cent of under graduates and 8.02 per cent of graduates. Only 2.23 per cent of the educated respondents were post graduates.

The housing types of the sampled respondents are given in table 6.11(A). A perusal of this table shows that around 66.48 per cent of the sampled households were of Kutcha type. While 27.55 per cent constituted Pucca Houses and 5.97 per cent were residing in houseboats or donga boats. Kutcha houses were found in all the five settlement sites with 36.31 per cent in Locut Dal Basin, 23.21 per cent in Bud Dal Basin, 24.37 per cent in Nishat Basin, 23.27 per cent in Hazratbal Basin and 19.85 per cent in Dal Gate Basin. Similarly, Houseboats or doonga Boats were also found in all the five basins as 11.77 per cent in Dal Gate Basin, 9.43 per cent in Hazratbal Basin, 3.51 per cent in Bud Dal Basin and 1.88 per cent in Nishat Basin. The houseboat tariff has a close relationship with their location as well as their numbers.

Table 6.9- Distribution of Respondents (in Percentage) According to Age and Sex Structure

Age Group	Gender	Nishat Basin	Dalgate Basin	Hazratbal Basin	Bud Dal Basin	Locut Dal Basin	Total Population
Below 30	Male	51.04	52.78	50.14	51.74	51.92	51.47
	Female	48.96	47.22	49.86	48.26	48.08	48.53
	Total	40.96	42.00	40.07	38.94	39.18	40.30
30-60	Male	50.16	52.63	51.86	50.93	50.09	51.04
	Female	49.84	47.37	48.14	49.07	49.90	48.96
	Total	52.96	51.00	54.01	56.09	55.01	53.70
Above 60	Male	49.30	50.00	51.79	48.48	50.00	50.00
	Female	50.70	50.00	48.21	51.52	50.00	50.00
	Total	6.08	7.00	5.92	4.97	5.81	6.00
Total Males		50.47	52.51	51.16	51.13	50.80	51.15
Total Females		49.53	47.49	48.84	48.87	49.20	48.85
Grand Total		**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher,2014-15

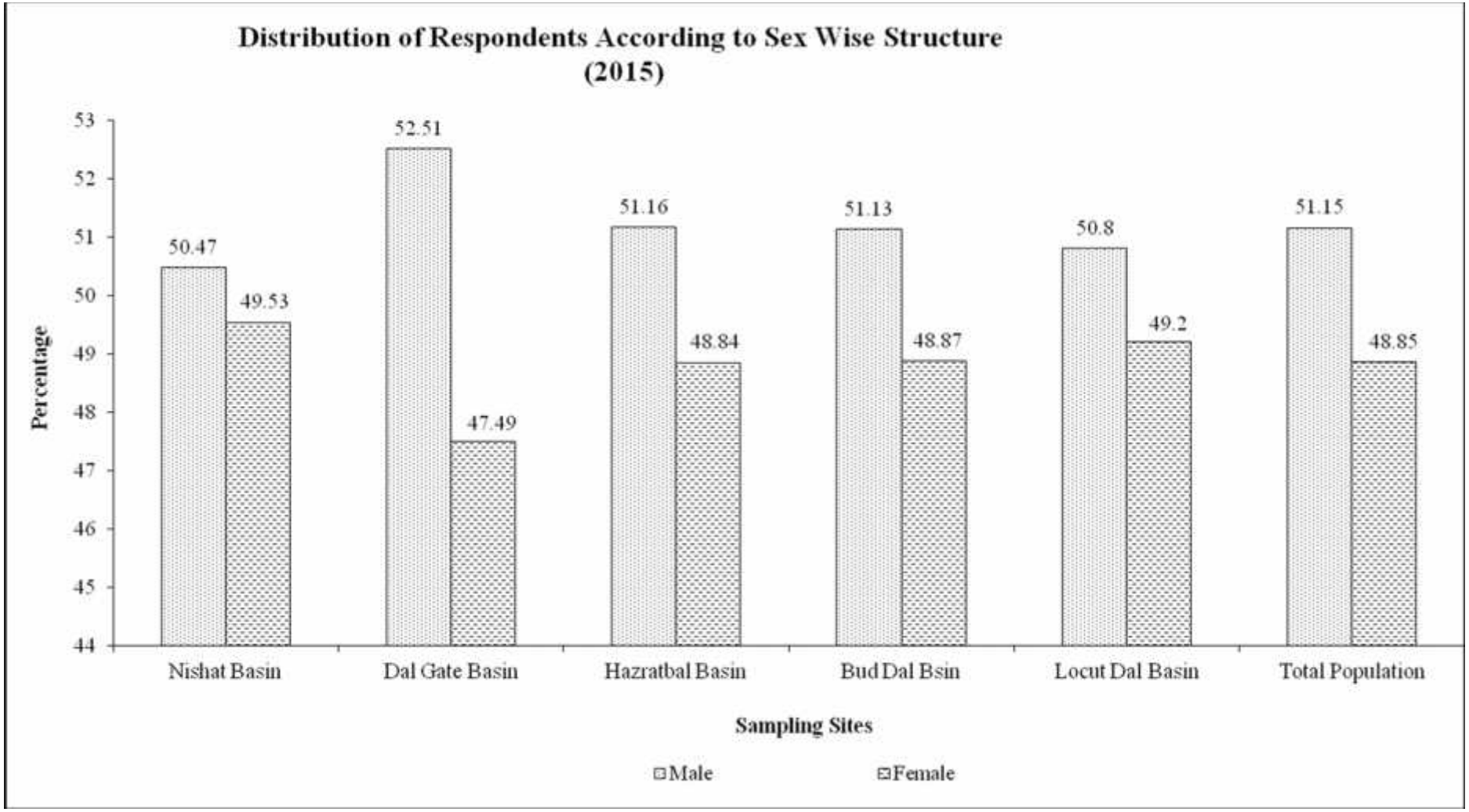

Distribution of Respondents According to Sex Wise Structure
(2015)
Percentage
53
52
51
50
49
48
47
46
45
44
50.47
49.53
52.51
47.49
51.16
48.84
51.13
48.87
50.8
49.2
51.15
48.85
Nishat Basin
Dal Gate Basin
Hazratbal Basin
Bud Dal Bsin
Locut Dal Basin
Total Population
Sampling Sites
Male
Female

Figure 6.5

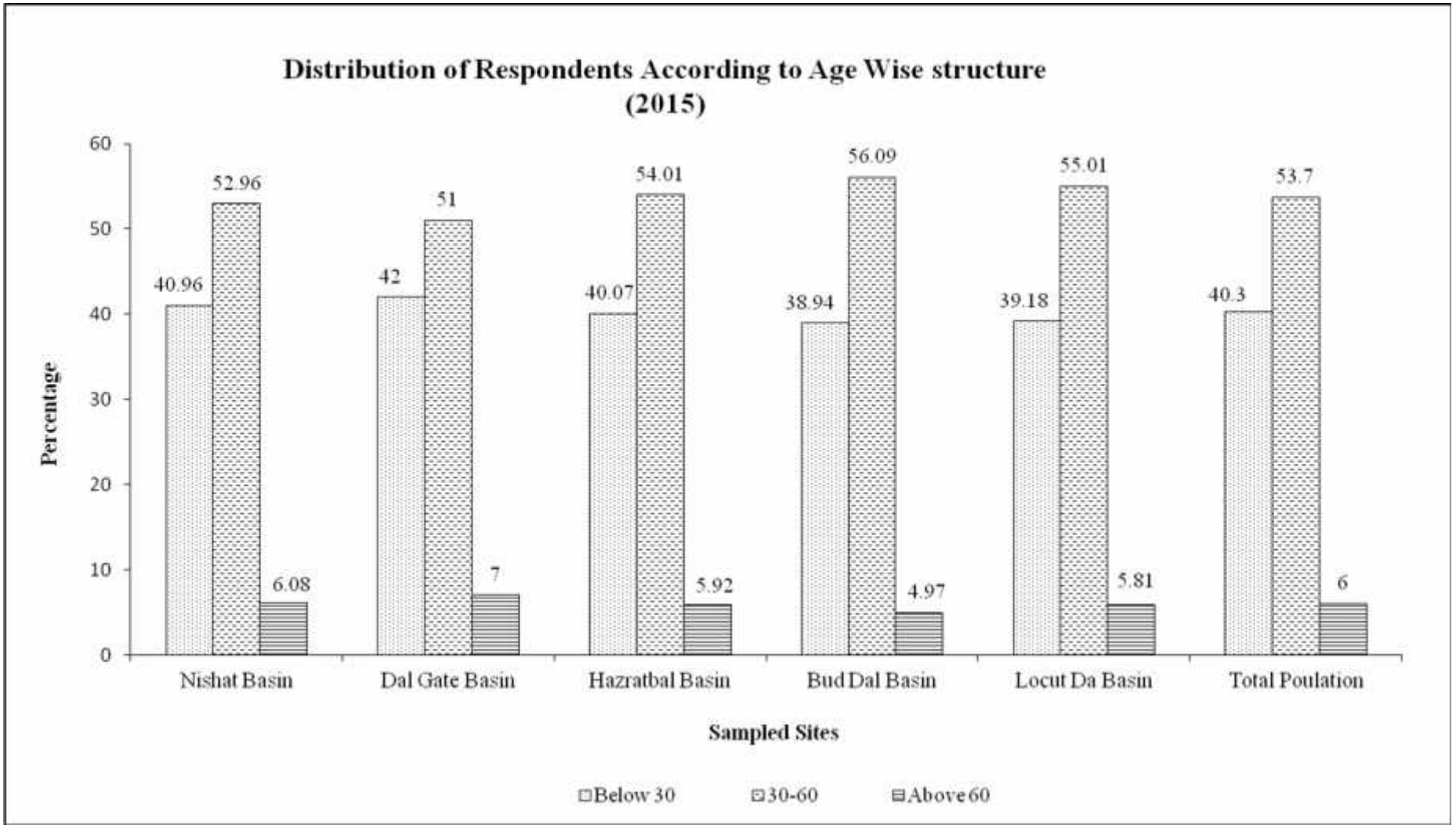

Distribution of Respondents According to Age Wise structure (2015)
Percentage
60
50
40
30
20
10
0
40.96
52.96
6.08
42
51
7
40.07
54.01
5.92
38.94
56.09
4.97
39.18
55.01
5.81
40.3
53.7
6
Nishat Basin
Dal Gate Basin
Hazratbal Basin
Bud Dal Basin
Locut Da Basin
Total Poulation
Sampled Sites
Below 30
30-60
Above 60

Figure 6.6

Table 6.10 (A) - Distribution of Respondents (in Percentage) According to Educational Structure

Educational Structure	Nishat Basin	Dalgate Basin	Hazratbal Basin	Bud Dal Basin	Locut Dal Basin	Total Population
Uneducated	62.99	65.00	63.96	69.93	70.04	66.07
Educated	37.01	35.00	36.04	30.07	29.96	33.93
Total	**100**	**100**	**100**	**100**	**100**	**100**

Table 6.10 (B) - Distribution of Respondents (in Percentage) According to Levels of Education

Levels of Education	Nishat Basin	Dalgate Basin	Hazratbal Basin	Bud Dal Basin	Locut Dal Basin	Total Population
Primary	56.02	54.00	56.01	52.00	54.18	54.77
Secondary	16.90	24.00	17.89	32.00	33.12	23.47
Under Graduate	14.12	11.00	14.07	9.00	7.02	11.51
Graduate	10.18	9.00	9.09	6.00	4.01	8.02
Post Graduate	2.78	2.00	2.94	1.00	1.67	2.23
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher,2014-15

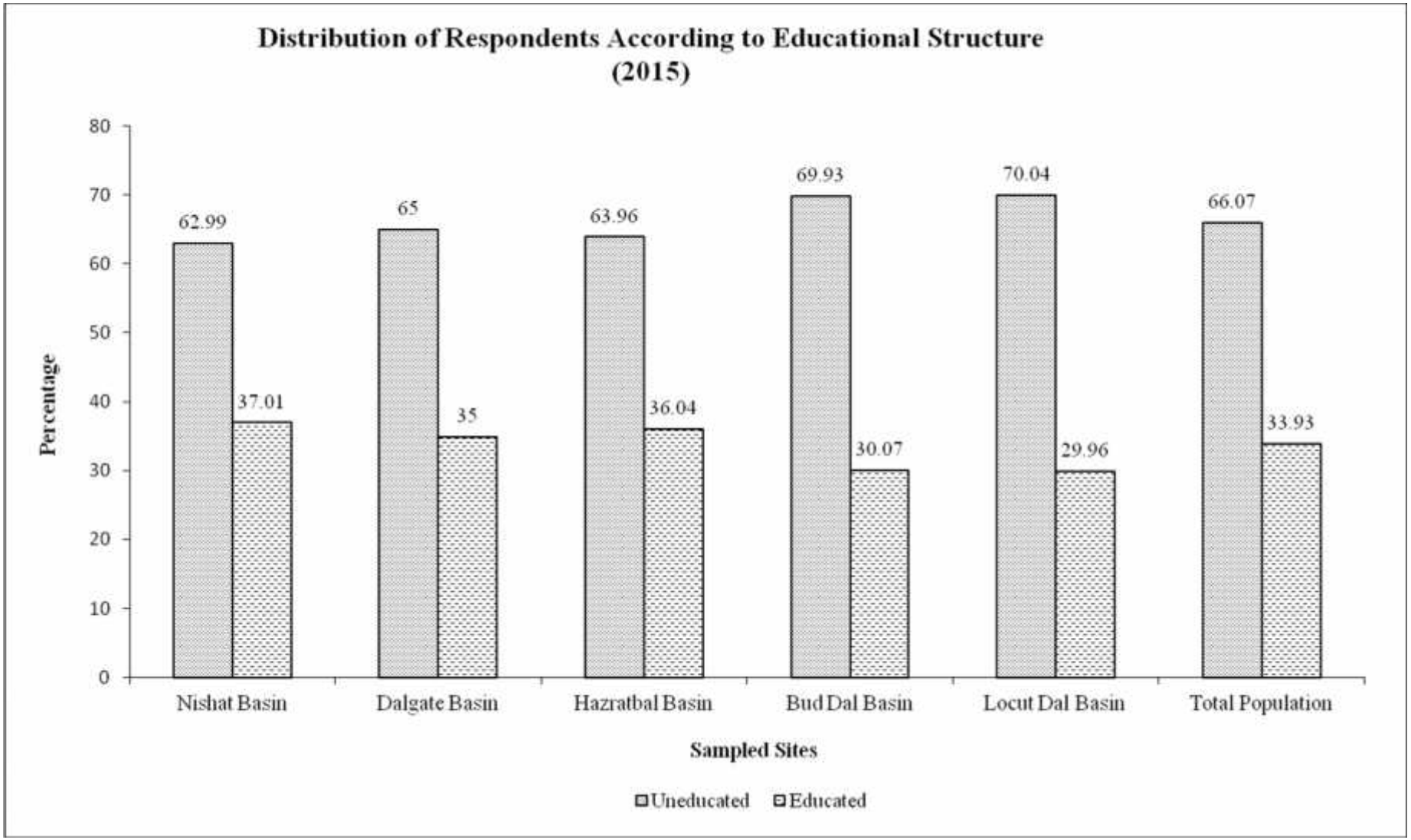

Distribution of Respondents According to Educational Structure
(2015)
Percentage
80
70
60
50
40
30
20
10
0
62.99
37.01
65
35
63.96
36.04
69.93
30.07
70.04
29.96
66.07
33.93
Nishat Basin
Dalgate Basin
Hazratbal Basin
Bud Dal Basin
Locut Dal Basin
Total Population
Sampled Sites
Uneducated
Educated

Figure 6.7

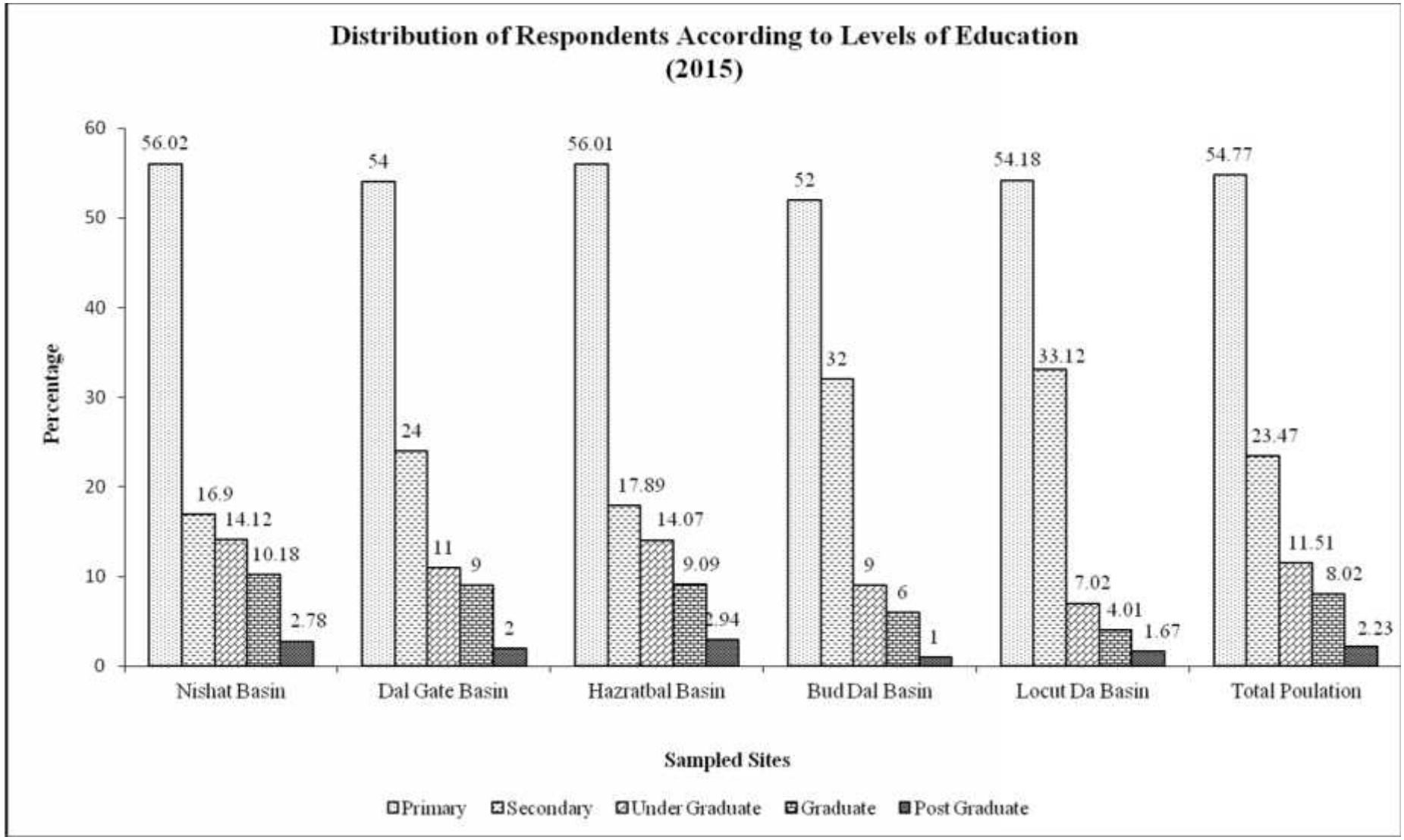

Distribution of Respondents According to Levels of Education
(2015)
Percentage
60
50
40
30
20
10
0
56.02
16.9
14.12
10.18
2.78
54
24
11
9
2
56.01
17.89
14.07
9.09
2.94
52
32
9
6
1
54.18
33.12
7.02
4.01
1.67
54.77
23.47
11.51
8.02
2.23
Nishat Basin
Dal Gate Basin
Hazratbal Basin
Bud Dal Basin
Locut Da Basin
Total Poulation
Sampled Sites
Primary
Secondary
Under Graduate
Graduate
Post Graduate

Figure 6.8

Table 6.11 (A) - Distribution of Households (in Percentage) According to Type of House

Type of House	Nishat Basin	Dalgate Basin	Hazratbal Basin	Bud Dal Basin	Locut Dal Basin	Total Population
Pucca	73.75	68.38	67.30	62.28	60.11	66.48
Kutcha	24.37	19.85	23.27	34.21	36.31	27.55
House Boats/ Doonga Boats	1.88	11.77	9.43	3.51	3.58	5.97
Total	**100**	**100**	**100**	**100**	**100**	**100**

Table 6.11 (B) - Distribution of Households (in Percentage) according to Source of Drinking Water

Source of Drinking Water	Nishat Basin	Dalgate Basin	Hazratbal Basin	Bud Dal Basin	Locut Dal Basin	Total Population
Lake Water	46.87	50.74	47.80	64.91	63.69	54.42
Municipality Water/P.H.E*	51.25	47.05	50.31	34.21	35.71	44.09
Hand Pump Water	1.88	2.21	1.89	0.88	0.60	1.49
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher,2014-15

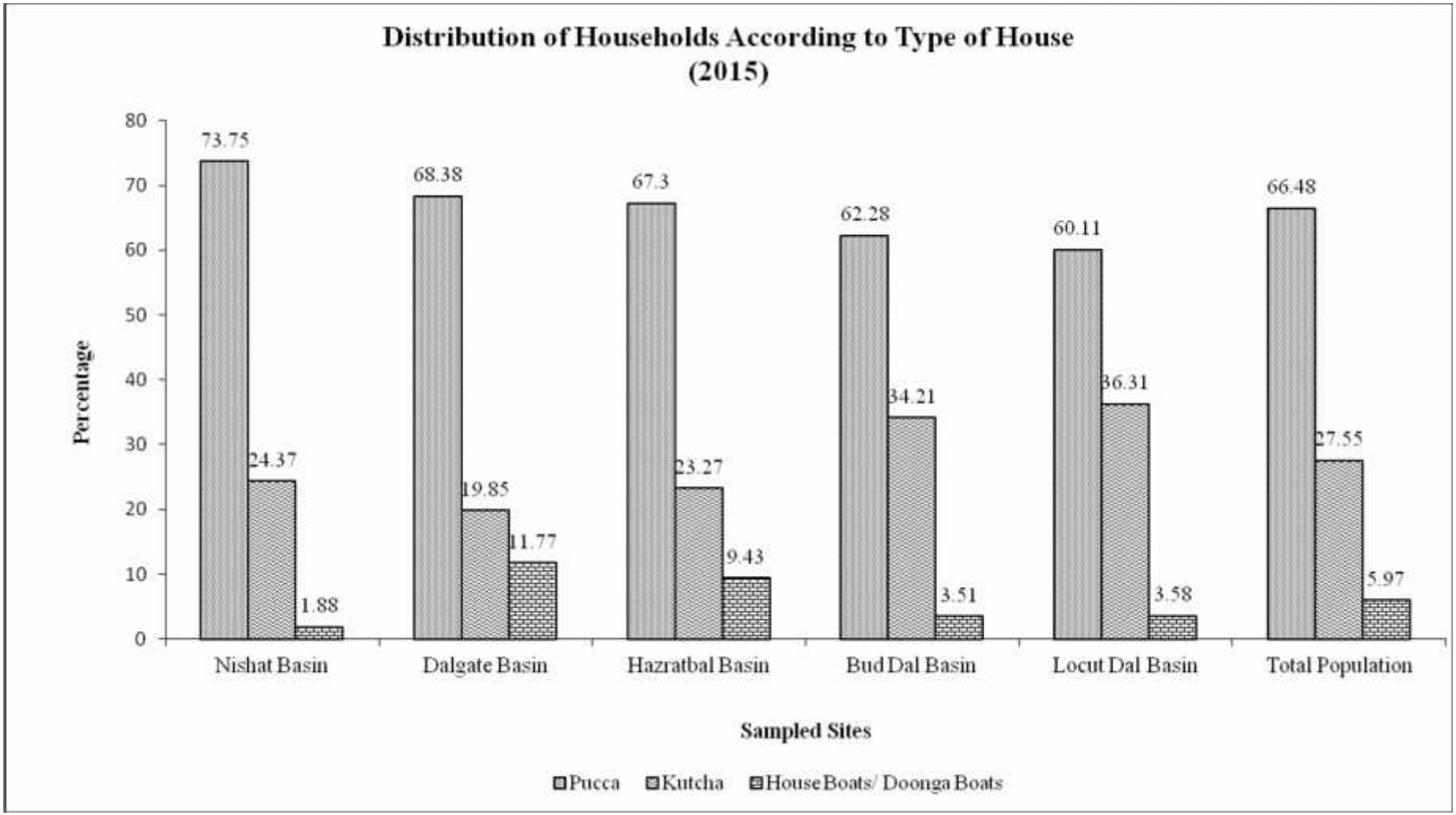

Distribution of Households According to Type of House
(2015)
Percentage
80
70
60
50
40
30
20
10
0
73.75
24.37
1.88
68.38
19.85
11.77
67.3
23.27
9.43
62.28
34.21
3.51
60.11
36.31
3.58
66.48
27.55
5.97
Nishat Basin
Dalgate Basin
Hazratbal Basin
Bud Dal Basin
Locut Dal Basin
Total Population
Sampled Sites
Pucca
Kutcha
House Boats/ Doonga Boats

Figure 6.9

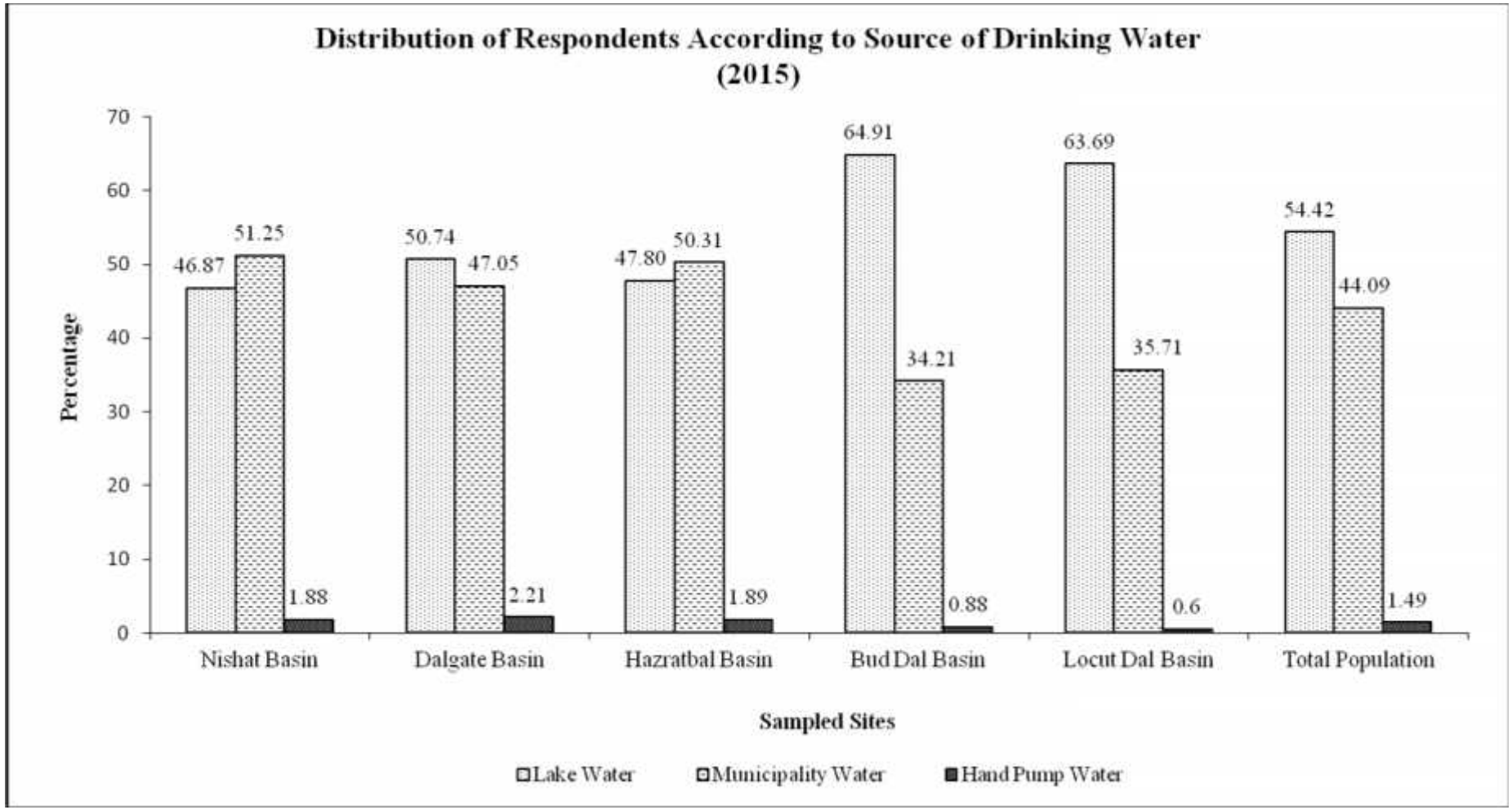

Distribution of Respondents According to Source of Drinking Water (2015)
Percentage
70
60
50
40
30
20
10
0
46.87
51.25
1.88
50.74
47.05
2.21
47.80
50.31
1.89
64.91
34.21
0.88
63.69
35.71
0.6
54.42
44.09
1.49
Nishat Basin
Dalgate Basin
Hazratbal Basin
Bud Dal Basin
Locut Dal Basin
Total Population
Sampled Sites
Lake Water
Municipality Water
Hand Pump Water

Figure 6.10

Table 6.11 (C) - Distribution of Households (in Percentage) According to Disposal of Solid Waste

Solid Waste Disposal	Nishat Basin	Dalgate Basin	Hazratbal Basin	Bud Dal Basin	Locut Dal Basin	Total Population
Lake	30.00	39.71	30.19	80.70	81.55	51.43
NGO Bins	56.25	49.26	54.08	3.51	2.98	34.19
Burning	7.50	5.14	6.92	10.53	9.52	7.87
Municipality Bins	5.00	3.68	5.03	2.63	2.38	3.80
Others*	1.25	2.21	3.78	2.63	3.57	2.71
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher,2014-15

Table 6.11 (D) - Distribution of Households (in Percentage) According to Disposal of Toilet Waste

Toilet Waste Disposal	Nishat Basin	Dalgate Basin	Hazratbal Basin	Bud Dal Basin	Locut Dal Basin	Total Population
Lake	83.12	84.56	86.16	85.08	83.93	84.53
Used as Manure	14.38	13.23	11.95	14.04	15.47	13.84
Septic Tank	2.50	2.21	1.89	0.88	0.60	1.63
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher,2014-15

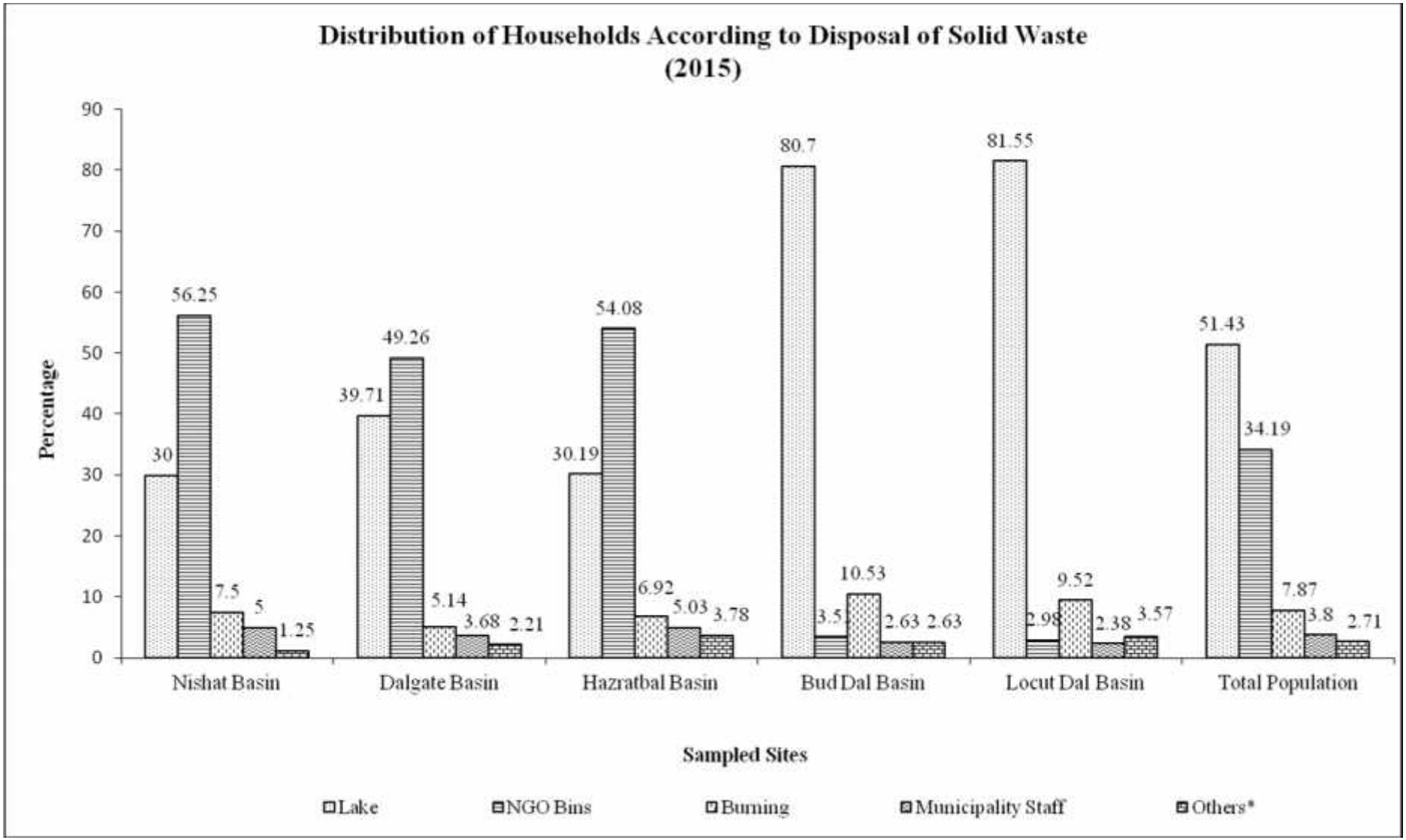

Distribution of Households According to Disposal of Solid Waste
(2015)
Percentage
90
80
70
60
50
40
30
20
10
0
30
56.25
7.5
5
1.25
39.71
49.26
5.14
3.68
2.21
30.19
54.08
6.92
5.03
3.78
80.7
3.5
10.53
2.63
2.63
81.55
2.98
9.52
2.38
3.57
51.43
34.19
7.87
3.8
2.71
Nishat Basin
Dalgate Basin
Hazratbal Basin
Bud Dal Basin
Locut Dal Basin
Total Population
Sampled Sites
Lake
NGO Bins
Burning
Municipality Staff
Others*

Figure 6.11

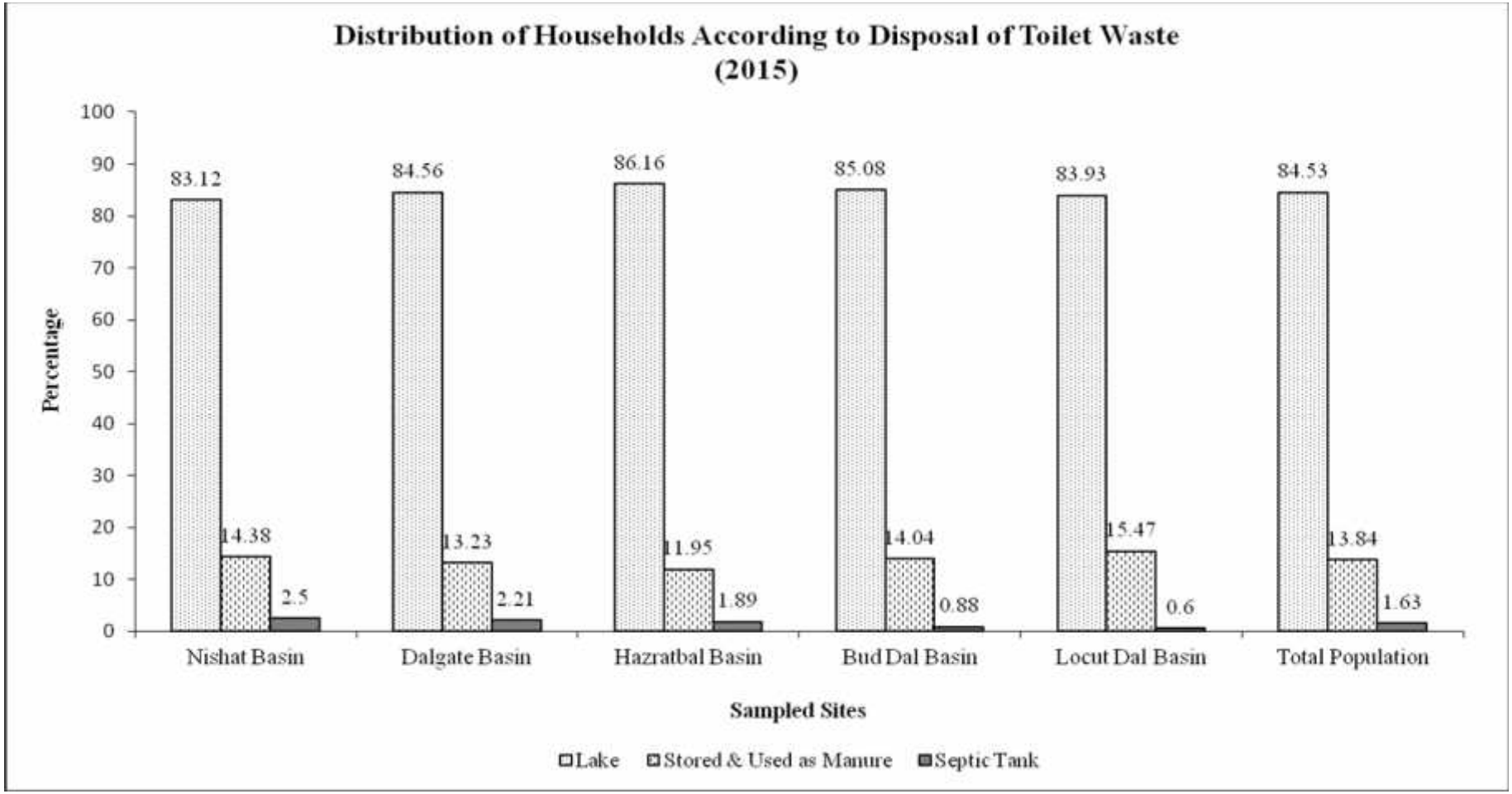

Distribution of Households According to Disposal of Toilet Waste
(2015)
Percentage
100
90
80
70
60
50
40
30
20
10
0
83.12
14.38
2.5
84.56
13.23
2.21
86.16
11.95
1.89
85.08
14.04
0.88
83.93
15.47
0.6
84.53
13.84
1.63
Nishat Basin
Dalgate Basin
Hazratbal Basin
Bud Dal Basin
Locut Dal Basin
Total Population
Sampled Sites
Lake
Stored & Used as Manure
Septic Tank

Figure 6.12

A perusal of table 6.11(B) shows the water supply conditions of the sampled settlements. Nearly 54.42 per cent of the households depend on the lake water for drinking (64.91 per cent in Bud Dal Basin, 63.69 per cent in Locut Dal Basin, 50.74 per cent in Dal Gate Basin, 47.80 per cent in Hazratbal Basin, 50.74 per cent in Dalgate Basin and 46.87 per cent in Nishat Basin). While 44.09 per cent used municipality water (51.25 per cent in Nishat Basin, 50.31 per cent in Hazratbal Basin, 47.05 per cent in Dalgate Basin, 35.71 per cent in Locut dal Basin and 34.21 per cent in Bud Dal Basin) and 1.49 per cent used water from Hand pumps. Around 92.21 per cent in Dalgate Basin, 1.89 per cent in Hazratbal Basin, 1.88 per cent in Nishat Basin, 0.88 per cent in Bud Dal Basin and 0.60 per cent in Locut Dal Basin) for drinking purposes.

Table 6.11 (C) shows the distribution of households according to solid waste disposal. A perusal of this table shows that almost 51.43 per cent of the sampled households dispose their solid waste directly or indirectly into the lake with Locut Dal Basin disposing around 81.55 per cent of solid waste followed by Bud Dal Basin with 80.70 per cent, Dal Gate Basin with 39.71 per cent, Hazratbal Basin with 30.19 per cent and Nishat Basin with 30 per cent. This is a highly significant indicator of their poverty. It also speaks of the non-availability of any civic amenities of even their solid waste disposal. Hence these people are the most deprived and live a highly rudimentary life. A sign of utter backwardness to which they can scarcely be held responsible. It is a stark sign of municipal neglect and apathy. Dal lake is nobody’s baby. Similarly, 34.19 per cent of the sampled households used NGO bins for the disposal of their solid waste with 56.25 per cent of Nishat Basin, 54.08 per cent of Hazratbal Basin, 49.26 per cent of Dal Gate Basin, 3.51 per cent of Bud Dal Basin and 2.98 per cent of Locut Dal Basin. Municipality staff collects about 3.80 per cent of the solid waste of these households (5.03 per cent from Hazratbal Basin, 5 per cent from Nishat Basin, 2.63 per cent from Bud Dal Basin and 2.38 per cent from Locut Dal Basin). Likewise, 2.71 per cent of the sampled households used other means of disposing their solid waste like backyard dumping, roadside dumping and street dumping etc.

A perusal of table 6.11(D) shows the distribution of households according to the distribution of toilet waste wherein it is clearly observed that 84.53 per cent of the sampled households dispose their toilet waste into the Dal Lake. The highest amount of toilet waste is disposed from Hazratbal Basin (86.16 per cent) which is followed by

Bud Dal Basin (85.08 per cent), Dal Gate Basin (84.56 per cent), Locut Dal Basin (83.93 per cent) and Nishat Basin (83.12 per cent). On the other hand, a meagre 13.84 per cent of toilet waste was stored and used as manure in the fields and vegetable gardens. (15.47 per cent by Locut Dal Basin, 14.38 per cent by Nishat Basin, 14.04 per cent by Bud Dal Basin, 13.23 per cent by Dal Gate Basin and 11.95 per cent by Hazratbal Basin). Moreover, the households disposing their toilet waste in septic tanks comprised only around 1.63 per cent with 2.50 per cent in Nishat Basin, 2.21 per cent in Dal Gate Basin, 1.89 per cent in Hazratbal Basin, 0.88 per cent in Bud Dal Basin and 0.60 per cent in Locut Dal Basin.

Table 6.12 shows the occupational structure of sampled respondents. A perusal of this table shows that almost 1/3rd i.e. 32.01 per cent of the respondents were engaged with House boats or Shikara boats with 41.98 per cent in Hazratbal Basin, 40.13 per cent in Dal Gate Basin, 30.09 per cent in Locut Dal Basin, 28.06 per cent in Bud Dal Basin and 23.98 per cent in Nishat Basin). Similarly, the sampled respondents engaged in cultivation comprised 28.25 per cent with 32.95 per cent in Locut Dal Basin, 32.02 per cent in Bud Dal Basin, 28.05 per cent in Nishat Basin, 26.86 per cent in Dal Gate Basin and 21.16 per cent in Hazratbal Basin and those respondents whose occupation was Arts and Crafts comprised around 26.09 per cent (31.91 per cent in Nishat Basin, 28.85 per cent in Bud Dal Basin, 26.07 per cent in Locut Dal Basin, 20.82 per cent in Hazratbal Basin and 20.06 per cent in Dal Gate Basin). The sampled respondents engaged in Business and Trade constituted around 7.66 (10.06 per cent in Nishat Basin, 8.87 per cent in Hazratbal Basin, 8.09 per cent in Dal Gate Basin, 5.14 per cent in Bud Dal Basin and 4.87 per cent in Locut Dal Basin). Similarly, fishing and fish marketing comprised the occupation of around 3.53 per cent of sampled respondents with 4.30 per cent in Locut Dal Basin, 4.10 per cent in Bud Dal Basin, 2.19 per cent in Dal Gate Basin and 2.78 per cent in Nishat Basin. Government employees comprised only 2.46 per cent of the sampled population. (3.22 per cent of Nishat Basin, 3.07 per cent of Hazratbal Basin, 1.98 per cent of Bud Dal Basin, 1.95 per cent of Dal Gate Basin and 1.72 per cent of Locut Dal Basin).

Table 6.12 - Distribution of Respondents (in Percentage) According to Occupational Structure

Occupation	Nishat Basin	Dalgate Basin	Hazratbal Basin	Bud Dal Basin	Locut Dal Basin	Total Population
House Boats/ Shikara Owners	23.98	40.13	41.98	28.06	30.09	32.01
Cultivation	28.05	26.86	21.16	32.02	32.95	28.25
Arts & crafts	31.91	20.06	20.82	28.85	26.07	26.09
Business & Trade	10.06	8.09	8.87	5.14	4.87	7.66
Fishing/ Fish marketing	2.78	2.91	4.10	3.95	4.30	3.53
Govt. Employees	3.22	1.95	3.07	1.98	1.72	2.46
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher,2014-15

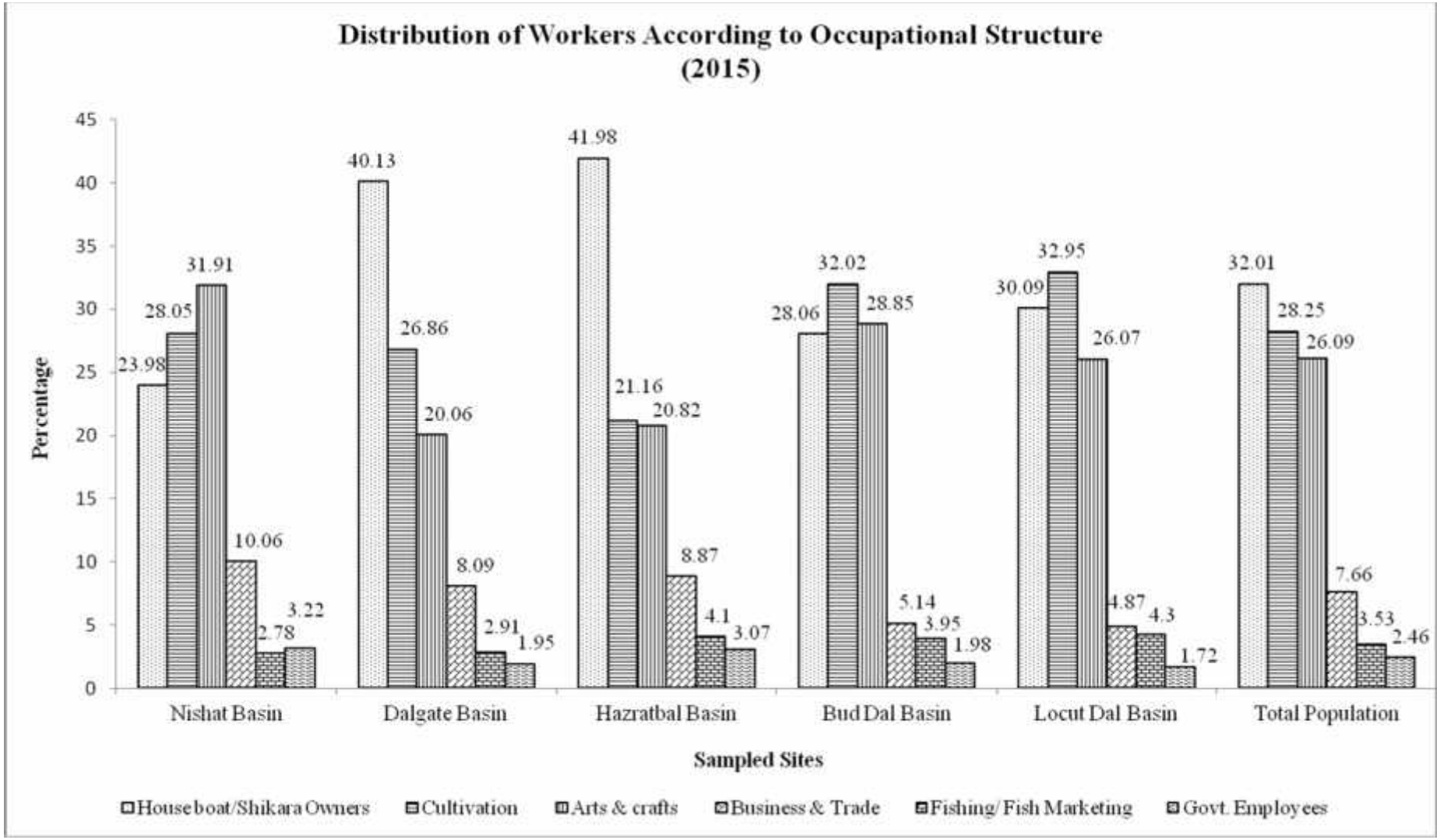

Distribution of Workers According to Occupational Structure
(2015)
Percentage
45
40
35
30
25
20
15
10
5
0
23.98
28.05
31.91
10.06
2.78
3.22
40.13
26.86
20.06
8.09
2.91
1.95
41.98
21.16
20.82
8.87
4.1
3.07
28.06
32.02
28.85
5.14
3.95
1.98
30.09
32.95
26.07
4.87
4.3
1.72
32.01
28.25
26.09
7.66
3.53
2.46
Nishat Basin
Dalgate Basin
Hazratbal Basin
Bud Dal Basin
Locut Dal Basin
Total Population
Sampled Sites
House boat/Shikara Owners
Cultivation
Arts & crafts
Business & Trade
Fishing/ Fish Marketing
Govt. Employees

Figure 6.13

Table 6.13 - Distribution of Households (in Percentage) According to Average Monthly Income Structure

Average Monthly Income (Rupees)	Nishat Basin	Dalgate Basin	Hazratbal Basin	Bud Dal Basin	Locut Dal Basin	Total Population
Below 3000	48.12	50.00	49.05	54.39	55.36	51.29
3000-6000	30.00	33.08	32.08	35.96	33.93	32.84
Above 6000	21.88	16.92	18.87	9.65	10.71	15.87
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher,2014-15

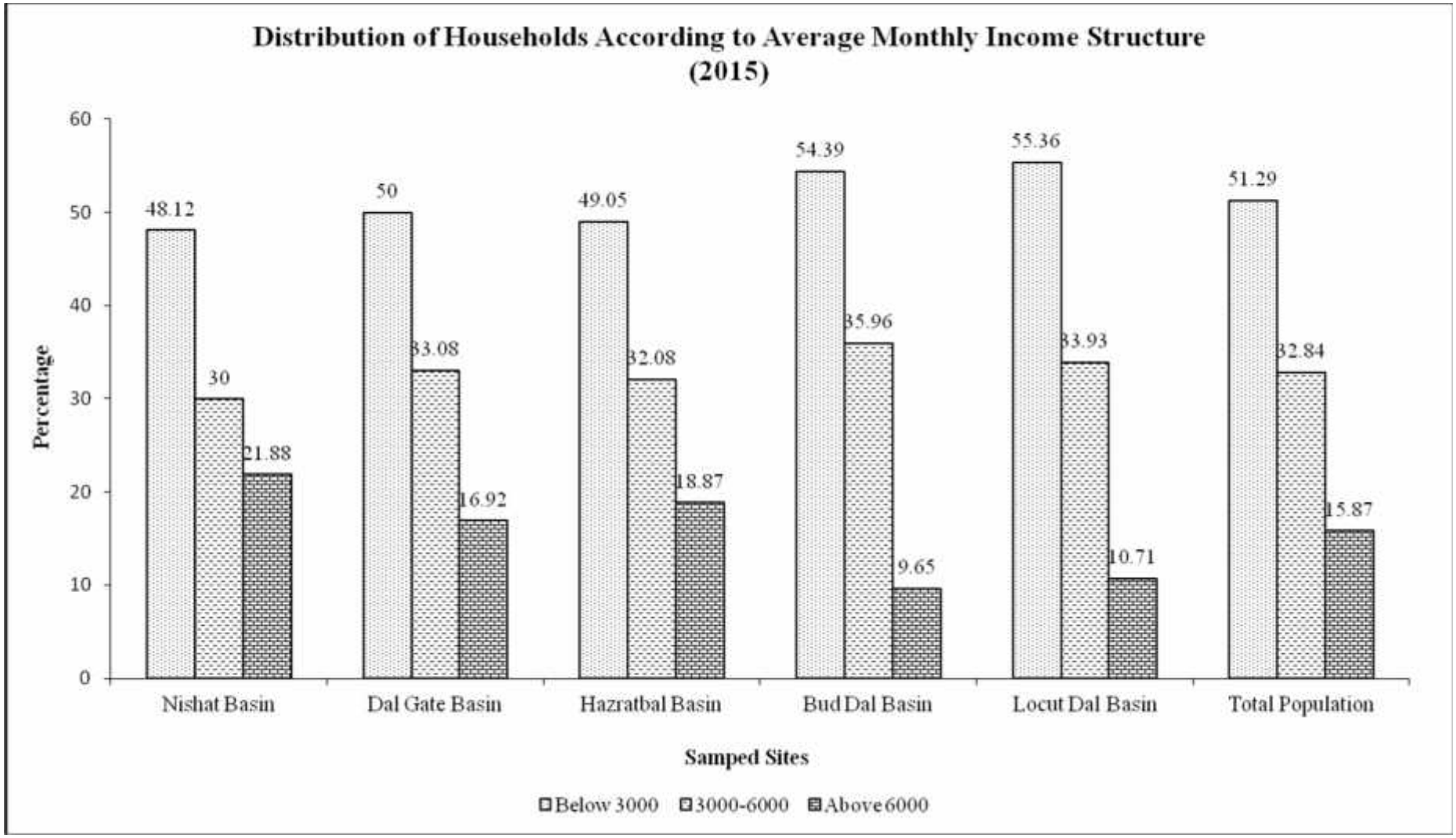

Distribution of Households According to Average Monthly Income Structure (2015)
Percentage
60
50
40
30
20
10
0
48.12
30
21.88
50
33.08
16.92
49.05
32.08
18.87
54.39
35.96
9.65
55.36
33.93
10.71
51.29
32.84
15.87
Nishat Basin
Dal Gate Basin
Hazratbal Basin
Bud Dal Basin
Locut Dal Basin
Total Population
Samped Sites
Below 3000
3000-6000
Above 6000

Figure 6.14

Table 6.13 shows the distribution of average monthly income of sampled households. A perusal of this table shows that nearly 51.29 per cent of the households have an income of below Rs.3000 per month. Their distribution shows 55.36 per cent of Locut Dal Basin, 54.39 per cent of Bud Dal Basin, 50 per cent of Dal Gate Basin, 49.05 per cent of Hazratbal Basin and 48.12 per cent of Nishat Basin. Another 32.84 per cent of households have the average monthly income between Rs. 3000-6000 with 35.96 per cent of Bud Dal Basin, 33.93 per cent of Locut Dal Basin, 33.08 per cent of Dal Gate Basin, 32.08 per cent of Hazratbal Basin and 30 per cent of Nishat Basin and only 15.87 per cent of households belong to the above Rs.6000 average income category showing 21.88 per cent in Nishat Basin, 18.87 per cent in Hazratbal Basin, 16.92 per cent in Dal Gate Basin, 10.71 per cent in Locut Dal Basin and 9.65 per cent in Bud Dal Basin.

Summary

Dal Lake, the second largest fresh water wetland of Kashmir Valley, located in the flood plain of river Jhelum holds a significant position in the history, culture and economy of the people of Kashmir Valley. It is famous not only for its beauty but also for its vibrancy as it sustains within its periphery a population of about 48,000 people that is unique to anywhere in the world .

With its large mountainous catchment area of around 316 square kilometers and water spread of over 1,620 hectares, it is surrounded by huge mountains on its three sides- By Zabarwan Hills from its eastern side, by Shankar Acharya Hills from its Southern side and by the hills of Kohi-Maran from its western side.

Dal Lake is a multi-basined lake with trellis and dendritic drainage pattern flowing from East – Southwest. Besides being fed by a number of underground springs, the main feeding channel of Dal is the alpine Marsar Lake that enters into it on its northern side as Telbal Nullah. The average inflow has been estimated to be 292 million cubic meter of which 80 per cent is contributed by Telbal Nullah by draining an area of around 145sq.kms

The lake has two outlets, one being the Dal Gate which discharges into a link channel called ‘Tsehunt kul’ for final discharge into river Jhelum and the other called Nullah Amir Khan which connects Dal Lake via Nageen Lake to Lake Gilsar and Anchar and

then discharges water into river Jhelum. The total outflow through these two channels is around 213 × 106 cubic meters and 27×106 cubic meter respectively.

Dal Lake is notable not only as an important tourist destination but also for providing habitat for aquatic flora and fauna as well as its utilization as an important source of food and water. However, being an urban lake it is vulnerable to both point and non-point sources of pollution. Thus, inflow of municipal and domestic wastes, excessive sedimentation, eutrophication and weed infestation have deteriorated its water chemistry and drastically reduced its health.

The socio economic analysis of the sampled settlements (737) that are located in and around this lake and the sampled population (4,663) that is dependent on this lake has clearly revealed that there is lack of basic facilities and social amenities such as drinking water, housing, education, means of disposing waste and toilet facilities etc. Around 54.42 per cent of the sampled households depend on lake water for various purposes and 27.55 per cent of the houses are of *Kutcha* type. Besides, 66.07 per cent of the sampled population is uneducated, 51.43 per cent do not have any proper means of disposing their solid waste and 84.53 per cent lack basic toilet facilities and use to dispose their toilet waste in open which finds its way directly into the lake. The survey also reveals that around 28.25 per cent people from the sampled settlements are engaged in agriculture and only 2.46 per cent are engaged in government jobs. Hence, the dependency of the sampled population is high on the meagre lake resources.

A perusal of this chapter shows that although Dal Lake plays an important role in the ecological and economic security of the region, it is, however, under intensive stress mainly due to anthropogenic pressures particularly the socio-administrative apathy and partly because of natural causes. The intensive weed growth, encroachments and changing land use/ land cover dynamics in and around Dal Lake coupled with tourism pressure has reduced its carrying capacity and deteriorated its health and water extent.

The unchecked deforestation on its catchment, intensive erosion, continuous siltation, weed infestation, addition of fertilizers and domestic and municipal effluents have left no stone unturned in changing this fresh water body, of once a high glory and grandeur, into a marshy and stagnant water body devoid of its sheen.

Thus, if this lake isn’t saved at this critical time, it is going to prove detrimental not only for the environment, but also for the state economy and for the people as well. Hence, need of the hour is to take necessary and concrete measures in a positive direction to save this wetland at priority.

CHAPTER VII

WULAR LAKE: A MICRO LEVEL ENVIRONMENTAL AND SOCIO-ECONOMIC ANALYSIS

This chapter deals with an intensive assessment of the Wular Lake-the largest natural fresh-water wetland of Kashmir Valley, and is divided into two parts. The first part deals with the general characteristics of the Wular Lake such as its catchment area, morphometry, hydrological regimes, water quality, land use/land cover dynamics and biodiversity. This part is based on secondary sources of data. The second part deals with the socio economic conditions of the sampled households from the selected villages located around and dependent on the Wular Lake. This part is mainly based on primary sources of data. On the basis of the nearness and dependency on the lake resources, 9 villages were selected from two districts (06 from District Bandipora and 03 from District Baramulla) for sampling and 10 per cent of the households from each village were randomly sampled. The field work was conducted during the year 2014-15 and the data was collected through questionnaire interviews (Appendix-I). The total sample size consisted of 466 households with the population of 3,534 (50.05per cent males and 49.95per cent females).

7.1 General Characteristics of Wular Lake

Wular-lake, situated at about 50km North West of Srinagar city at an altitude of 1,570 metres above msl between 34°16'-34°25'N latitude and 74°29'E-74°40'E longitude (National Wetland Atlas J&K, 2010[1], is the largest fresher water wetland in India (J&K Envis Newsletter, 2014)[2]. This balloon shaped lake (Fig. 7.1) with a maximum length of 16 Kms, maximum width of 7.6 Kms, water temperature of 2° to 29.5^{o}c and average depth of 5.8 meters is calm and placid across most seasons of the year (http://www.discoverindia.com)[3]. The deepest portion of the lake is called “Mota Khon” or ‘Gulf of corpses’.

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1 National Wetland Atlas, Jammu & Kashmir. (2010), Space Application Centre, ISRO, Ahmadabad. Retrieved from http://envfor.nic.in/*downloads/public-information/NWIA_ Jammu_and_Kashmir_Atlas.pdf*

2 ENVIS News Letter. (2014). Water bodies of Jammu & Kashmir, Department of Ecology, Environment and Remote Sensing, Government of Jammu and Kashmir.

3 Wular Lake in Kashmir- the largest fresh water lake of Asia. Retrieved from http://www.discoverindia.com/jammu-and-kashmir/attractions/river-andlakes/water-lake.html.

Wular Lake is drained by three major rivers of Madhumati, Erin and Jhelum. The river Jhelum enters it at Banyari (40 Kms from Srinagar) and again separates at Ningli.

There are diverging opinions regarding the area of this wetland. As per Topo-sheets of 1911, Wular Lake is 217.8 sq. kms and Survery of India Maps (1978) held its area to be 58.7 sq.kms. (in lean season) and 173 sq. kms. (in peak season). However, In the revenue records, its area is mentioned as equivalent to 130 sq. kms.

Whatever may be its area, one thing is quite evident that this wetland plays an important role in the sustenance of a large population of all the 31- villages located along its Shoreline (Compressive Management Action Plan for Wular Lake, 2007)[4]. It plays an equally significant role in the hydrographic system of Kashmir valley by acting as a huge absorption basin for the annual flood waters of river Jhelum. Besides being a natural habitat for wildlife, it is an important fish resource, accounting to about 60per cent of the total fish production in the Valley[5].

On the basis of its immense hydrological, biological and socio-economic significance, Wular Lake has been declared as the wetland of national importance under the wetlands program of Ministry of Environment and Forestry, Govt. of India in 1986 and subsequently declared as a Ramsar Site (Site No. 461)[6] on 23th of March, 1990 to give it the status of wetland of International importance.

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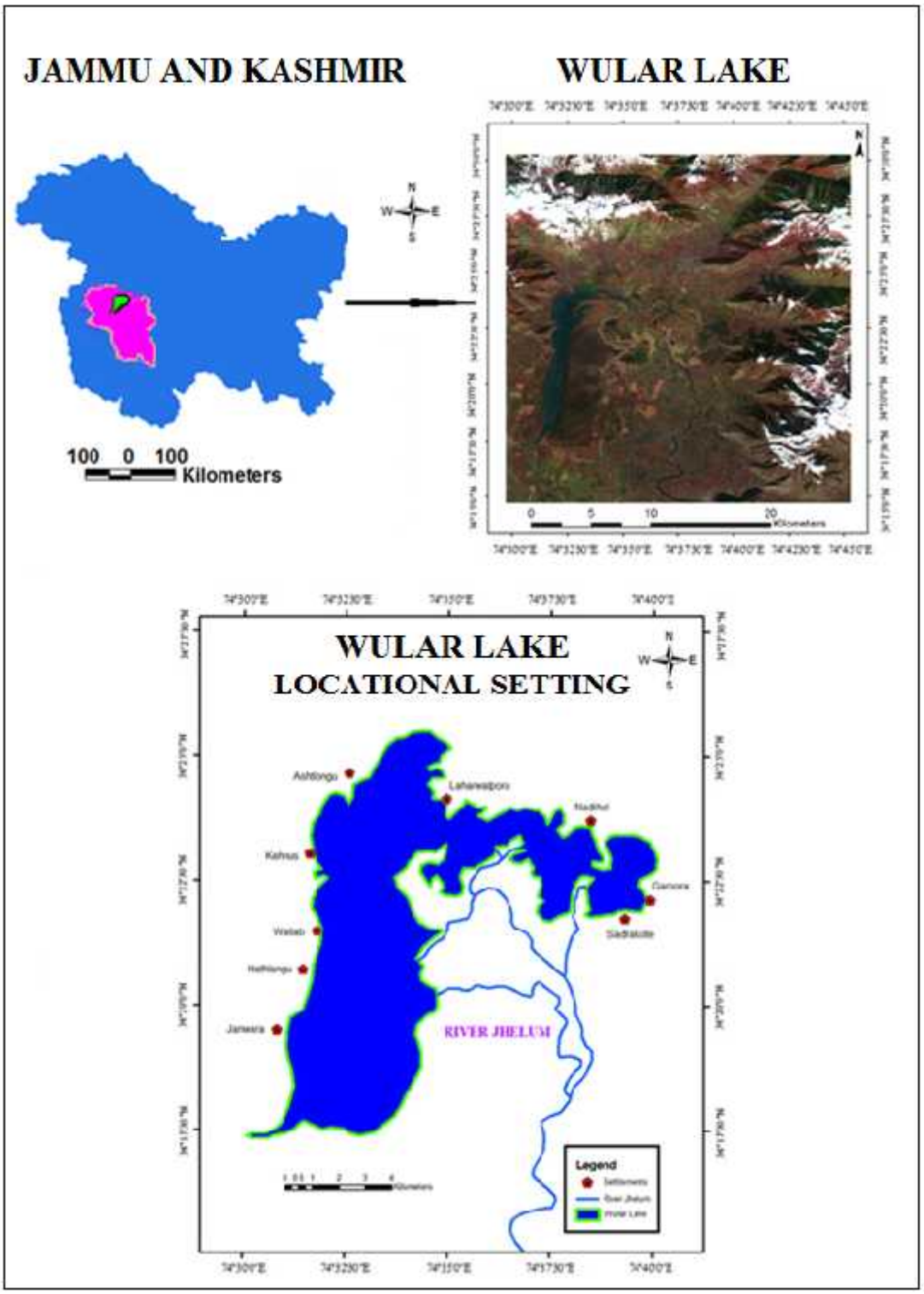
4 Comprehensive Management Action Plan for Wular Lake, Kashmir. (2007). Final Report prepared for the Department of Wildlife Protection, Govt. of J&K, *Wetlands International, South Asia*. Retrieved from http://www.wetlands.org

4 Census (2001). Office of the Registrar general and census commissioner, Ministry of Home Affairs, Government of India.

5 Directory of Lakes and water-bodies of J&K State. (2012). *Department of Ecology, Environment and Remote Sensing, Jammu and* Water-bodies of J&K *Kashmir*.

6 ENVIS News Letter. (2014). Water bodies of Jammu & Kashmir, Department of Ecology, Environment and Remote Sensing, Government of Jammu and Kashmir.



Source: Prepared by the Researche from Topgraphic Maps of Kashmir Valley

Figure 7.1

7.1.1 Origin of Wular Lake

Many mythological Kings and legends are associated with the origin of Wular Lake (Mahapadmasar) starting from Nilmat Puranam.

7.1.1.1 Legend of Nilamat Puranam

This legend unfolds with a conversation between king Gonanda-II (Son of King Gonada-I and Queen Yasomati) and sage Badaravasa about the Naga's who had their abode in Kashmir. Further, it mentions that the area of Mahapadmasar (Wular lake) which was the abode of King Sadangula (Naga King) was not a lake but was lying vacant. However, Sadangula, because of his unlimited lust for women was banned by King Nila to the mountains of Drava (Darda/ Dardistan- Present day Pok).

Mahapadma (The mythological Snake King) had come to another mythological King 'Nila' to seek a new place of habitation in Kashmir for him and his large family for which the Nila King replied that there is not a little space that hasn't been fully occupied by the Nagas. But the beautiful territory of Sadangula was vacant which the Nila King would give him but only on the permission of yet another mythological King 'Visvagasva' (The Protector of the Earth).

Mahapadma did the same and after making humble request to the king Visvagasva was gifted with a sufficient dwelling place for him and his large family for the dependents and dependents of his dependents. Thus, the beautiful city of Candrapura (area of Mahapadmasar) of the king Visvagasva in the beautiful territory of Sadangula was given to Mahapadama and was asked to turn that into a lake. Kalhana also mentions in his *Rajtarangini* about a large mythological city (Candrapura) submerged under the Wular (Mahapadmasar). The legend continues with the Mahapadma flooding the city and living there with his enlarged family. The lake was thus, called Mahapadmasar and its dimensions and characteristics as given in Nilamat Puranam are much lesser than it is existing today that indicates more changes.[7]

7 Kaul, B. R. (2007). Kashmir, Sacred Rivers and Wular Lake. *Retrieved from http://*ikashmir.net/rattankaul /doc/WularLake.pdf

7.1.1.2 Archaeological and Geographical View

A detailed and extensive survery of Kashmir Valley during the last century has revealed later Neolithic settlements (2,800 B.C.) in Kashimr that too widely distributed from Anantnag to Pampore, Gurhom Sangri (Near Wular Lake) and at many other places. These surveys reveal the fact that Kashmir Valley was pulsating with the Neolithic people and their descendants as the time passed. These archaeological evidences date back to around 2600± 200 B.C and for the naming of mahapadmasar, megalithic period is relevant, dating about 1600± 200 B.C.

Mahapadmassar has been reffered as 'Bolor' by Al-Biruni (960-1031A.D). Bolar referred to by him in his chronicle has been interpreted as the mountains overlooking Mahapadmasar, Wular or Wular Lake.

The origin of Wular Lake may also be attributed to a Kashmiri word 'Wul' which refers to a gap or a fissure which could be a pointer to its origin to a fissure or gap created by some natural phenomena. However, Wular for 'Wul' possibly became common around 12th century.

7.1.1.3 Geological Origin of Wular Lake

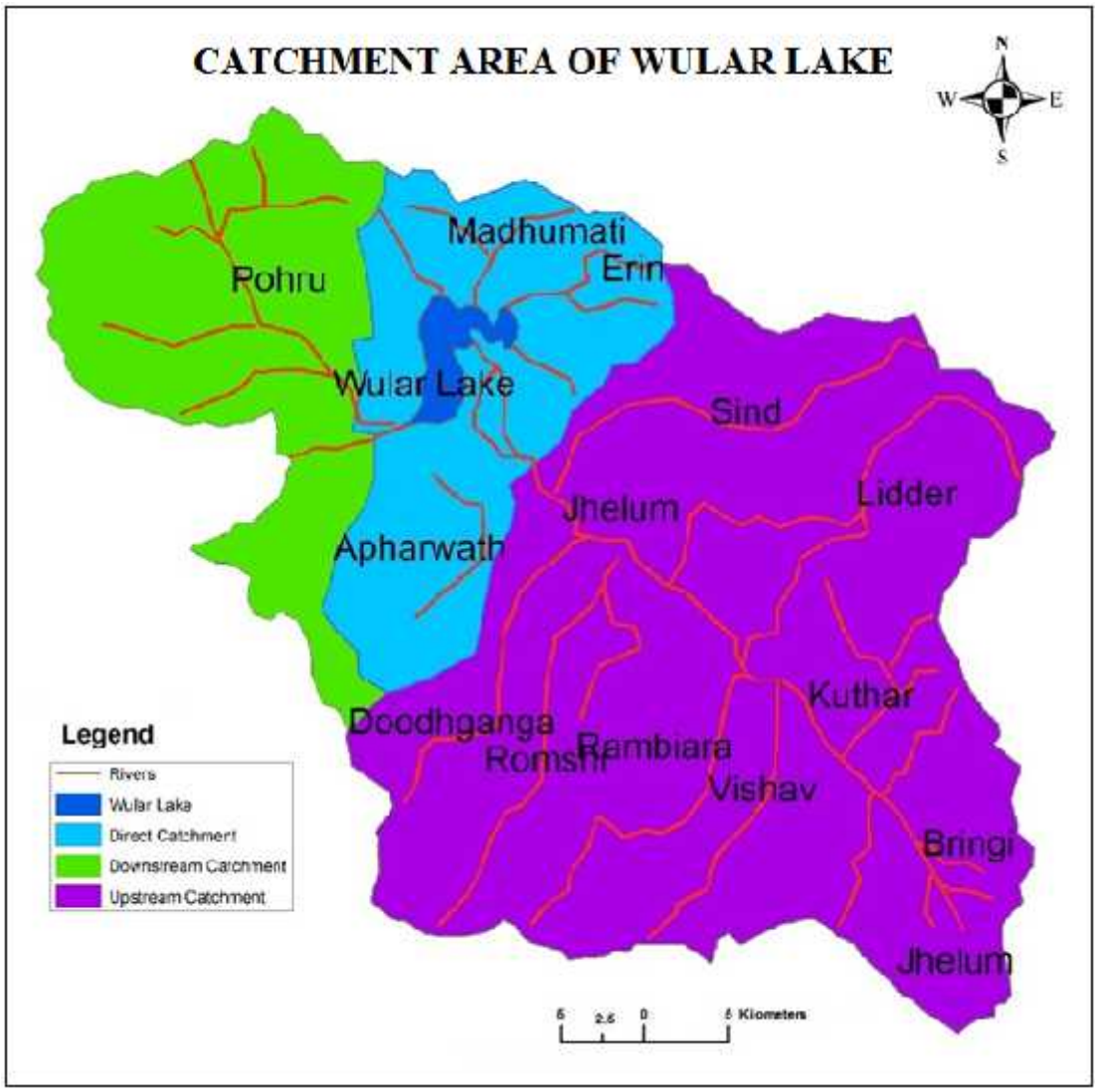
Over 60 million years ago, a series of earth movements took place as a result of which Himalayas started forming. In this process of lateral thrusting, various over thrust folds and fractures came into existence in the form of main boundary Himalayan range. As a result of further upliftement, Pir Panjal ranges uplifted giving rise to a vast lake in Kashmir called the Karewa lake (Satisar of Nilamat Puranam).Opening of a geological fault finally drained this lake out after which clay deposits in the exposed lake sediments in the Valley (Karewas or Uddas in Kashmir) remained.

However, the five fresh water bodies of Dal, Wular, Anchar, Mansabal and Hokersar were formed mainly during the recent geological period and are not remnants of Karewa lake. At present, it is believed that Wular Lake was formed as a result of tectonic activity.

7.1.2 Catchment Area of Wular Lake

Almost all the wetlands in Kashmir Valley are directly or indirectly connected longitudinally and altitudinally with river Jhelum (Wetlands International South Asia,

2007). Wular Lake too forms a part of river Jhelum basin which is a sub-division of Indus-Basin. The Jhelum basin extends to 12,777 Sq. Kms. of which six watersheds with an area of 1,444 Sq. Kms drain directly into the lake forming its direct catchment. (Fig.7.2).



Source: Comprehensive Management Action Plan for Wular Lake, Kashmir.(2007). Wetlands International, South Asia.

Figure 7.2

Wular lake is surrounded by high mountain ranges on the North- Eastern and North Western sides, which drain their runoff into it through various Nullahs prominent being Erin and Madhumati. Their watersheds located on the Northern periphery of Wular account for 20 per cent and 32 per cent of its catchment area respectively. Madhumati (Bod Kol) rises from the northern slopes of Harmukh glacier and drains into Wular near Dacchigam passing through Kalusa bridge. Erin catchment is

contiguous to Madhumati on its northern side and is formed from the drainage of 'Shir-Sar' and 'SukhaSar' draining through Chitrar Nullah, Titwan Kain Nulllah, and Kubnai-nar which meet at Isrur tar to from Erin.

Wular Lake is surrounded by 31 villages within the districts of Baramulla and Bandipora with a population of 10,964 households (Census of India, 2001)[8]. Besides, 26 villages of nomadic origin inhabit the hills around this wetland.

On its eastern and western sides, this wetland is surrounded by the low lying areas of Sonawari which used to get inundated almost every year until numerous criss-crossing embankments were constructed along river Jhelum. The wetland area thus reclaimed has in the recent past been brought under cultivation of paddy and plantations of willow, poplar and fruit trees.

On the western side in the Sopore-Watlab section, low lying areas have also been brought under paddy cultivation and on the eastern side of the wetland , there is an island which was raised and shaped by a famous ruler of Kashmir, Zainual Abideen (1420-1470 A.D.)[9]

The southern tip of Wular Lake is enclosed by Ningli and Gundar watersheds. Ningli drains highly erodible Karewas whereas Gundar watersheds are influenced by the drainage of Apharwat and Tangmarg, the famous alpine pastures of Kashmir valley.

Above all, Wular Lake is flanked by a series of short and flashy drains on its right and left which form extensive marshes on both sides of river Jhelum and play an important role in governing the hydrological regimes apart from sustaining its rich biodiversity.

The catchment area of this wetland supports coniferous forests, alpine pastures and orchards, adding to the natural grandeur of the wetland. However, the entire Jhelum basin including the direct catchment of Wular Lake is highly degraded that contributes to heavy load of silt into it leading to its shrinkage and reduction in water level

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8 Census (2001). Office of the Registrar general and census commissioner, Ministry of Home Affairs, Government of India.

9 Raina, M. K. (2012). Know your motherland- Wular Lake. Retrieved from http://ikashmir.net/mkraina/14html

7.1.3 Morphometric Analysis of Wular Lake

Morphometric descriptions represent relatively simple approaches to describe basin processes and to compare basin characteristics (Mesa, 2007)[10] and enable an enhanced understanding of the geological and geomorphic history of a drainage basin (Strathler, 1964)[11]. The morphometric assessment helps to elaborate a primary hydrological diagnosis in order to predict approximate behavior of a watershed if correctly coupled with geomorphology and geology. (Esper, 2008)[12]. Thus, morphmetric analysis of a watershed is an essential first step towards basic understanding of watershed-dynamics.

Wular Lake consists of a vast catchment area of 1200.36 km^2 which falls in 3 districts of Kashmir valley viz. Bandipora, Baramulla and Ganderbal and accounts for 7.6 per cent of the total area of Kashmir Valley (Kanth and Hasan, 2012)[13]. Its altitudinal range varies from 1,580 meters near Wular Lake to about 4,500 meters near Hurmukh range. The major rivers that flow in the Wular catchment are Jhelum, Erin and Madhumati. The mophometry of Wular lake can be studied under 2- parameters as (1) Linear parameters and (2) Shape parameters.

7.1.3.1 Linear parameters

These include various parameters like stream order, number, drainage, density, stream frequency, bifurcation ration, drainage- texture and length of overland flow etc. These have a direct relationship with erodibility, Higher the value, more is the erodibility.

The first and the foremost important parameter in the drainage basin analysis is ordering, whereby the hierarchical position of the streams is designated. Following Strathler' scheme, it has been found that the total number of streams in Wular catchment is 2,708, out of which 2,158 belong to I^{st} order, 427 are of 2nd order, 94 are of 3rd order, 25 are of 4th order, 3 are of 5th order and 1 is of 6th order, besides Jhelum that too is of 6th order.

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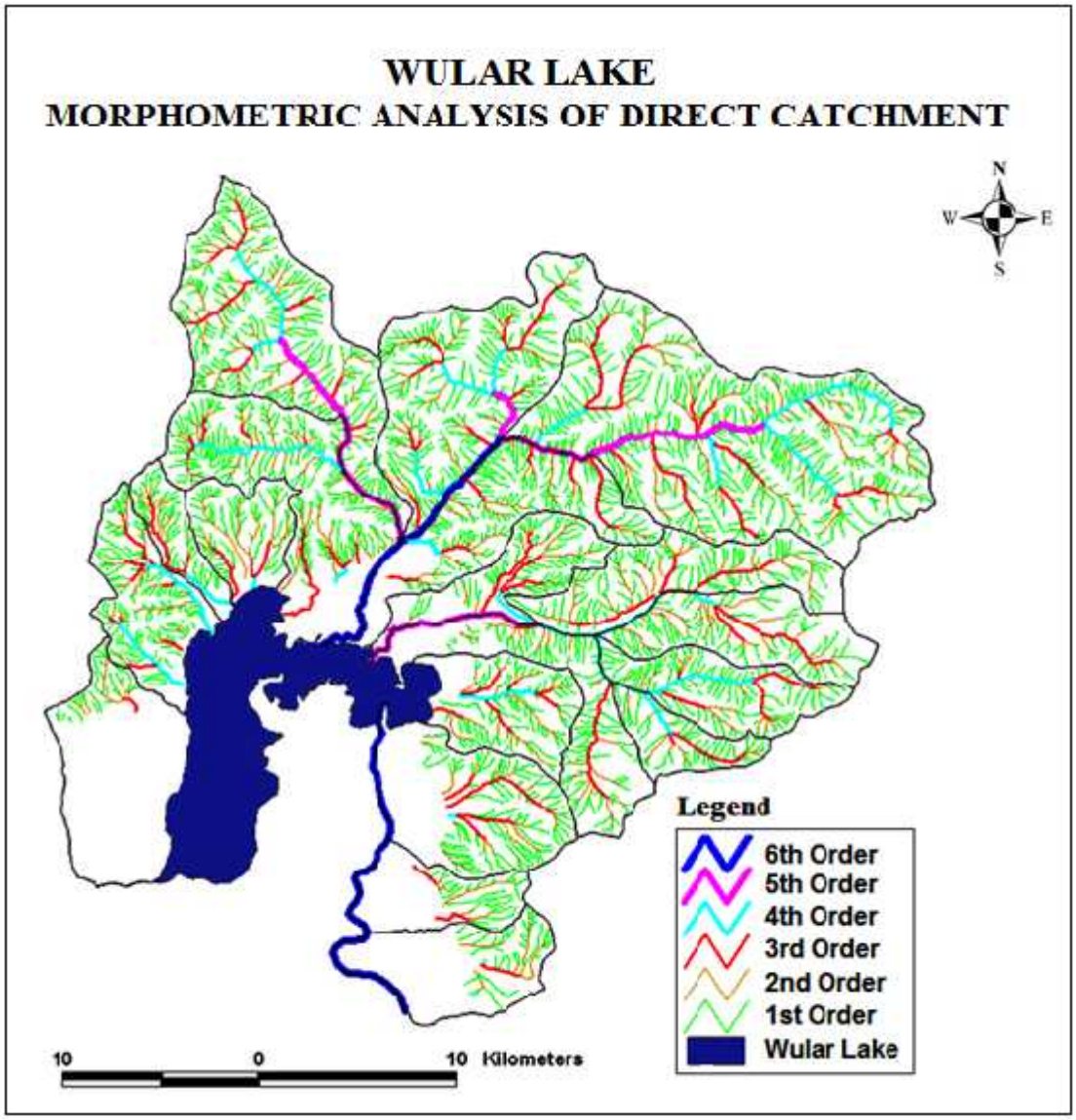
10 Mesa, L. M. (2007). Morphometric analysis of a Subtropical Andean Basin (Tucuman, Argentina). *Environmental Geology, 50,* 1235-1242.

11 Strahler, A. N. (1964). Quantitative geomorphology of drainage basins and channel networks. In chow, V.T. (eds.), *Hand book of applied hydrology.* MC Graw Hill Book Company: New York.

12 Esper, A. M. Y. (2008). Morphometric analysis of Colanguil river basin & Flash flood Hazard, San Juan, Argentina. *Environmental Geology, 55,* 107-191.

13 Kanth, T. A., & Hassan, Z. (2012). Morphometric analysis and Prioritization of watershed for soil and water Resource Management in wular catchment using Geo-spatial tools. *International Journal of Geology, Earth and Environmental Science, 2* (1), 30-41.

The drainage network of Wular catchment is characterized by total length of 2317.8 Km. whereas that of Jhelum .It comprises 21.1 km. The drainage density exhibits a wide range from 0.45- 3.29. The mean value (2.39) of drainage density indicates that the region is composed of impermeable sub- surface materials, sparse vegetation and high mountainous relief.



Source: Adapted from Kanth, T. A., & Hassan, Z. (2012). Morphometric analysis and Prioritization of watershed for soil and water Resource Management in wular catchment using Geo-spatial tools. *International Journal of Geology, Earth and Environmental Science, 2* (1), 30-41.

Figure 7.3

The stream frequency ranges from 0.61-4.65. The mean value of stream frequency is 2.8. The higher value of stream frequency indicates high relief and low infiltration capacity of the bedrock- meaning thereby the increase in stream population with respect to increase in drainage density. The watersheds having large area under dense

forests have low drainage frequency and the area having more agricultural land has high drainage frequency. High value of drainage frequency means more runoff in comparison to others.

The mean bifurcation ratio of the Wular catchment is 4.93. It varies from 3.33 to 6.92. Low bifurcation ratio means less structural disturbance and high bifurcation ratio means high structural complexity and low permeability of terrain.

The drainage texture ranges from very course to course from 1.05-7.85. Similarly, the length of overland flow of Wular catchment is 0.84. It also varies from 0.61- 4.39. Higher value of overland flow represents low relief. Whereas, it's lower value is an indicator of high relief.

7.1.3.2 Shape Parameters

These comprise of parameters like form factor, shape factor, circulatory ratio, elongation ratio and compactness coefficient etc. These have an inverse relationship with erodibility (Nooka Ratnam et.al., 2005)[14].

Table 7.1- Morphometric Analysis of Wular Catchment

S.No.	Parameters	Value
1.	Area (A) Km^2	961.8
2.	Perimeter (P) Km	208
3.	Length of Basin (LB) Km	64.91
4.	Stream frequency (Fs) Km/Km^2	2.82
5.	Drainage density (Dd)	2.39
6.	Form factor (Rf)	0.23
7.	Elongation ratio (Re)	0.54
8.	Mean Bifurcation Ratio (Rb)	4.03
9.	Drainage Texture (T)	13.02
10.	Length of overland flow (Lg)	0.84
11.	Compactness coefficient (Ce)	1.89
12.	Shape factor (Bs)	4.38

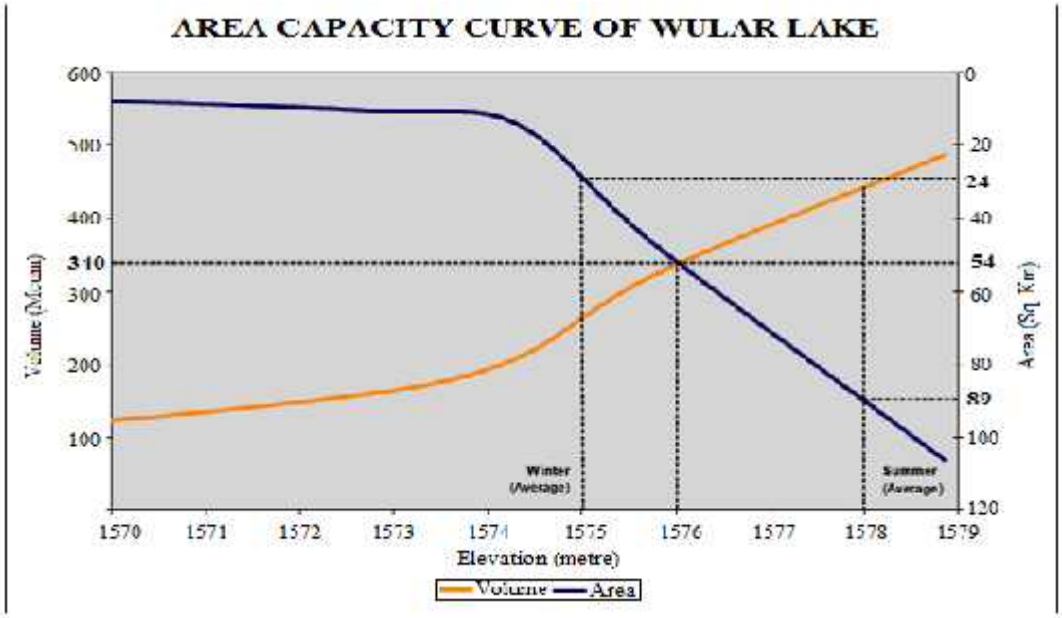
Source: Kanth, T.A. And Hassan, Z. (2012). Morphometric analysis and prioritization of watersheds for soil and water resource Management in Wular catchment using Geo-spatial Tools. International Journal of Geology, Earth and Environmental Sciences. 2(1).

14 Nooka, R., K. Srivastav., Y. K. Venkaterwara Rao., V. Amminedu., & Murthy, K. S. (2005). Check Dam Positioning by Prioritization of Micro watersheds sing SYI Model and Morphometric Analysis- Remote Sensing and GIS Perspective. *J. Indian Remote. Sens., 3* (1), 25-38.

Lower the value more is the erodibillity. Wular catchment has a form factor of 0.23. It varies from 0.29-0.40 which indicates the elongated shape and suggesting flatter peak flow for longer duration. Shape factor varies from 2.50-3.45, its mean value is 4.38. Similarly, the elongation ratio varies from 0.61-0.71 and its mean value is 0.45 which is an indicative of high relief and steep ground slope. Lastly, the compactness coefficient which varies from 1.25-1.98 is 1.89 for Wular catchment. Morphometric features of Wular Lake are given in Table 7.1.

7.1.4 Hydrological Regimes

Hydrological regimes of Wular Lake are primarily linked with Jhelum and its tributaries. (Wetlands International South Asia, 2007)[15].There is a marked absence of detailed information on hydrological regimes of Wular. However, the weekly discharge records of state irrigation and flood control department reveal that River Jhelum is the largest contributor of water inflows (88 per cent) into Wular , the rest being from the immediate catchments and precipitation. Similarly, the outflow through river Jhelum is the highest (96.9 per cent). The rest accounted for by human abstractions (1.7 per cent) and evapo-transpiration (1.4 per cent).



Source: Comprehensive Management Action Plan for Wular Lake, Kashmir. (2007). Final Report prepared for the Department of Wildlife Protection, Govt. of J&K, *Wetlands International, South Asia*. Retrieved from http://www.wetlands.org

Figure 7.4

15Comprehensive Management Action Plan for Wular lake, Kashmir.(2007). Final Report Prepared for the Deptt.of wildilife Protection Govt. of J&K, Wetlands International, South Asia.

Secondly, Inflows and outflows are highly variable with time of the year. About 80 per cent of the inflows and 86 per cent of the outflows take place in summer. Thirdly, the net outflows from the Wular at Sopore are higher than the inflows. The wetland system is a net absorber of water from September to February, which is then released during March to June. Likewise, assessment of flow trends of river Jhelum at Baramulla indicate that the lowest discharges occur during October to February, when 1-5 per cent of the annual runoff is discharged every month. At the maximum discharge during May and June, more than 15per cent is discharged every month with the maximum peaks exceeding 1500 cumecs. Flows appear to be strongly linked to temperature which rises from March- July, there by inducing melting of the glaciers and corresponding high flows till June. Lastly, River Pohru significantly influences the water regimes of Wular lake. The 60 Km long river with an overall catchment area of 2,030 Sq.Km becomes flashy during floods and cuts across the main river Jhelum and creates a temporary water barrier which leads to back afflux in the upstream portion of river Jhelum.

The total water holding capacity of the Wular at normal lake levels (1576m) is 340 Mcum. The storage available between the average winter levels and summer levels is of about 170 M cum. The lake water-spread undergoes a significant fluctuation between the summer and winter months. The average area has been estimated as 54 sq. Km, which declines to 24 sq. km during the lean period and increases to 89 sq. km during summer months. Maximum part of the storage is achieved when the lake levels reach beyond 1,574 m above msl. (Figure 7.4).

The average lake depth varies from less than 3 feet in the southern segment of the lake to more than 16 feet in the northern segment. The lake has less than 1 meter depth in the north eastern portion where the river Jhelum enters the wetland and in the southern section between Banyari and Shahgund (Fig. 7.5).

About one fifth of the water holding capacity of the Wular Lake has been lost over the last three decades. This is equivalent to an annual lake sedimentation rate of 2,470 acre feet. This loss of capacity is attributed to shrinkage of the lake area and lake siltation. Thus, loss of water absorption capacity of Wular is directly linked to flooding in its peripheral areas. Irrigation and water supply are the primary water uses

linked with the hydrological regimes of Wular Lake. However, in downstream reaches, the water from the Jhelum river is also used for generation of hydropower.

7.1.5 Water Quality of Wular Lake

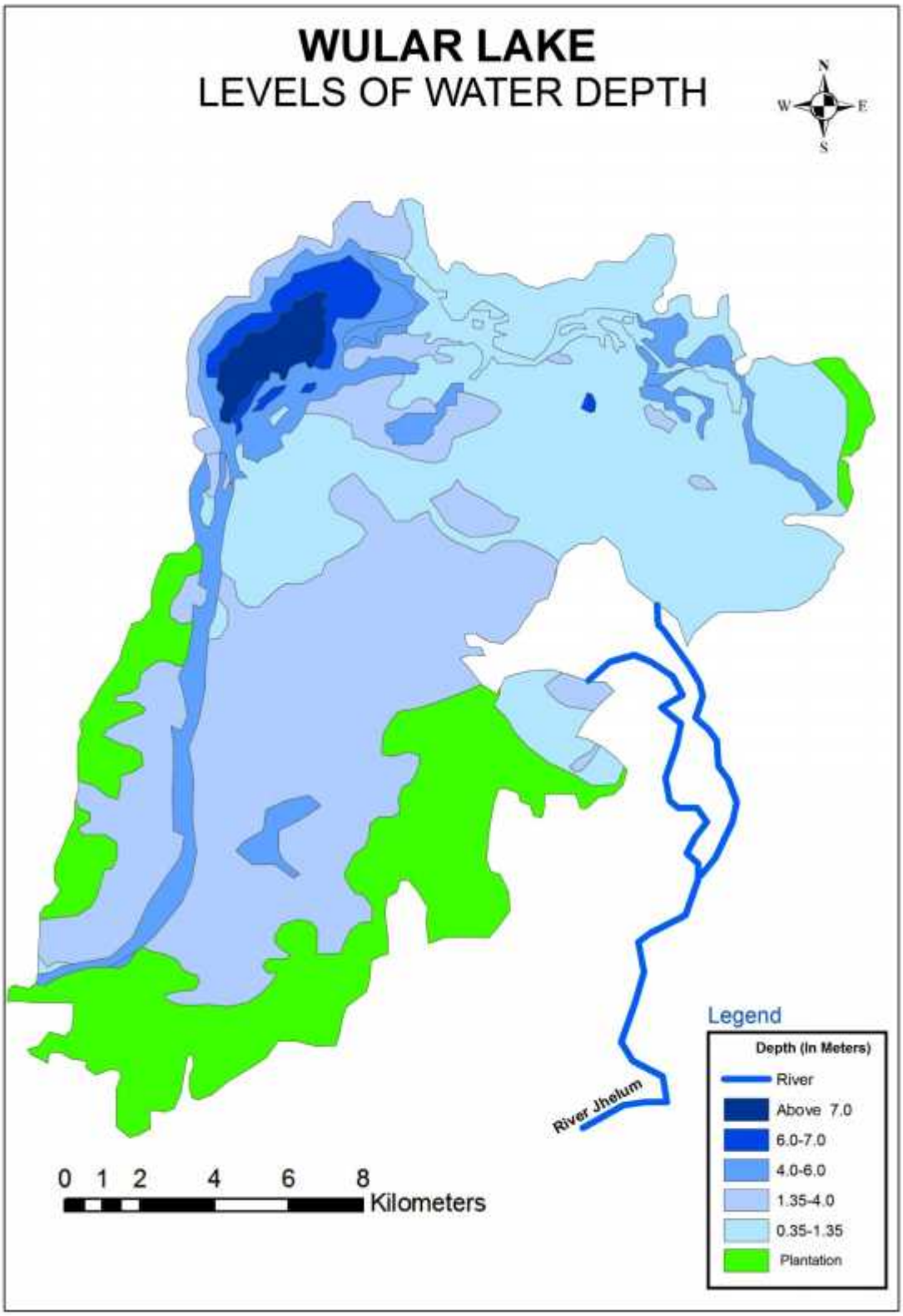
A review of literature from the studies on quality of water reveals that the Wular Lake and other wetlands of Kashmir Valley are generally alkaline in nature with relatively higher amounts of magnesium, calcium and other ions and are hence categorized as hard water systems. The valley lakes are essentially shallow basined, profusely covered by aquatic vegetation and most of the lakes are eutrophic in nature with high concentrations of biologically important nutrients. (Wetlands International South Asia, 2007)[16]

Table 7.2- Changes in Water Chemistry of Wular Lake (1992 to 2006)

Parameters	**Units**	**1992**	**2006**
Water Temperature	^{o}C	3.1-25	6.3-27.3
Transparency	M	0.1-1.3	0.16-0.73
pH	---	7.1-9.8	7.2-7.7
Conductivity	µs/cm	57.0-350	118-429
Dissolved Oxygen	mg/l	1.3-15.2	4.5-8.0
Chloride	mg/l	11.0-81.0	11.8-28.0
Calcium	mg/l	4.6-73.8	20.5-62.3
Magnesium	mg/l	0.8-35.6	12.2-30.1
Ammonia	µg/l	1.0-205	64.0-101
Nitrate Nitrogen	µg/l	9.0-580	205-419
Ortho Phosphate	µg/l	0.0-31.0	79-131.7
Total Phosphorus	µg/l	0.0-103	180.0-292.5

Source: Comprehensive Management Action Plan for Wular Lake, Kashmir. (2007). Final Report prepared for the Department of Wildlife Protection, Govt. of J&K, Wetlands International, South Asia. Retrieved from http://www.wetlands.org

16 Ibid., p.22



Source: Comprehensive Management Action Plan for Wular Lake, Kashmir. (2007). Final Report prepared for the Department of Wildlife Protection, Govt. of J&K, Wetlands International, South Asia. Retrieved from http://www.wetlands.org

Figure 7.5

Wular Lake being at the terminus of the drainage system acts as a receptacle for pollutants flowing downstream from highly urbanized area of Srinagar. Discharge of solid, liquid and other wastes from human settlements all along Jhelum River are finally deposited in the Wular Lake. Besides, heavy doses of fertilizers and pesticides used in agricultural fields and spraying chemical in orchards for pest control are ultimately washed into Jhelum flowing into Wular Lake. There are no regulations for the disposal of solid wastes including carcasses throughout Jhelum. The sewerage system is generally lacking throughout the Valley except in some parts of Srinagar. All the streams, channels and aquatic bodies directly or indirectly draining into river Jhelum deposit heavy load of pollutants into Wular Lake.

Thus, the quality of water has deteriorated over a period of time and there has been a progressive increase in specific conductivity, orthophosphates and total phosphates with a decline in transparency and dissolved oxygen as shown in the Table 7.2. On the basis of the analysis of water quality, Wular Lake falls within 'C' category as per CPCB's (Central Pollution Control Board) designated criteria.

7.1.6 Land-Use/ Land Cover Dynamics of Wular Lake

Land-Use/land Cover dynamics involves the complete replacement of one type of land use by another and is the result of interplay between socio-economic, institutional and environmental factors. (Lesschen et. al.,2015)[17].Change detection is the process of identifying differences in the state of an object/ phenomenon by observing it at different periods of time. It involves the ability to quantify temporal effects using Multi-Temporal datasets from Satellite imageries (Othman et al., 2013)[18]

Land use/ land cover dynamics has become a fundamental tool in assessing the environmental consequences of human activity (Veldkamp and Lambin, 2001)[19]. It

17 Leschen, J. P., Verburg, P. H., & Stall, S. J. (2005). Statistical methods for analyzing the spatial dimension of changes in land use and farming systems. *LULC report -series 7.* The international livestock Research Institute, Nairobi, Kenya and LULC focus 3 office, Wegeningen University, The Netherlands.

18 Othman, A. A., Al-Saady, Y. I., Al-Khafaji, A. K., & Gloaguen, K. (2013). Environmental change detection in the central part of Iraq using Remote Sensing and GIS. *Arab Jour. Geo Sci.* Doi: 10.1007/5 12517-103-0870-0

19 Veldkamp, A., Lambin, E. F. (2001). Predicting land use change. *Agric. Ecosyst. Environ., 85* (1), 1-6.

also influences the Water Quality (Shippers et. al., 2004)[20], Geo-Chemical cycles (Powers, 2004)[21] and level of Biodiversity (Tallamon et. al., 2003)[22].

Wular Lake that plays a significant role in the hydrography of Kashmir Valley by acting as a huge absorption basin for flood waters (Dar et., 2013)[23], is at the verge of extinction. The lack of understanding of the values and functions of Wular Lake and its associated wetlands led to the conversion of its large area for plantation, agriculture, settlements and other developmental activates (Wetlands International South Asia, 2007)[24]. The lake with its associated wetlands is an important habitat for migratory water birds within the central Asian flyway and supports rich biodiversity.

The land use/ land cover of Wular Lake has been analyzed by various scholars, agencies and organizations from time to time. However, Fayma Mushtaq and A.C. Pandey have elaborated it very extensively in their study by covering an area of 425 Sq. Km around Wular Catchment. These scholars have peeped deep into the analysis of this wetland by taking the help of satellite data from Landsat TM, Landsat ETM, IRS-P_4 –LISS-III and IRS-P6-LISS-III sensors of 1992, 2001, 2005 and 2008 respectively.

Table 7.3- Satellite Data Used for Analyzing Land Use/Land Cover Changes Around Wular Lake

Sensor	Date of acquisition	Spatial Resolution (mtrs)
Landsat TM	15 October,1992	30
Land Sat ETM+	30 September,2001	30
IRS-P4-LISS-III	6 October,2005	23.5
IRS-P4-LISS-III	3 October,2008	23.5

Source: Mushtaq, F., Pandey, A. C. (2013). Assessment of Land Use / Land Cover dynamics Vis-a-viz hydro-meterological variability in Wular Lake Environs Kashmir Valley, India using Multi-Temporal satellite data. *Arab. J. Geo.sci., 7,* 4707-4715.

20 Shippers, J., Vermaat, E., Klein, J., & Mooij, W. M. (2004). The effect of atmosphere Co_2 elevation on plant growth in fresh water ecosystems. *Ecosystems. 7* (1), 63-74.

21 Powers, J. S. (2004). Changes in Soil Carbon and nitrogen after contrasting land use transitions in North- Eastern Costa Rica. *Ecosystems, 7,* 134-146.

22 Tallmon, D. A., Jules, E. S., Radke, N. J., & Mills, S. (2003). Of mice and Men and trillium: Cascading effects of forest fragmentation. *Ecol. Appl.13* (5), 1193-1203.

23 Dar, N. A., Hamid, A., Pandit, A. K., Ganai, B. A., Bhat, S. U., & Hussain, A. (2013). Total lipid content in macrophytes of Wular Lake, A Ramsar site in Kashmir Himalaya. *Int. Jour. of Plant Physiol BioChem, 5* (1), 11-15.

24 Comprehensive Management Action Plan for Wular Lake, Kashmir. (2007). Final Report prepared for the Department of Wildlife Protection, Govt. of J&K, *Wetlands International, South Asia*. Retrieved from http://www.wetlands.org

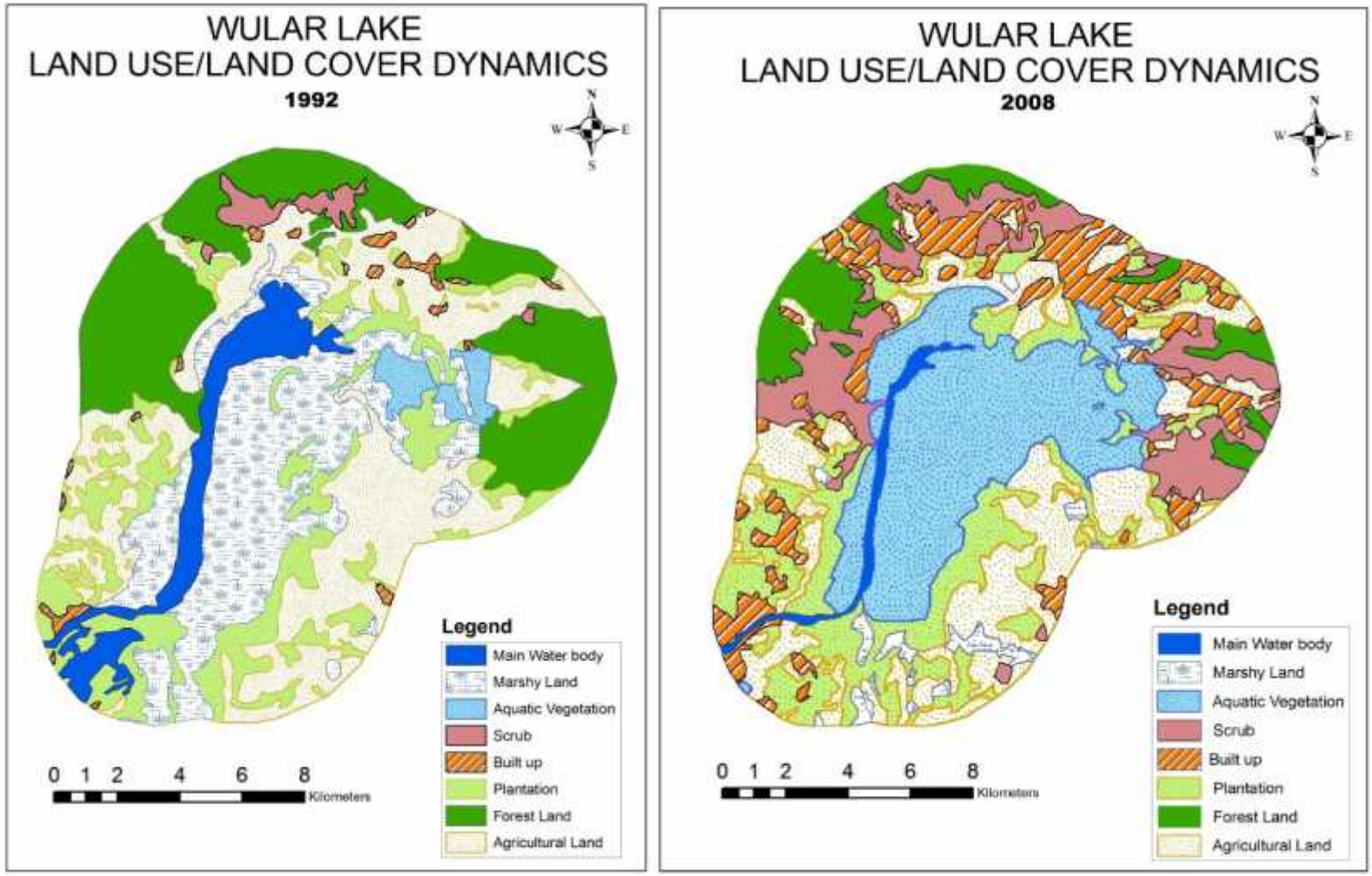
From the interpretation of the above satellite data, various land use classes were framed out like agriculture, marshy area, build-up area, water body, plantation, aquatic vegetation, forest area and scrubs and then change in their respective areas was detected in different time periods.

The Land Use/Land Cover data of 1992 reveals that agriculture tops the list with 125 Sq. Km area constituting about 29 per cent of the catchment area of the lake (425 Sq. Km) followed by forest area of 9 Sq. Km (22 per cent) and marshy area of 85 Sq. Km (20 per cent), Similarly, plantation covers an area of 75 Sq. Km (17.64 per cent) and water body cover merely an area of 24 Sq. Km (5.65 per cent) which was followed by area under aquatic vegetation of 9 Sq. Km (2.11 per cent) and the buildup area and scrubs of 7 Km^2 each (1.64 per cent)

In 2008, aquatic vegetation surpassed all the land use classes with 97 Sq. Km area (22.82 per cent) followed by area under agriculture as 91 Sq. Km (21.41 per cent). Plantation comprised of 87 sq. km. Similarly, scrub and built-up constituted 52 sq. km (12.25 per cent) each followed by forest area of 32 sq. kms (7.52 per cent). The water area and marshy- land was further reduced to 9 Kms^2 (2.11 per cent) and $5km^2$ (1.17 per cent) respectively.

Based on the results of the above analysis it is quite clear that the rate of change of LULC classes is high. It was observed that the area of the land use type for ecological uses (water body, forest, marshy land) tend to decrease, but the area of the land use types like agriculture, plantation and human settlements tend to increase. The percentage of change in build-up, plantation, aquatic vegetation and scrub-land was observed as 642.85 per cent, 16 per cent, 977.77 per cent and 642.85 per cent respectively. Whereas for agriculture, forest, water body and marshy area it was observed as -27.2 per cent, 65.59 per cent, -62.5 per cent and 94.11 per cent respectively.

Thus, it can be conclude that Wular Lake is showing the signs of deterioration and degradation primarily on account of anthropogenic influences and the changes in land use/ land cover of its catchment area.



Source: Mushtaq, F., Pandey, A. C. (2013). Assessment of Land Use / Land Cover dynamics Vis-a-viz hydro-meterological variability in Wular Lake Environs Kashmir Valley, India using Multi-Temporal satellite data. *Arab. J. Geo.sci., 7*, 4707-4715.

Figure 7.6

Table 7.4- Land Use/ Land Cover Dynamics of Wular Lake (1992-2008)

Category	1992		2008		Total change	
	Area (km)2	Area (per cent)	Area (km)2	Area (per cent)	Area (km)2	Area (per cent)
Built Up	7	1.64	52	12.23	45	642.85
Agriculture	152	29.41	91	21.41	-34	-27.2
Plantation	75	17364	87	20.47	12	16
Forest	93	21.88	32	7.52	-61	65.59
Water body	24	5.64	9	2.11	-15	-62.5
Aquatic vegetation	9	2.11	97	22.82	88	977.77
Scrub	7	1.64	52	12.23	45	642.85
Marshy	85	20.0	5	1.17	-80	-94.11
Total	**425**	**100**	**425**	**100**		

Source: Mushtaq, F., Pandey, A. C. (2013). Assessment of Land Use / Land Cover dynamics Vis-a-viz hydro-meterological variability in Wular Lake Environs Kashmir Valley, India using Multi-Temporal satellite data. *Arab. J. Geo.sci., 7,* 4707-4715.

7.1.7 Biodiversity of Wular Lake

Strategically located at the western extremity of the Himalayan range in India and south of the Pamirs, the wetlands of Kashmir serve as important staging grounds for rich biodiversity. Considering its national and international importance due to the large population of water birds, biodiversity and socio economic aspects, Wular Lake has already been included under Ramsar convention of wetlands in 1990. Its rich biodiversity can be elaborated as under.

7.1.7.1 Water Birds

Water birds of Wular include resident and migratory species. Resident species spend entire year in the valley. While the migratory species may be seasonal or international migrants. The seasonal migrants nest in the valley during April to August and then

move out during August to other parts of the country. The international migrants nest in the Northern latitudes of central Asia and Siberia. And may stop/ stage in the valley during southward migration to wetlands in the sub- continent and or during northward migration to the breeding grounds.

Water birds utilize the Wular lake and satellite wetlands on a daily basis for different purposes. It is observed that the birds visit Wular during the night time to feed when there is no disturbance from fishing boats and hunters. During the day time they seek refuge in the Hokersar, Haigam, Shallabugh and other adjoining wetlands. Some water birds species include northern pintail, mallard, common teal, Northern Shoveller and EuraianWigeon.

7.1.7.2 Fish Diversity

Wular Lake with its large expanse of water is an important resource for fisheries. The fisheries of Wular lake is a combination of capture and culture fisheries. Recent surveys in the year 2000 by J&K Lands and Waterways Development Authority (LAWDA) indicate the occurrence of 13- species of fishes from Jhelum and associated lakes including Wular. A list of fish species recorded from Wular and associated wetlands is given in table 7.5 as:

Table 7.5-List of Fish Species From Wular Lake

Order Cyprinformes		**ZOOLOGICAL NAME**	**KASHMIRI NAME**
Family cyprinidae			
Sub family schizothoracine	1	Schizothorex curvifrons Heckel	Sater Gaad
	2.	S. esocinus Heckel	
	3.	S. hugeli Heckel	
	4.	S. longipinnus Heckel	
	5.	S. micropogon Heckel	Ramgaad
	6.	S. nasus Heckel	
	7.	S. Niger Heckel	
	8.	S. planifrons Heckel	
	9.	S. progastus Heckel	

	10.	S. punctatus Heckel	
	11.	Oreinus plagiostomus Mclelland	Khont
	12.	O. sinutatus Heckel	
	13.	Ptychobarbus conirostris Steind	
	14.	Schizopygopsis stoliczkee Steind	
	15.	Cyprinus carpio Linn.	Panjaeb gaad
	16.	Labeo dero Heckel	Roput
	17.	L. dyocheilus Mc Clelland	Heol
	18.	Carassius carassius Linn	Gang
	19.	Puntius conshonius	Safed bacha
Sub- family Garrinae	20.	Gara gotyla Gray	
	21.	Crosocheilus diplochilus Heckel	Tetthur
Order Siluriformes			
Family Cobitidae			
Sub- family Botinae	22.	Botia birdi Chaudhury	Rama gurun
Sub-family Nemachilinae	23.	Nemachilus gracilis day	Ara Gurun
	24.	N. Vitatus Heckel	Ara Gurun
	25.	N. Kashmirensis Hora	Ara Gurun
	26.	N. marmoratus Heckel	Ara Gurun
	27.	N. rupicola Mc clelland	Ara Gurun
	28.	N. yasinensis Alcock	Ara Gurun
	29.	N. stoliczki Steind	Ara Gurun
Family Sisoridae	30.	Glyptothorax kashmirensis Hora	Anuir
	31.	G. reticulatum Mc Clelland	Anuir
	32.	Exostoma Stolixzki Day	
Family Siluridae	33.	Ompok bimaculatus Bloch	
Family Poecilidae	34.	Gambusia affinia (Baird & Girard)	Mahe gad
Order Salmoniformes			

Family Salmonidae	35.	Salmo truttta linn	Trouth
	36.	S. gairdnir Richardson	Trouth

Source: Comprehensive Management Action Plan for Wular Lake, Kashmir. (2007). Final Report prepared for the Department of Wildlife Protection, Govt. of J&K, *Wetlands International, South Asia*. Retrieved from http://www.wetlands.org

An analysis of fish fauna reveals that three species are endemic to Kashmir valley viz- triplophisa Kashmiriensis, Schizothoraxniger (Snow trout) and Triplophisa marmorata. Besides, 7- native and 2- exotic species of Wular lake are commercially important. In commercial catches, the exotic carps contribute 52-67 per cent and the local fishes constitute 30 per cent of total fish catch. The state government fisheries department has established 9- landing centers at different locations of the lake. These landing centers serve as connecting points. On the whole, Wular Lake contributes 23-26 per cent of the total fish production of Jammu and Kashmir.

7.1.7.3 Vegetation

Vegetation of Wular Lake constitutes an important component of the lake ecosystem providing both ecological of economic benefits. The aquatic vegetation has been utilized for various purposes like food and fodder etc by the communities living in and around Wular Lake. However, dense growth of some species has chocked the lake area, thereby reducing water flow and overall potential to provide ecological and economic benefits.

There is diversity of opinions regarding the number of species present in Wular lake. Kundangar (1993) reports the presence of 13 plant species. However, Kaul and Trisal (1985) have reported 24 species of plants from wular lake. A list of species recorded from Wular and associated wetlands is given in table 7.6.

In general, vegetation forms well defined zones distinguishing emergents, rooted floating leaf, free- floating and submerged belts which area essentially adapted to water level fluctuations of the lake besides other environmental factors. The general sequence of the macrophytic species indicates occurrence of submerged and rooted floating leaf types and emergents towards the lake shore.

A key feature of the vegetation around Wular is the presence of extensive willow plantations on its periphery. These plantations were raised by the various govt. departments to meet the fuel wood requirements of the state. Lake vegetation also includes some economically important species utilized for food, fuel and fodder by the communities nearby to wular, water chestnut (Singhara) and nelumbium species (Nadru) are the two major food resources plants derived from these plant species. Water chestnuts occupy an overall 21.2 Sq. Km of lake are representing 49.8 per cent of the lake vegetation. It is distributed throughout the lake but the maximum concentration is found on the eastern side near right shoreline which is relatively deeper area. Nelumbium nucifera with large floating leaves and underground rhizomes is used as a vegetable and sold in the markets of surrounding villages and towns. The flowers as well as fruits of the plant are used for religious purposes. The species are spread from Ashtangu to Kanusa and a few patches are confined to Lunkershpura, Kolhma and Garoora covering a total area of 0.49 sq. km representing 1.14 per cent of the total vegetation.

Table 7.6- List of Macrophytes in Wular Lake

Acorus calamus	Sparganium errectum
Alisma plantigina	Typha angustata
Arthroxon lancifolia	Veronica anagallis
Butomus umbellatus	Ceratophyllum demersum
Carex scrotinus	Hydrilla verticillata
Chara zeylanica	Myriophullum verticellatum
Cladium mariscus	Myrophyllum spicatum
Cyperus rotundus	Najas graminea
Cyperus serorinus	Potamogeton pusillus
Echinochloa crusgalli	Potamogeton natans
Eleocharis palustris	Potamogeton lucens
Hydrocharis morsusranae	Potamogeton pectinatus
Hydrocharis dubia	potamogeton crispus
Lycopus europqeus	Trapa bispinosa
Marsilea quadrifolia	Trapa natans
Menyanthes trifoliata	Nelumbium nucifera
Myosotis sylvatica	Nymphaea stellata

Phragmites communis	Nymphaea alba
Polygonum hydropiper	Nymphoides peltatum
Potentilla repans	Salvinia natans
Rananculus scleratus	Lemna Sp.
Rumex maritimus	Azolla Sp.
Scripus lacustris	Sium latijugum
Scripus palustris	

Source: Comprehensive Management Action Plan for Wular Lake, Kashmir. (2007). Final Report prepared for the Department of Wildlife Protection, Govt. of J&K, *Wetlands International, South Asia*. Retrieved from http://www.wetlands.org

The main species utilized as fodder include phragmites, nymphoides and nymphoea. Overall, fodder plants cover an area of 18.60 sq. km of the lake which represents 43.69per cent of the total lake vegetation. Besides, willow plantation covering 27.30 sq. kms in the lake area is utilized for supply of fuel world mainly to Srinagar besides its utilization for manufacture of cricket bats.

7.2 Socio Economic Conditions of Sampled Settlements on Wular Lake

Wetlands of Jhelum Basin, especially Wular Lake, are the lifeline of Kashmir Valley. Through their natural functioning, these water bodies provide economic and ecological security to the entire Valley of Kashmir. Wular Lake forms the base of food security of the Valley by providing fish and aquatic vegetation to its surrounding inhabitants. It accounts to 60 per cent fish production of Kashmir Valley and plays an equally significant role in the hydrographic system of the region by acting as a huge basin for the annual flood waters of River Jhelum. Besides being a natural habitat for wildlife, it plays an important role in the sustenance of a large population of all the villages located along its periphery. The lake with its associated wetlands is an important habitat for migratory water birds within the Central Asian flyway and supports rich biodiversity.

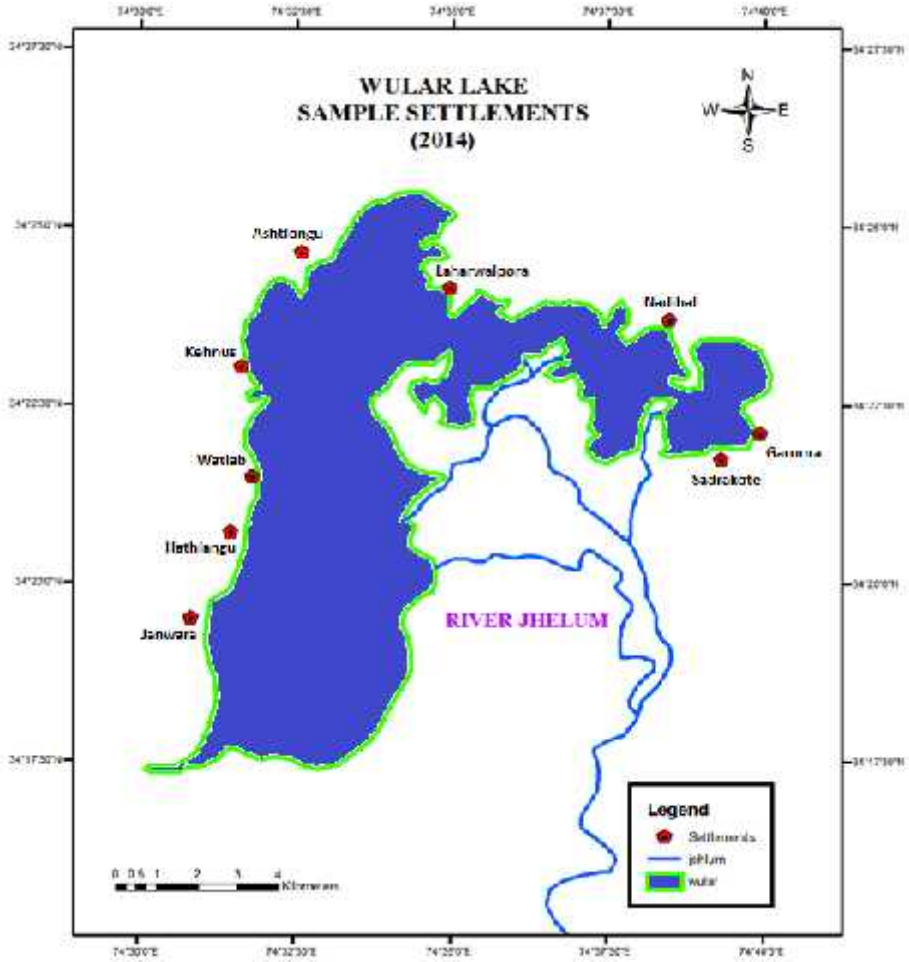
River Jhelum is the largest contributor of water inflows, almost 88 per cent, into Wular and the rest comes from its immediate catchments and precipitation. Similarly, the outflow through river Jhelum is the highest (96.9 per cent) and the remaining is accounted for by human abstractions, 1.7 per cent, and evapotranspiration, 1.4 per cent. The Wular Lake is primarily utilized for irrigation and water supply, besides

fishing. However, in the downstream reaches, the water from this lake is used for the generation of electricity.

Wular Lake has a vast catchment area which supports coniferous forests, alpine pastures and orchards adding to the natural beauty of the Valley. However, the entire Jhelum Basin, especially the direct catchment of Wular, is highly degraded that contributes to deposition of heavy load of silt into it. As a consequence of which, there is rapid shrinkage of the lake and reduction of its water level.

Being the largest fresh water wetland of Kashmir Valley, Wular Lake incorporates 127 villages in total in the two districts of Bandipora and Baramulla with a population size of 0.50 million which constitutes 13 per cent of the total population of Kashmir Valley. Of this population, 20 per cent inhabit the 31 villages located around lakeshore, 71 per cent within 70 villages on foot-hills and 9 per cent within 26 hill settlements.

The total number of towns in the two encompassing districts of Wular is 12 and total number of villages is 647. Around 20.38 per cent of the population of Baramulla and 10.39 per cent population of Bandipora is below poverty line. Baramulla comprises around 15.57 per cent households of Kashmir Valley with 22.54 per cent Scheduled Castes and 8.36 per cent of scheduled Tribes. Literate population of the district comprises of 15.90 per cent and the total working population accounts to 14.29 per cent of the total share of Valley. Similarly, Bandipora district comprises about 5.96 per cent households of Kashmir Valley with 5.99 per cent of Scheduled Castes and 16.71 per cent of Scheduled Tribes population. The total literates comprise of 5.42per cent and the total working population accounts for 7.01 per cent share of the Valley.



Source: Prepared by the Researcher from Topographic Maps of Kashmir Valley

Figure 7.7

7.2.1 General Characteristics of Sampled Settlements

Wular Lake, the largest wetland of Kashmir Valley, is spread between two districts of Baramulla and Bandipora. Beside few urban Settlements of Sopore and Bandipora, the major portion of the area surrounding Wular is rural in its geographical landscape. Almost all the villages located in the vicinity of Wular Lake are less populated and the settlement pattern is not so compact as that of Srinagar. Thus, 9 villages (6 from District Bandipora and 3 from District Baramulla) have been selected for sampling purpose and 10 per cent of the total households have been taken as the sample size. The 6 villages of District Bandipora include Ashtlongu, Kehnus, Nadihal, Garoora, Sadrakote and Laharwal Pora and the 3 villages of District Baramulla uinclude Watlab, Hathlangu and Janwara.

Table 7.7 shows the selection of Settlements on the basis of their location and dependency on Wular Lake. A perusal of this table shows that out of total sampled population of 3,534 persons, 1283 (36.30 per cent) were workers. Garoora consisted of 42.07 per cent of working population followed by Ashtlongu (40.07 per cent), Laharwal Pora (38.12 per cent), Sadrakote (37.07 per cent), Nadihal (36.87 per cent), Kehnusa (35.12 per cent), Watlab (32.17 per cent), Janwara (30 per cent) and Hathlangu (29.87 per cent)

The average household size of the sampled population was calculated as 7.58. The highest average household size of 8.01 was calculated from Ashtlongu followed by Watlab (7.82), Laharwal Pora (7.67), Nadihal (7.67), Kehnus (7.63), Garoora (7.48), Sadrakote (7.41), Janwara (7.35) and Hathlanga (7.00).

Wular Lake is encircled by three roads which include Srinagar to Bandipora road of 67 km, Bandipora to Sopore road of 40 km. and Sopore to Hajan road of 19 km. Of the 31 villages located in the immediate periphery of Wular Lake, 09 villages selected for sampling are located at 41 km (Sadrakote), 48 km (Garoora), 52 km (Nadihal), 55 km(Janwara), 56 km (Laharwal Pora), 60 km (Ashtlongu), 60 km (Watlab) and 61km (Kehnus) apart from Srinagar. Out of the 9 sampled villages, Kehnus comprises highest number of sampled households (78) and the sampled population of 595 people followed by Nadihal with 76 households and 583 people, Ashtlongu with 60 households and 481 people, Garoora with 54 households and population of 404, Sadrakote with 48 households and 356 people, Hathlangu with 44 households and population of 308, Laharwal Pora with 39 households and 299 people,

Janwara with 34 households and 250 people and Watlab with 33 households and a population of 258 people.

7.2.2 Socio Economic Conditions

The profile of the 9 sampled villages located around and dependent on Wular Lake is given in Table 7.7 and the distribution of sampled respondents according to their age and sex structure is given in table 7.8. A perusal of these tables shows that out of the total sampled population, nearly 50.05 per cent are males and 49.95 per cent are females. The dominance of male population was seen in 04 villages namely Ashtlongu (51.14 per cent), Kehnus (50.76 per cent), Sadrakote (50.28 per cent) and Watlab (50.39 per cent). While as females are dominated in 04 villages of Nadihal (51.12 per cent), Garoora (50.25 per cent), Laharwal Pora (50.50 per cent) and Hathlangu (50.32 per cent). The village Janwara recorded equal number of males and female population.

On the basis of age structure, it was observed that about 42.41 per cent of sampled population lies in Below 30 years of age group, 52.81 per cent belong to the age group of 30-60 years and only 4.78 per cent of people are categorized in the Above 60 years age group.

Table 7.9(A) and 7.9(B) show the educational structure and levels of education of the sampled respondents. A perusal of these tables show that of the total sampled respondents, only about 38.05 per cent were educated and 61.95 per cent were uneducated. The highest number of educated people was observed in Garoora (41.83 per cent) followed by Nadihal (41.83 per cent), Janwara (38.01 per cent), Watlab (37.20 per cent), Kehnus (36.13 per cent). Ashtlongu (35.97 per cent), Laharwal Pora (35.12 per cent) and Hathlangu (34.87 per cent). The analysis of the levels of education reveals that around 46.77 per cent of the respondents were educated up to primary level and 25 per cent had received education up to secondary level which was followed by 20.79 per cent of under-graduates and 5.42 per cent of graduates. The number of Post Graduates was only 2.02 per cent of the total educated people.

The Housing conditions of sampled villages are shown in table 7.10 (A), 7.10 (B), 7.10 (C) and 7.10 (D). A perusal of table 7.10 (A) shows that around 34.40 per cent of the sampled households were of Kutcha type and 65.60 per cent were of Pucca type.

Kutcha houses were found in all the 09 sampled villages. The highest number of kutcha houses were found in Ashtlongu (38.33 per cent) followed by Hathlangu (37.46 per cent), Laharwal Pora (35.9 per cent), Sadrakote (35.42 per cent), Janwara (34.78 per cent), Kehnus (34.61 per cent), Garoora (33.33 per cent), Nadihal (31.58 per cent) and Watlab (30.3 per cent).

Table 7.7- Selection of Settlements and Households on the Basis of their Location and Dependency on Wular Lake (2015)

SELECTED SETTLEMENTS								SAMPLED SETTLEMENTS				
Districts	**Number**	**Name**	**Total No of Households**	**Total Population**	**Average Household Size**	**Total Workers**	**Percentage of Workers to the Total Population**	**Household (Number)**	**Population (Number)**	**Average Household Size**	**Workers (Number)**	**Percentage of Workers to the Sampled Population**
Bandipora	6	**Ashtlongu**	601	4,074	6.77	1,644	40.35	60	481	8.01	193	40.12
		Kehnus	777	5,271	6.78	1,826	34.64	78	595	7.63	209	35.12
		Nadihal	758	5,167	6.81	1,826	35.33	76	583	7.67	215	36.87
		Garoora	537	3,528	6.56	1,484	42.06	54	404	7.48	170	42.07
		Sadrakote	479	3,246	6.77	1,181	36.38	48	356	7.41	132	37.07
		Laharwalpora	386	2,197	5.69	803	36.54	39	299	7.67	114	38.12
Baramulla	3	**Watlab**	325	2,164	6.66	603	27.86	33	258	7.82	83	32.17
		Hathlangu	440	2,988	6.79	747	25.00	44	308	7.00	92	29.87
		Janwara	335	2,462	7.35	658	26.70	34	250	7.35	75	30.00
Total	**09**		**4,638**	**31,097**	**6.70**	**10,772**	**34.64**	**466**	**3,534**	**7.58**	**1,283**	**36.30**

Source: 1. Census of India (2011), Directorate of Census Operations, Jammu & Kashmir
2. Based on Field Survey by the Researcher, 2014-15

Table 7.8- Distribution of Respondents (in percentage) According to Age and Sex Structure (2015)

Age Group	Gender	Ashtlongu	Kehnus	Nadihal	Garoora	Sadrakote	Laharwalpora	Watlab	Hathlangu	Janwara	Total Population
Below 30	Male	50.95	50.20	48.96	48.77	50.95	50.00	50.45	49.62	50.00	49.89
	Female	49.05	49.80	51.04	51.23	49.05	50.00	49.55	50.38	50.00	50.10
	Total	44.07	42.86	41.00	40.09	44.10	44.81	43.03	41.88	40.00	42.41
30-60	Male	51.34	51.11	49.20	50.49	50.27	49.07	50.37	49.69	50.38	50.32
	Female	48.66	48.89	50.80	49.51	49.73	50.93	49.63	50.31	49.62	49.68
	Total	54.26	52.94	54.03	51.00	51.97	53.85	52.32	50.97	53.20	52.81
Above 60	Male	50.00	51.10	48.28	50.00	50.56	50.00	49.50	50.00	49.85	49.12
	Female	50.00	49.90	51.72	50.00	49.44	50.00	50.50	50.00	50.15	50.88
	Total	1.67	4.20	4.97	8.91	3.93	1.34	4.65	7.15	6.80	4.78
Total Males		51.14	50.76	48.88	49.75	50.28	49.50	50.39	49.68	50.00	50.05
Total Females		48.86	49.24	51.12	50.25	49.72	50.50	49.61	50.32	50.00	49.95
Grand Total		**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher, 2014-15

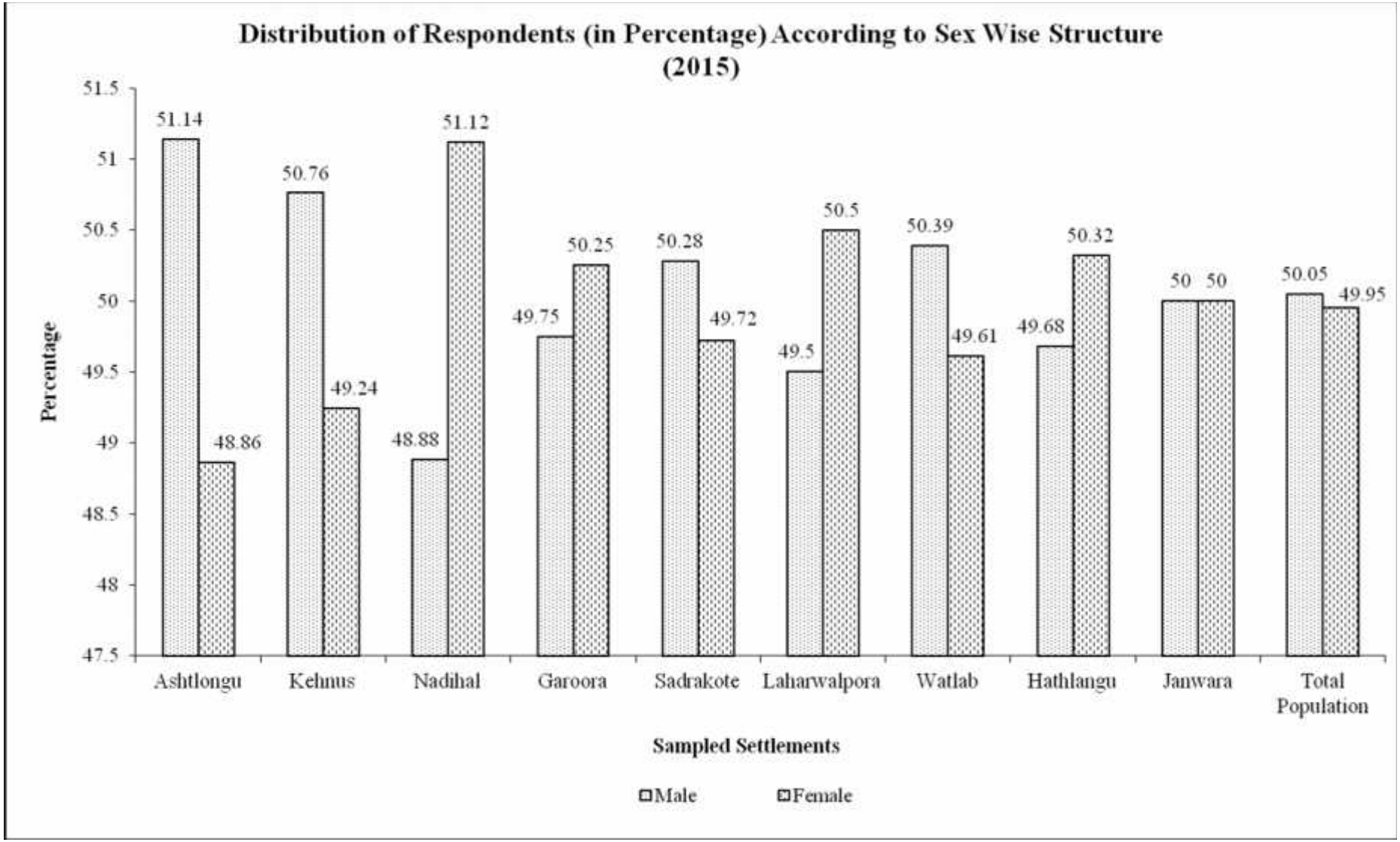

Distribution of Respondents (in Percentage) According to Sex Wise Structure (2015)
Percentage
51.5
51
50.5
50
49.5
49
48.5
48
47.5
51.14
48.86
50.76
49.24
48.88
51.12
49.75
50.25
50.28
49.72
49.5
50.5
50.39
49.61
49.68
50.32
50
50
50.05
49.95
Ashtlongu
Kehnus
Nadihal
Garoora
Sadrakote
Laharwalpora
Watlab
Hathlangu
Janwara
Total Population
Sampled Settlements
Male
Female

Figure 7.8

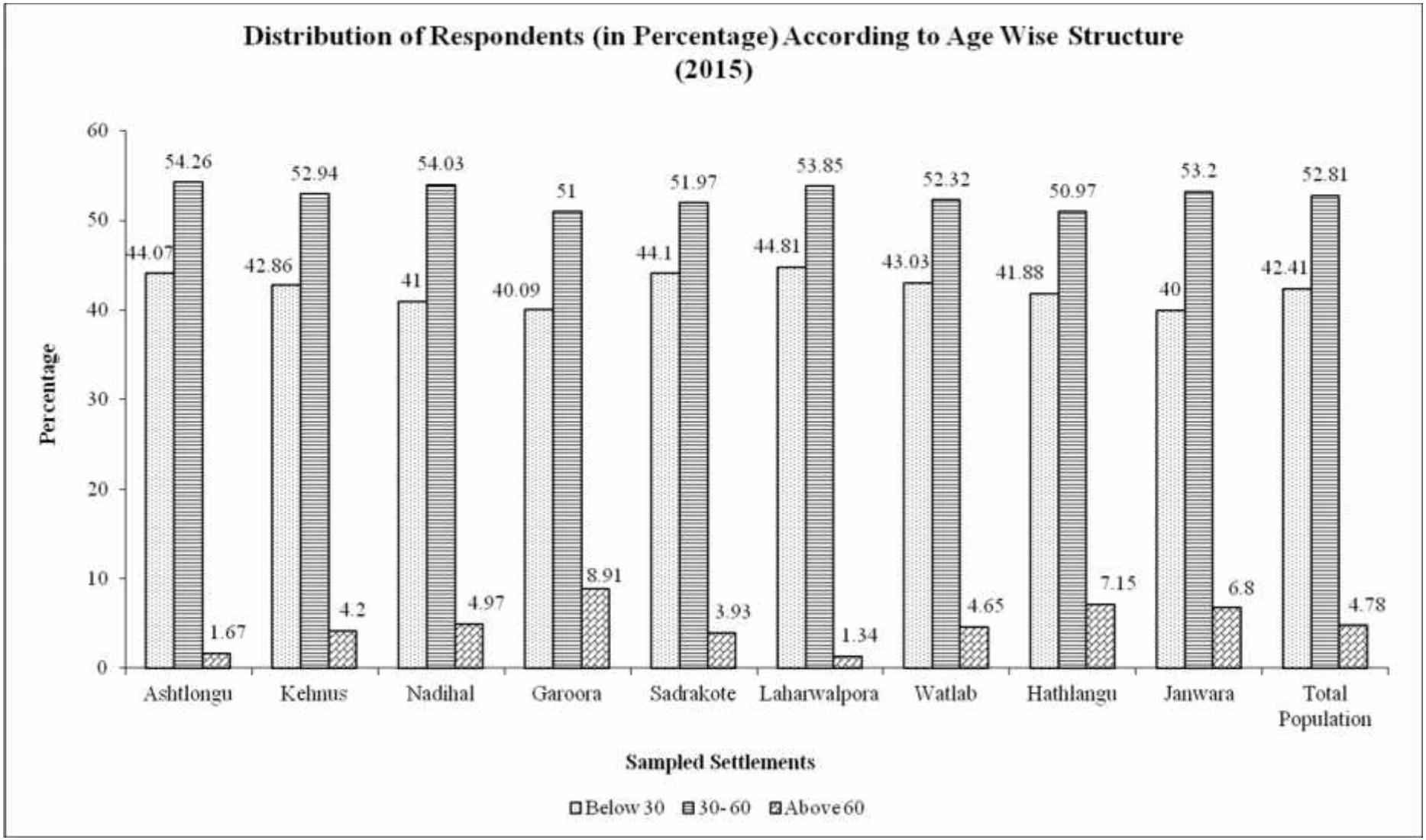

Distribution of Respondents (in Percentage) According to Age Wise Structure (2015)
Percentage
60
50
40
30
20
10
0
44.07
54.26
1.67
42.86
52.94
4.2
41
54.03
4.97
40.09
51
8.91
44.1
51.97
3.93
44.81
53.85
1.34
43.03
52.32
4.65
41.88
50.97
7.15
40
53.2
6.8
42.41
52.81
4.78
Ashtlongu
Kehnus
Nadihal
Garoora
Sadrakote
Laharwalpora
Watlab
Hathlangu
Janwara
Total Population
Sampled Settlements
Below 30
30-60
Above 60

Figure 7.9

Table 7.9 (A) - Distribution of Respondents (in Percentage) According to Educational Structure (2015)

Educational Structure	Ashtlongu	Kehnus	Nadihal	Garoora	Sadrakote	Laharwalpora	Watlab	Hathlangu	Janwara	Total Population
Uneducated	64.03	63.87	59.01	58.17	60.96	64.88	62.80	65.00	61.99	61.94
Educated	35.97	36.13	40.99	41.83	39.04	35.12	37.20	35.00	38.01	38.06
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher, 2014-15

Table 7.9 (B) - Distribution of Respondents (in Percentage) According to Levels of Education (2015)

Levels of Education	Ashtlongu	Kehnus	Nadihal	Garoora	Sadrakote	Laharwalpora	Watlab	Hathlangu	Janwara	Total Population
Primary	45.08	46.51	48.12	48.52	47.48	44.76	46.88	45.71	46.15	46.77
Secondary	24.28	24.19	25.95	26.03	25.18	24.76	25	22.86	24.61	25.00
Under Graduate	20.23	20.47	21.33	20.71	20.14	20.00	21.88	20.00	21.53	20.79
Graduate	8.09	6.04	2.93	3.55	5.76	7.61	5.20	8.57	4.61	5.42
Post Graduate	2.31	2.79	1.67	1.18	1.44	2.86	1.04	2.86	3.07	2.02
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher, 2014-15

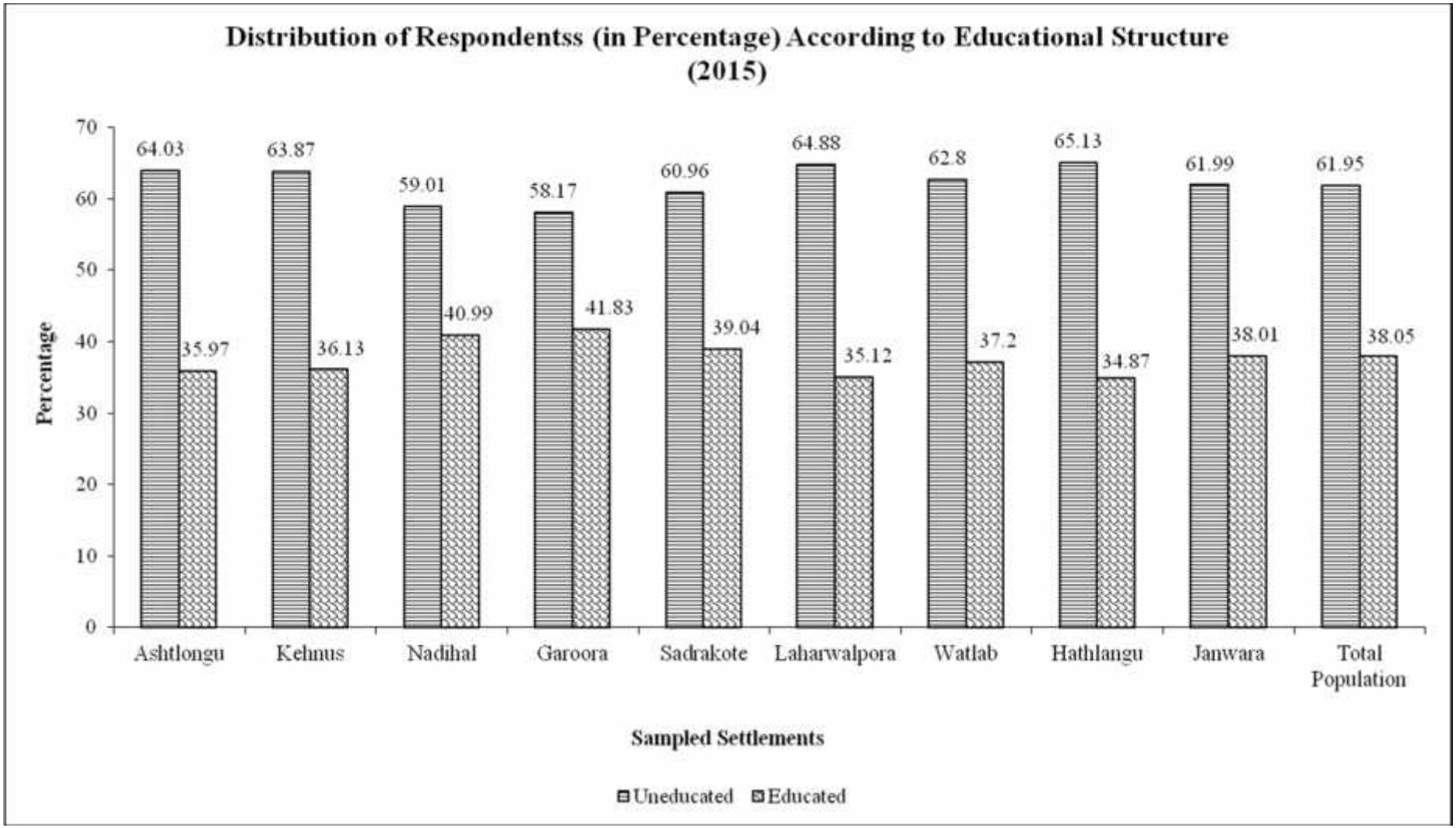

Distribution of Respondentss (in Percentage) According to Educational Structure (2015)
Percentage
70
60
50
40
30
20
10
0
64.03
35.97
63.87
36.13
59.01
40.99
58.17
41.83
60.96
39.04
64.88
35.12
62.8
37.2
65.13
34.87
61.99
38.01
61.95
38.05
Ashtlongu
Kehnus
Nadihal
Garoora
Sadrakote
Laharwalpora
Watlab
Hathlangu
Janwara
Total Population
Sampled Settlements
Uneducated
Educated

Figure 7.10

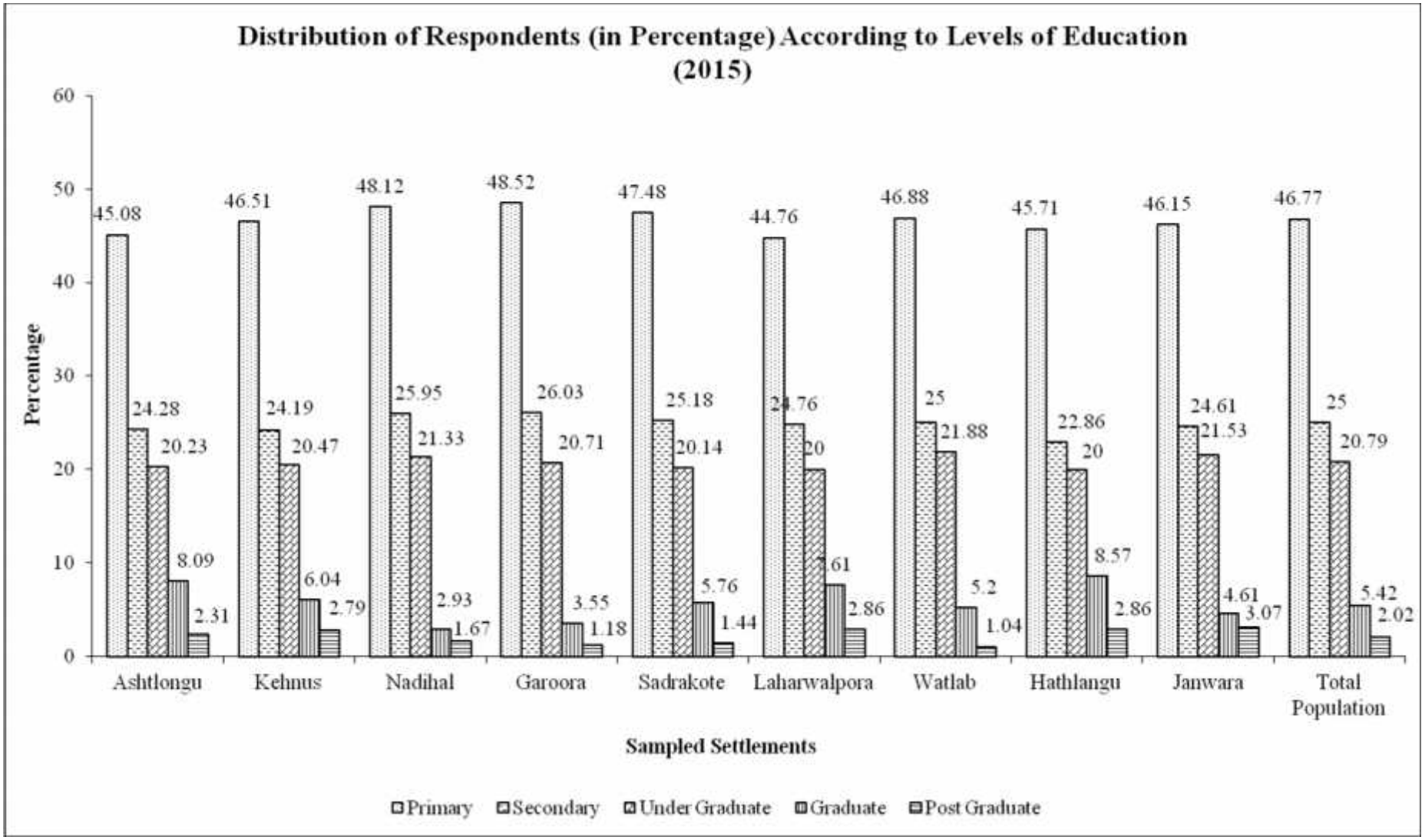

Distribution of Respondents (in Percentage) According to Levels of Education (2015)
Percentage
60
50
40
30
20
10
0
45.08
24.28
20.23
8.09
2.31
46.51
24.19
20.47
6.04
2.79
48.12
25.95
21.33
2.93
1.67
48.52
26.03
20.71
3.55
1.18
47.48
25.18
20.14
5.76
1.44
44.76
24.76
20
7.61
2.86
46.88
25
21.88
5.2
1.04
45.71
22.86
20
8.57
2.86
46.15
24.61
21.53
4.61
3.07
46.77
25
20.79
5.42
2.02
Ashtlongu
Kehnus
Nadihal
Garoora
Sadrakote
Laharwalpora
Watlab
Hathlangu
Janwara
Total Population
Sampled Settlements
Primary
Secondary
Under Graduate
Graduate
Post Graduate

Figure 7.11

Table 7.10 (A) - Distribution of Respondents (in Percentage) According to Housing Conditions

Type of House	Ashtlongu	Kehnus	Nadihal	Garoora	Sadrakote	Laharwalpora	Watlab	Hathlangu	Janwara	Total Population
Kutcha	38.33	34.61	31.58	33.33	35.42	35.9	30.3	37.46	34.78	34.40
Pucca	61.67	65.39	68.42	66.67	64.58	64.1	69.7	62.54	65.22	65.60
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher, 2014-15

Table 7.10 (B) - Distribution of Respondents (in Percentage) According to Source of Drinking Water

Source of Drinking Water	Ashtlongu	Kehnus	Nadihal	Garoora	Sadrakote	Laharwalpora	Watlab	Hathlangu	Janwara	Total Population
Municipality/P.H.E*	41.67	39.75	43.42	42.6	39.58	35.9	39.39	38.46	43.48	40.8
River/Nullah	26.67	24.36	18.42	16.67	10.42	23.07	21.21	15.38	21.74	20.28
Lake	20	19.23	23.68	25.92	29.16	28.2	27.28	23.07	21.74	23.82
Hand Pump	10	14.1	11.84	9.26	16.68	7.71	9.09	15.38	8.7	11.56
Spring	1.66	2.56	2.64	5.55	4.16	5.12	3.03	7.7	4.34	3.54
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher, 2014-15
**P.H.E- Public Health Engineering Department*

Table 7.10 (C) - Distribution of Respondents (in Percentage) According to Solid Waste Disposal

Solid Waste Disposal	Ashtlongu	Kehnus	Nadihal	Garoora	Sadrakote	Laharwalpora	Watlab	Hathlangu	Janwara	Total Population
Lake	28.33	39.74	26.31	33.33	35.42	30.77	30.3	30.77	30.43	32.07
River/Nullah	40	30.77	39.48	35.19	27.08	30.77	39.4	38.46	30.43	34.67
Burning	25	21.79	21.05	12.96	20.83	20.51	18.18	23.07	21.75	20.52
Others*	6.67	7.69	13.16	18.52	16.67	17.95	12.12	7.7	17.39	12.74
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher, 2014-15

Table 7.10 (D) - Distribution of Respondents (in Percentage) According to Toilet Waste Disposal

Toilet Waste Disposal	Ashtlongu	Kehnus	Nadihal	Garoora	Sadrakote	Laharwalpora	Watlab	Hathlangu	Janwara	Total Population
Lake	25	50	42.1	31.48	47.92	61.54	48.48	38.46	39.13	42.45
Septic Tank	10	5.13	9.21	12.96	8.33	7.69	9.09	7.69	8.7	8.73
Used as Manure	65	44.87	48.69	55.56	43.75	30.77	42.43	53.85	52.17	48.82
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher, 2014-15

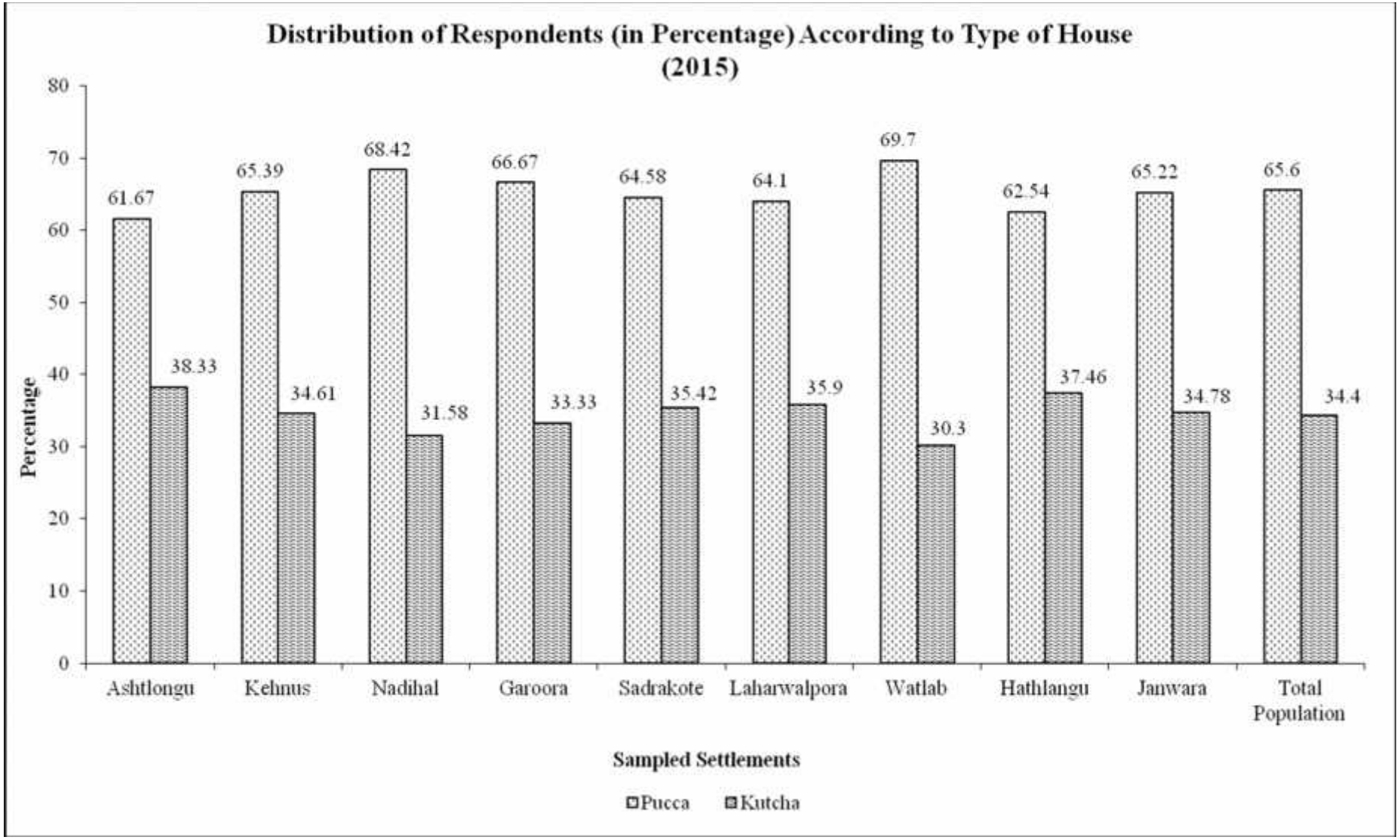

Distribution of Respondents (in Percentage) According to Type of House (2015)
Percentage
80
70
60
50
40
30
20
10
0
61.67
38.33
65.39
34.61
68.42
31.58
66.67
33.33
64.58
35.42
64.1
35.9
69.7
30.3
62.54
37.46
65.22
34.78
65.6
34.4
Ashtlongu
Kehnus
Nadihal
Garoora
Sadrakote
Laharwalpora
Watlab
Hathlangu
Janwara
Total Population
Sampled Settlements
Pucca
Kutcha

Figure 7.12

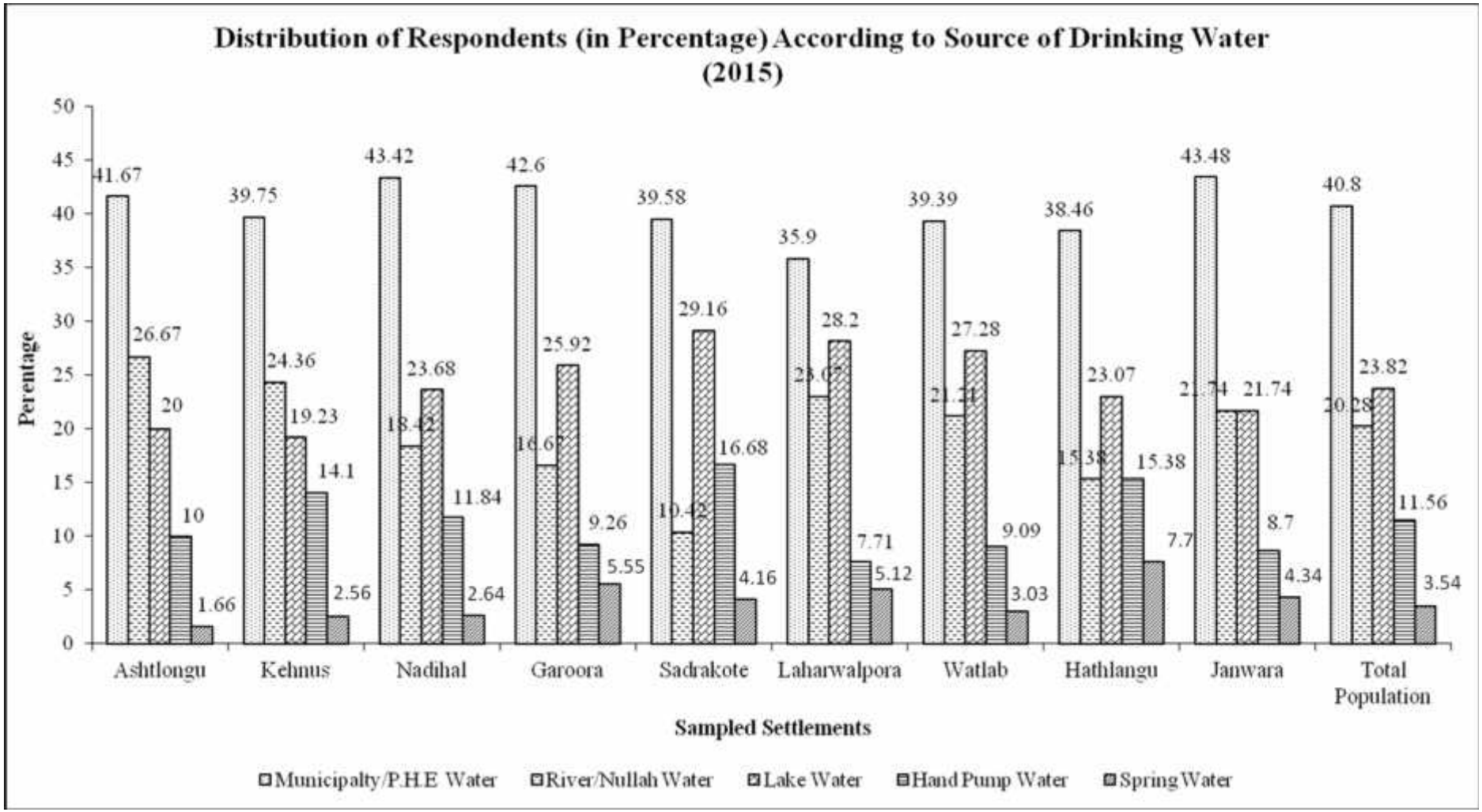

Distribution of Respondents (in Percentage) According to Source of Drinking Water (2015)
Perentage
50
45
40
35
30
25
20
15
10
5
0
41.67
26.67
20
10
1.66
39.75
24.36
19.23
14.1
2.56
43.42
18.42
23.68
11.84
2.64
42.6
16.67
25.92
9.26
5.55
39.58
10.42
29.16
16.68
4.16
35.9
23.07
28.2
7.71
5.12
39.39
21.21
27.28
9.09
3.03
38.46
15.38
23.07
15.38
7.7
43.48
21.74
21.74
8.7
4.34
40.8
20.28
23.82
11.56
3.54
Ashtlongu
Kehnus
Nadihal
Garoora
Sadrakote
Laharwalpora
Watlab
Hathlangu
Janwara
Total Population
Sampled Settlements
Municipalty/P.H.E Water
River/Nullah Water
Lake Water
Hand Pump Water
Spring Water

Figure 7.13

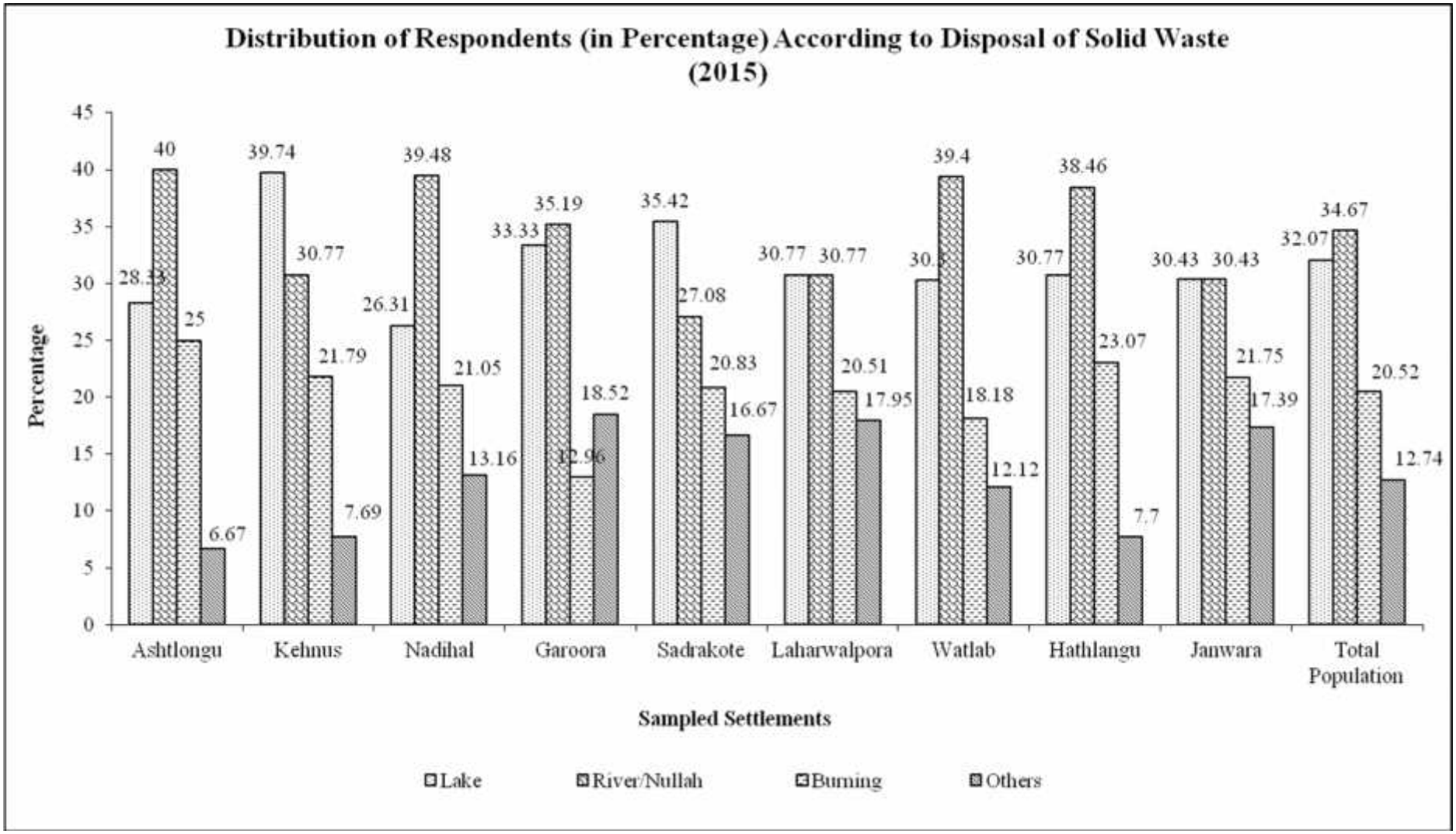

Distribution of Respondents (in Percentage) According to Disposal of Solid Waste (2015)
Percentage
45
40
35
30
25
20
15
10
5
0
28.33
40
25
6.67
39.74
30.77
21.79
7.69
26.31
39.48
21.05
13.16
33.33
35.19
12.96
18.52
35.42
27.08
20.83
16.67
30.77
30.77
20.51
17.95
30.3
39.4
18.18
12.12
30.77
38.46
23.07
7.7
30.43
30.43
21.75
17.39
32.07
34.67
20.52
12.74
Ashtlongu
Kehnus
Nadihal
Garoora
Sadrakote
Laharwalpora
Watlab
Hathlangu
Janwara
Total Population
Sampled Settlements
Lake
River/Nullah
Burning
Others

Figure 7.14

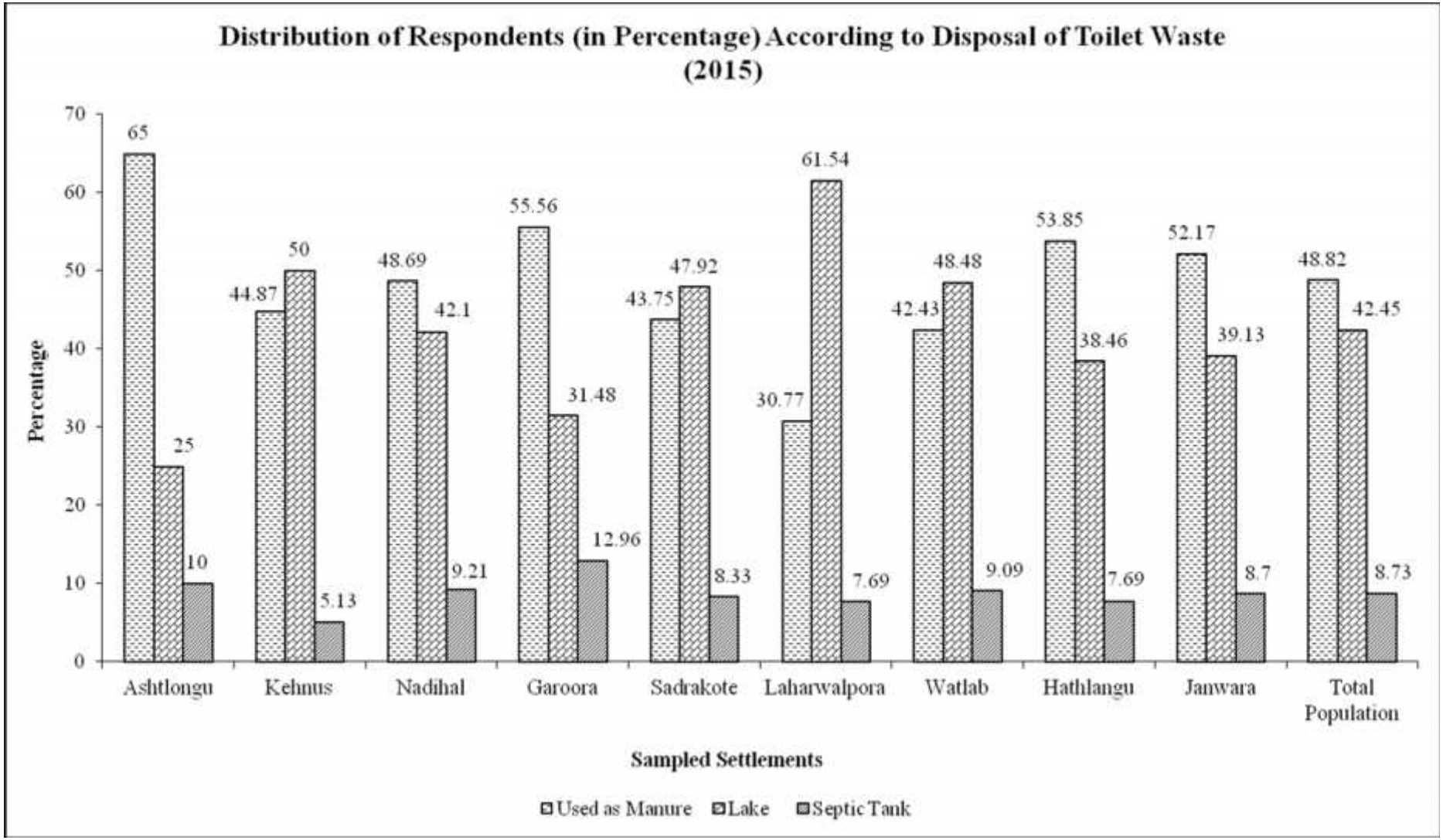

Distribution of Respondents (in Percentage) According to Disposal of Toilet Waste (2015)
Percentage
70
60
50
40
30
20
10
0
65
25
10
44.87
50
5.13
48.69
42.1
9.21
55.56
31.48
12.96
43.75
47.92
8.33
30.77
61.54
7.69
42.43
48.48
9.09
53.85
38.46
7.69
52.17
39.13
8.7
48.82
42.45
8.73
Ashtlongu
Kehnus
Nadihal
Garoora
Sadrakote
Laharwalpora
Watlab
Hathlangu
Janwara
Total Population
Sampled Settlements
Used as Manure
Lake
Septic Tank

Figure 7.15

Table 7.10 (B) shows the source of Drinking water to the sampled villages. A perusal of this table shows that nearly 23.82 per cent of the sampled population is dependent upon lake water for drinking purposes like Sadrakote (29.16 per cent), Laharwal Pora (28.20 per cent), Watlab (27.28 per cent), Garoora (25.92 per cent), Nadihal (23.68 per cent), Hathlangu (23.07 per cent), Janwara (21.74 per cent), Ashtlongu (20 per cent) and Kehnus (19.23 per cent). Likewise, Municipality water and water from the Department of Public Health Engineering (PHE) is used by 40.8 per cent of sampled population for drinking. Janwara utilizes 43.48 per cent of Municipality/PHE water followed by Nadihal (43.42 per cent), Garoora (42.6 per cent), Ashtlongu (41.67 per cent), Kehnus (39.75 per cent), Hathlangu (38.46 per cent) and Laharwal Pora (35.9 per cent). Besides, 20.28 per cent of the sampled population uses water from small rivers and streams for drinking purposes. Ashtlongu (26.67 per cent) is followed by Kehnus (24.36 per cent), Laharwalpora (23.07 per cent), Janwara (21.74 per cent), Watlab (21.21 per cent), Nadihal (18.42 per cent), Garoora (16.67 per cent), Hathlanga (15.38 per cent) and Sadrakote (10.42 per cent). Similarly, water from hand pumps is utilized by around 11.56 per cent of sampled population which includes 16.68 per cent population of Sadrakote, 15.38 per cent of Hathlangu, 14.1 per cent of Kehnus, 11.84 per cent of Nadihal, 10 per cent of Ashtlongu, 9.26 per cent of Garoora, 9.09 per cent of Watlab, 8.7 per cent of Janwara and 7.71 per cent of Laharwalpora. Above all, 3.54 per cent of the sampled population used spring water for drinking purposes which comprised 7.7 per cent people of Hathlangu, 5.55 per cent of Garoora, 5.12 per cent of Laharwal Pora, 4.34 per cent of Janwara, 4.16 per cent of Sadrakote, 3.03 per cent of Watlab, 2.64 per cent of Nadihal, 2.56 per cent of Kehnus and 1.66 per cent of Ashtlongu.

Table 7.10 (C) shows the distribution of households according to disposal of Solid waste. A perusal of this table shows that around 32.07 per cent of the total sampled population disposes their solid waste directly/indirectly into the lake. Kehnus disposes 39.74 per cent of its solid waste into Wular Lake followed by Sadrakote (35.42 per cent), Garoora (33.33 per cent), Laharwal Pora (30.77 per cent), Hathlangu (30.77 per cent), Ashtlongu (28.33 per cent) and Nadihal (26.31 per cent). Moreover, 34.67 per cent of sampled households dispose their solid waste into rivers and Nullahas which include 40 per cent people of Ashtlongu, 39.48 per cent of Nadihal, 39.4 per cent of Watlab, 38.46 per cent of Hathlangu, 35.19 per cent of Garoora, 30.77 per cent of

Laharwal Pora, 30.77 per cent of Kehnus, 30.43 per cent of Janwara and 27.08 per cent of Sadrakote. Likewise, 20.52 per cent of the total sampled households burn their solid waste which includes 25 per cent population of Ashtlongu, 23.07 per cent of Hathlangu, 21.79 per cent of Kehnus, 21.75 per cent of Janwara, 21.05 per cent of Nadihal, 20.83 per cent of Sadrakote, 20.51 per cent of Laharwal Pora, 18.18 per cent of Watlab and 12.96 per cent of Garoora. Above all, 12.74 per cent of the sampled households dispose their solid waste by other means including road side dumping, backyard dumping and street dumping and so on.

Table 7.10 (D) shows the distribution of sampled households according to the disposal of toilet waste. A perusal of this table shows that 42.45 per cent of the sampled households dispose their toilet waste into Wular Lake. Laharwalpora contributes 61.54 per cent to this disposal followed by 50 per cent disposal by Kehnus, 47.92 per cent by Sadrakote, 42.1 per cent by Nadihal, 39.13 per cent by Janwara, 38.46 per cent by Hathlangu, 31.48 per cent by Garoora and 25 per cent by Ashtlongu. Only 8.73 per cent of the sampled households have septic tanks to dispose their toilet waste which include 12.96 per cent of Garoora, 10 per cent of Ashtlongu, 9.21 per cent of Nadihal, 9.09 per cent of Watlab, 8.7 per cent of Janwara, 8.33 per cent of Sadrakote, 7.69 per cent of Laharwalpora, 7.69 per cent of Hathlangu, and 5.13 per cent of Kehnus. However, 48.82 per cent of the sampled households used toilet waste as manure in their fields and vegetable gardens which include 65 per cent households of Ashtlongu, 55.56 per cent of Garoora, 53.85 per cent of Hathlanga, 52.17 per cent of Janwara, 48.69 per cent of Nadihal, 44.87 per centof Kehnus, 43.75 per cent of Sadrakote, 42.43 per cent of Watlab and 30.77 per cent of Laharwalpora.

Table 7.11- Distribution of Respondents (in Percentage) According to Occupational Structure

Occupational Structure	Ashtlongu	Kehnus	Nadihal	Garoora	Sadrakote	Laharwalpora	Watlab	Hathlangu	Janwara	Total Population
Cultivation	21.19	23.03	22.85	24.17	22.91	21.91	22.82	25	25.78	22.95
Arts and Crafts	30.08	26.06	23.18	20.38	26.82	26.4	28.19	28.85	23.17	25.67
Business and Trade	9.32	9.09	9.93	9.96	7.82	10.11	4.7	7.69	11.34	9.06
Govt. Employees	5.09	3.03	5.96	5.21	2.23	2.25	4.02	3.85	3.09	4.03
Fishing/Fish Marketing	34.32	38.79	38.08	40.28	40.22	39.33	40.27	34.61	36.08	38.29
Total	100	100	100	100	100	100	100	100	100	100

Source: Based on Field Survey by the Researcher, 2014-15

Table 7.12: Distribution of Respondents (in Percentage) Accoerding to Average Monthly Income Structure

Average Monthly Income (Rupees)	Ashtlongu	Kehnus	Nadihal	Garoora	Sadrakote	Laharwalpora	Watlab	Hathlangu	Janwara	Total Population
Below 3000	53.34	53.65	52.63	55.56	54.16	58.97	57.58	53.85	56.52	54.72
3000- 6000	36.66	37.18	34.21	35.19	37.5	35.9	36.36	30.77	34.79	35.85
Above 6000	10	8.97	13.16	9.25	8.34	5.13	6.06	15.38	8.6	9.43
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher, 2014-15

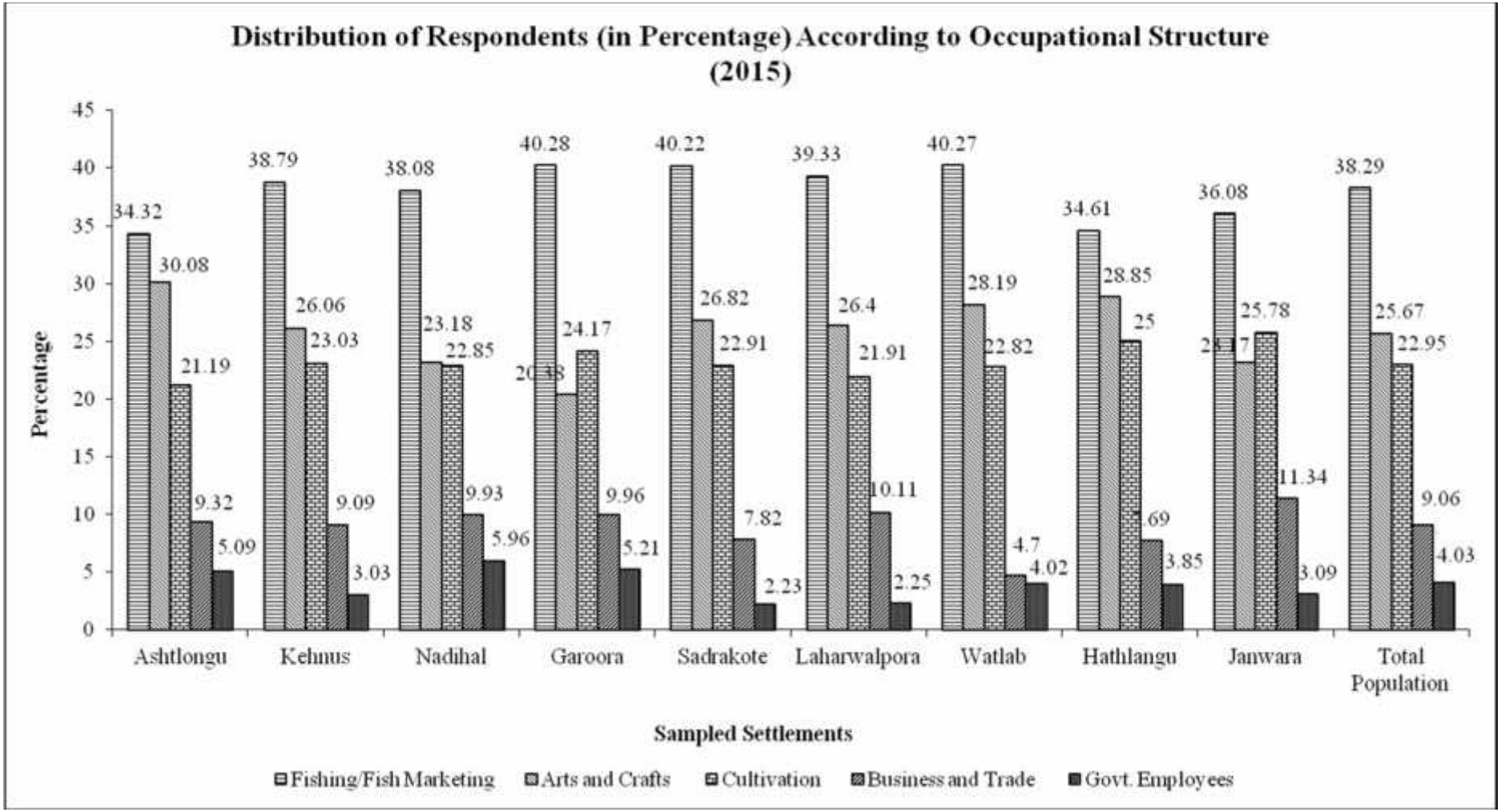

Distribution of Respondents (in Percentage) According to Occupational Structure (2015)
Percentage
45
40
35
30
25
20
15
10
5
0
34.32
30.08
21.19
9.32
5.09
38.79
26.06
23.03
9.09
3.03
38.08
23.18
22.85
9.93
5.96
40.28
24.17
9.96
5.21
40.22
26.82
22.91
7.82
2.23
39.33
26.4
21.91
10.11
2.25
40.27
28.19
22.82
4.7
4.02
34.61
28.85
25
3.85
36.08
25.78
11.34
3.09
38.29
25.67
22.95
9.06
4.03
Ashtlongu
Kehnus
Nadihal
Garoora
Sadrakote
Laharwalpora
Watlab
Hathlangu
Janwara
Total Population
Sampled Settlements
Fishing/Fish Marketing
Arts and Crafts
Cultivation
Business and Trade
Govt. Employees

Figure 7.16

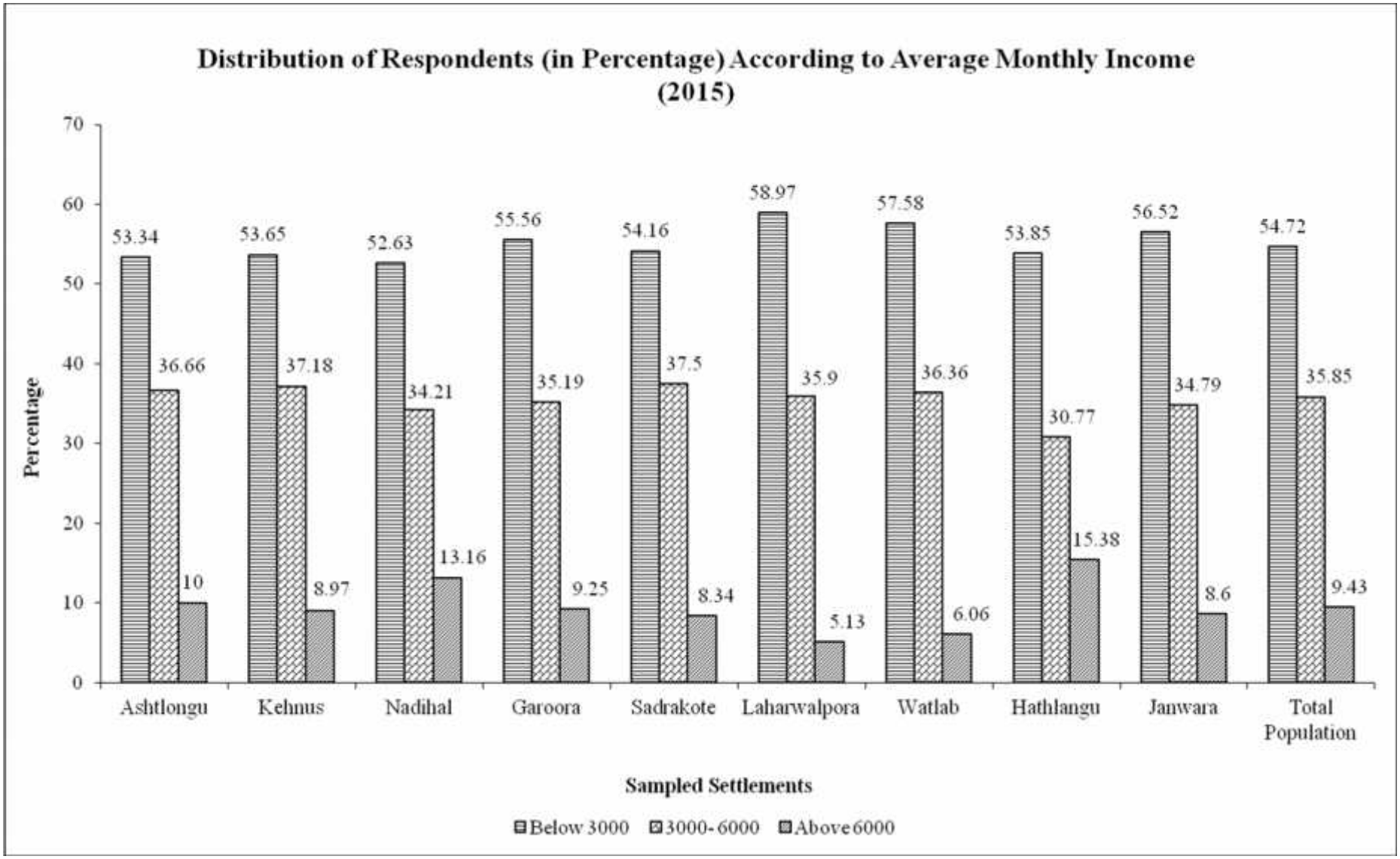

Distribution of Respondents (in Percentage) According to Average Monthly Income (2015)
Percentage
70
60
50
40
30
20
10
0
53.34
36.66
10
53.65
37.18
8.97
52.63
34.21
13.16
55.56
35.19
9.25
54.16
37.5
8.34
58.97
35.9
5.13
57.58
36.36
6.06
53.85
30.77
15.38
56.52
34.79
8.6
54.72
35.85
9.43
Ashtlongu
Kehnus
Nadihal
Garoora
Sadrakote
Laharwalpora
Watlab
Hathlangu
Janwara
Total Population
Sampled Settlements
Below 3000
3000-6000
Above 6000

Figure 7.17

Table 7.11 shows the occupational structure of the sampled population. A perusal of this table shows that 38.29 per cent of these respondents were engaged in fishing and fish marketing which includes 40.28 per cent population of Garoora followed by 40.27 per cent of Watlab, 40.22 per cent of Sadrakote, 39.33 per cent of Laharwalpora, 38.79 per cent of Kehnus, 38.08 per cent of Nadihal, 36.08 per cent of Janwara, 34.61 per cent of Hathlangu and 34.32 per cent of Ashtlongu. Almost 25.67 per cent of the sampled respondents were engaged with arts and crafts which include 30.08 per cent of the sampled population of Ashtlongu, 28.85 per cent of Hathlanga, 28.19 per cent of Watlab, 26.82 per cent of Sadrakote, 26.40 per cent of Laharwalpora, 26.06 per cent of Kehnus, 23.18 per cent of Nadihal, 23.17 per cent of Janwara and 20.38 per cent of Garoora. Cultivation was the occupation of 25.78 per cent of the sampled respondents which include 25 per cent of Hathlangu, 24.17 per cent of Garoora, 23.03 per centof Kehnus, 22.91 per cent of Sadrakote, 22.85 per cent of Nadihal, 22.82 per cent of Watlab, 21.91 per cent of Laharwalpora, and 21.19 per cent of Ashtlongu. Similarly 9.06 per cent of the sampled population was engaged with Business and Trade which include 11.34 per cent of the population of Janwara, 10.11 per cent of Laharwalpora, 9.96 per cent of Garoora, 9.93 per cent of Nadihal, 9.32 per cent of Ashtlongu, 9.09 per cent of Kehnus, 7.82 per cent of Sadrakote, 7.69 per cent of Hathlangu and 4.7 per cent of Watlab. The least number of people (4.03 per cent) are employed in government jobs which include 5.96 per cent of population of Nadihal,5.21 per cent of Garoora, 5.09 per cent of asgtlongu, 4.02 per cent of Watlab, 3.85 per cent of Hathlangu, 3.09 per cent of Janwara, 3.03 per cent of Kehnus, 2.25 per centof Laharwalpora and 2.23 per cent of Sadrakote.

Table 7.12 shows the distribution of sampled respondents according to the average monthly income. A perusal of this table shows that there are 54.72 per cent of the respondents whose average monthly income is below Rs.3,000 which include 58.97 per cent people of Laharwalpora, 57.58 per cent of Watlab, 56.52 per cent of Janwara, 55.56 per cent of Garoora, 54.16 per cent of Sadrakote, 53.85 per cent of Hathlangu, 53.65 per cent of Kehnus, 53.34 per cent of Ashtlongu and 52.63 per cent of Nadihal. Similarly, 35.85 per cent of the sampled respondents have monthly income of Rs.3,000- 6,000 which include 37.5 per cent population of Sadrakote followed by 37.18 per cent of Kehnus, 36.66 per cent of Ashtlongu, 36.36 per cent of Watlab, 35.9 per cent of Laharwalpora, 35.19 per cent of Garoora, 34.79 per cent of

Janwara, 34.21 per cent of Nadihal and 30.72 per cent of Hathlangu. Out of the total sampled population, only 9.43 per cent were having average monthly income of above Rs. 6,000 which include 15.38 per cent of Hathlangu, 13.16 per cent of Nadihal, 10 per cent of Ashtlongu, 9.25 per cent of Garoora, 8.97 per cent of Kehnus, 8.6 per cent of Janwara, 8.34 per cent of Sadrakote, 6.06 per cent of Watlab and 5.13 per cent of Laharwalpora.

Summary

In the present chapter, an attempt has been made to evaluate the various physical, hydrological, and socio economic dimensions of the largest wetland of Kashmir Valley, Wular Lake; wherein besides various viewpoints on its origin, its catchment area, hydrological regimes, water quality, land Use/ Land Cover dynamics and biodiversity have been taken into consideration.

The analysis of all these parameters has given a clear picture of the importance of Wular Lake in the Socio economic setup of Kashmir Valley. It has been held that this lake acts as a huge absorption basin for the flood waters of Jhelum River as well as acts as reservoir of food and fodder for the huge population living on its periphery.

However, it has also been noticed that the catchment area of this wetland is highly degradable which leads to the loosening, transportation and the consequent deposition of huge amounts of silt into its bed. It also acts as a receptacle for the pollutants flowing down from the highly urbanized areas of Srinagar as well as from all its surrounding settlements. In addition to it, Wular Lake has also lost extensive portion of its area to willow plantations. Thus, all these factors have deteriorated the water quality and overall health of this wetland and have reduced its areal extent and water levels.

This chapter has also tried to look into the socio economic profile of the 9 villages located on Wular Lake wherein it has been clearly found that Wular Lake is surrounded by the poor and deprived section of the society. The surrounding population is deprived even of the basic necessities of housing, water and infrastructure. Only 38.06per cent of the sampled population is educated and even from that almost 47per cent are educated up to primary levels only. Secondly,

34.40per cent of the sampled population resides in *Kutcha* or flimsy houses and around 44per cent depend on lakes and rivers for drinking purposes.

The sampled population does not have any means of disposing their solid and liquid wastes as well. Almost 66.73per cent of them use rivers and wetlands for the disposal of their solid waste. Thirdly, 42.45per cent of the sampled population disposes their toilet waste directly/ indirectly into Wular Lake and only 8.73per cent have septic tanks. Similarly, the occupational structure of these households shows that 38.29per cent of them is engaged with fishing and fish marketing and only 4.03per cent is associated with government jobs.

The sampled population is so poor that and deprived of the socio economic benefits that around 54.72per cent have their average monthly income of below 3,000 rupees followed by 35.85per cent of population between an income group of Rs.3,000 – 6000 per month. Only a small population of 9.43per cent was having an average monthly income of above Rs.6,000.

To conclude with the above discussion, it is worthwhile to note down few things about Wular Lake here. Firstly, the Wular Lake is passing through a deplorable state of environment. It is under severe threat of siltation and waste deposition from its catchment as well as from the surrounding settlements. Secondly, The state of its surrounding population is very pathetic that contributes to the degrading status and health of this wetland. Thus, need of the hour is to take both these aspects into consideration and come out with some positive and concrete steps in order to save this wetland from further degradation.

CHAPTER VIII

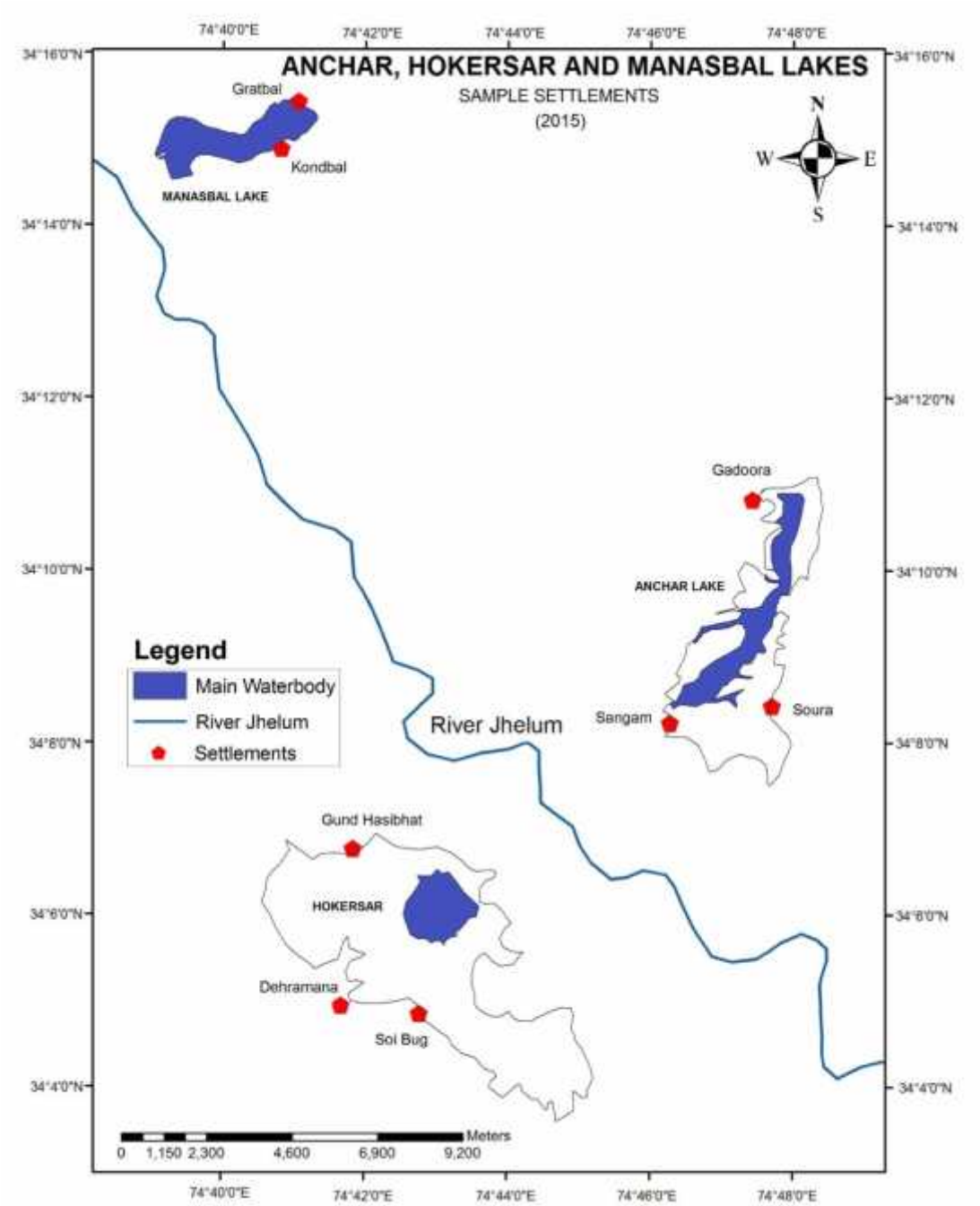
A MICRO LEVEL ENVIRONMENTAL AND SOCIO-ECONOMIC ANALYSIS OF ANCHAR, HOKERSAR AND MANASBAL LAKES

This Chapter deals with an intensive assessment of the three smaller wetlands of Kashmir Valley namely Anchar Lake, Hokersar and Manasbal Lake **(**Figure 8.1**)**. The ecology of smaller wetlands is more endangered. The study is divided into two parts. First part deals with the general characteristics of these lakes – their location, catchment area, morphometry, hydrological regimes, water quality, land use / land cover dynamics and biodiversity. This part is based on secondary sources of data. Second part deals with the socio-economic conditions of the sampled villages located around these Wetlands. This part is mainly based on primary sources of data. On the basis of nearness and dependency on the lake resources, eight sample villages were selected for socio-economic enquiry of the households. Two sampled villages were taken from the northwestern Manasbal Lake, three sampled villages were taken from the southeastern Anchar Lake and another three sampled villages were taken from the southwestern Hokersar Lake. These lakes are located in three districts of Srinagar, Ganderbal and Budgam. Nearly 10 per cent of the households from each village were randomly sampled (Table 8.14). The field work was conducted during the year 2014-15 and data was collected through questionnaire interviews.

8.1 Anchar Lake: General Characteristics

Kashmir Valley is dotted with number of Small and Large Wetlands. However, most of them have lost their magnificence and one of the Wetlands is Anchar Lake which is a shallow basin lake with fluviatile origin. It is situated near Soura, 10 Kilometers to the North-West of Srinagar at an altitude of 1,583 meters above m.s.l within the geographical coordinates of 34° 20' -34° 36' N latitude and 74° 82' -74° 85' E longitude in semi-urban conditions. (Ahangar et. al., 2012).[1]

1 Ahangar, I. A., Mir, M. F., Saksena, D. N., & Ahangar, M. A. (2012). Zooplankton diversity with relation to trophic status in Anchar Lake, Kashmir. *International Journal of Current Research, 4* (7), 46-48.



Source: Cartographed by the researcher from Survey of India Topographic sheets, 1969.

Figure 8.1

Sprawled over a wide swath of the area along the Western side of Srinagar to Ganderbal road, Anchar Lake lies in a pathetic condition with its alkaline waters. The general characteristics of Anchar Lake are illustrated below:

8.1.1 Catchment Area of Anchar Lake

Anchar Lake is situated in the low lying areas and flood-plain of River-Sind. The lake is mono-basin with its catchment comprising North-Western part of Srinagar City and a number of adjacent villages.

A major portion of its peripheral area on the eastern side has been encroached by the local population who have constructed residential plots and other concrete structures as well as converted it into vegetable gardens. The complex of Sheri-Kashmir Institute of Medical Sciences (SKIMS) is also situated at its South-Eastern side which drains much of its effluents into this lake. (Ahangar et. al., 2012).[2] The littorals of the lake are surrounded by a thick canopy of poplar and willow trees that supply the base material for the manufacturing of cricket bats, baskets and wood-carvings etc. (Jeelani and Kaur, 2012).[3]

Anchar Lake is slowly and gradually losing its catchment area both by natural as well as anthropogenic factors. Due to increased run-off, there is accelerated pace of erosion in the catchment area of Anchar Lake that results in higher sedimentation rates and due to enhanced anthropogenic activities such as Urbanization, the area and volume of lake has shrunken drastically. (Ali and Pandit, 2009).[4]

Above all, the Wetland receives huge amounts of sludge from its adjacent localities of Buchpora, Sangam, Soura and Ellahibagh through a chain of open drains. (Ahangar et. al., 2012).[5] Consequently, the depth of the lake has been reduced considerably and as such much of the lake has been converted into marshland.

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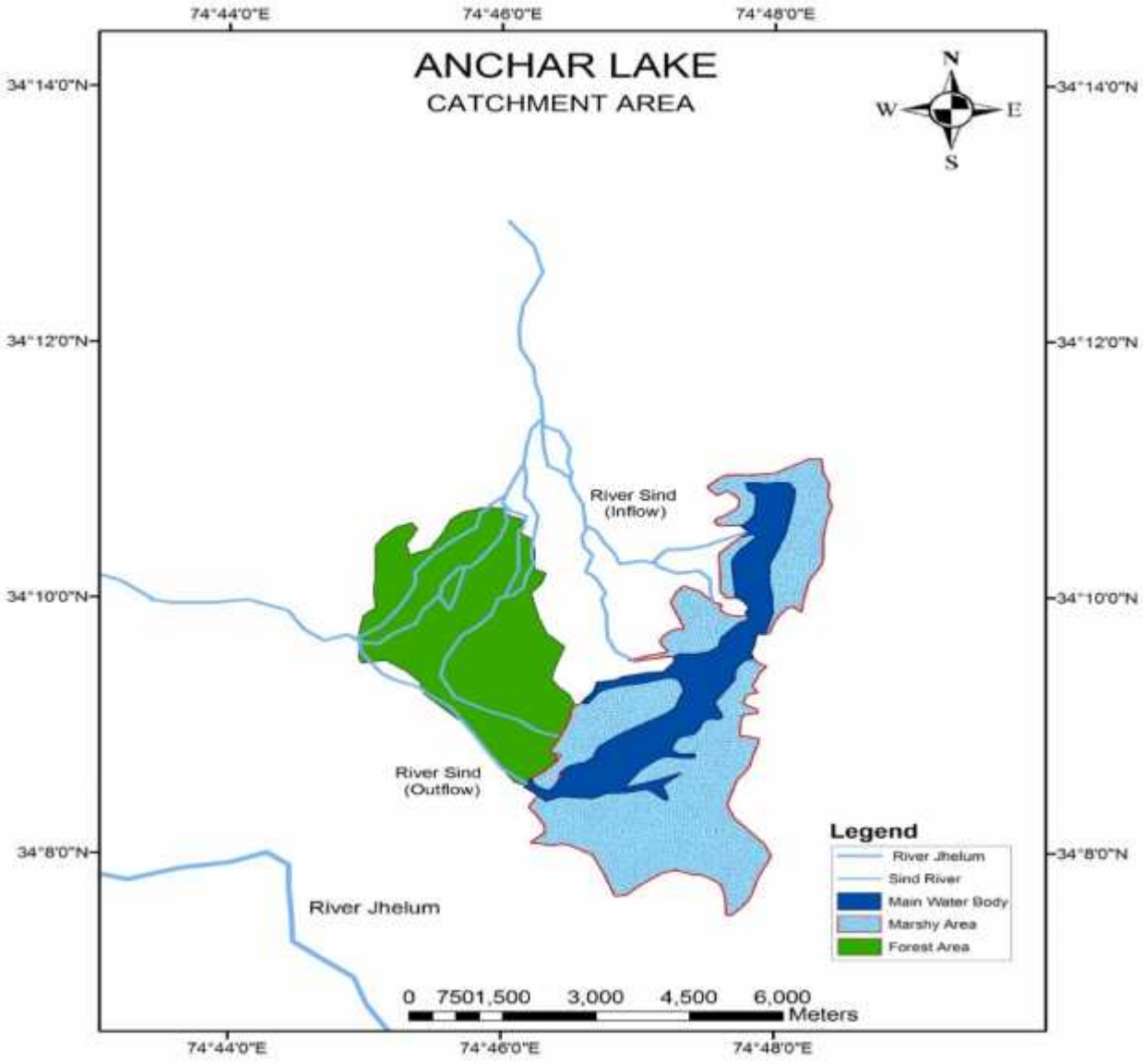
2. Ahangar, I. A., Saksena, D. N., & Mir, F. M. (2012). Seasonal Variation in zooplankton community structure of Anchar Lake, Kashmir. *Universal Journal of Environmental Research and Technology, 2* (4), 305-310.
3. Jeelani, M., & Kaur, H. (2012). Ecological understanding of Anchar Lake, Kashmir. *Biono Frontier, 5*, 2-11.
4. Ali, N., & Pandit, A. K. (2009). Macrophytic diversity in Anchar lake, Kashmir. *Journal of Research and Development, 9*, 13-19.
5. Op. Cit., P.15.



Source: Cartographed by the researcher from Survey of India Topographic-sheets, 1969.

Figure 8.2

8.1.2 Hydrological Regimes of Anchar Lake

Anchar is a shallow lake with single basin. A network of channels from river Sind enters this lake on its northern shore and serves as its main water source. It also receives water from Dal Lake through a stream called Nallah 'Amir-Khan' via

Khushalsar Lake. (Sushil et. al., 2014).[6] Anchar lake has a number of small outlet channels that drain its water into the nearby Shalbugh wetland and thereby into river Jhelum.

Being a shallow lake, this wetland has a small depth. However, the depth varies from area to area. The center of the lake with the open water area has maximum depth of 1.73 meters. This area has little submerged growth of vegetation. The Western side of the lake near Sangam village is 1.23 meter deep and the northern part of the lake near the inlet of river Sindh has a depth of 1.72 meters. This area of lake is dominated by vegetation. The South-Eastern side near SKIMS (Sher-e-Kashmir Institute of Medical Sciences) is 1.66 meters deep and is recognized by the tremendous growth of pollution indicator species. (Ahangar et. al., 2012).[7]

Due to continuous inflow of nutrients from the catchment, Anchar Lake has reached the state of eutrophication which has resulted in disappearance of sensitive species of macrophytes from this wetland. (Ahangar et. al., 2012). Moreover, the silt deposited year after year continuously in the bed of the lake reduces not only the depth and water spread area but also the water storage capacity of the lake leading to its extinction.

8.1.3 Water Quality of Anchar Lake

The health of the Wetlands and their biological diversity are directly related to health of almost every component of the ecosystem. (Ramesh et. al., 2007).[8] The trophic status of a water body also depends on the surrounding locality and its topography. Anchar lake, like any other water body records minimum water level in summer primarily because of high temperature and maximum evaporation. The electrical conductivity which measures the ability of a solution to conduct electric current fluctuates between 296.4 μs/cm in winter to 461.10 μs/cm in summer because of the

6. Sushil, M., Reshi, J. M., & Krishna, M. (2014). To evaluate the Water Quality Status and responsible factors for variation in Anchar lake, Kashmir. *IOSR Journal of Environmental Science, Toxicology and Food Technology, 8* (2), 55-62.
7. Ahangar, I. A., Mir, M. F., Saksena, D. N., & Ahangar, M. A. (2012). Zooplankton diversity with relation to trophic status in Anchar Lake, Kashmir. *International Journal of Current Research, 4* (7), 46-48.
8. Ramesh, M., Saravanam, M., & Pradeepa, G. (2007). Studies on the Physico-Chemical Characteristics of the Singallunar Lake, Coimbatore, South India. *In Proceedings of National Seminar of Limnol.* Maharana Pratap University of Agric. Technology, Udaipur, India.

higher turbidity in summer caused by silt, clay, organic matter and plantation growth etc. (Kishor and Joshi, 2005).[9] The high electrical conductivity means the lake is polluted. The dissolved oxygen varies from 2.0 mg/ltr in summer to 6.9 mg/ltr in winter. The variations in dissolved oxygen with season are mainly because it is temperature dependent. (Khare and Jadav, 2008).[10] At high temperatures, the oxygen holding capacity of water decreases. (Shyamala et. al., 2008).[11] Thus, in summer, the dissolved oxygen of Anchar lake is recorded minimum.

Free carbon-dioxide that is liberated during the respiration of micro-organisms and decay of organic matter varies from 4-34 mg/ltr that depicts the highly productive nature of the Wetland. (Munawar, 1970).[12] Similarly, the concentration of chlorides ranges from 20.2 mg/ltr in winter to 52.8 mg/ltr in summer. Large content of chlorides is again an indicator of organic pollution. (Venkatasubramani and Meenambgal, 2007).[13]

Besides, a large variation in pH (7.96- 8.39) is an indication of a highly polluted nature of Wetland. (Sreenivasan, 1976).[14] The high values of pH may be probably because of the production of salicylic acid by the hydrolysis of silicates in the rock beds of catchment areas of the lake. (Sankar et. al., 2010).[15]

Thus, Anchar Lake can be categorized as eutrophic Wetland inclined towards extinction and the main causes responsible for this include increasing agricultural runoff, siltation and urbanized catchment coupled with other anthropogenic pressures like disposal of medical waste from SKIMS and other Household wastes. All these

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9. Kishor, K., & Joshi, B. D. D. (2005). Physico-Chemical Characteristics of Pond Water in Khanpur Village in Bareilly district, U.P. *Himl. J. Environ. Zool.,19*, 89-92.
10. Khare, K.C. and Jadav, M.S. (2008). Water Quality Assessment of Katraj Lake, Pune (Maharashtra, India). In Sengupta,M and Dalwani,R.(Eds.).*Proceedings of Taal 2007:The 12th World Lake Conference*, pp.292-299.
11. Shyamala, G., Shivanand, K.P. and Babu, S.S. (2008). A preliminary report on the Phyisco-Chemical nature of water pollution in and around Erode Town, Tamil Nadu, *Natl. Environ. Pollu. Technol.*,7(3):55-559
12. Manawar, M. (1970). Limnological studies on fresh water pond of Hyderabad, India. *Biotype Hydrobiol.*, 35:127-162.
13. Venkatasubramani, R and Meenambal, T. (2007). Study of Sub-surface Water Quality in Mattupalayam Taluk of Coimbatore district, Tamil Nadu. *Nat. Environ. Pol. Tech.*, 6: 307-310.
14. Sreenivasan, A. (1976). Limnological studies and primary production in temple pond Ecosystem. *Hydrobiol.*,48: 117-123.
15. Sankar, R., Ramkumar, L., Rajkumar, M., Sun, S. and Ananthan, G. (2010). Seasonal variations in Physico-Chemical parameters and heavy metals in waters and sediments of uppanar estuary, Nagapattinam, India, *Journal of Environmental Biology*, 31(5): 681-686.

factors have polluted the water of Anchar Lake beyond limits and have turned it into menace for the population living on the lake-side.

Table 8.1- Water Chemistry of Anchar Lake (2010)

S. No.	Parameter	Range of Variation	
		Min	Max
1	Depth (Meters)	0.71	1.73
2	Transparency (m)	0.27	0.93
3	Temperature (^{o}C)	3.1	25.6
4	Ph	7.96	8.39
5	Dissolved Oxygen (mg/l)	2.0	6.9
6	Free Carbon-dioxice (mg/l)	4.0	34.00
7	Total Alakalinity (mg/l)	236.4	381.2
8	Conductivity (µs/cm)	296.4	461.10
9	Silicates (mg/l)	2.00	4.46
10	Total Harness (mg/l)	125.2	267.4
11	Chlorides (mg/l)	20.2	52.8
12	Calcium (mg/l)	13.8	58.6
13	Magnesium (mg/l)	3.7	16.8
14	Total Phosphate Phosphorus (µg/l)	287.7	512.4
15	Ortho Phosphate Phosphorus (µg/l)	51.4	179.6
16	Ammonical Nitrogen (µg/l)	210.3	499.3
17	Sodium (mg/l)	2.5	17.8
18	Potassium (mg/l)	2.1	9.2
19	Nitrate Nitrogen (µg/l)	137.3	323.4

Source: Ahangar, I.A., Saksena, D.N and Mir, M.F. (2012) Limnological Studies, assessment of nutrients, trophic status and major threats to Anchar lake, Kashmir, *International Journal of Science and Knowledge*,1(1):3-16.

8.1.4 Biodiversity of Anchar Lake

Biodiversity includes variety of organisms considered at all levels. It comprises genetic and ecosystem variants which include array of species, genera and families as well as communities of organisms within particular habitats and the physical

conditions under which they live. A great diversity of phytoplanktons and zooplanktons has been recorded from Anchar Lake. A total of 41- macrophyte species belonging to 23- families have been recorded from Anchar lake and the maximum number of species were recorded in summer (Ali and Pandit, 2009).[16] All the four ecological groups viz- emergents, rooted floating type, free floating and submergents were recorded from the lake. The role of macrophytes in fresh water ecosystems has received an increased attention over the last 15-20 years primarily due to their widespread decline in many wetlands as a result of sustained cultural eutrophication. (Egertson et. al., 2004).[17] Macrophytes are the best indicators of the health of a Wetland because of the varying levels of tolerance of the individual species to a wide array of stressors.

The emergent vegetation has expanded rapidly across the lake, presumably in response to shallowing of lake caused by its rapid infilling and siltation of river Sindh. However, the submerged vegetation has declined because of advanced eutrophication and explosive expansion of non-native invasive plant species like Azolla which form a solid cover to create thick and compact mats that shade the water column below and hence restrict the submergent growth of the lake. Above all, a comparison of present data with the earlier ones reveal that there has been a considerable decline in the macrophytic diversity of the lake.

Similarly, Zooplanktons play an important role in aquatic ecosystems. They constitute a link between the primary producers, phytoplanktons, and the higher trophic level organisms. Nearly, all the fish depend on zooplanktons for their food during their larval stages (Madin et. al., 2001).[18] Besides, Zooplanktons respond quickly to aquatic environmental changes for their short life cycle and are, thus, used as indicators of overall health of the lake. (Carriack and Schelske, 1977).[19] In year 2001, Anchar lake

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16. Ali, N., & Pandit, A. K. (2009). Macrophytic diversity in Anchar lake, Kashmir. *Journal of Research and Development, 9,* 13-19.
17. Egertson, C. J., Koposka, J. A., & Downing, J. A. (2004). A century of change in macrophytic abundance and composition in response to agricultural euthrophication. *Hydrobiologia*, 524,145-156.
18. Madin, L. P., Horgan, E. F., & Steinberg, D. K. (2001). Zooplankton at the Bermuda Atlantic Time Series Study (BATS): diel, Seasonal and International Variation in Biomass, *Deep Sea Res., 48* (8-9), 2063-2082.
19. Carriack, J.H. and Schelske, L.C. (1977). Have we over looked the importance of small phytoplankton in productive waters. *Limnology and Oceanography*, 42: 1612-1613

has recorded 68-species of Zooplanktons in total (Ahangar et. al., 2012).[20] Temperature has been considered as one of the primary factors to cause the abundance of zooplanktons in freshwaters particularly so in shallow lakes where bottom exhibit considerable variations in temperature especially with the progress o

Table 8.2- Types of Macrophytes Recorded From Anchar Lake (2009)

(A) EMERGENTS	
1. Alism Plantago aqauatica Limn. 3. Bidens Cirnua 5. Eleocharis Plaustris Limn. 7. Hippuris Vulagaris Limn. 9. Myriophyllum Trifoliate Limn. 11. Paspalum Paspaloides 13. Phragmites Australis Trin. 15. Ranunculus Scleratus Limn 17. Scirpus Sp. 19. Sparganium Ramosum Huds. 21. Veronica Sp.	2. Carex Sp. 4. Cyperus SP. 6. Galliium Sp. 8. Lycopus europus Limn. 10. Menyanthese Verticillatun Limn. 12. Polygonum amphibian Limn. 14. Polygonum hydropiper Limn. 16. Ranumculus ling 49 Limn. 18. Sagittaria Sagittifola Limn. 20. Typha Latfolia 22. Typha angustata Bory and Chaub
(B) ROOTED FLOATING LEAF TYPE	
23. Hydrocharis dubia (Blume) Baquer 25. Nelumbo nucifera 27. Numphaea alba Limn. 29. Trapa natans Limn.	24. Marsilea Quadrifolia Limn. 26. Nymphoides peltatum (Gmel) Kunize 28. Potamogeton natans Limn.
(C) SUBMERGENTS	
30. Ceratophyllum demssum Limn. 32. Myriophyllum Spicatum Limn. 34. Potamogeton Pusillus Rxb	31. Hydrila verticillata (2.F) Royle 33. Potamogeton Crispus Limn. 35. Potamogeton Lucens Limn. 36. Potamogeton Pectinatus
(D) FREE FLOATING TYPE	
37. Azolla Pinnata 38. Lemna Spp. 39. Salvinia Natans Limn.	

Source: Ali, N., & Pandit, A. K. (2009). Macrophytic diversity in Anchar lake, Kashmir. *Journal of Research and Development, 9,* 13-19.

20. Ahangar, I. A., Saksena, D. N., & Mir, F. M. (2012). Seasonal Variation in zooplankton community structure of Anchar Lake, Kashmir. *Universal Journal of Environmental Research and Technology, 2* (4), 305-310.

Table 8.3- Types of Zooplanktons Recorded From Anchar Lake (2012)

(A) PROTOZOA	
01. Arcella mitrata	04. Difflugia oblongata
02. Centrophyxis aculeate	05. Euglypha ciliate
03. Centrophyxis constricta	06. Euglypha laevis
(2) CLADOCERA	
07. Alona affinis	11. Daphnia manga
08. Bosmina coregoni	12. Chydorous sphaericus
09. Bosmina longirostris	13. Moina brachata
10. Daphnia pulex	
(3) ROTIFERA	
14. Brachionus bidentata	18. Keratella valga
15. Brachionus calyciflorous	19. Keratella cochlearis
16. Brachnionus quadridentata	20. Lecane Luna
17. Bryocamptus heimalis	21. Notholca acuminate
(4) COPEPODA	
22. Cyclops scutifera	23. Cyclops bicuspidatus
(5) OSTRACODA	
24. Cypris sybglobora	

Source: Ahangar, I. A., Saksena, D. N., & Mir, F. M. (2012). Seasonal Variation in zooplankton community structure of Anchar Lake, Kashmir. *Universal Journal of Environmental Research and Technology, 2* (4), 305-310.

the warm season as it stimulates their growth by providing adequate light and nutrients in the environment. (Taylor, 1974).[21] However, in 2012, a total of only 24 zooplankton species belonging to rotifers, protozoa and crustacea were recorded which in itself is a matter of great concern

8.2 Hokersar: General Characteristics

Hokersar, the Queen of Wetlands in Kashmir Himalayas (Romshoo and Rashid, 2012)[22], located at 34° 05'N and 74°43'E at an altitude of 1,584m above m.s.l. in North-West of Srinagar City on left side of Srinagar Baramulla National Highway, is

21. Taylor, W. W. (1974). The Planktonic crustaceans of Moncove Lakes, Monroe country. *W.Va. Proc. West Virginia, Acac-Sci, 46*, 223-229.
22. Romshoo, S. A., Rashid, I. (2012). Assessing the impacts of changing Land cover and Climate on Hokersar wetland in Indian Himalayas. *Arab J. Geosci.,7*, 143-160.

one of the renowned Wetlands and Waterfowl habitats of Kashmir Valley. It is a permanent eutrophic lake (Joshi et. al., 2011)[23] with an area of 4.5 km^2 surrounded by fresh water marshes on the flood plains of river Jhelum.

Hokersar has been notified as Reserve in 1945 and declared as Ramsar Site on 8 November, 2005 (No. 1570). Presently, it is maintained by Department of Wildlife Protection, Government of J&K. Being located in the Doodhganga Watershed of Western Himalayas (Alam et. al., 2011)[24] with an average rainfall of 650mm and average temperature of 7.5^{o}C in winter and 19.8^{o}C in Summer (Pandit and Qadri, 1991)[25], the lake reaches a maximum depth of 2.5m in spring with snow melt water and a minimum of 0.7m in autumn.

The benefits goods and services in Hokersar are of high socio-economic importance like conservation of Biodiversity, pollution abatement, trapping sediments and nutrients, flood mitigation, ground water recycling and climatic stability (http://www.wetlands.org/reports).[26] Besides, it harbors about 2-million migratory waterfowl during winter that migrate from Siberia, China, Central-Asia, North Europe and Other Countries as well as summer migrants coming from Indian Sub-continent (Romshoo et. al., 2011)[27]. However, this Wetland has undergone tremendous deterioration over the last five decades owing to siltation coupled with floods and growing human interferences.

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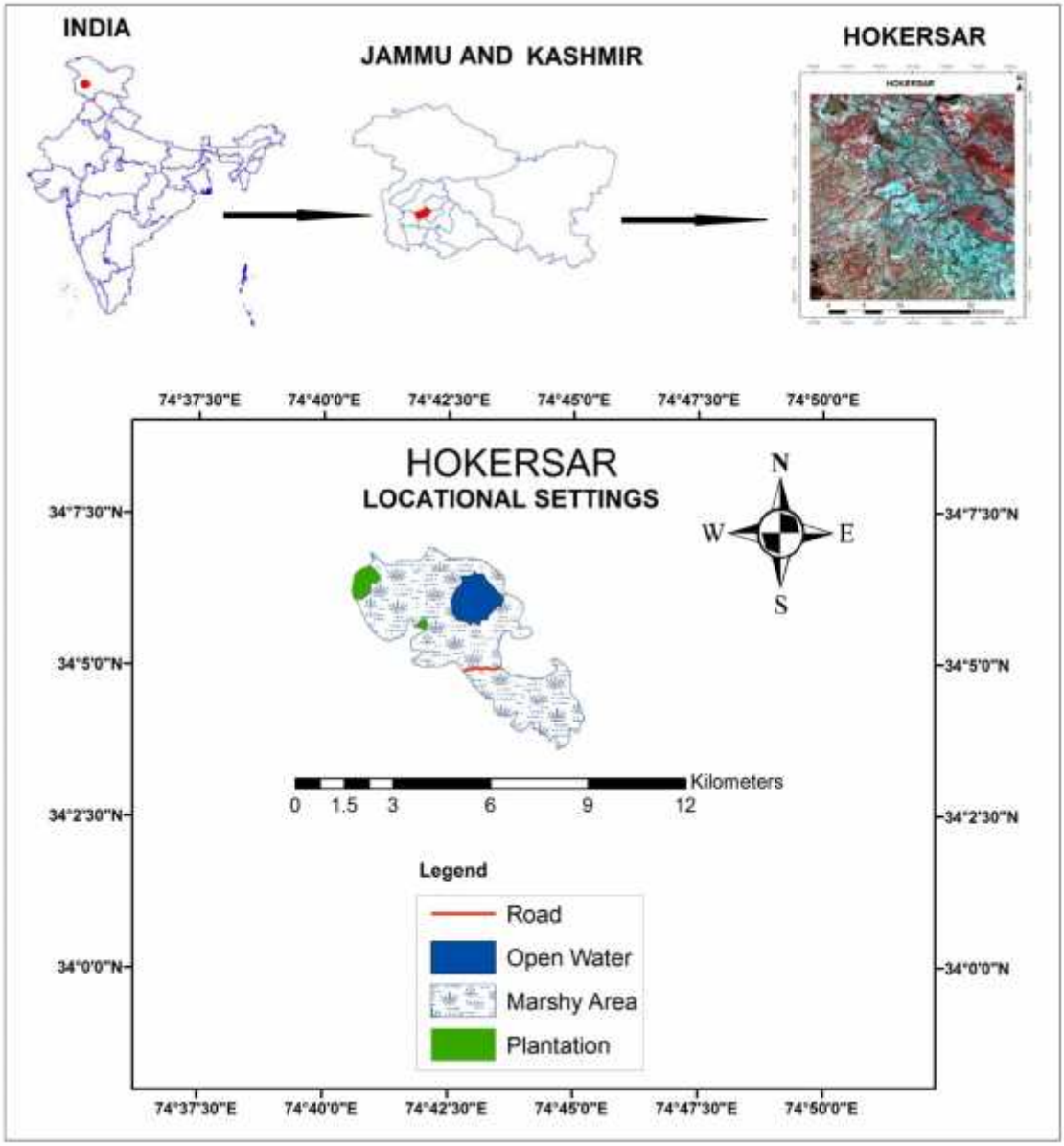
23. Joshi, P. K., Rashid, H., & Roy, P.S. (2011). Landscape dynamics in Hokersar wetland- J&K, An application of geospatial approach. *Journal of Indian society and remote sensing, 30* (1).
24. Alam, A., Rahid, S. M., Bhat, M. S., & Sheikh, A. H. (2011). Impact of land use/ land cover dynamics on Himalayan Wetland Ecosystem. *Journal of Experimental Sciences, 2* (3), 60-64.
25. Pandit, A. K., & Qadri, S. S. (1991). Floods threatening Kashmir Wetlands. *Journal of Environmental Management 31,* 299-311.
26. Valuing Biodiversity of Hokera Wetland Reserve: A contingent valuation approach. Retrieved from http:// www.wetlands.org/ reports/ PIS/ 2IN02/ RISen 05.Pdf
27. Romshoo, S. A., Ali, N., & Rashid, I. (2011). Geoinformatics for characterizing and understanding the spatio-temporal dynamics (1969 to 2008) of Hokersar wetland in Kashmir Himalayas. *International journal of the Physical Sciences, 6* (5), 1026-1038.



Source: Cartographed by the researcher from Survey of India Topographic-sheets, 1969.

Figure 8.3

8.2.1 Catchment Area of Hokersar

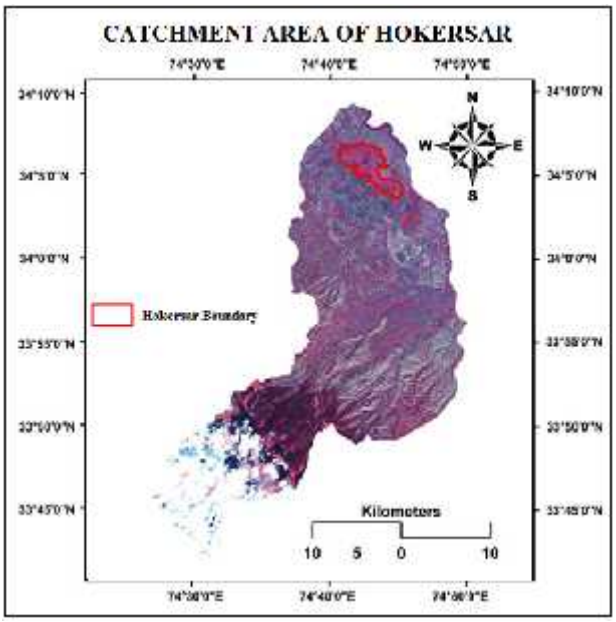
Hokersar is a shallow but permanent water body surrounded by catchments with varied land use/ land cover patterns. The water body is fed by Doodhganga ,the only perennial stream, from east, Sukhnag from west and several small and seasonal channels (Khan and Shah, 2010)[28]. Doodhganga stream, one of the major left bank

28. Khan, M. A., & Shah, M. A. (2010). Studies on Biomass changes and nutrient lock-up efficiency in a Kashmir Himalayan wetland ecosystem, India. *Journal of Ecology and the Natural Environment, 2* (8),147-183.

tributaries of River Jhelum, located between 33°15-34°15'latitude and 74°45'-74°83' longitude forms the main source of water in the Hokersar catchment. Doodhganga flows for a course of about 56 kilometers before emptying into Hokersar Wetland.

Hokersar catchment is bounded by lofty Pir Panjal Mountains on the South and has a varied topography. Its relief is diverse, exhibiting altitudinal extremes of 1,548-4,634 meters above msl and comprises of steep slopes, plateaus, plains and alluvial fans. The plains down the catchment are very fertile and ideal for agriculture. Whereas, the higher reaches comprise dense pine forests and lush green alpine pastures (Romshoo and Rashid, 2012)[29]. There are a number of orchards, crop fields and willow plantations in its catchment.

Geologically, the area comprises of Panjal traps, limestone, Karewa formation and recent alluvium. The characteristics of Karewa formation in relatively lower elevations are ideal for horticulture. Moreover, the catchment area experiences temperate climate with the average winter and summer temperatures ranging between 5 - 25° Celsius.



Source: Romshoo, S. A., Rashid, I. (2012). Assessing the impacts of changing Land cover and Climate on Hokersar wetland in Indian Himalayas. *Arab J. Geosci*.,*7*, 143-160.

Figure 8.4

29 Romshoo, S.A and Rashid,I.(2012). Assessing the impacts of changing Land cover and Climate on Hokersar wetland in Indian Himalayas. *Arab J. Geosci*.,7:143-160

8.2.2 Morphometry of Hokersar Catchment

Morphometry is the measurement and mathematical analysis of the configuration of the earth's surface, shape and dimension of its landforms (Agarwal, 1998).[30] Morphometric analysis of a drainage basin demonstrates the dynamic equilibrium that has been achieved due to interaction between matter and energy. It helps to understand the prevailing geo-hydrological characteristics of a catchment.

Morphometric analysis requires measurement of linear features, areal aspects, gradient of channel network and contributing ground slopes of the drainage basin (Nag, 1998).[31] The various morphometric parameters, following strahler's classification scheme of morphometric analysis have been studied and analyzed by Kuchay and Bhat (2013)[32] under Linear Parameters and shape parameters as:

8.2.2.1 Linear Parameters

1. Stream Order (Nu)

In the drainage basin analysis, the first step is to determine the stream orders. It is defined as a measure of the position of a stream in the hierarchy of tributaries. Generally, higher the order, longer the length of streams in nature. Hokersar catchment is a 6th order drainage basin were the total number of identified streams is 890 and out of which 696 are of 1st order, 148 of 2nd order, 36 of 3rd order, 7 of 4th order, 2 of 5th order and 1 of 6th order.

2. Bifurcation Ratio (Rb)

Bifurcation ratio is used to express the ratio of the number of streams of any given order to the number of streams in next higher order. (Schumn, 1956).[33] These range between 3.0 and 5.0 for basins in which the geologic structures do not distort the drainage pattern. If the Bifurcation Ratio isn't same from one order to its next order,

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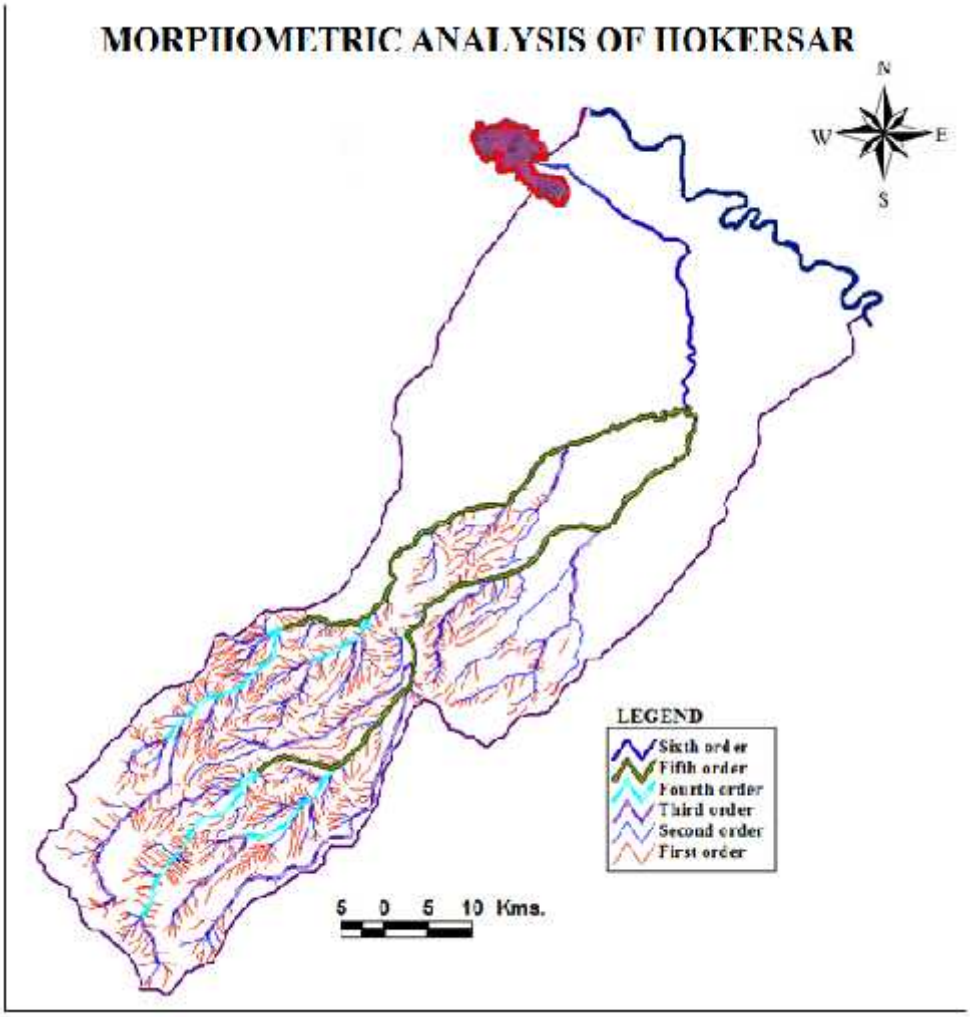
30. Agarwal, C. S. (1998). Study of drainage pattern through aerial data in Naugarh area of Varanasi, U.P. *Journal of Indian Society of Remote* Sensing, *26*, 169-175.
31. Nag, S. K. (1998). Morphometric analysis using remote sensing techniques in the Chaka sub-basin, Purulia district, West Bengal. *Journal of Indian Society of Remote Sensing*, *26*, 69-76.
32. Kuchay, N. A., & Bhat, M. S. (2013). Automated Drainage Characterization of Dudganga Watershed in Western Himalayas. *European Scientific Journal*, *9* (35): 126-138.
33. Schumn, S. A. (1956). Evolution of drainage system and slope in badlands at Perth Amboy, New Jersey. *Bulletin. Geological Survey of America*, *67*, 597-646.

then these irregularities are dependent upon the geological and lithological development of the drainage basin, (Strahler, 1964).[34] In the study area, mean bifurcation ratio is 3.89 which suggests less structural disturbance.

3. Drainage density (D)

It is the ratio of total channel segment lengths cumulated for all orders within a basin to the basin area, which is usually expressed in terms of Km/Km^2, It shows the landscape dissection, runoff potential, infiltration capacity of the land, climatic conditions and vegetation cover of the basin. Low drainage density leads to coarse drainage texture; while high drainage density leads to fine drainage texture. A drainage density value of 1.21 in the study area suggests that this catchment is underlined by highly permeable material.

34. Strahler, A. N. (1964). Quantitative geomorphology of drainage basins and channel networks. In chow, V.T. (eds.), *Hand book of applied hydrology*. MC Graw Hill Book Company: New York.



Source: Adapted from Kuchay, N. A., & Bhat, M. S. (2013). Automated Drainage Characterization of Dudganga Watershed in Western Himalayas. *European Scientific Journal, 9* (35): 126-138.

Figure 8.5

4. Stream Length (Lu)

Streams of relatively smaller lengths are characteristic of areas with steeper slopes and finer textures. Longer lengths of streams are generally indicative of relatively flatter gradients. Generally, the total length of stream segments is maximum in first order streams and decreases as the stream order increases. The order wise mean stream length in the study area for the first order is 0.65 km, 0.84 km for second order, 2.32 km for third order, 4.67 km for fourth order, 31.27 km for fifth order and 11.64 km for the 6th order trunk stream.

5. Stream Frequency (Fs)

Stream Frequency or Channel frequency is the total number of stream segments of all orders per unit area (Horton, 1932).[35] Stream frequency values of Doodhganga or Hokersar Watershed is 1.41. Low values indicate presence of a permeable subsurface material and low relief.

6. Drainage Texture (Rt)

It refers to the total no. of stream segments of all orders divided by the perimeter of the Watershed. The study area with drainage texture of 4.69 falls in moderate category, Drainage texture < 2 indicates very coarse, between 2 and 4 is coarse, between 4 and 6 is moderate, between 6 and 8 is fine and greater than 8 is very fine drainage texture.

7. Length of Overland Flow (Lo)

It is referred to as the distance of flow of the precipitated water, over the land surface to reach the stream. The calculated value for the study area was 0.41 km.

8.2.2.2 Shape Parameters

1. Form Factor Ratio (Rf)

It is a dimensionless ratio of basin Area (A) to the square of basin length (Lb). The value of form factor would always be less than 0.7854 (for a perfectly circular basin). The basins with higher form factor are normally circular and have high peak flows for shorter duration, whereas, elongated basins with lower values of form factor have low peak flows for longer duration. The form factor value of the study area watershed is 0.24 indicating an elongated basin in shape. Flood flows of such elongated basins are easier to manage than of the circular basin (Nautiyal, 1994).[36]

35. Horton, R. E. (1932). Drainage Basin Characteristics. *Trans. Amer. Geophys. Union*, *13*, 350-361.
36. Nautiyal, M. D. (1994). Morphometric analysis of a drainage basin, District Dehradun, U.P. *Jour. Indian Soc. Remote Sensing*, *22* (4), 251-261.

2. Circularity Ratio (Rc)

It is defined as the ratio of basin area to the area of circle having the same perimeter as the basin and is dimensionless. The circularity ratio value of the present watershed is 0.3 which indicates that the catchment is characterized by elongated shape, low discharge of runoff and high permeability of the subsoil conditions. It is helpful for assessment of flood hazard. Higher the Rc value, higher is the flood hazard at the peak time at the outlet point.

Table 8.4-Morphometric Analysis of Doodhganga Watershed (2013)

Morphometric Parameter	Symbol/Formula	Calculated Value
Area (Km^2)	A	635
Perimeter (Km)	P	148.38
Basin Length (Km)	$Lb = 1.312 * A^{0.568}$	51.18
Stream Frequency	Fs = Nu/A	1.41
Form Factor	Rf = A/Lb	0.24
Elongation Ratio	$Re = (2/Lb) * (A/P_2)^{0.5}$	0.15
Circularity Ratio	Rc = 4® * A/P^2	0.36
Texture Ratio	$T = N_1/P$	4.69
Drainage Density (Km/Km^2)	D = Lu/A	1.21
Length of Overland Flow	Lg = 1/D*2	0.41

Source: Kuchay, N. A., & Bhat, M. S. (2013). Automated Drainage Characterization of Dudganga Watershed in Western Himalayas. *European Scientific Journal, 9* (35): 126-138.

3. Elongation Ratio (Re)

It is defined as the ratio of diameter of a circle of the same area as the basin to the maximum basin length and is found generally varying from 0.6 -1.0 depending upon vagaries of climate and geology. It helps to give an idea about the hydrological character of the drainage basin. The Elongation Ratio (Re) of the watershed under study is 0.15.

Thus, the morphometric analysis has shown that Doodhganga watershed is composed of impermeable subsurface materials, sparse vegetation and high mountainous relief causing higher surface runoff and a higher level of degree of dissection. The mean Bifurcation ratio value of 3.89 indicates that the geological structure is less disturbing to the drainage pattern. Similarly, the medium drainage density (1.21 km/km^2) of the

watershed indicates the moderately permeable subsoil and moderate vegetative cover and the stream frequency (1.41) exhibits a positive correlation with the drainage density value of the area indicating an increase in stream population with respect to increase in drainage density.

8.2.3 Hydrological Regimes of Hokersar

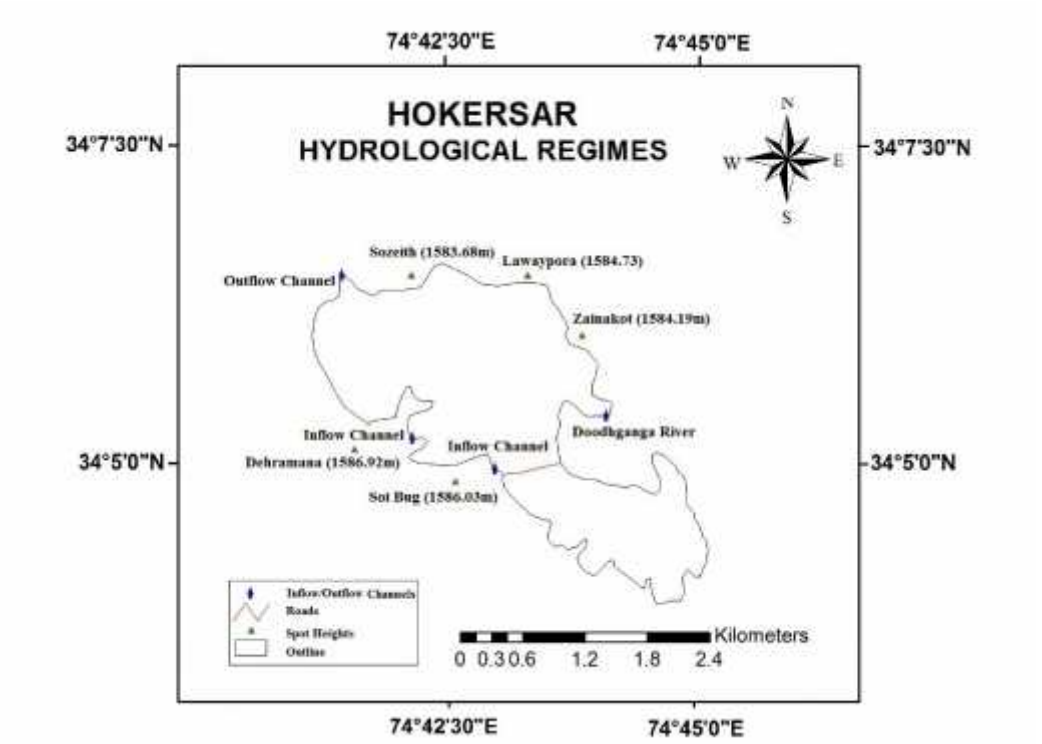
Doodhganga, a perennial feeding channel, constitutes the main source of water to Hokersar wetland. Other seasonal channels include Soibug and Dehramana as shown in figure 8.6. A small channel at Churpur, towards the North-west of the wetland, acts as inlet or outlet depending upon the water level in the wetland.

Table 8.5- Total Water Budget ($10^6 m^3$) for Hokersar Wetland (2004)

Month	Input through inlets	Input through precipitation	Total	Output through outlets	Output through evaporation	Total
January	3.34	0.50	3.84	2.03	0.38	2.41
February	2.70	0.62	3.32	1.45	0.29	1.74
March	4.17	0.60	4.77	1.39	0.63	2.02
April	14.72	0.97	15.69	11.53	0.88	12.41
May	9.21	0.43	9.64	2.22	1.37	3.59
June	1.94	0.84	2.78	0.46	1.24	1.70
July	1.07	0.01	1.14	0.13	1.29	1.42
August	3.24	0.30	3.54	0.18	1.25	1.43
September	8.32	0.46	8.78	0.15	1.26	1.41
October	0.00	0.13	0.13	0.02	0.68	0.70
November	2.64	0.14	2.78	1.24	0.53	1.77
December	3.18	0.27	3.46	1.66	0.28	1.94

Source: Adapted from Khan, M. A., Shah, M. A., Mir, S. S and Bashir, S (2004). The environmental status of a Kashmir Himalayan wetland game reserve: Aquatic plant communities and eco-restoration measures. *Lakes & reservoirs: Research and managemen*t, *9*, 125-132.

The main outlet at Sozeith (western side) of the wetland is closed by means of an artificially constructed needle weir gate to regulate optimum water level in the game Reserve (Khan et al., 2004).[37] Another outlet near Gund-Hasibhat village has been in operation since July 2001. The water budget of the wetland is given in the Table 8.5



Source: Adapted and modified from Khan, M.A., Shah, M.A., Mir, S.S and Bashir, S.(2004). The environmental status of a Kashmir Himalayan Wetland game reserve: Aquatic plant communities and eco-restoration measures. *Lakes and Reservoirs: Research and Management*,9:125-132

Figure 8.6

The total water budget of this area is 10 million cubic meters which keeps fluctuating on seasonal basis. Thus, water levels in wetlands fluctuate with the different periods of a year in response to different factors, like rainfall, evaporation, groundwater movement and surface water inflow (Yousuf et al., 2015).[38] Hokersar lake attains maximum depth of 2.5 m in spring due to appreciation in discharge from the snow-

37. Khan, M. A., Shah, M. A., Mir, S. S and Bashir, S (2004). The environmental status of a Kashmir Himalayan wetland game reserve: Aquatic plant communities and eco-restoration measures. *Lakes & reservoirs: Research and management*, *9*, 125-132.
38. Yousuf, T., Yousuf, A.R. and Mushtaq, B. (2015). Comparative account on Physico-Chemical Parameters of two wetlands of Kashmir Valley. International Journal of Recent Scientific Research,6(2):2876-2882

melt water in the upper reaches of its catchment (Romshoo et al., 2011).[39] The water depth in autumn is minimum of 0.7 meters.

Besides, silt and clay constitute the major components of Hokersar wetland sediments. Around 21,630 tons of sediments from various channels find their way into this ecosystem and 4,783 tons go out through Sozeith outlet, leaving a balance of 16,862 tons to accumulate in the wetland basin.

Thus, hydrologically complex Hokersar wetland of Kashmir Valley is greatly influenced by a perennial feeding channel (Doodhganga) and two seasonal inlets (Soibug and Deharamuna). Low flushing rate and high residence time (97.3 days) considerably contribute to the increased nutrient retention in the wetland causing accelerated eutrophication.

8.2.4 Water Quality of Hokersar

The Valley of Kashmir is a lacustrine basin of the inter-montane depression characterized by numerous aquatic ecosystems of great ecological and economic

Table 8.6- Water Chemistry of Hokersar (2004)

VARIABLE	RANGE	MEAN
pH	6.6-8.8	7.34
Specific Conductance (μs/cm)	210-580	350.00
Calcium (mg/l)	39-77	52.00
Magnesium (mg/l)	12.8-46	22.20
Sodium (mg/l)	8.3-16	11.80
Potassium (mg/l)	1-6.8	3.00
Sulphate (mg/l)	3.4-21.8	12.90
Chloride (mg/l)	17.6	30.70
Bicarbonate (mg/l)	50-120	67.70
Total Phosphorous (μg/l)	101-968	393.60
Nitrate Nitrogen (μg/l)	370-4750	2510.00
Dissolved oxygen (mg/l)	3.5-16.6	10.00
BOD (mg/l)	1-28.3	10.00
COD (mg/l)	10-40.8	25.30
DOM (mg/l)	3-30	9.70

Source: Khan, M.A., Shah, M.A., Mir, S.S. and Bashir, S. (2004). The environmental status of a Kashmir Himalayan Wetland game reserve: Aquatic Plant Communities and eco-restoration measures. *Lakes & Reservoirs: Research and Management*, 9:125-132.

39. Romshoo, S.A., Ali, N. and Rashid, I. (2011). Geoinformatics for characterizing and understanding the spatio-temporal dynamics (1969-2008) of Hokersar wetland in Kashmir Himalayas. International Journal of the Physical Sciences,6(5),1026-1038

importance. However, in recent decades, these aquatic ecosystems have changed drastically and have come under exacerbated threat because of disturbances in their catchment areas. As a result of heavy anthropogenic pressures, their area is shrinking and water quality deteriorating (Yousuf et al., 2015).[40] Thus, the most important step for the conservation of wetland ecosystems is to maintain a proper water quality (Smitha and Shivashankar, 2013).[41] Water Quality directly reflects the health of any water body. So far as Hokersar wetland is concerned, its waters are alkaline as depicted from table 8.6The above table clearly reveals the alkaline nature and calcium-rich property of the Hokersar wetland. The nutrient status shows that high levels of phosphorous and nitrogen occur in this wetland. This is despite the role of macrophytes and sediments which act as major sinks of nutrients. Relatively high concentrations of NO_3-N in Hokersar waters might be attributed to leaching from agricultural fields in the catchment where high quantity of fertilizers is used annually (Khan et al., 2004).[42] Besides, the high levels of BOD and COD which are the important pollution indicators of water support the meso-eutrophic status of the wetland ecosystem. The spectrum of ionic pattern is generally in agreement with the observed ions on other Kashmir wetlands (Khan, 1986).[43] Water transparency has been reported low because of silt and sand laden water and the higher biogenic activities, lower mass and decomposition (Saxena et al., 1966).[44]

Applying specific conductivity as an index of enrichment, Hokersar wetland can be placed in ß-mesotrophic type (Yousuf et al., 2015).[45] In shallow wetlands like Hokersar, the levels of oxygen falling below 2 mg/l during summer are attributable to the addition of agricultural and domestic affluents containing oxidizable matter and subsequent biodegradation and decay of vegetation leading to consumption of oxygen

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40. Yousuf, T., Yousuf, A. R., & Mushtaq, B. (2015). Comparative account on Physico-Chemical Parameters of two wetlands of Kashmir Valley. *International Journal of Recent Scientific Research,6* (2), 2876-2882.
41. Smitha, A. D., & Shivashankar, P. (2013). Physico-chemical analysis of the freshwater at River Kapila, Nanjanguda Industrial area, Mysore, India. *J. Env.Sci., 2* (8), 59-65.
42. Khan, M. A., Shah, M. A., Mir, S. S and Bashir, S (2004). The environmental status of a Kashmir Himalayan wetland game reserve: Aquatic plant communities and eco-restoration measures. *Lakes & reservoirs: Research and managemen*t, *9*, 125-132.
43. Khan, M. A. (1986). Hydrobiology and organic production in a marl lake of Kashmir Himalayan Valley. *Hydrobiologia,135,* 233-242
44. Saxena, K. L., Chakrabarty, R. N., Khan, A. K., Chattopadhya, S. N., & Chandra, H. (1966). Pollution studies of the river Ganga near Kanpur. *Environmental Health, 8,* 270-285.
45. Op.cit., p. 237

present in water (Jamal, 1998).[46] Besides, free CO_2 has been recorded in the wetland round the year because of photosynthetic activity in the wetland ecosystem.

Specific conductance varied from 210-580 μs/cm, suggesting the wetland to be quite rich in calcium and magnesium. The amount of calcium remained generally high (39-77 mg/l) and magnesium (12.8-46 mg/l) placing the wetland in Ca^{++} rich type. The chloride content ranges from 17.6 mg/l to 58 mg/l which can be related to the organic pollution of animal origin. The inlet sites having high anthropogenic pressure, contaminated with sewerage and other polluted effluents, record high Concentration of phosphorous. There is higher concentration of nitrogen compounds found in the wetland. It is due to the surface run-off of nitro-phosphate fertilizers from nearby residential areas (Mushtaq et al., 2013).[47] The overall high concentration of both phosphate and nitrate nutrients may be as a result of bird excreta as well because the wetland is visited by large number of migratory water fowl, ducks and Geese that arrive in autumn and reside till the end of winter.

8.2.5 Land Use/Land Cover Dynamics of Hokersar

Wetlands occupy about 7 Per cent of the Earth's land surface (MEA, 2005)[48] and in the mountainous region of Kashmir Himalayas alone, there are 3,813 wetlands and water bodies (Romshoo et al., 2010).[49] However, the World's wetlands are degrading at an alarming rate more than any other ecosystems primarily because of accelerated rate of human intervention and human induced modification of natural processes (Vorosmarty et. al., 2010)[50]. Besides the lack of understanding of the values and functions of the wetlands have led to their conversion for agriculture, settlements,

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46. Jameel, A. (1998). Physico-chemical studies in Vyakondam Channel Water of Cauvery. *Pollution Research, 17* (2), 111-114.
47. Mushtaq, B., Raina, R., Yaseen, T., Wanganeo, A., & Yousuf, A. R. (2013).Variations in the physico- chemical properties of Dal Lake, Srinagar, Kashmir. *Journal of Environmental Science and technology, 7* (7), 624-633.
48. Millennium Ecosystem Assessment. (2005). Ecosystems and Human wellbeing: Wetlands and water synthesis. *World Resources Institute, Washington*. Retrieved from www.millenniumassessment.org/documents/document.358.aspx.pdf
49. Romshoo, S. A., Qadri, T., Rashid, I., Muslim, M., Panigrahy, S., Singh, T. S., & Patel, J. G. (2010). National Wetlands Atlas, Jammu and Kashmir, Space Applications Centre, ISRO, Ahmedabad.
50 Vorosmarty, C. J., McIntyre, P. B., Gessner, M. O., Dudgeon, D., Prusevich, A., Green, P., Glidden, S., & Davies, P. M. (2010). Global threats to Human water security and river Biodiversity. *Nature, 465*, 551-561.

plantations and other developmental activities (Wetlands International, 2007).[51] Similar scenario is being witnessed in the mountainous Himalayan Region where unplanned urbanization, reckless deforestation and the depleting snow and glacial resources are the major causes of the wetland depletion.

To analyze the land use/land cover in and around Hokersar wetland, many scholars like M.S. Bhat, S.A. Romshoo, Joshi and others. have put up their best efforts. However, the work carried out by Romshoo and Rashid in 2012 seems to be much exhaustive. These scholars have used Survey of India (SOI) topographical maps of 1969 at 1,50,000 scale for generating the base map of the Hokersar on a time series of satellite data for monitoring the spatial and temporal changes in the wetland.

Table 8.7- Satellite Data Used for Monitoring Change in Hokersar Land use

S. No.	Satellite	Year	Sp. Resolution	Path/Row
1.	Land sat TM	15 Oct. 1992	30 m	149/36
2.	Land sat ETM	30 Sept. 2001	30 m	149/36
3.	IRS-LISS-III	19 Oct. 2005	23.5 m	92/46
4.	IKONOS	11 Jan. 2008	1 m	--

Due to unavailability of cloud-free satellite data in autumn, the January IKONOS data has been used for monitoring the changes in the wetland upto 2008.

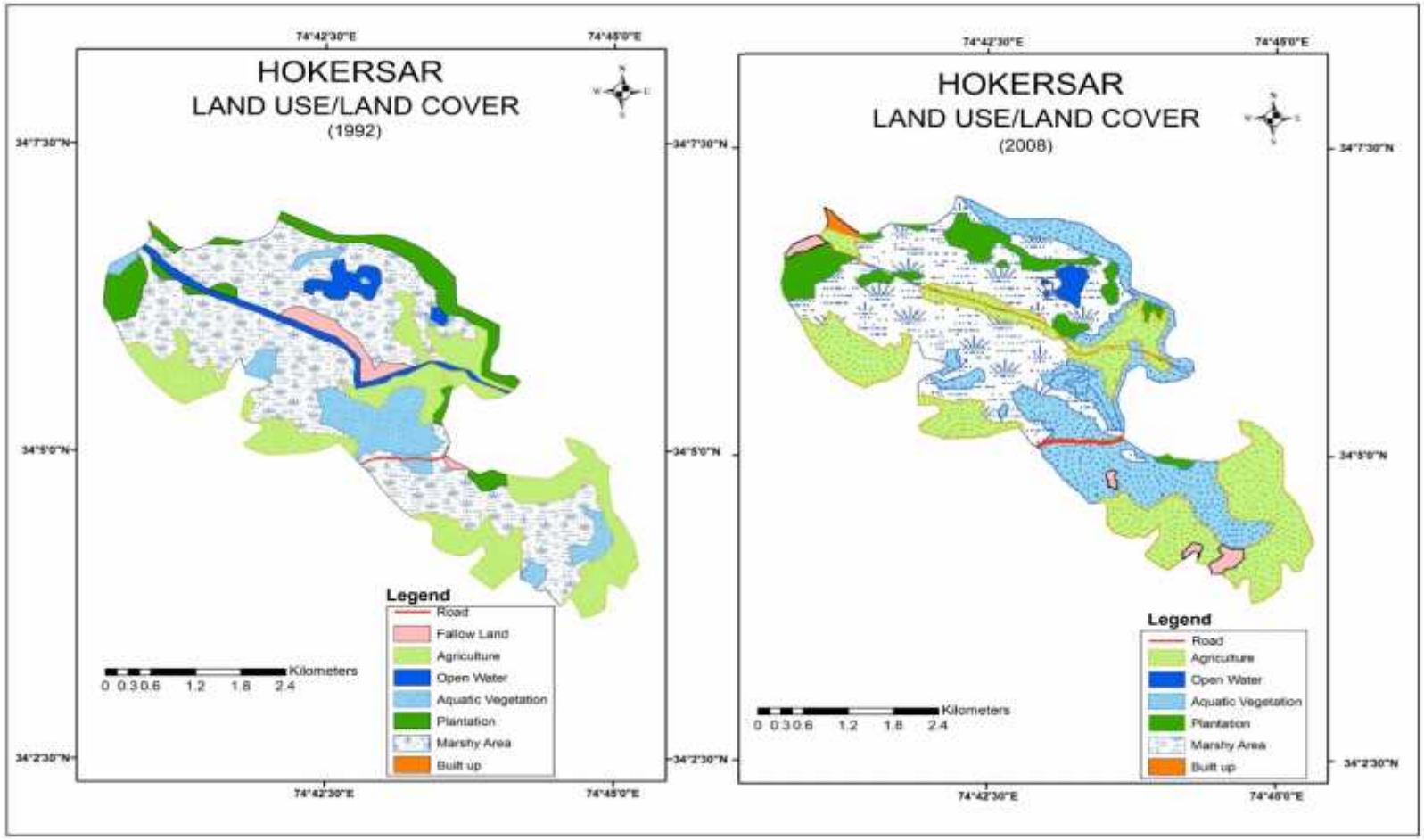
The analysis of this data shows that the wetland has shrunk and depleted over a period of time from 18.75 km^2 in 1969 to 13.00 km^2 in 2008. Following table gives the land use and land cover types delineated from the scanned topographic map of 1969.

Table 8.8- Land Use/ Land Cover Types of Hokersar (1969)

CLASS NAME	AREA $(KM)^2$
Marshy	16.30
Open Water	1.74
Plantation	0.64
Road	0.05

Source: Delineated by the Researcher from Topographic Map of 1969 of Hokersar.

51. Comprehensive Management Action Plan for Wular Lake, Kashmir. (2007). Final Report prepared for the Department of Wildlife Protection, Govt. of J&K, *Wetlands International, South Asia*. Retrieved from http://www.wetlands.org



Source: Adapted from Romshoo, S. A., Rashid, I. (2012). Assessing the impacts of changing Land cover and Climate on Hokersar wetland in Indian Himalayas. *Arab J. Geosci*.,*7*, 143-160.

Figure 8.7

Table 8.9- Area Covered by Different Land Use/land Cover Types with in Hokersar (1992 - 2008)

Category	Area 1992 $(km)^2$	Area 2001 $(km)^2$	Area 2005 $(km)^2$	Area 2008 $(km)^2$	Change from 1992 to 2008 $(km)^2$	Per cent Change
Agriculture	4.26	3.69	3.23	4.95	0.69	3.69
Aquatic vegetation	2.5	3.48	4.56	4.46	1.96	10.73
Built-up	0.01	0.05	0.12	0.11	0.1	0.55
Fallow	0.88	0.21	0.27	0.48	-0.4	-2.22
Marshy	7.74	8.06	7.27	5.62	-2.12	-11.86
Open Water	0.85	0.43	0.31	0.36	-0.49	-2.72
Plantation	1.82	2.18	2.32	2.16	0.34	1.83
Road	0.03	0.03	0.03	0.03	0	0

Source: Romshoo, S. A., Rashid, I. (2012). Assessing the impacts of changing Land cover and Climate on Hokersar wetland in Indian Himalayas. *Arab J. Geosci*.,*7*, 143-160.

Hokersar wetland has been delineated into eight (8) types of land use and land cover classes as agriculture, fallow, plantation, marshy lands, aquatic vegetation, built-up, open water and road as shown in the Table 8.9

From the analysis of figure 8.7 and table 8.9, it is evident that the area under marshy land was 16.30 km^2, plantation was 0.64 km^2 and open water was 1.74 km^2 out of the total area of 18.75 km^2. There is no category of built-up, agriculture, fallow and aquatic vegetation shown on the topographic map and hence these three categories are missing in table 8.8. From the analysis of 1992 data, all the 08, categories of the land use and land cover are presented in the wetland. Marshy lands dominate the wetland area covering an area of 7.74 km^2 that constitutes 42.7 Per cent of then wetland area. Agriculture that was non-existent in 1969, is the second major land use type in the wetland covering about 23.51 Per cent of the wetland area. Similarly, the built-up area

has emerged within the wetland that was not present before 1969 and covers an area of 0.01 km^2 (0.09 Per cent). The area under the open waters has also drastically reduced in 1992 compared to the baseline data (1969). The open water body within the wetland has reduced from 1.74 km^2 in 1969 to 0.85 km^2 in 1992.

Similarly, the analysis of 2001 data shows that marshy lands are predominant in the wetland followed by agriculture. The built-up area has increased from 0.01 km^2 in 1992 to 0.05 km^2 in 2001. However, the open water body has shrunk by more than half from 0.85 to 0.43 km^2. From the analysis of 2005 data, it is observed that the area under the aquatic vegetation has significantly increased from 3.48 km^2 in 2001 to 4.56 km^2 in 2005. Similarly, the built-up area is showing an increase and marshy lands are showing a decrease from 8.06 to 7.27 km^2 during 2001 to 2005 period. The area estimates of the land use and land cover types derived from 2008 high resolution IKONOS data are not showing consistent trend as observed from 1969-2005 except for marshy and aquatic vegetation categories. In fact, due to different image acquisition date of 2008 data, i.e. January, when the water discharge is usually a bit higher than the autumn when it is at the minimum, there is increase in the water extent observed from the 2008 data. However, compared to the area estimates of the dominant land cover types observed in 1969, there are sharp changes in open water body, marshy lands, aquatic vegetation, and built-up area observed in 2008.

Thus, the depletion in the wetland extent is mainly attributed to the encroachment by the farmers, increase in the settlements, conversion of wetland area into agriculture, plantation and built-up. This depletion has serious implications not only on the flora and fauna but also on livelihood of the people dependent on the goods and services provided by the wetland. Moreover, this depletion shall have adverse impact on the efficacy of the wetland in retaining flood waters during peak discharge and flash floods and thus endanger the lives and property of the Srinagar city dwellers.

8.2.6 Biodiversity of Hokersar:

Wetlands represent the most productive ecosystems in the world (Shah et al., 2015).[52] These sustain diverse taxonomic groups and are rated most productive than the adjacent terrestrial and aquatic ecosystems. However, wetlands fed by surface waters and agricultural runoff from urbanized watersheds tend to be relatively less species rich with low quality species (Kercher and Zedler, 2004).[53]

Hokersar is considered to be the heaven of migratory birds in Kashmir for best duck game grounds in the valley. The wetland provides excellent wintering resort, cover and safe roosting grounds to a large number of migratory water fowl as well as breeding and nesting grounds for diverse migratory and resident birds in summer (Fazili, 2014).[54] Some of the important birds include mallard, geese, pochard and coots.

The macrophytic vegetation of the wetland can be classified into O4-distinct groups as (a) Emergents: These macrophytes are found in the littoral region of Hokersar. The dominant macrophyte, "Sparganium erectum", colonizes the expanded peripheral area with the distinct tendency to invade open waters (b) Rooted floating leaf type**:** These dominate the shallow waters of the wetland. An important species, Nymphoides peltata, dominates open waters (c) Free floating type: These form thick, mat-like stands which dominate the side channels of the wetland. These get highly accumulated at Sozeith, the semi-closed outlet, of the Hokersar and (d) Submersed Type: This group includes species like potamogeton crispus which dominate the eastern part of the wetland and is found frequently in Doodhganga feeding channel and potamogeton pectinatus and potamegeton filiformis that dominate the western part of the wetland. These are shown in table 8.10 as:

52. Shah, J.A., Pandit, A.K. and Shah, G.M. (2015). Dynamics of key plant nutrients (N&P) in Hokersar, a typical wetland of Kashmir Himalayas, India. *Journal of Environmental Engineering and Ecological Science*,4(1):1-7
53. Kercher, S.M. and Zedler, J.B. (2004). Multiple disturbances accelerate invasion of reed canary grass phalaris arundinaceac in a mesocosm study. Ecologica,138:455-467
54. Fazili, M.F. (2014). Comparative study of reproductive biology of Moorhens inhabiting Hokersar wetland, Kashmir. *Global Journal of Current Research*,2(3):47-50

Table 8.10- Species Composition and Relative Abundance of Macrophytes in Hokersar

Plant	Abundance	Plant	Abund Ance	Plant	Abundance
(1) EMERGENTS					
Alisma Plantago-aquatica	3	Juncus articulataus	2	Seirpus lacustris	3
Atlarnanthera Sessilis	2	Menyanthes trifoliate	2	Solidago vir-aurea	1
Barbarea vulgaris	2	Mentha arvensis	1	Spargnium erectum	5
Berula erecta	1	Myosptis syluestris	2	Spiranthes sinesis	3
Carex wallichiana	3	Phagomites australis	2	Typha laxmanii	2
Cyperus serotinus	2	Polygonum hydropipes	2	Typha angustata	4
Cyperus nubigena	3	Rananculus lingua	2	Utricularia aurea	2
Digitaria cruciata	2	Rumex nepalensis	3	Vernica anagalis aquatica	2
Gallium aparine	2	Segittaria sagittifolia	3	Polygonum amphibium	1
(2) ROOTED FLOATING LEAF TYPE					
Marsilea quadrifolia	3	Nymphaea stellata	3	Potamogeton natans	3
Marsilea minuta	1	Nymphaea alba	1	Trapa natans var. bispinosa	2
Nymphoides peltata	5				
(3) FREE FLOATING TYPE					
Lenna gribba	5	Lenna minor	4		
(4) SUBMERGED					
Batrachium trichophyllum	3	Myriorphyllum verticillatum	4	Potamogeton lucens	2
Ceratophyllum demersum	3	Potamogeton Pectinatus	3	Potamogeton crispus	4
Myriophyllum spicatum	3	Potamogeton filiformis	2	Rananculus aquaticuss	2

Source: Khan, M.A., Shah, M.A, Mir, S.S. and Bashir, S. (2004). The Environmental Status of a Kashmir Himalayan Wetland game Reserve: Aquatic Plant Communities and eco-restoration measures. *Lakes and Reservoirs, Research and Management*, 9: 125-132.

Note-{ 5- Dominant, 4- Sub dominant, 3- Frequent, 2- Occassional, 1- Rare }

Besides, there are a number of fungal species present in Hokersar wetland such as Pencillium, Aspergillus, Cladosporium, Fusarium, Verticillium and Rhizopus etc.[55] However, in recent times, Hokersar has experienced the loss of habitat for varied aquatic flora and fauna and the number of macrophytic plants species has decreased substantially. This may be attributed to the accelerated eutrophication and anthropogenic pressures. Plants at the extremes of an environmental gradient survive because of their great ecological tolerance to such environmental conditions. Over the years, Hokersar wetland has witnessed considerable shift in the vegetation pattern and even some economically important plant species like Nelumbo nucifera, Euryale ferox and Acorus calamus have almost disappeared (Khan and Shah, 2010).[56]

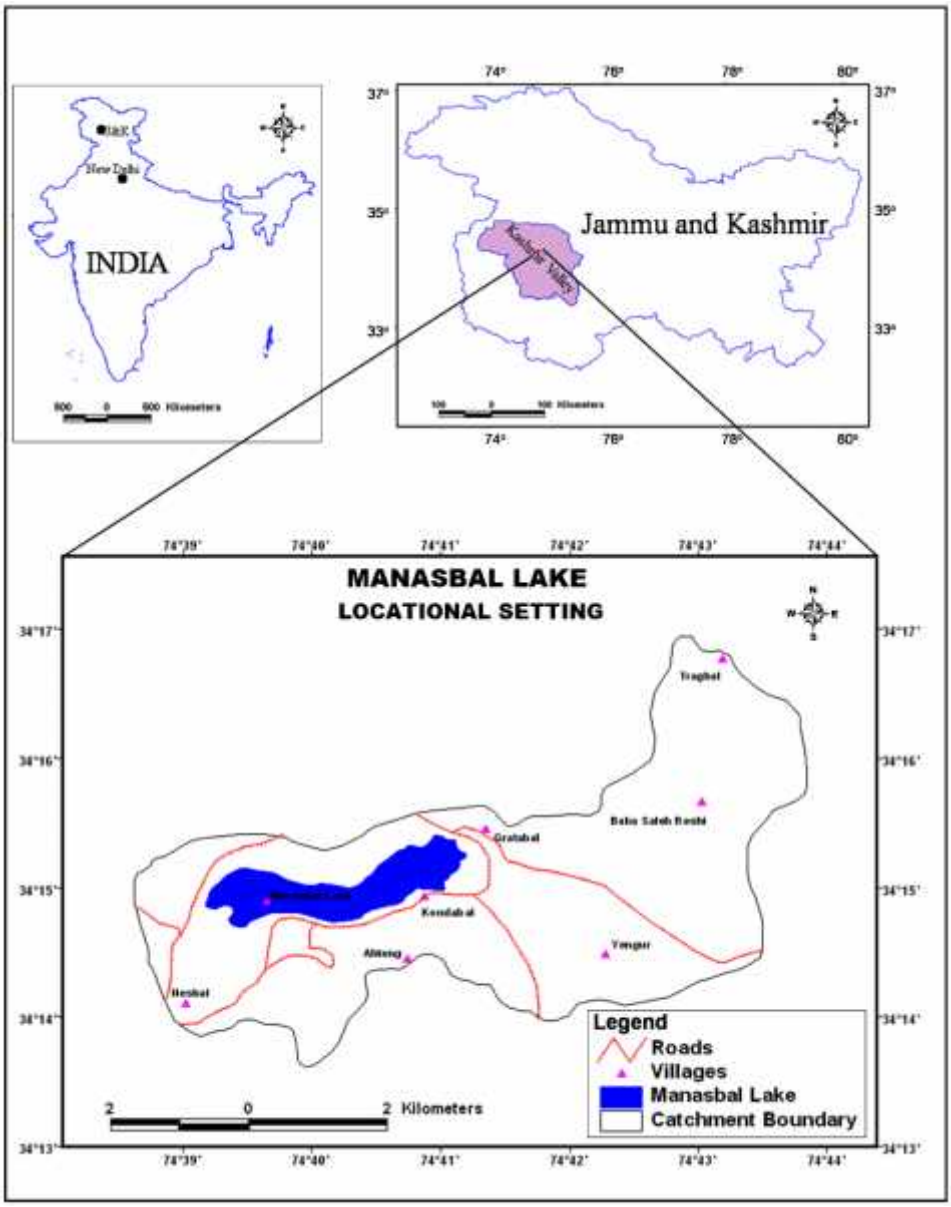
To conclude with the above discussion on the biodiversity of Hokersar, it is worthwhile to mention here that the maintenance of congenial environmental conditions in Hokersar wetland entails the reversal of nutrient enrichment, partially through periodic removal of nutrients by dredging the accumulated sediment mass and pollution from point and non-point sources should be addressed on scientific grounds. Besides, the indiscriminate harvesting of aquatic macrophytes as a major nutrient removal mechanism isn't desirable since the wetland sustains myriad of water fowl-population. However, selective manual/mechanical deweeding could be an alternative option for ensuring the proper ecology of the wetland ecosystem.

8.3 Manasbal Lake: General Characteristics

Manasbal Lake, an ox-bow type warm mono-mictic lake, is situated about 32 kilometers away towards North-west of Srinagar city in Ganderbal district of Kashmir valley. It lies between 34°15′N latitude and 34°39′-34°41′E longitude at an attitude of 1,583 meters above m.s.l. and covers an area of about 280 sq.ha. of which 25 hectares is marshy.[57] The oblong shape of Manasbal Lake extends in North-East to South-West direction with a maximum length of 3.5 kilometers and width of 1.5 kilometers. It is

55. Jan, D., Mir, T.A., Kamilli, A.N., Pandit, A.K. and Aijaz, S. (2014). Relationship between fungal community and physico-chemical characteristics in the Hokersar wetland, Kashmir Himalayas. *African Journal of Microbiology Research*,8(4):368-374
56. Khan, M.A. and Shah, M.A. (2010). Studies on Biomass Changes and nutrient lock-up efficiency in a Kashmir Himalayan wetland ecosystem, India. *Journal of Ecology and the Natural Environment*, 2(8):147-183
57. Sarah, S., Jeelani, Gh and Ahmad, S. (2011). Assessing variability of Water Quality in a ground-water fed perennial lake of Kashmir Himalayas using linear geostatistics. *J. Earth Syst. Sci.*,120(3):399-411

the deepest of all the fresh water lakes of Kashmir Valley. It is fed by ground water and has predominantly a rural ambience with three villages namely Gratbal, Kondbal and Jarokbal in its surroundings. It serves as an important natural water reservoir for the local population and its water is used for drinking and agricultural purposes.[58] The General characteristics of Manasbal Lake are illustrated as:



Source: Rashid, I., Farooq, M., Muslim, M., & Romshoo, S.A. (2013). Assessing the impact of anthropogenic activities on Manasbal Lake in Kashmir Himalayas. *International Journal of Environmental Sciences, 3* (6), 2036-2042.

Figure 8.8

58. Zutshi, D.P. and Vass, K.K. (1976). Ecology of macrophytic vegetation of Kashmir Lakes. C.K. Varshney & J. Rzoska (Eds.). Aquatic Weeds in South East Asia. The Hague, pp.141-146.

8.3.1 Catchment Area

The actual location of Manasbal catchment is defined by latitudes 34°14′ to 34°16′N and longitudes 74°40′ to 74°43′E with an altitude of 1,551 meters above sea-level. The lake catchment covers an area of about 22 km^2. The topography of the catchment area is hilly with flat areas at lower elevations. The lake is surrounded by moderately high mountains on its eastern and southern sides. The topography gently drops in west and south-west direction with lowest point being at 1551 meter around Manasbal Lake. A few limestone quarries exist towards the eastern part and the northern bank of the lake comprises a raised land of Karewas. The catchment of Manasbal Lake consists mainly of Triassic limestone, Quaternary karewas and recent alluvium. Triassic limestone is made up of a thick series of compact blue limestone, slates and dolomites (Krishnan 1958).[59] Karewas are the lacustrine deposits of the Pleistocene age and are composed of fine silty clays with sand and boulder gravel (Bhat, 1989).[60] The Karewa Series Consist of blue, grey and bluff silts, sand, partly compacted conglomerates and embedded moraines (Wadia 1953).[61] The alluvium consists of boulders, pebbles and sands.

The climate of the catchment is characterized by warm summers and cold winters. The drainage pattern observed is trellis with flow direction from East to Southwest. Some of the main crops cultivated in the catchment area include rice and mustard. Large areas of barren waste lands and Horticulture are also found in the catchment area of Manasbal Lake.

During recent years, the rapid increase in population has resulted in establishment of new human settlements in the catchment area of the lake. Similarly, the vast area of forest have been converted into agriculture and farmlands that resulted in opening up the terrestrial ecosystem, with heavy loads of nutrients leaching into the lake from the fertile top soil of the catchment area (Romshoo and Muslim, 2011).[62]

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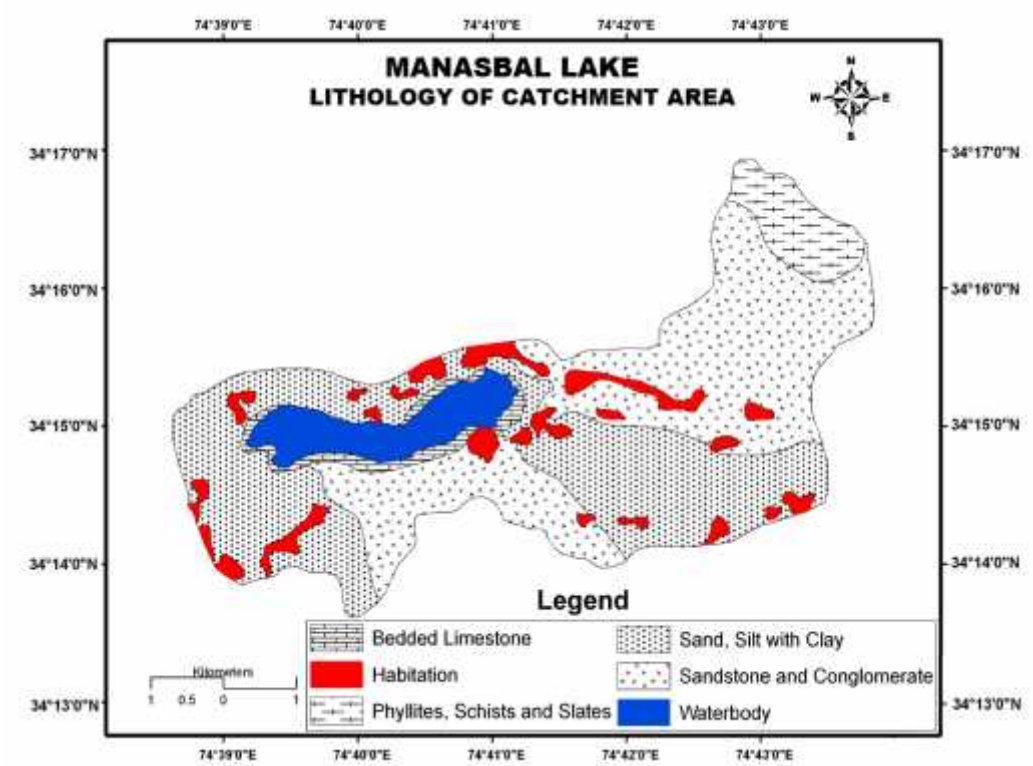
59. Krishnan, M. S. (1968). *Geology of India and Burma*. Higginbotham pvt. Ltd,: Madras.
60. Bhat, D. K. (1989). Geology of Karewa Basin, Kashmir. *Geol. Survey India Rec.*, 122.
61. Wadia, D. N. (1953). *Geology of India, carboniferous and Permian systems.* Tata MC. Graw Hill: New Delhi.
62. Romshoo, S. A., & Muslim, M. (2011). Geospatial modeling for assessing the nutrient load of a Himalayan lakes, Environmental Earth Sciences, *64*, 1269-1282.

In addition to the sewage and domestic effluents from the new and expanding human settlements, the run-off from fertilized agricultural land and the residual insecticides and pesticides from the arable lands and orchard plantations also drain into the lake.



Source: Adapted from Rashid, I., Farooq, M., Muslim, M., & Romshoo, S.A. (2013). Assessing the impact of anthropogenic activities on Manasbal Lake in Kashmir Himalayas. *International Journal of Environmental Sciences, 3* (6), 2036-2042.

Figure 8.9

8.3.2 Hydrological Regimes of Manasbal Lake

Kashmir Valley is blessed with a number of small and large lakes with different hydrological settings. The origin of lakes in this valley is either tectonic or fluviatile. This is because of the fact that this region is tectonically active and almost all the water-bodies lie on the flood plain of River Jhelum.

Although Manasbal Lake has no major inflows and its water supply is chiefly derived from internal springs and precipitation. Laar Kul, a small irrigational stream which takes off from Sindh nullah and irrigates the agricultural fields throughout its course,

drains into the lake on its eastern-side. However, this stream is operational only during summer season (Shafi et. al., 2013)[63]

The central area of the lake represents the open water zone with a maximum depth of 12.5 meters and relatively clear with greater visibility. The lake outlet on its western side is characterized by more turbid water due to the sediment loading. The water comes out of the lake through this outlet and enters into river Jhelum through 1.6 kilometer Nunyar Nallah near Sumbal Village.

The volume of the water has been estimated as 12.8 x 10^6 m^3 (Yousuf, 1992).[64] Manasbal lake can be categorized into category-III and designated as satisfactory for the purpose of bathing.

8.3.3 Water Quality of Manasbal Lake

Water Quality plays an important role in determining the status and condition of a fresh water ecosystem. Since water affects our life at every step, it has become our prime responsibility to maintain the quality of water supplies and to conserve natural fresh water aquatic environment for a balanced ecosystem.[65]

The picturesque Valley of Kashmir, located in the foothills of Himalayas, abounds in fresh water natural lakes that have come into existence as a result of various geological changes. These lakes categoried into glacial, Alpine and valley lakes based on their origin, altitude and nature of biota, provide an excellent opportunity for studying the structural and functional process of an aquatic ecosystem (Kaul, 1977).[66] However, anthropogenic activities have resulted in heavy inflow of nutrients into these lakes from the catchment areas. These anthropogenic activities not only deteriorate the water quality, but also affect the aquatic life in the lakes, as a result of

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63 Shafi, S., Kamili, A. N., Shah, M. A., & Bandh, S. A. (2013). Coliform Bacterial estimation: A total for assessing water Quality of Manasbal lake of Kashmir Himalayas. *African Journal of Microbiology Research*, *7* (31), 3996-4000.

64. Yousuf, A. R. (1992). Biotic communities and their role in the tropic conditions in Kashmir Himalayan Lakes. *Technical report submitted by the University of Kashmir*, CSIR Research Project.

65. Solanki, V. R., Raja, S. S., & Hussain, M. (2000). Studies on temperature fluctuation and dissolved oxygen levels in Bellal Lake of Bodhan, Andhra Pradesh. *Pollution Research*, *25*, 91-93.

66. Kaul, V. (1977). Limnological survey of Kashmir Lakes with reference to tropic status and conservation. *International Journal of Ecology and Environmental Sciences*, *3*, 29-44.

which the process of aging of these lakes has hastened (Odada et al., 2004).[67] Consequently, most of the lakes of Kashmir valley are exhibiting eutrophication (Khan, 2008).[68]

As per the trophic status, Manasbal Lake falls under mesotrophic category. pH of water is slightly basic (7.9-10). Dissolved oxygen varies from 6.8-8.6 mg/ltr. The maximum concentration of dissolved oxygen (DO) in surfae waters can be attributed to vigorous photosynthetic activity of the autotrophs variations of pH over a high range are often observed in the lakes due to influence of fresh-water inputs, pollution. Photosynthesis, interaction with suspended matter etc. High range of pH at surface indicates the higher productivity of the water body.

The dissolved oxygen content of 8.6 depicts that lake waters have good oxygen content enough to sustain fish and other aquatic biodiversity therein. Besides, High Calcium content (32.8 mg/ltr) has been found in its waters mainly because the lithology of the lake catchment is dominated by bedded limestone. Thus, the lake is typically a marl lake.

Moreover, the higher levels of phosphorous and nitrogen content can be attributed to the direct sewage ingress into the lake from the surrounding settlements. The turbidity index value ranges from 3.35-4.58. These low values have been attributed to different factors viz. Plankton population, setting of materials in calm weather, glacial silt, incoming sewage and high loading of dissolved organic matter. Very high electrical conductivity values are due to periodical sedimentation of decomposing organic material (191-490 μs/cm). Total alkalinity value ranges between 121 to 147 mg/ltr. This was due to intense photosynthetic activity removing free as well as bound CO_2 from bi-carbonates which inturn precipitates calcium carbonate and pH value increases.

Calcium, magnesium and sodium are the most abundant cations with the concentrations ranging from 11.2-29.7, 4.3-18 and 5.7-18 mg/ltr respectively. Potassium is the least abundant major cation with an average value of 2.36 mg/ltr. Bi-

67. Odada, E. O., Olago, D. O., Kalindova, K., Ntiba, M., & Wangida, S. (2004). Mitigation of options analysis, *Ambio, 33*, 13-23.
68. Khan, M. A. (2008). Chemical environment and nutrient fluxes in a flood plain wetland ecosystem, Kashmir Himalayan lakes. *Hydrobiologica, 192* (23), 215-222.

carbonate (HCO_3) is the most dominant anion with an average value of 20-230 mg/ltr followed by chlorine with an average value of 3.36 mg/ltr. The concentration of sulphate and nitrate ranges from 0.005-0.371 mg/ltr and 0.018-2.014 mg/ltr respectively. Hence, it can be said that the lake water composition is dominated by calcium and HCO_3 ions.

Above all, the concentration of all the trace elements like Mn, Fe, Zn, and Cu in the lake water is within permissible limits of WHO standards, 1998. These trace elements are vital to plant metabolism as they play an essential role in the processes of respiration and photosynthesis.

Table 8.11- Water Quality of Manasbal Lake

Parameter	**Value**
pH	7.7 to 10
Dissolved oxygen	6.8 to 8.6 mg/ltr
Electrical conductivity	191 to 490 μs/cm
Total alkalinity	121 to 149 mg/ltr
Calcium	32.8 mg/ltr
Magnesium	4.3 to 18.1 mg/ltr
Sodium	5.7 to 18 mg/ltr
Potassium	2.36 mg/ltr
Chlorine	3.36 mg/ltr
Total Phosphorous	74 mg/ltr
Ammonical Nitrogen	106 mg/ltr
Sulphates	0.005 to 0.371 mg/ltr
Nitrates	0.018 to 2.014 mg/ltr
Bicarbonates (HCO_3)	20 to 230 mg/ltr
Total dissolved salts	122 to 314 mg/ltr

Source: Khan, M. A. (2008). Chemical environment and nutrient fluxes in a flood plain wetland ecosystem, Kashmir Himalayan lakes. *Hydrobiologica, 192* (23), 215-222.

Thus, three types of waters can be found in Manasbal lake- $CaHCO_3$, $MgHCO_3$ and hybrid water which reflect the initial stage of evolution of the lake water. Secondly, significant temporal variations found in the trace elements may be due to biological

productivity in the lake and thirdly, the sources of solutes were found to be lithogenic with carbonate and silicate as the dominant sources of solutes. Lastly, all the constituent elements found within the permissible limits of World Health Organization (WHO) standards indicate that the lake water is potable and suitable for other purposes.

8.3.4 Land use/Land cover Dynamics of Manasbal Lake

In order to understand land use/land cover dynamics of the catchment area of Manasbal Lake, various scholars and researchers have put forward their efforts. However, the work done by Rashid and others 2013[69] is most exhaustive and striking. These scholars have made use of IRS-LISS-III bi-seasonal satellite data (with spatial resolution of 23.5 mtr) and Digital elevation model in order to quantify various anthropogenic activities and their impact on the environmental quality of Manasbal Lake and its catchment.

Using on screen image interpretation, the land use/land cover has been mapped and a total of 12-land use classes have been delineated from the given satellite data. The statistics of the land use reveals that highest area is occupied by Barren land (29.52 Per cent) followed by agriculture (17.85 Per cent), Plantation (13.35 Per cent), water body (7.61 Per cent). The least dominant land cover type is Bare Rock occupying 0.42 Per cent of the catchment area.

A considerable area is under built-up (6.76 Per cent). Besides, more than 31 Per cent area is without any vegetation comprising of Barren land, Bare Rock and Stone Quarrying Sites, which bring in tremendous amounts of limestone sediments into the lake eco-system.

The high sediment load comprising mostly of limestone particles is responsible for the lake being categorized as Marl. Hence, afforestation of barren-lands with local coniferous forest species like Pinus wallichiana so as to reduce the silt load on the water-body is the need of the hour.

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69. Rashid, I., Farooq, M., Muslim, M., & Romshoo, S.A. (2013). Assessing the impact of anthropogenic activities on Manasbal Lake in Kashmir Himalayas. *International Journal of Environmental Sciences, 3* (6), 2036-2042.

Besides, an appropriate mechanism be established for continuous monitoring of the wetland, its immediate surroundings and the catchment for land system changes, hydrochemistry, bio-diversity and lake hydrology so that a robust strategy and action plan is developed for the conservation and restoration of this important wetland in Kashmir Valley.

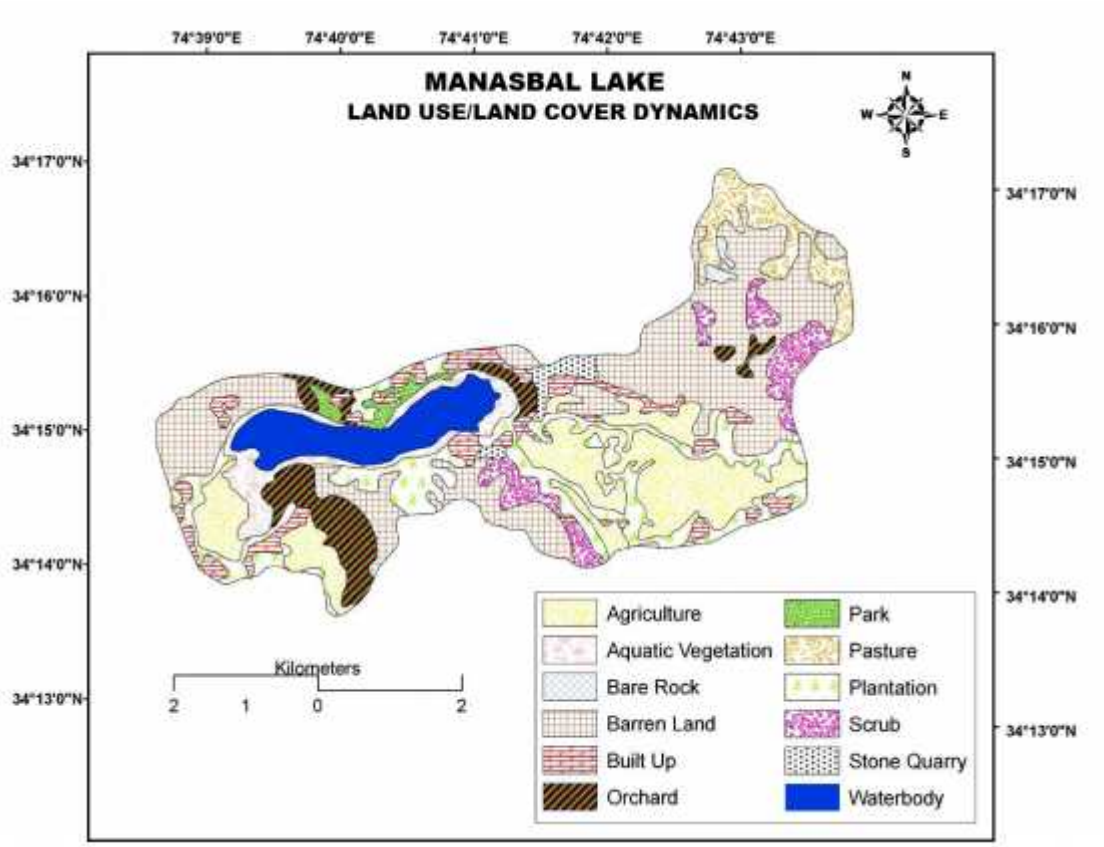

Figure 8.10

Source: Adapted from Rashid, I., Farooq, M., Muslim, M., & Romshoo, S.A. (2013). Assessing the impact of anthropogenic activities on Manasbal Lake in Kashmir Himalayas. *International Journal of Environmental Sciences, 3* (6), 2036-2042.

Table 8.12- Land Use/land Cover Dynamis of Manasbal Catchment

CLASS NAME	AREA $(km)^2$	PERCENTAGE
Agriculture	4.01	17.85
Aquatic vegetation	1.08	4.83
Bare Rock	0.09	0.42
Barren Land	6.52	29.52
Built up	1.52	6.76
Orchard	1.46	6.51
Park	0.28	1.25
Pasture	1.18	6.25
Plantation	3.01	13.39
Scrub	1.17	5.23
Stone Quarry	0.31	1.39
Water-body	1.71	7.60
Total catchment area	**22.74**	**100.00**

Source: Rashid, I., Farooq, M., Muslim, M., & Romshoo, S.A. (2013). Assessing the impact of anthropogenic activities on Manasbal Lake in Kashmir Himalayas. *International Journal of Environmental Sciences, 3* (6), 2036-2042.

8.3.5 Biodiversity of Manasbal Lake

Manasbal Lake is biologically very rich and diverse. It sustains various species of phytoplanktons, zooplanktons and algae So far as macrophytes are concerned, they comprise an essential component of aquatic ecosystem vital for their steady state. Although, they tend to be under-developed because of their size, seasonality and distribution but they play an integral role as limnological assets. Thus, their effective carbon capture and storage role and rates are encouragingly promising and significantly sustainable.

Maqbool and Khan[70] are of the view that a total of 15 emergent species are found to inhabit the Manasbal Lake which are represented by 10-families as shown in Table 8.13

Table 8.13- Floral Species of Manasbal Lake

S.No	FLORAL SPECIES	FAMILY
1.	Alisma Plantago	Alismataceae
2.	Sagittaria sagittifolia	Alismataceae
3.	Bidens Cernua	Asteraceae
4.	Lycopus europus	Lamiaceae
5.	Carex species	Cyperaceae
6.	Eleocharis palustris	Cyperaceae
7.	Cyperus difformis	Cyperaceae
8.	Scirpus trigueter	Cyperaceae
9.	Myriophyllum verticillatum	Haloragaceae
10.	Polygonum amhibium	Polygonaceae
11.	Echinocloa crusgalli	Poaceae
12.	Phragnites australis	Poaceae
13.	Typha latifolia	Typhceae
14.	Nasturtium officinale	Brassicaceae
15.	Sium Latijugum	Apiaceae

Source: Maqbool, C., & Khan, A. B. (2013). Biomass and carbon content of Emergent Macrophytes in lake Manasbal, Kashmir: Implications for Carbon capture and sequestration. *International Journal of Scientific Research Publications, 3* (2), 1-7.

70. Maqbool, C., & Khan, A. B. (2013). Biomass and carbon content of Emergent Macrophytes in lake Manasbal, Kashmir: Implications for Carbon capture and sequestration. *International Journal of Scientific Research Publications, 3* (2), 1-7.

The eastern side of Manasbal lake near Kondbal is mostly dominated by macrophytes like ceratophyllum demerrum and myriophyllum spicatum. While the western side of the lake near its outlet channel is dominated by Nelumbo nucifera.

Zooplanktons, especially rotifers are abundant and diverse wherever macrophytes are abundant in the littoral zones of Manasbal lake. As reported by Jameela et al. (2014),[71] the largest recorded rotifer family is Brachionidae with 16-species followed by Lecanidae (5-species), Lepadellidae (4-species), Notammatidae (3-species), synchaetidae (2-species) and Trichocercidae (2-species).

Similarly, Parray and Others (2009)[72] have reported various species of Fungi in Manasbal lake like Aspergillus species, Penicillium species, Rhizospus species, Fusarium species, Cladoporium species and Verticullium species. The species of genus Penicillium and Aspergillus are usually found in polluted lake waters and act as cellulose decomposers (Kellern and McBeth, 1912).[73]

Water Quality and fungal population are deeply inter-related. The density of fungus increases with increase in water conductivity. Secondly, dissolved oxygen in water in higher concentration decreases fungal population and vice-versa and Higher Concentration of sulphates and nitrates shows low fungal population and vice-versa (Khulbe and Durgapal, 1992).[74]

8.4 Socio Economic Conditions of Sampled Settlements Located on Anchar, Hokersar and Manasbal Lakes

The Valley of Kashmir is a lacustrine basin of the intermontane depression characterized by numerous large and small aquatic ecosystems of great ecological and economic significance. Few of these small but important wetlands include Anchar, Hokersar and Manasbal Lakes. Anchar is a shallow-basin semi-urban lake to the

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71. Jamila, I., Yousuf, A. R., Parveen, M., Hassan, K., Rehman, M., & Sheikh, B. A. (2014). Rotifer community in Manasbal Lake of Kashmir. *International Journal of Fisheries and Aquatic Studies,1* (6),190-198.
72. Parray, J. A., Kamili, A. N., Bhat, A. A., & Hamid, R. (2009). Microbiological analysis of Manasbal Lake with reference to fungal community. *J. Himalayan Ecol. Sustain. Dev., 4,* 22-26.
73. Kellerman, K. E., & Mc Beth, I. G. (1912). The fermentation of cellulose. *ZBI Bakt. I. Abs.,34,* 485-494.
74. Khulbe, R. D., & Durgapal, A. (1992). Population dynamics of Geo fungi in a polluted fresh water body at Nainital Kumaon Himalaya, Nainital, *Journal of Ecology and Natural Environment, 24,* 180-187.

North-West of Srinagar city near Soura in the low lying areas and flood plains of river Sind and Hokersar, the queen of wetlands in Kashmir Valley, is a shallow eutrophic lake at the borderline of Srinagar and Budgam districts. Manasbal, on the other hand, lying 40kms to the North-West of Srinagar, near Safapora, in Ganderbal district, is the deepest fresh water lake of Kashmir Valley.

The littorals of the Anchar Lake are surrounded by a thick canopy of willow and poplar trees that supply the base material for the manufacturing of cricket bats, baskets and wood carvings etc. Similarly, the catchments of Hokersar and Manasbal lakes are enriched with a number of orchards, crop fields and willow plantations that add significantly to the resource base of Kashmir Valley. Besides, Hokersar is considered to be heaven of migratory birds and best duck shooting grounds of Kashmir Valley and Manasbal serves as an important natural water reservoir for the local population.

However, all these three wetlands have become passed through several stages of eutrophic evolution, particularly the Anchar Lake which is leading towards extinction on account of agricultural runoff, siltation and semi- urban catchment coupled with disposal of domestic and medical wastes from SKIMS (Sher-e-Kashmir Institute of Medical Sciences), Soura. The status of Hokersar and Manasbal Lakes is not much different from each other. The areal extent of Hokersar has been drastically reduced because of encroachments by farmers, increase in number of settlements and conversion of wetland area into agriculture, plantation and built up. Likewise, the intensive quarrying activities in the catchment of Manasbal Lake have reduced its water quality upto great extent.

All these factors have deteriorated not only the water quality of these wetlands but also have reduced their depth and volume which is a matter of grave concern for their sustenance.

The three wetlands of Anchar, Hokersar and Manasbal encompass three districts of Srinagar, Budgam and Ganderbal which in aggregate comprise of 34.72 Per cent of total households and 36.12 Per cent of the total population of the Valley. These three districts contribute about 35.79 Per cent literate population to the Valley of Kashmir. Besides, these districts are a home to about 25.24 Per cent of the Scheduled Castes

and 20.82 Per cent of the Scheduled Tribes population of Kashmir Valley. In addition to this, about 33.97 Per cent of the working force of the Valley comes from the districts of Srinagar, Budgam and Ganderbal. There are 10 towns and 614 villages in these districts and these houses around 12.73 Per cent are Below Poverty Line (BPL) population of the Valley of Kashmir.

8.4.1 General Characteristics of the Sampled Settlements

All the three smaller lakes Anchar, Hokersar and Manasbal, of Jhelum Basin of Kashmir Valley, are surrounded by rural landscape. However, the eastern part of Anchar Lake lies in semi-urban environment as well. For the purpose of socio economic survey, 10 Per cent of the surrounding households of 8(eight) settlements or villages were taken as sample size. These eight settlements included Soura and Sangam from district Srinagar, Gadoora, Kondbal and Gratbal from district Ganderbal and Soibug, Gund Hasibhat and Dehramana from district Budgam.

Soura is located at a distance of 9.5 kms to the North-West of Srinagar (Lal Chowk), Sangam is located at 6kms and Gadoora at a distance of 24 kms from Lal Chowk in the same direction. Similarly, Kondbal and Gratbal are located to the North-West of Srinagar at 30 and 28 kms respectively. In the same way, Dehramana, Soibug and Gund-Hasibhat are located at 14, 15 and 16 kms to the West from Srinagar respectively.

The total number of sampled households was 512 and total sampled population was calculated to be 3,517 people. The average household size was recorded as 6.86 and the percentage of workers to the total sampled population was noted to be 33.86 Per cent. The highest percentage of working population was recorded from Gadoora (67.93 Per cent) followed by Kondbal (41.53 Per cent), Sangam (39.77 Per cent), Gratbal (38.02 Per cent), Gund Hasibhat (33.12 Per cent), Dehramana (31.07 Per cent), Soura (28.96 Per cent) and Soibug (26.03 Per cent).

8.4.2 Socio Economic Conditions

The profile of the 8 sampled settlements located around and dependent on three smaller wetlands (Anchar, Hokersar and Manasbal) of Kashmir Valley is given under Table 8.14. A perusal of this table shows that these 8 settlements namely Soura,

Table 8.14- Selection of Settlements and Households on the Basis of their Location and Dependency on Anchar, Hokersar and Manasbal Lakes (2015)

SELECTED SETTLEMENTS							SAMPLED SETTLEMENTS				
District	**Name of the Settlement**	**Total Population**	**Total No. of Households**	**Average Household Size**	**Total Workers**	**Percentage of Workers to the Total Population**	**Sampled Population (Number)**	**Sampled Households (Number)**	**Average Household Size**	**Sampled Workers (Number)**	**Percentage of Workers to the Sampled Population**
Srinagar	**Soura**	11,636	1,732	6.71	3,299	28.35	1,191	173	6.87	345	28.96
	Sangam	1,819	276	6.59	694	38.15	181	27	6.70	72	39.77
Ganderbal	**Gadoora**	3,654	440	8.30	2,458	67.26	368	44	8.36	250	67.93
	Kondbal	1,286	201	6.39	526	40.90	130	20	6.50	54	41.53
	Gratbal	660	105	6.28	248	37.58	71	11	6.45	27	38.02
Budgam	**Soi bug**	9,873	1,471	6.71	2,377	24.07	991	147	6.74	258	26.03
	Gund Hasibhat	478	234	6.79	478	30.06	157	23	6.82	52	33.12
	Dehramana	1,158	665	6.20	1,158	28.07	428	67	6.38	133	31.07
Total		**3,4642**	**5,124**	**6.76**	**11,238**	**32.44**	**3,517**	**512**	**6.86**	**1,191**	**33.86**

Source: 1. Census of India (2011), Directorate of Census Operations, Srinagar, Jammu and Kashmir.
2. Based on Field Survey by the Researcher, 2014-15

Table 8.15- Distribution of Respondents (in Percentage) According to Age and Sex Structure

Age Group (in Years)	Gender	Soura	Sangam	Gadoora	Kondbal	Gratbal	Soi Bug	Gund Hasibhat	Dehramana	Total Population
Below 30	Male	49.16	50.72	51.02	50.90	50.00	49.86	50.82	50.93	50.03
	Female	50.83	49.28	48.98	49.10	50.00	50.14	49.18	49.07	49.97
	Total	35.01	38.12	39.95	42.30	39.44	36.03	38.85	38.08	36.87
30-60	Male	51.67	49.52	49.02	50.73	51.28	50.08	49.44	50.00	50.50
	Female	48.33	50.48	50.98	49.27	48.72	49.91	50.56	50.00	49.50
	Total	58.02	56.90	55.98	53.07	54.93	58.02	56.69	56.07	57.21
Above 60	Male	49.40	50.00	50.72	50.00	50.00	49.15	51.28	52.00	50.48
	Female	50.60	50.00	49.28	50.00	50.00	50.85	48.72	48.00	49.52
	Total	6.97	4.98	4.07	4.63	5.63	5.95	4.46	5.85	5.92
Total Males		50.63	50.27	50.00	50.77	50.70	49.94	50.31	50.47	50.33
Total Females		49.37	49.73	50.00	49.23	49.30	50.06	49.69	49.53	49.67
Grand Total		**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher, 2014-15

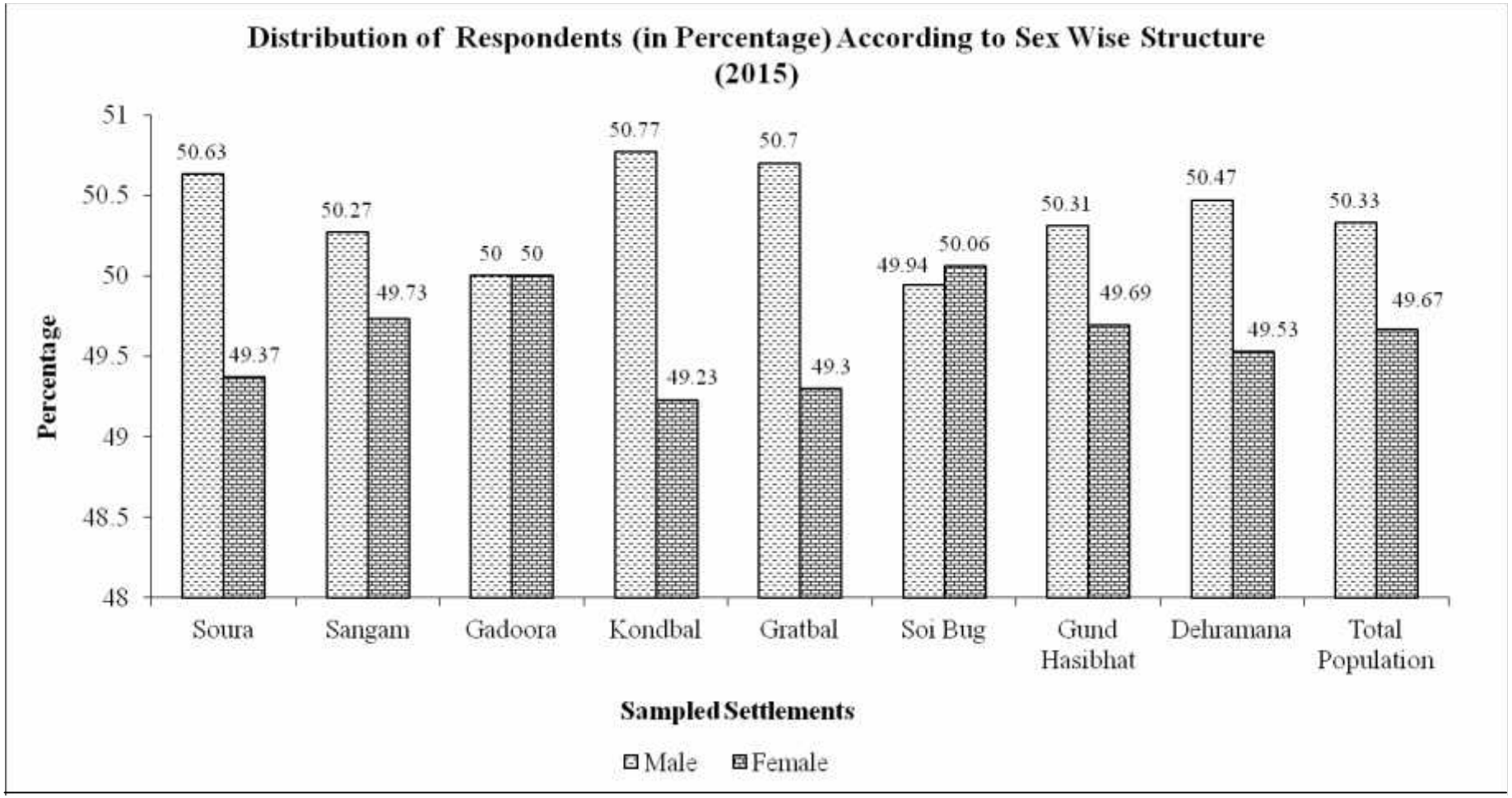
Distribution of Respondents (in Percentage) According to Sex Wise Structure (2015)
Percentage
51
50.5
50
49.5
49
48.5
48
50.63
49.37
50.27
49.73
50
50
50.77
49.23
50.7
49.3
49.94
50.06
50.31
49.69
50.47
49.53
50.33
49.67
Soura
Sangam
Gadoora
Kondbal
Gratbal
Soi Bug
Gund Hasibhat
Dehramana
Total Population
Sampled Settlements
Male
Female

Figure 8.11

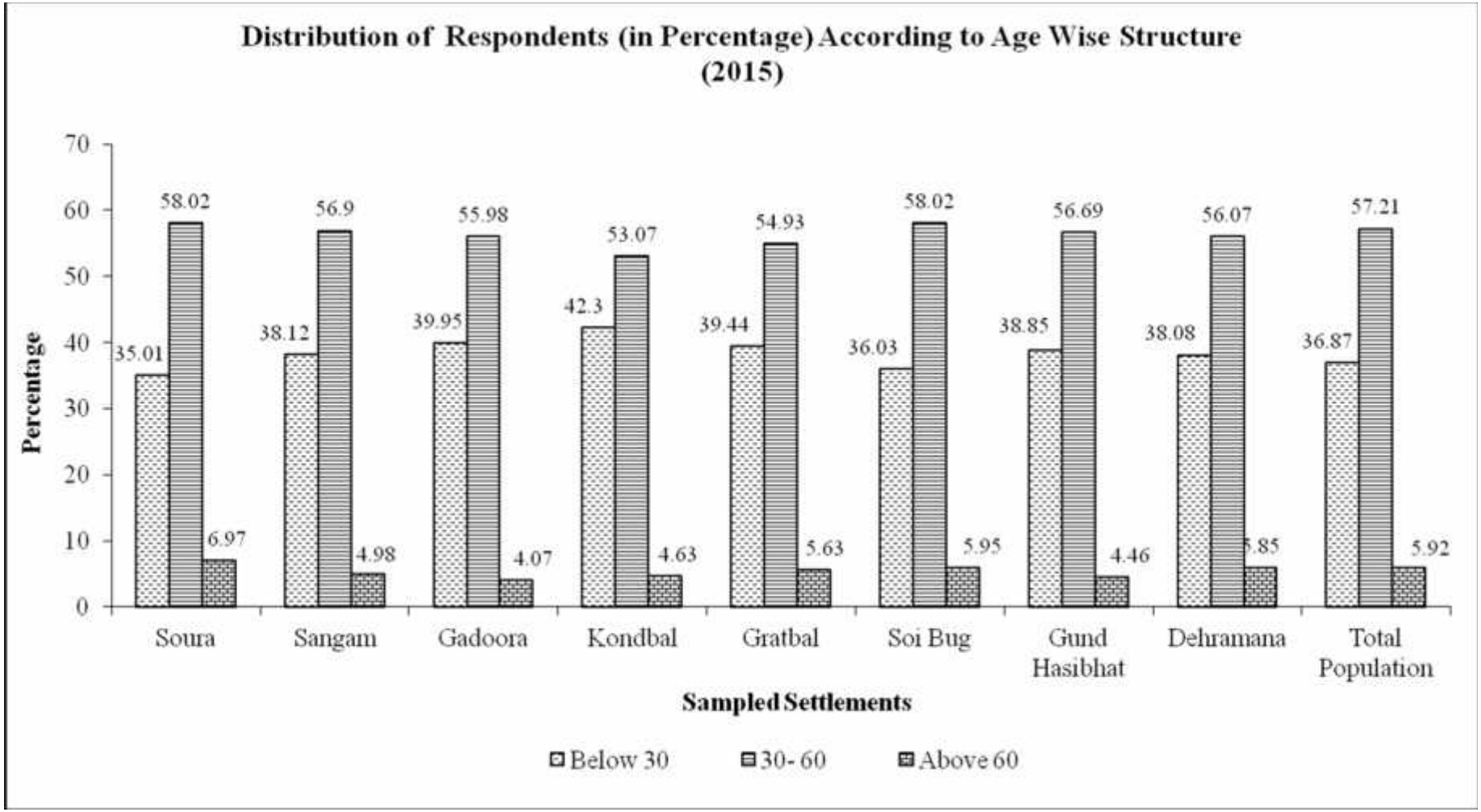
Distribution of Respondents (in Percentage) According to Age Wise Structure (2015)
Percentage
70
60
50
40
30
20
10
0
35.01
58.02
6.97
38.12
56.9
4.98
39.95
55.98
4.07
42.3
53.07
4.63
39.44
54.93
5.63
36.03
58.02
5.95
38.85
56.69
4.46
38.08
56.07
5.85
36.87
57.21
5.92
Soura
Sangam
Gadoora
Kondbal
Gratbal
Soi Bug
Gund Hasibhat
Delramana
Total Population
Sampled Settlements
Below 30
30- 60
Above 60

Figure 8.12

Table 8.16 (A) - Distribution of Respondents (in Percentage) According to Educational Structure

Educational Structure	Soura	Sangam	Gadoora	Kondbal	Gratbal	Soi Bug	Gund Hasibhat	Dehramana	Total Population
Uneducated	49.63	60.22	62.23	70.77	66.20	54.60	61.79	59.11	55.93
Educated	50.37	39.78	37.77	29.23	33.80	45.40	38.21	40.89	44.07
Total	100	100	100	100	100	100	100	100	100

Source: Based on Field Survey by the Researcher, 2014-15

Table 8.16 (B)- Distribution of Respondents (in Percentage) According to Levels of Education

Levels of Education	Soura	Sangam	Gadoora	Kondbal	Gratbal	Soi Bug	Gund Hasibhat	Dehramana	Total Population
Primary	54.06	51.39	50.36	50.60	52.00	52.23	50.00	51.43	52.53
Secondary	21.96	22.22	23.03	31.58	25.00	26.67	25.00	24.58	24.13
Under Graduate	10.47	13.89	15.10	10.53	12.50	10.00	13.33	12.57	11.29
Graduate	8.45	9.72	9.35	5.26	8.33	6.67	8.34	8.02	7.94
Post Graduate	5.06	2.78	2.16	2.03	2.17	4.44	3.33	4.00	4.01
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher, 2014-15

Table 8.16 (A) - Distribution of Respondents (in Percentage) According to Educational Structure

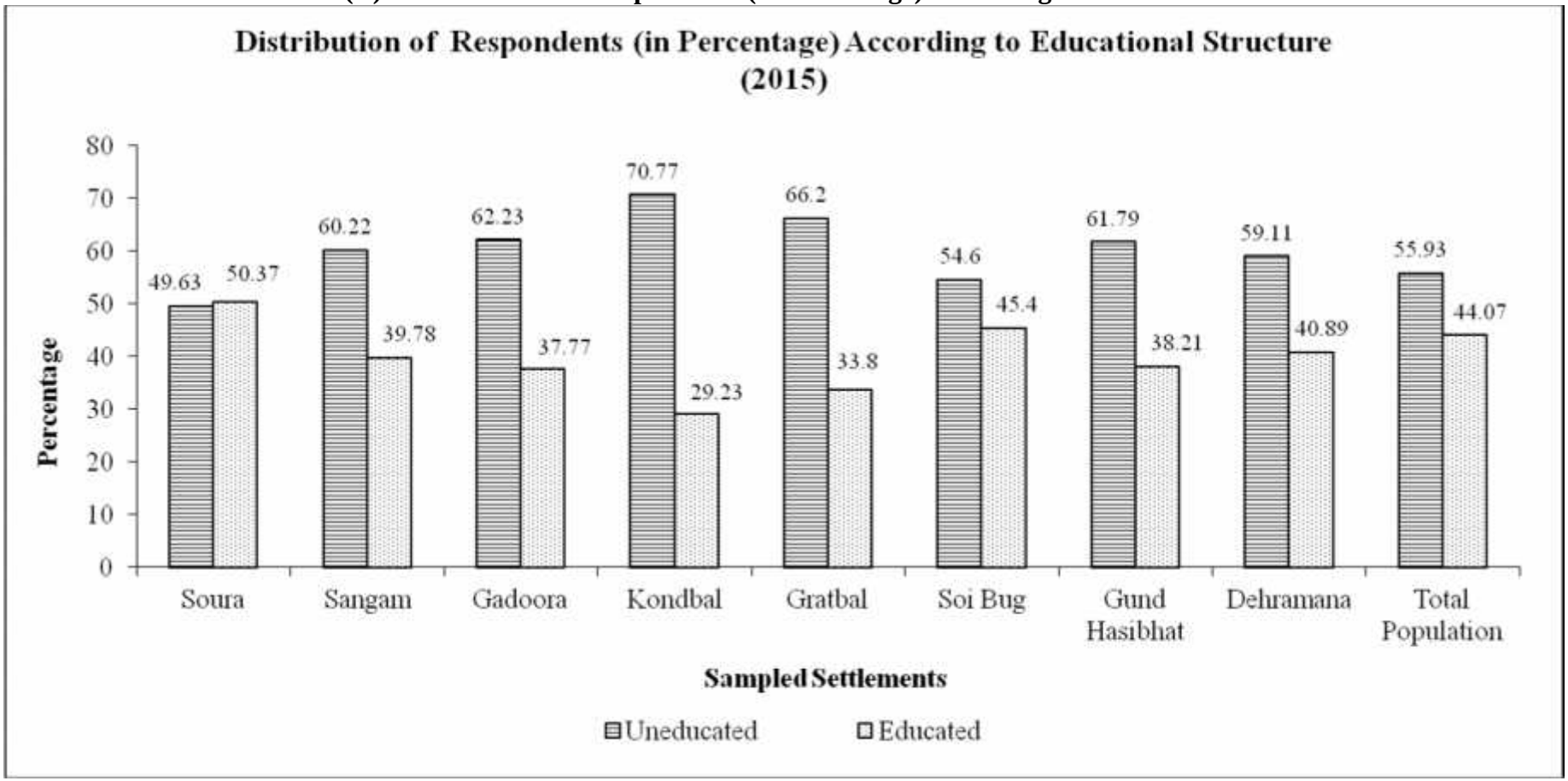

Figure 8.13

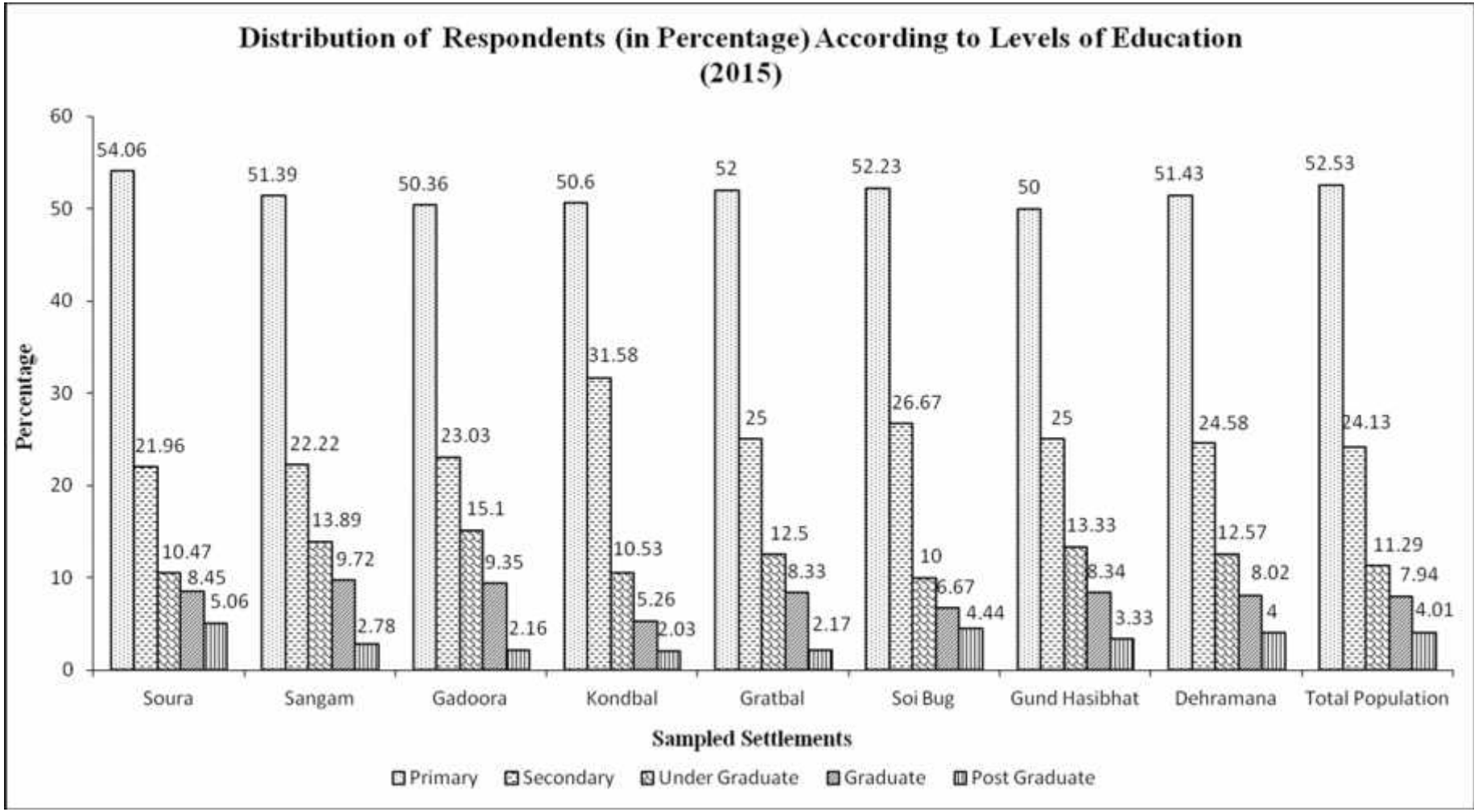
Distribution of Respondents (in Percentage) According to Levels of Education (2015)
Percentage
60
50
40
30
20
10
0
54.06
21.96
10.47
8.45
5.06
51.39
22.22
13.89
9.72
2.78
50.36
23.03
15.1
9.35
2.16
50.6
31.58
10.53
5.26
2.03
52
25
12.5
8.33
2.17
52.23
26.67
10
6.67
4.44
50
25
13.33
8.34
3.33
51.43
24.58
12.57
8.02
4
52.53
24.13
11.29
7.94
4.01
Soura
Sangam
Gadoora
Kondbal
Gratbal
Soi Bug
Gund Hasibhat
Dehramana
Total Population
Sampled Settlements
Primary
Secondary
Under Graduate
Graduate
Post Graduate

Figure-8.14

Sangam, Gadoora, Kondbal, Gratbal, Soibug, Gund Hasibhat and Dehramana consisting the areas of three districts of Srinagar, Budgam and Ganderbal comprise 34,642 people. The total number of households was 5,124 with the average household size of 6.76 and 32.44 Per cent of working population. A smaller number of 512 households (10 Per cent) comprising a population of 3,517 have been taken as sample size. The total workers of the sampled population were 33.86 Per cent and the average household size was calculated to be 6.86 persons.

The three tier classification, as shown in table 8.15, of the age structure of sampled population under below 30 years, 30- 60 years and above 60 years shows that 36.87 Per cent of the sampled population belong to below 30 group, 57.21 Per cent fall in 30-60 years group and only 5.92 Per cent were categorized as above 60 years of age. Six villages showed dominance of male population as Kondbal (50.77 Per cent), Gratbal (50.70 Per cent), Soura (50.63 Per cent), Dehramana (50.47 Per cent), Gund Hasibhat (50.31 Per cent) and Sangam (50.27 Per cent). Only one village (Soibug) showed dominance of female population (50.06 Per cent), whereas Gadoora comprised equal number of male and female population.

The educational structure and the levels of education of the sampled respondents have been shown in table 8.16 (A) and 8.16 (B). A perusal of table 8.16(A) shows that 55.93 Per cent of the sampled population is uneducated with Kondbal having 70.77 Per cent of uneducated population followed by Gratbal (66.20 Per cent), Gadoora (62.23 Per cent), Gund Hasibhat (61.79 Per cent), Sangam (60.22 Per cent), Dehramana (59.11 Per cent), Soibug (54.60 Per cent) and Soura (49.63 Per cent). The educated population comprised of only 44.07 Per cent of the total population size. Likewise a perusal of table 8.16 (B) shows that more than half (52.45 Per cent) of the sampled population has studied up to primary or elementary levels with 24.13 Per cent has acquired secondary education whereas 11.29 Per cent were under graduates, 7.94 Per cent were graduates and only 4.19 Per cent were post graduates. The highest number of Post graduates was seen in Soura (5.06 Per cent) followed by Soibug (4.44 Per cent), Dehramana (4.00 Per cent), Gund Hasibhat (3.33 Per cent), Sangam (2.78 Per cent), Gadoora (2.16 Per cent), gratbal (2.16 Per cent) and Kondbal (2.03 Per cent).

Table 8.17 (A) - Distribution of Households (in Percentage) According to Type of House

Type of House	Soura	Sangam	Gadoora	Kondbal	Gratbal	Soi Bug	Gund Hasibhat	Dehramana	Total Population
Pucca	92.49	85.19	79.55	75.00	81.82	85.04	82.61	85.07	86.52
Kutcha	7.51	14.81	20.45	25.00	18.18	14.96	17.39	14.93	13.48
Total	100	100	100	100	100	100	100	100	100

Source: Based on Field Survey by the Researcher, 2014-15

Table 8.17 (B) - Distribution of Households (in Percentage) According to Source of Drinking Water.

Source of Drinking Water	Soura	Sangam	Gadoora	Kondbal	Gratbal	Soi Bug	Gund Hasibhat	Dehramana	Total Population
Municipality/ P.H.E*	90.17	81.48	54.55	55.00	54.54	64.63	65.22	65.67	72.85
Spring	1.74	7.41	15.90	15.00	27.28	20.40	21.74	19.40	12.89
Hand Pump	8.09	11.11	4.55	10.00	9.09	8.84	13.04	10.45	8.79
River/Stream	00	00	25.00	00	00	6.13	00	4.48	4.49
Lake	00	00	00	20.00	9.09	00	00	00	0.98
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher, 2014-15

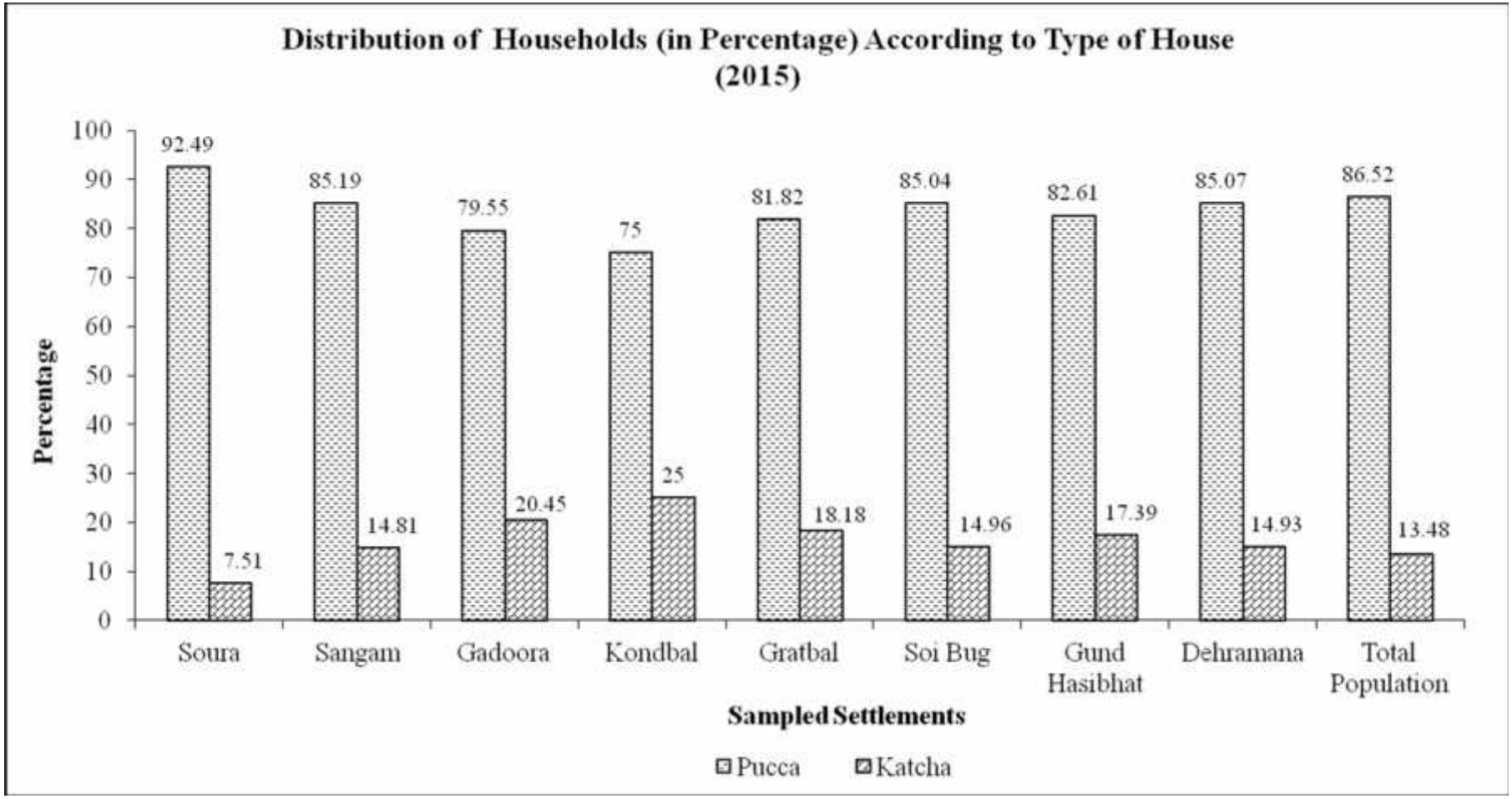
Distribution of Households (in Percentage) According to Type of House (2015)
Percentage
100
90
80
70
60
50
40
30
20
10
0
92.49
7.51
85.19
14.81
79.55
20.45
75
25
81.82
18.18
85.04
14.96
82.61
17.39
85.07
14.93
86.52
13.48
Soura
Sangam
Gadoora
Kondbal
Gratbal
Soi Bug
Gund Hasibhat
Dehramana
Total Population
Sampled Settlements
Pucca
Katcha

Figure 8.15

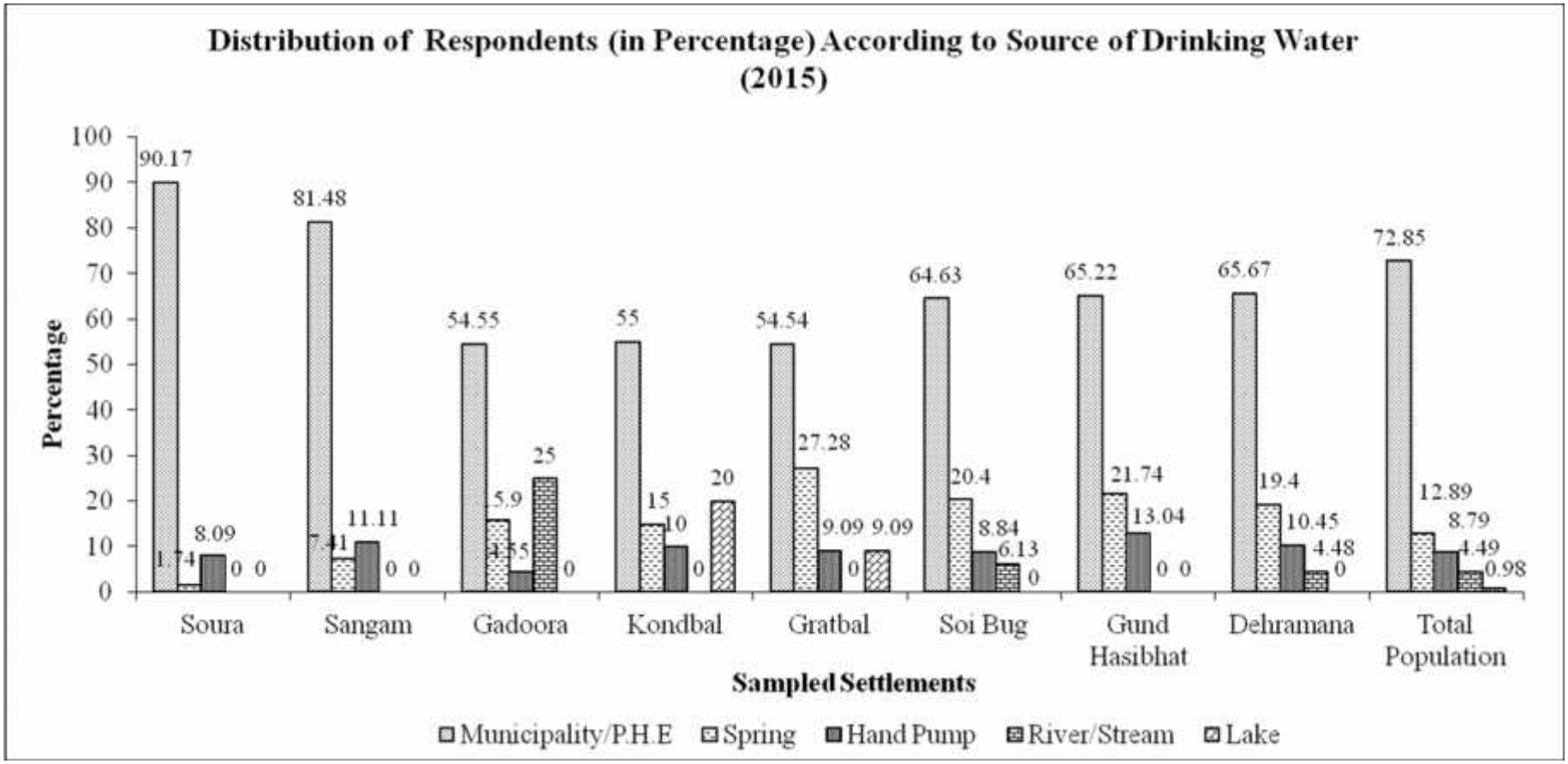
Distribution of Respondents (in Percentage) According to Source of Drinking Water (2015)
Percentage
100
90
80
70
60
50
40
30
20
10
0
90.17
1.74
8.09
0 0
81.48
7.41
11.11
0 0
54.55
15.9
4.55
25
0
55
15
10
0
20
54.54
27.28
9.09 9.09
0
64.63
20.4
8.84
6.13
0
65.22
21.74
13.04
0 0
65.67
19.4
10.45
4.48
0
72.85
12.89
8.79
4.49
0.98
Soura
Sangam
Gadoora
Kondbal
Gratbal
Soi Bug
Gund Hasibhat
Dehramana
Total Population
Sampled Settlements
Municipality/P.H.E
Spring
Hand Pump
River/Stream
Lake

Figure 8.16

Table 8.17 (C) – Distribution of Households (in Percentage) According to Disposal of Solid Waste.

Solid Waste Disposal	Soura	Sangam	Gadoora	Kondbal	Gratbal	Soi Bug	Gund Hasibhat	Dehramana	Total Population
Lake	43.35	51.84	22.72	50.00	36.36	34.69	26.08	23.88	36.33
Burning	20.23	18.52	31.82	30.00	36.36	21.77	34.78	38.80	25.39
River/Nullah	00	14.82	27.27	00	00	29.25	8.70	11.94	13.48
Municipality Bins	21.96	00	00	00	00	00	00	00	7.42
Others*	14.46	14.82	18.19	20.00	27.28	14.29	30.44	25.38	17.38
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

**Others- Back yard dumping, Road side dumping, Street dumping etc.*
Source: Based on Field Survey by the Researcher, 2014-15

Table 8.17 (D) – Distribution of Households (in Percentage) According to Disposal of Toilet Waste.

Toilet Waste Disposal	Soura	Sangam	Gadoora	Kondbal	Gratbal	Soi Bug	Gund Hasibhat	Dehramana	Total Population
Used as Manure	31.79	62.96	63.64	60.00	54.55	70.06	56.52	64.18	54.10
River/Lake	50.28	29.63	29.55	35.00	36.36	18.37	34.78	26.87	33.60
Septic Tank	17.93	7.41	6.81	5.00	9.09	11.57	8.70	8.95	12.30
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher, 2014-15

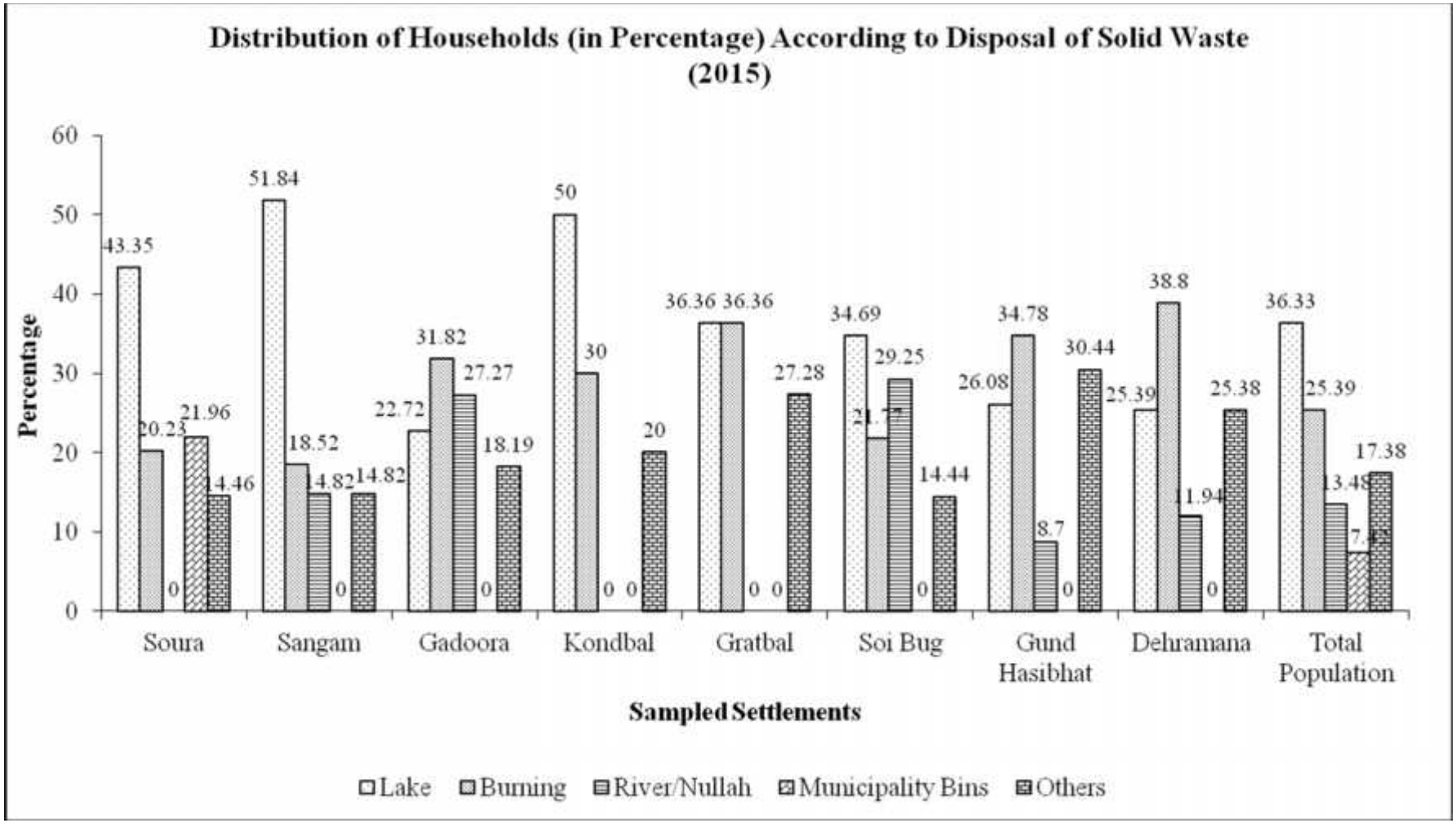
Distribution of Households (in Percentage) According to Disposal of Solid Waste (2015)
Percentage
60
50
40
30
20
10
0
43.35
20.23
0
21.96
14.46
51.84
18.52
14.82
0
14.82
22.72
31.82
27.27
0
18.19
50
30
0
0
20
36.36
36.36
0
0
27.28
34.69
21.75
29.25
0
14.44
26.08
34.78
8.7
0
30.44
25.39
38.8
11.94
0
25.38
36.33
25.39
13.48
7.4
17.38
Soura
Sangam
Gadoora
Kondbal
Gratbal
Soi Bug
Gund Hasibhat
Dehramana
Total Population
Sampled Settlements
Lake
Burning
River/Nullah
Municipality Bins
Others

Figure 8.17

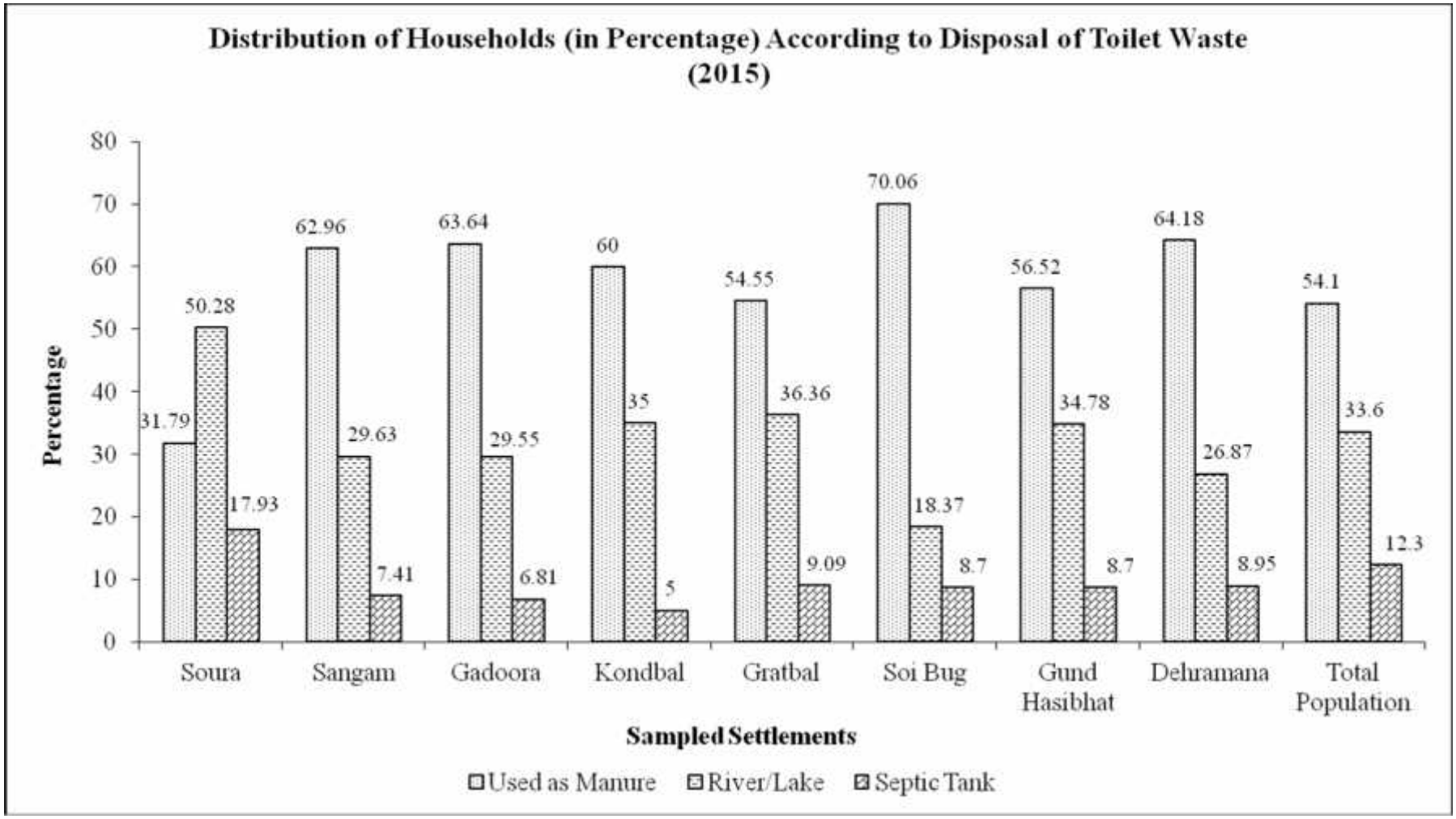
Distribution of Households (in Percentage) According to Disposal of Toilet Waste (2015)
Percentage
80
70
60
50
40
30
20
10
0
31.79
50.28
17.93
62.96
29.63
7.41
63.64
29.55
6.81
60
35
5
54.55
36.36
9.09
70.06
18.37
8.7
56.52
34.78
8.7
64.18
26.87
8.95
54.1
33.6
12.3
Soura
Sangam
Gadoora
Kondbal
Gratbal
Soi Bug
Gund Hasibhat
Delramana
Total Population
Sampled Settlements
Used as Manure
River/Lake
Septic Tank

Figure-8.18

Table 8.17 (A) shows the distribution of Households of the sampled population according to their type of houses. A perusal of this table shows that 13.48 Per cent of the sampled households are of kutcha type as Kondbal (25 Per cent), Gadoora (20.45 Per cent), Gratbal (18.18 Per cent), Gund Hasibhat (17.39 Per cent), Soibug (14.96 Per cent), Dehramana (14.93 Per cent), Sangam (14.81 Per cent) and Soura (7.51 Per cent) whereas, 86.52 Per cent are of pucca type.

Table 8.17 (B) shows the distribution of Sampled households as per the source of drinking water. A perusal of this table shows that 72.85 Per cent of the sampled households obtain drinking water from municipality or the department of Public Health Engineering, 12.89 Per cent use water from spring for drinking purpose, 8.79 Per cent use water from hand pumps and 4.49 Per cent have to depend on stream or river water for drinking. However, only about 0.98 Per cent of the sampled households use lake water for drinking. Except 20 Per cent households of Kondbal and 9.09 Per cent households of Gratbal that use water from Manasbal Lake for drinking, no other sampled settlement uses water from Anchar or Hokersar for drinking which in itself reveals the intensity and degree of the pollution of these Lakes.

Table 8.17 (C) and Table 8.17 (D) show the distribution of sampled households according to the disposal of solid waste and toilet waste. A perusal of table 8.17 (C) shows that 36.33 Per cent of the sampled households dispose their solid waste directly or indirectly into the lakes and 25.39 Per cent burn it. Nearly, 13.48 Per cent dispose the solid waste into rivers and nullahas which later on reach to the lakes indirectly. Municipality bins are used by 7.42 Per cent of the sampled households for disposing their solid waste and 17.38 Per cent of the households go for other means of disposal like road side and street side dumping.

A perusal of table 8.17 (D) shows that 33.60 Per cent of the households use lakes or rivers to dispose their toilet waste. Soura with 50.28 Per cent of its sampled households stands at the top in the disposal of toilet waste into Anchar Lake followed by Gratbal (36.36 Per cent), Kondbal (35 Per cent), Gund Hasibhat (34.78 Per cent), Sangam (29.63 Per cent), Gadoora (29.55 Per cent), Dehramana (26.87 Per cent) and Soibug (18.37 Per cent). Only 12.30 Per cent of the sampled households have septic tanks. However, 54.10 Per cent of these households use toilet waste as manure.

Table 8.18 – Distribution of Workers (in Percentage) According to Occupational Structure.

Occupation	Soura	Sangam	Gadoora	Kondbal	Gratbal	Soi Bug	Gund Hasibhat	Dehramana	Total Population
Cultivation	28.88	44.45	42.80	35.19	37.03	46.90	46.15	45.11	39.55
Business and Trade	35.99	22.22	16.00	19.63	18.23	25.00	17.38	20.04	23.59
Arts and Crafts	14.98	15.28	34.00	25.37	19.52	18.80	24	27.32	22.50
Fishing/Fish Marketing	15.07	13.89	5.20	17.96	21.52	3.49	8.62	4.52	9.99
Government Employees	6.08	4.16	2.00	1.85	3.70	5.81	3.85	3.01	4.37
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher, 2014-15

Table 8.19– Distribution of Respondents (in Percentage) According to Average Monthly Income

Average Monthly Income (In Rupees)	Soura	Sangam	Gadoora	Kondbal	Gratbal	Soi Bug	Gund Hasibhat	Dehramana	Total Population
Below 3000	49.13	55.55	56.82	60.00	57.54	50.34	60.87	57.20	53.12
3000- 6000	31.21	29.62	34.09	30.00	29.27	34.01	29.43	28.85	31.86
Above 6000	19.66	14.83	9.09	10.00	13.19	15.65	8.70	13.95	15.02
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Based on Field Survey by the Researcher,2014-15

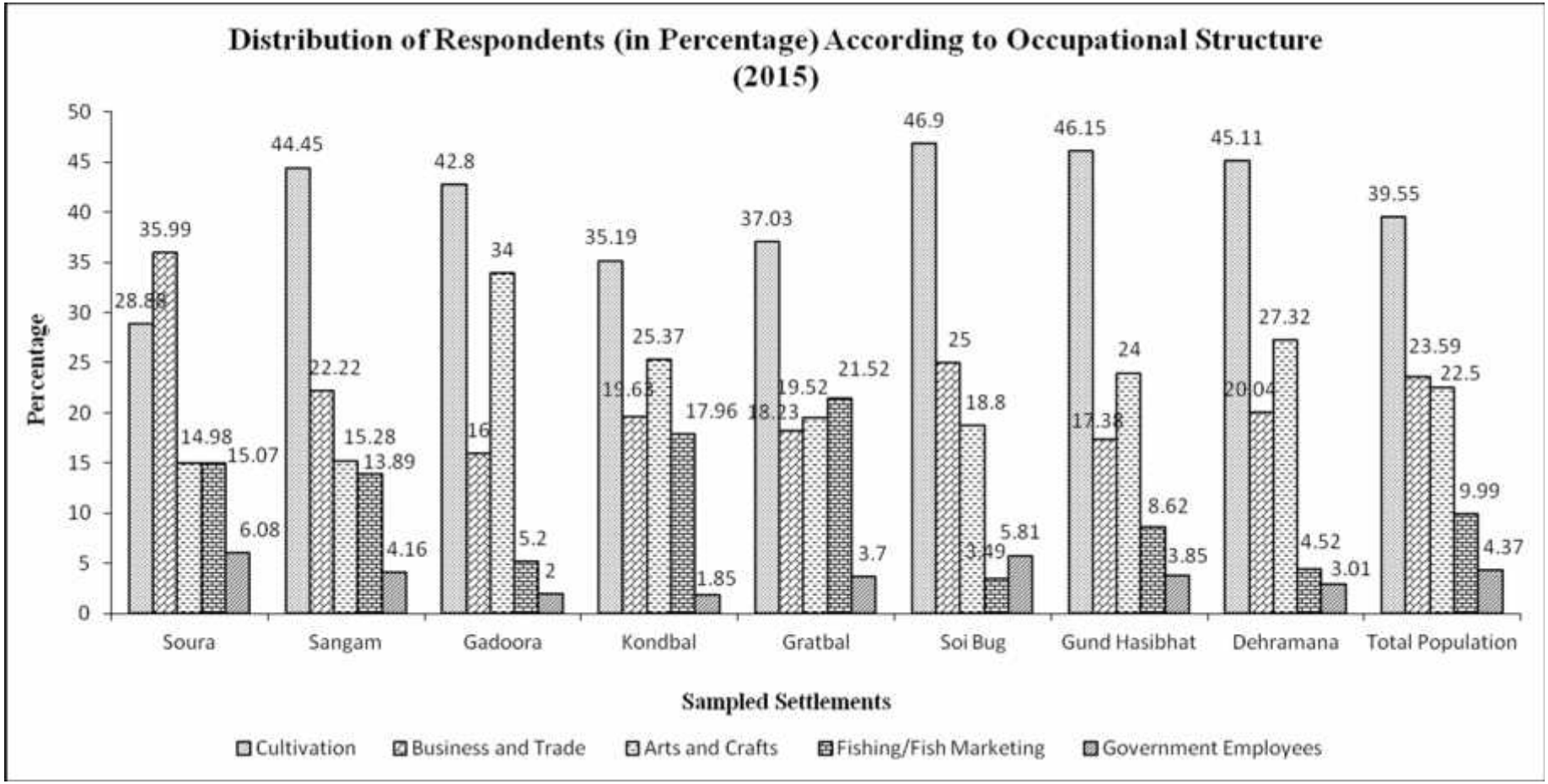
Distribution of Respondents (in Percentage) According to Occupational Structure (2015)
Percentage
50
45
40
35
30
25
20
15
10
5
0
28.88
35.99
14.98
15.07
6.08
44.45
22.22
15.28
13.89
4.16
42.8
16
34
5.2
2
35.19
19.63
25.37
17.96
1.85
37.03
18.23
19.52
21.52
3.7
46.9
25
18.8
3.49
5.81
46.15
17.38
24
8.62
3.85
45.11
20.04
27.32
4.52
3.01
39.55
23.59
22.5
9.99
4.37
Soura
Sangam
Gadoora
Kondbal
Gratbal
Soi Bug
Gund Hasibhat
Dehramana
Total Population
Sampled Settlements
Cultivation
Business and Trade
Arts and Crafts
Fishing/Fish Marketing
Government Employees

Figure 8.19

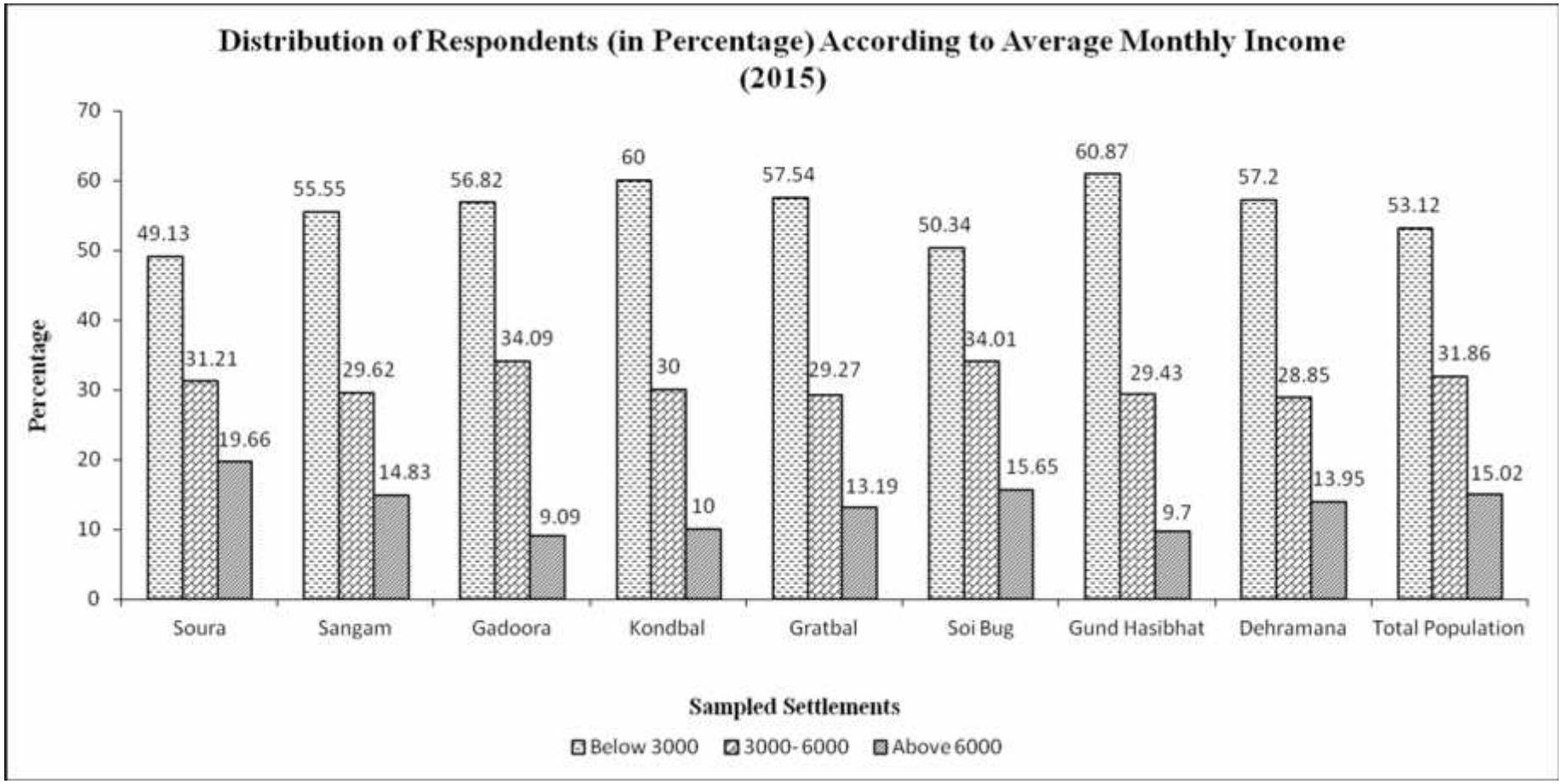
Distribution of Respondents (in Percentage) According to Average Monthly Income (2015)
Percentage
70
60
50
40
30
20
10
0
49.13
31.21
19.66
55.55
29.62
14.83
56.82
34.09
9.09
60
30
10
57.54
29.27
13.19
50.34
34.01
15.65
60.87
29.43
9.7
57.2
28.85
13.95
53.12
31.86
15.02
Soura
Sangam
Gadoora
Kondbal
Gratbal
Soi Bug
Gund Hasibhat
Dehramana
Total Population
Sampled Settlements
Below 3000
3000-6000
Above 6000

Figure 8.20

Table 8.18 shows the occupational structure of the sampled respondents. A perusal of this table shows that 39.55 Per cent of the sampled respondents are engaged in cultivation. Soibug has the highest proportion of its population (46.90 Per cent) engaged in cultivation followed by Gund Hasibhat (46.15 Per cent), Dehramana (45.11 Per cent), Sangam (44.45 Per cent), Gadoora (42.80 Per cent), Gratbal (37.03 Per cent), Kondbal (35.19 Per cent) and soura (28.88 Per cent). Similarly, arts and crafts comprised the occupation of 22.50 Per cent of sampled respondents. A sizeable 34 Per cent of the sampled population of Gadoora is engaged in arts and crafts followed by 27.32 Per cent of Dehramana, 25.37 Per cent of Kondbal, 24 Per cent of Gund Hasibhat, 19.52 Per cent of Gratbal, 18.80 Per cent of Soibug, 15.28 Per cent of Sangam and 14.98 Per cent of Soura. Business and Trade comprises the occupation of 23.59 Per cent of the sampled respondents which included 35.99 Per cent of the sampled population of Soura followed by 25.10 Per cent of Soi Bug, 22.22 Per cent of Sangam, 20.04 Per cent of Dehramana, 19.63 Per cent of Kondbal, 18.23 Per cent of Gratbal, 17.38 Per cent of Gund Hasibhat and 16 Per cent of Gadoora. Besides, 9.99 Per cent of Sampled respondents were engaged in fishing and fish marketing with Gratbal comprising 21.52 Per cent of its sampling population engaged in this occupation followed by Kondbal (17.96 Per cent), Soura (15.07 Per cent), Sangam (13.89 Per cent), Gund Hasibhat (8.62 Per cent), Gadoora (5.20 Per cent), Dehramana (4.52 Per cent) and Soi Bug (3.49 Per cent). Moreover, 4.37 Per cent of the sampled respondents are government employees. Soura with 6.08 Per cent of its sampled population engaged with government jobs is followed by Soibug (3.855), Gratbal (3.70 Per cent), Dehramana (3.01 Per cent), Gadoora (2 Per cent) and Kondbal (1.85 Per cent).

Table 8.19 shows the Average Monthly Income Structure of sampled respondents. A perusal of this table shows that 53.12 Per cent of the respondents belong to the income group of below Rs.3000. Around 60.87 Per cent population of sampled respondents of Gund Hasibhat are of this category followed by Kondbal (60 Per cent), Gratbal (57.54 Per cent), Dehramana (57.20 Per cent), Gadoora (56.82 Per cent), Sangam (55.55 Per cent), Soibug (50.34 Per cent) and Soura (49.13 Per cent). Similarly, 31.86 Per cent of the sampled population belong to Rs.3000- 6000 income group and only 15.40 Per cent of the sampled population have their average monthly income of above Rs.6000. Soura at 19.66 Per cent is followed by Soibug (15.65 Per cent), Sangam (14.835),

ehramana (13.95 Per cent), Gratbal (13.19 Per cent), Kondbal (10 Per cent), Gund Hasibhat (9.70 Per cent) and Gadoora (9.09 Per cent).

Summary

In this chapter an attempt has been made to intensively assess the three smaller wetlands (Anchar, Hokersar and Manasbal Lakes) of the Jhelum Basin of Kashmir Valley and has tried to evaluate their respective catchments, water chemistry, morphometry, hydrological regimes, dynamics of land use / land cover and biodiversity. It has been observed that two of these wetlands, Anchar and Hokersar, have attained eutrophic state of evolution because of the intensive natural as well as anthropogenic causes that have not only deteriorated their water quality but has also reduced their depth, areal extent and volume which has, thus, rendered their waters unfit for drinking, washing and domestic use.

Besides, an attempt has also been made to analyze the socio-economic conditions of the surrounding population of these wetlands. The field survey has revealed that only 44.07 Per cent of the population living on the banks of these lakes is educated which comprised more than half (52.53 Per cent) who were educated up to primary or elementary level and only 11.95 Per cent of graduates and post-graduates. Moreover, 13.48 Per cent of the sampled households were of *kutcha* type and 27.15 Per cent were deprived of municipality facilities for drinking purpose. In addition to this, only 7.42 Per cent of the sampled population had access to municipality bins for disposing their solid waste and 12.30 Per cent were having facility of septic tanks in their houses. Above all, only 4.37 Per cent of this population was engaged with government jobs and 53.12 Per cent were having average monthly income of below Rs.3000.

After taking into consideration all the above physical, hydrological and socio-economic dimensions of the three smaller lakes of Kashmir Valley and their surrounding landscape and settlements, it becomes quite clear that these wetland ecosystems are in a state of continuous degradation and pollution and the socio economic profile of the their surroundings is in a pathetic state and poverty which needs to be addressed seriously by the concerned authorities and departments before it is too late.

CHAPTER IX

FUNCTIONS, PROBLEMS AND MANAGEMENT OF WETLAND ECOSYSTEMS IN KASHMIR VALLEY

After an intensive assessment of the major wetlands (Wular and Dal) and the minor ones (Anchar, Hokersar and Manasbal) located in the Jhelum basin of Kashmir Valley, there is a need to assess the functions and problems as well as management imperative of these wetlands.

Wetlands are the most productive and dynamic ecosystems of the world[1]. The wetlands change over time and may function differently from season to season and year to year[2]. Every wetland is unique in itself and contributes to the overall health of the environment. Earlier wetlands were considered as mere wastelands. However, their economic, social and ecological importance has been increasingly recognized and these are now considered as 'wealth lands' and the 'Biological Supermarkets'[3].

Wetlands are mainly valued because of their location on the landscape, uniqueness of their plant and animal communities, their open space, aesthetic and educational traits and locations of archaeological and historical sites[4]. They are also significant in reducing environmental problems like 'Algal Blooms', dead zones and fish kills and functioning as sediment traps and carbon sinks[5]. Besides, they act like efficient sewage treatment plants by absorbing chemicals, breaking down solids, filtering pollutants and neutralizing pathogens[6].

Thus, Wetlands play a vital role in our quality of life and indeed in our survival. In order to protect these wetlands, the public must first recognize the values of wetlands. There is also a need to understand what is lost when a wetland is changed into an agricultural field, a parking lot, a housing development or a dump.

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1 Wetland Functions and Values, Fact sheet-USDA Retrieved from www.nrcs.usda.gov/internet/FSE-DOCUMENTS/stelprdb 1043634.pdf

2 Wetland functional values Retrieved from http://dmr.wi.gov/topic/waterways/construction/wetland_ ip/Wz026.pdf-34k-2009-05-26

3 Ansari ans Oseni. (2012). Wetlands and Global Warming

4 Novitzki,R.P., Smith,R.D and Fretwell,J.D.(2016). Wetland functions,values and Assessment Retrieved from https://water.usgs.gov/nwsum/WSP2425/functions.html

5 Op cit., p. 10.

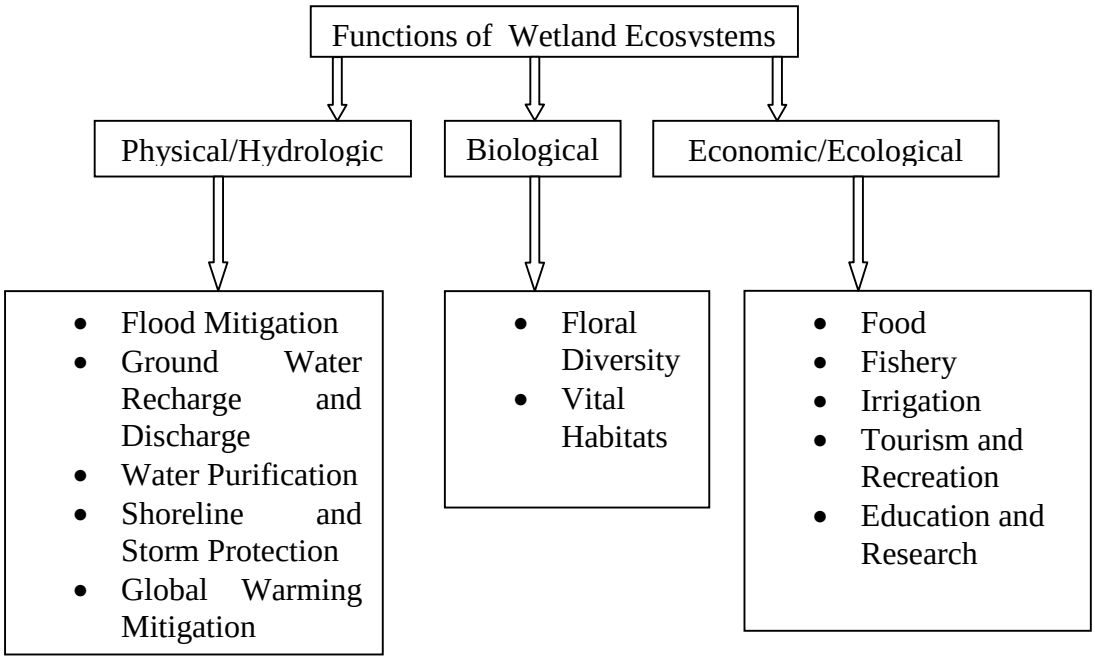
6 The values of Wetlands (Retrieved from http://wwf.panda.org/about_our_earth/about_freshwater/intro/value)

In this chapter an attempt has been made to examine the functions, problems and management of all the sampled wetlands in Kashmir Valley. This chapter is divided into three parts. The first part deals with the functions of the sampled wetlands of Kashmir Valley viz, physical/hydrological, biological, economic and ecological functions. The second part deals with the threats or problems to the sampled wetlands including both natural and anthropogenic and the third part deals with the management of wetland ecosystems in Kashmir Valley. This chapter is based on both primary and secondary sources of data. Data was collected through questionnaire interviews and field work was carried out during 2014-2015.

9.1 Functions of Wetland Ecosystems

The physical, chemical and biological interactions within a wetland are often referred to as the functions of a wetland. These are the processes necessary for the self-maintenance of a wetland ecosystem. Like all ecosystems, wetlands too have functions and values. By values it means the characteristics of wetlands that are beneficial for the society.

Figure 9.1- Functions of Wetland Ecosystems in Kashmir Valley



Source: Based on Field survey by the Researcher, 2014-15

Not all the wetlands perform all functions nor do they perform all functions equally well. However, our understanding of the complexities of wetland ecosystems is still developing and the more we learn, the more valuable wetlands become. Some of these basic functions of wetlands and their associated values include storage of surface and sub-surface water, cycling of nutrients, retention of sediments and maintenance of gene pool of species, water purification and recharge of ground water.

The functions of wetlands can be categorized as physical/ hydrological, biological, ecological and economical (figure 9.1). These can be illustrated as follows:

9.1.1 Physical/ Hydrological Functions

This includes Flood Mitigation, Ground Water Recharge and Discharge, Water Purification, Shoreline and Storm Protection and Global Warming Mitigation.

9.1.1.1 Flood Mitigation

Wetlands function like great sponge by soaking up rainwater and releasing it over the time to prevent downstream areas from inundation. An acre of wetland can store 1-1.5 million gallons of flood water[7]. Thus, wetlands have huge potential for capturing and storing excess water in the landscape to regulate the natural flow of water and mitigate the effects of flood. However, the size, shape, soil type and location of a wetland determine its capacity to reduce downstream flooding. The September, 2014 floods of Kashmir Valley bear witness to the extreme type of devastation because of the inability of the Wetlands of the Jhelum basin like Dal lake, Hokersar, Anchar and Wular lake to absorb the flood waters on account of the changing land use in and around them which reduced their size and the water holding capacity drastically.

9.1.1.2 Ground Water Recharge and Discharge

Ground water recharge is the process by which surface water moves into the ground water system and ground water discharge is the process by which ground water is discharged to the surface. Recharge usually takes place in the higher areas of landscape. Whereas, discharge is a more common function of a wetland that can be essential for stabilizing stream flows especially during dry season which can result in

7 Functions and Values of Wetlands (2002). U.S Environmental protection Agency (Retrieved from http://nepis.epa.gov/Exe/ZyPURL.cgi? Dockey=200053Q1.txt)

the enhancement of the aquatic life in downstream areas. In Kashmir Valley, ground water discharge sites are distinctively visible through springs on the banks of various wetlands. e.g. spring near Gratbal on the North-Eastern side of Manasbal Lake, near Jinab Sahab on the Eastern side of Anchar Lake, near Soibug on the South Western side of Hokersar and near Garoora on the North eastern side of Wular Lake.

9.1.1.3 Water Purification

Wetlands purify water and improve its quality by trapping sediments and retaining excess nutrients and heavy metals which enter into them mainly through surface run off from buildings and streets in residential, commercial and industrial areas. The slow velocity of water in the wetlands allows the sediments to settle down at the bottom of wetland beds and the plants hold these accumulated particles in place[8]. Besides, wetland ecosystems protect surface waters from nutrient overloading by removing and converting the excess nutrients into less harmful chemical forms in the soil to use by the plants of the wetland. However, almost all the wetlands of Kashmir Valley like the Dal Lake, Anchar Lake, Manasbal Lake , Hokersar and Wular Lake have degraded to such an extent that water gets hardly purified by them. Instead, because of their heavy organic and inorganic load, problems like Algal Blooms and low levels of oxygen have arisen therein that have seriously affected their flora and fauna and have deteriorated their water quality up to a large extent.

9.1.1.4 Shoreline and Storm Protection

Worldwide, an estimated 200 million people who live in low lying coastal areas are at potential risk from catastrophic flooding[9]. Wetlands that occur along the shoreline of Lakes or along the banks of rivers and streams help in protecting shoreline soils from the erosive forces of currents and waves. Wetland plants hold the soil in place with their extensive root system, absorb the energy of waves and break up the flow of water currents to provide a physical barrier for the incoming storm surges which reduces their height and destructive power and gives protection to the people[10].

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8 Functions and Values of Wetlands, Washington State Department of Ecology. Retrieved from http://www.ecy.wa.gov/programs/sea/wetlands/functions.html.

9 Values in Numbers. Retrieved from http://wwf.panda.org/about-our-earth/about-freshwater/intro/value/in/numbers.

10 Wetlands Functions and Values, Watershed Academy Web. Retrieved from http://cfpub.epa.gov/watertrain/moduleframe.cfm?parent_object_id=262.

9.1.1.5 Global Warming Mitigation

Wetlands are often referred to as 'Carbon Sinks'. There is no doubt that wetlands constitute a carbon sink where a huge amount of carbon is stored as it is estimated that wetlands store 300- 700 billion tons of carbon globally. Thus, the role of wetlands in sucking up the atmospheric carbon-dioxide and storing it in their biomass is a significant mechanism towards reducing global warming[11].

9.1.2 Biological Functions

Biological functions relate to vegetation, habitats and species diversity. Climate change and the changes in water chemistry can affect the composition of vegetation, quality and areal extent of habitat available to species and their diversity. (Junk, W.J, 1993).

9.1.2.1 Floral Diversity

Wetlands support a wide variety of flora and fauna which contributes to the earth's biodiversity. The more valuable wetland ecosystems usually support a greater variety of native plants. For example, the Comprehensive Management Action Plan for Wular Lake (2007) by Wetlands International, South Asia reported around 48 species of plants to be present in Wular Lake besides the presence of extensive willow plantations (27.30 sq. Kilometers) on its periphery. Economically important species of food crops like water chestnuts cover around 21 sq. Kilometers of Wular Lake. Similarly, Dal Lake also abounds in floral diversity as Qadri and Yosuf (2008) have reported presence of 31 species of plants from this wetland. Hokersar is rich in emergent, rooted floating leaf type, free floating type and submerged types of macrophytes. These also comprise an essential part of Manasbal Lake which supports a huge diversity of phytoplanktons, zooplanktons and algae. In the same way almost 41 species of macrophytes have been reported by Ali and Pandit (2009) from Anchar Lake. In addition to it, these ecosystems also provide food and shelter for many animal species at critical times during their life cycles.

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11 Ansari, A. H., Oseni, U. A. (2012). *Wetlands and Global Warming: Impacts, Adaptation and Mitigation- Developing Countries Perspective*. Serial Publications: New Delhi.

9.1.2.2 Vital Habitats

It has been estimated that fresh water ecosystems cover only 1 per cent of the earth's surface but they hold more than 40 per cent of the world's species and 12 per cent of the animal species[12]. Fish and wildlife use wetlands up to varying degrees depending upon the species involved. For many species, wetlands are primary habitats necessary for their survival and for others these ecosystems provide essential seasonal habitats with availability of plenty of food, water and shelter. Migratory birds, that visit these wetlands in winters, also depend on them besides many species of endangered and threatened birds and animals. The wetlands of Kashmir Valley particularly Wular Lake, Manasbal and Hokersar are important grounds for migratory birds like Mallard (Anas platyrhynchos), Pintail (Anos acuta), Common Teal (Anas crecca), Red crested Pochard (Netta rufina), Wigeon (Anas Penelope), Greylag Goose (Anser), Garganay (Anas guerguedula), Shoveller (Anas clypeata), Gadwall (Anas ctripera) and Coot (Fulica atra) who visit these wetlands from cold places like Siberia and Central Asia in winter. These ecosystems also provide an essential and fertile ground for smaller aquatic organisms in the food chain and food web including insects, crustaceans, mollusks and planktonic organisms.

9.1.3 Economic and Ecological Functions

The ecological diversity and high productivity of wetlands make them one of the most important ecosystems on any landscape. Some of their economic and ecological functions include providing food, fisheries, irrigation, facilities for tourism, recreation, education and research.

9.1.3.1 Food

Wetlands provide tremendous amount of food grown all-round the world. Rice, the staple diet of nearly half the world's population (3 Billion people) is grown in the wetlands across USA, West Africa, and Asia[13]. Similarly, palms from the wetlands of Africa yield valuable oils for cooking and soap making. Kashmir Valley wetlands are rich in many species of food crops like rice, *Nadroo* (Nelumbo nucifera), and *Gaer* (Trapa). These food crops produced in the wetlands of Dal Lake, Wular Lake, Anchar,

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12 The Value of wetlands. Retrieved from http://wwf.panda.org/about_our_earth/about_freshwater/intro/value.

13 Ibid., p.4

Hokersar and Manasbal are consumed domestically and brought to the market as well. However, with the deterioration of these wetlands, the areas under these food crops have drastically reduced which has affected their market supply and increased their prices as well. People in almost all the villages around Wular, Dal, Hokersar, Anchar and Manasbal lake who were attached to the cultivation of these crops have now shifted to other sectors like small scale business and handicrafts on account of the least output of these once highly remunerative crops from the deteriorating wetlands of Kashmir Valley.

9.1.3.2 Fishery

Wetlands all over the Kashmir Valley are one of the highly productive and fertile grounds for carrying out fishing activities. The wetlands of Jhelum Basin have reported around 13 species of fish (LAWDA, Srinagar). Wular Lake is the main fish producer which Contributes about one-fourth of the State's total production. Government of Jammu & Kashmir has established 9 fish landing centers at different locations on Wular Lake such as Sopore, Watlab, Kehnusa, Ashtangoo, Laharwalpora, Lankreshpora, Kulhama, S.K Colony and Ningli Bala. Other wetlands like Dal, Manasbal, Anchar and Hokersar also produce fish but their output is not so significant. Results of field survey show that around 38.29 per cent of people around Wular Lake and 4 per cent of people around Dal Lake are related to fishing and Fish marketing. Similarly, the residents around other wetlands of the Kashmir Valley like Anchar, Hokersar and Manasbal constitute about 9 per cent who are involved with fishing or fish marketing activities. Figure 9.2 shows the fish landing centers around Wular Lake.

9.1.3.3 Irrigation

Irrigation is one of the most important functions of wetlands all over the World. Wetlands of Kashmir Valley including lakes, rivers and streams are of utmost significance from the irrigational point of view. Kashmir Valley possesses a significant area of land irrigated through canals. These canals which are fed by the wetlands like Dal, Hokersar, Wular, Anchar and Manasbal are used to irrigate the vast agricultural lands of the Kashmir Valley. Besides this, the water of Manasbal and Wular is treated and supplied for domestic purposes to the wide areas of Ganderbal and Sopore.

9.1.3.4 Tourism and Recreation

Wetlands provide many facilities for tourism and recreation. Wetlands like Dal are one of the prime destinations of tourists visiting Kashmir Valley. This wetland located in the heart of Srinagar city attracts a huge flow of tourists round the year. Being saddled in the lap of Mughal Gardens of Nishat, Shalimar, Harwan and Chashm-e-Shahi on its East and North Eastern side and by the shrine of Hazratbal and University of Kashmir on its Western side, it gives a magnificent look. Similarly, the larger but untrodden wetlands like Wular Lake and few smaller ones like Manasbal can also prove as the high potential destinations for this purpose. Thus, tourism and recreation related to wetlands can be the fastest growing activity of the tourism industry of Kashmir which may include bird watching, biking, boating and pleasure walking besides the capturing of the beauty of these wetlands by writers and artists on canvas and paper and through cameras and videos.

9.1.3.5 Education and Research

Wetlands serve as excellent study sites for educational and research purposes. Students and researchers can learn practically about various ecological phenomena like biodiversity, vegetative structure, plant animal interactions and food chains and food webs etc[14]. Wetlands can also be studied in conjunction with environmental programs at different universities and environmental centers. In Kashmir Valley, Wetlands like Hokersar and Anchar can be used to serve this purpose.

9.2 Problems of Wetland Ecosystems in Kashmir Valley

In a balanced ecosystem, nutrients are recycled between the producers, consumers and decomposers. Oxygen and carbon dioxide are recycled between the plants and animals and water is cycled through the water cycle. When something untoward happens to upset the balance, the effects range from a slight disturbance to a catastrophe. Nature has some in-built mechanism that helps to keep the balance in check. Although nature can compensate for some of the natural setbacks in an ecosystem, there is a limit to the amount of stress that can be placed on an ecosystem before it collapses. In many areas wetlands are being pushed past their tolerance limit and are being destroyed. Natural devastations such as excessive flooding

14 Watershed Academy Web. Retrieved from http://www.epa.gov/watertrain.

Table 9.1- Main Problems of Indian Wetlands (1997)

Problems	Incidence (No of Sites)	Percentage of Incidence
1. Poaching, illegal trapping and hunting	50	38.00
2. Pollution from water boats, domestic sewage, pesticides, fertilizers and effluents.	49	37.00
3. Grazing by livestock	39	29.00
4. Alteration of wetlands to other land use categories for agriculture, urban development, industrial sites, forestry operations etc.	37	28.00
5. Pressure due to over fishing	30	23.00
6. Degradation of watersheds, deforestation and soil erosion.	22	17.00
7. Cutting of timber, trees and mangroves for fuel wood and domestic use.	21	16.00
8. Encroachment of wetlands for construction of roads and railways.	20	15.00
9. Infestation with aquatic weeds and accelerated eutrophication	17	13.00
10. Distribution from recreation and eco-tourism	12	9.00
11. Collection of corals and eggs/young of reptiles and water birds	9	7.00
12. Diversion of water for irrigation, domestic or industrial uses.	8	6.00
13. Use of poisons and explosives in hunting and fishing.	8	6.00
14. Award of mining licenses and oil exploration	4	3.00
15. Drying due to natural causes like prolonged drought	2	2.00
16. Illegal burning of wood.	1	1.00

Source: Daniel, J.C., Y.N. Rao and Manini, A., (1997). Wetland Conservation- An overview, capacity 21 Project, BNHS.

and drought can cause temporary impediments but these natural events are actually critical to the long term survival of some wetlands. In fact, people are the single biggest cause of the destruction of wetlands[15].

Experts have estimated that since 1990, about half of the world's total wetlands have been lost due to a number of well documented primary and proximate threats (Lukacs and Finlayson,2008)[16]. Primary drivers are mainly social and institutional like lack of public awareness of wetland values, Poorly resourced conservation institutions, sectoral decision making promoting policies and studies rather than action, Bureaucratic obstacles and historical legacies of land tenure and land use. These primary drivers bring changes in proximate drivers which include changes in hydrological regimes, invasive species, over harvesting and pollution etc. These threats will often remain if the underlying causes can't be removed

A perusal of Table 9.1 that enlists the number and the percentage of incidence of various threats of 147 wetlands listed in the directory of Indian wetlands (1993) shows that about 38 per cent of these sites are under serious threats of poaching, hunting and illegal trapping followed by 37 per cent of the sites under pollution from boats, sewage, pesticides, and fertilizers, 29 per cent are under the threats of livestock grazing, 28 per cent face land use/land cover changes, 23 per cent are threatened by over fishing, 16 per cent face siltation problem, 15 per cent witness encroachments, 13 per cent observe weed infestation, and 9 per cent are under threats of recreation and tourism. Besides, other threats in this list that contribute significantly to around 25 per cent include threats from collection of coral reefs, use of poisons and explosives in hunting and illegal burning etc.

Almost every wetland of Kashmir Valley has been the victim of environmental degradation, only the degree of deterioration differs[17]. The degree of threats and problems, however, vary from wetland to wetland but is more pronounced in urban

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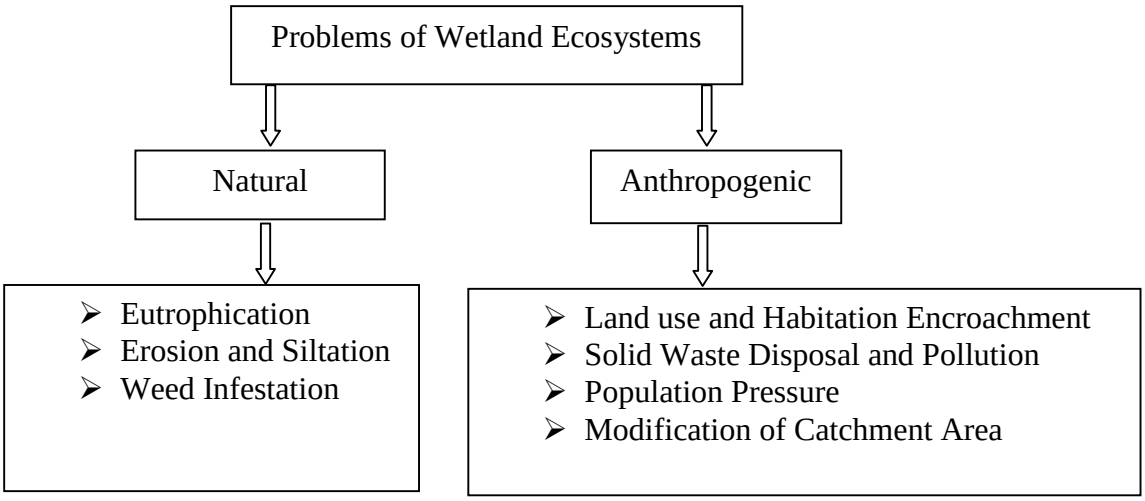
15 Teacher's Guide to Wetland Activities, Duck's Unlimited, Canada. Retrieved from www.fs.fed.us/outdoors/naturewatch/.../DU-wetland-teacher-Guide.PDF.

16 Lukacs, G.P. and Finlayson, C.M. (2008). General Introduction. In G.P. Lukacs and C.M. Finlayson (eds) 2008. *A Compendium of Ecological Information on Australia's Northern Tropical Rivers. Sub-project 1 of Australia's Tropical Rivers – an integrated data assessment and analysis (DET18).* A report to Land & Water Australia. National Centre for Tropical Wetland Research, Townsville, Queensland.

17 Reddy,M.S and Char,N.V.V.(2006). Management of Lakes in India. *Lakes and Reservoirs:Research and Management*,11:227-237

wetlands and water bodies like the famous Dal Lake and Anchar Lake. The wetlands of Kashmir Valley are fast deteriorating on account of uncontrolled urbanization, expansion of agricultural land and, above all, careless attitude and negligence of people towards them. Field investigations have revealed that these ecosystems are facing problems both from natural and anthropogenic causes which are discussed as:

Figure 9.2-Problems of Wetlands Ecosystems in Kashmir Valley



Source: Based on Field Survey by the Researcher, 2014-2015

9.2.1 Natural Problems

This comprises of problems like eutrophication, Erosion, Siltation and Weed Infestation

9.2.1.1 Eutrophication

Eutrophication is the process of increasing the botanical productivity rates of weeds in the aquatic ecosystems. It gains momentum with its age[18]. At the same time eutrophication undermines the faunal capacity of the wetlands due to increasing floral activity and the resultant decrease in the dissolved oxygen levels. Thus, eutrophication is a process of enhancing the floral growth of weeds and undermining the faunal growth of fish in the wetlands. In the floral-faunal competition for

18 Environmental Fact Sheet, New Hampshire, Department of Environmental Sciences. Retrieved from http://des.nh.gov/organization/commissioner/pip/factsheets/bb/documents/bb-3.pdf.

dissolved oxygen demand, the fauna tends to lose the availability. As a result of it the faunal population decreases.

Pollution and eutrophication is not the same thing. Industrial waste dumped into the water bodies adds to the pollution but the domestic waste dumped into the water bodies can't be equated with pollution in the same measure. In fact, the bio-degradable domestic wastes thrown into the water bodies enhance the process of eutrophication. It is eutrophication of water bodies which is more dangerous to its ecosystem than a chemical pollution. However, both pollution and eutrophication compound the problem of aquatic ecosystem.

Any activity in the watershed of a wetland that increases input of nutrients leads to eutrophication and the natural succession is from lake to pond, pond to marsh, marsh to meadow and meadow to dry land. Although, this term is applied to fresh water lakes and water bodies, it can also be applied to flowing waters, coastal marine waters and estuaries. (Edmondson,1991)[19]. In this process, a wetland becomes rich in nutrients, particularly nitrogen and phosphorous and thus stimulates rapid growth of plants and algae which clog the waterways and create toxic algal blooms to cause death of animal life by depriving it of oxygen[20].

Photo Plate 15: Excessive Eutrophication in Wular Lake

Almost all the wetlands of Jhelum basin of Kashmir Valley are under the severe threat of eutrophication primarily on account of the untreated waste water effluents, excessive fertilizer inputs and use of soaps and detergents in their respective

19 Edmondson,W.T.(1991). The uses of Ecology: Lake Washington and Beyond. University of Washington Press: Seattle,WA.

20 Leng,R.(2009). The Impacts of cultural Eutrophication on Lakes: A Review of Damages and Nutrient Control Measures. Retrieved from http://twp.duke.edu/uploads/assets/Leng(1).pdf

catchment areas. Substantial amount of nitrogen is applied to the farmlands in the form of manures and fertilizers in the hinterlands of Dal Lake, Wular Lake, Manasbal Lake, Hokersar and Anchar Lake. A significant fraction of this agricultural nitrogen is used for plant growth and the surplus nitrogen gets either accumulated in soil or migrates from the land surface into lower lands or water bodies. Besides, people use flowing waters of rivers and streams like Jhelum and its tributaries as convenient waste water disposal system which also leads to their high productivity and consequent eutrophication. As a matter of fact, the year 1991 witnessed the first red algae bloom on the surface of Dal Lake. A perusal of Table 9.2 shows that Dal Lake accumulates a total of 14.8 metric tons of phosphorous and 322.1 metric tons of nitrogen in it from different catchments which speaks volumes about its level of eutrophication as:

Table 9.2- Inflow and Outflow of Major Nutrients (MT) Into Dal Lake From Different Catchment Areas.

(+ inflow, - Outflow)

Catchment	Phosphorous (MT)	Nitrogen (MT)
Dachigam and Telbal Nallah	+9.0	+261
Hillside	+2.4	+58.5
Dal Lake	+5.1	0.45
Outflows	-1.7	-42.4
Balance	+14.8	+322.1

Source: J&K Lands and Waterways Development Authority

9.2.1.2 Erosion and Siltation

The nature and haracteristics of watershed determine the health of a wetland up to great extent. The condition of the soil where precipitation takes place and gets collected to flow as run off influence the character and hydrological regime of downstream wetlands. In addition to it, when deforestation, agricultural practices and

over grazing disturb the water holding capacity of the soil, the erosion of soil becomes more pronounced[21].

Erosion by rivers and streams is a natural process and the presence of sediments of varying sizes is necessary to support healthy fresh water ecosystems. Siltation in rivers is intrinsically linked to the erosion of top soil by wind and rain action and accelerated by land use and land cover changes in the catchment[22]. However, despite being a valuable resource, topsoil also contains nutrients which can negatively alter the balance of fresh water ecosystems. When fine sediments are over supplied, these infill the spaces between pebbles and gravels and give rise to problems such as the loss in interspatial habitat and binding of polluting molecules which in turn leads to de oxygenation of the substrate.

Table 9.3- District Wise Erosion Intensity Status of Kashmir Valley (In Hectares)

Name of Districts	Slight Erosion	Moderate Erosion	Severe Erosion	Marshy/ Saline Areas	Stream Banks	Reservoirs/ Lakes	Total Erosive Area
Baramulla	78,911	1,38197	1,95,062	8,996	15,034	11,550	4,57,200
Kupwara	57,996	1,16058	62,022	____	1,824	____	2,37,000
Anantnag	58,782	1,51,399	98,587	____	6,102	____	3,23,076
Budgam	48,121	35,226	31,697	____	4,466	____	1,19,510
Pulwama	46,790	51,140	59,632	944	7,391	629	1,66,526
Srinagar	40,842	50,661	37,375	7,543	6,731	3,456	1,74,663
Total	3,31,542	5,42,681	4,84,375	17,483	42,048	15,635	14,77,975

Source: Envis Newsletter (Jan-Mar,2003). State Environment Related Issues, J&K. Directorate of Environment and Remote Sensing

The surface runoff from the catchments of wetlands like Dal, Hokersar, Manasbal and Anchar Lakes results in the loss of fertile top soil and their consequent siltation. The surface runoff of Dal Lake catchment has been estimated to be 185 million/cubic

21 Prasad, S. N., Sengupta, T., Kumar, A., Vijayan, V. S., & Vijayan, L. (2016). Wetlands of India, *Energy*. Retrieved from http://wgbis.ces.iisc.ernet.in/energy/water/paper/wetlands/impacts.html#5

22 Siltation and Pressure on River Habitats,Tyne Rivers Trust (2012). Retrieved from tynerivertrust.org/…/position-ststement-siltation-and-pressure-on-river-habitats.pdf

meter. Similarly, the gross sediment yield has been estimated as 1, 84,476 tons/year and the net sediment yield as 60,877 tons/year. (DPR AHEC-ROORKEE, 2000)[23]. Thus, wetland sediments which act as the storehouse of the pollutants can be the important sources of internal pollution loads. The sediment inflow and the erosional load have also been enhanced by the biotic interference and the intensification of agricultural activities.

Table 9.3 shows the district wise status of erosion intensity in hectares of Kashmir Valley. A perusal of the above table shows that 14,77,975 hectares of land of Kashmir Valley are affected by menace of erosion annually in which 4,84,375 hectares are severely eroded. The district of Baramulla is under severe threat of erosion with 4, 57,200 hectares of land getting eroded. Lakes and reservoirs erode around 15,635 hectares of land and further 17,483 hectares get eroded by marshy wetlands and water bodies.

9.2.1.3 Weed Infestation

Wetlands are particularly susceptible to weeds[24]. In a balanced ecosystem, the creatures are adapted to live and co-exist with other members of that particular habitat. When an outsider species enters into the ecosystem, it brings many changes into the system like spreading at an alarming rate because of the absence of any such enemies or competitors in its new habitat. It out competes the indigenous plants and chokes the floating and submerged vegetation of shallow water and damages the open water habitat which results in the death of various species of mammals, birds, reptiles and amphibians that lost their shelter and food supply without the indigenous vegetation[25]. For example, introduction of exotic species of weeds like alligator weed (*Alternanthera philoxeroides*), Mad dog weed (*Alisma plantago-aquatica),* Marsh Beggarticks (*Bidens cirnua),* Water Fern (*Azolla cristata* Kaulf.) and Pond water-starwart (*Callitriche stagnalis* Scop.) etc. have threatened the wetlands of Kashmir Valley by clogging the waterways and competing with the native vegetation.

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23 Detailed Project Report for Conservation and Management of Dal Lake, AHEC Roorkee (2000). Retrieved from http://jklda.org/restoration.aspx

24 Understanding Ecological and Biophysical processes in Queensland's wetlands: Literature Review and Gap Analysis. (2007). Retrieved from http://wetlandinfo.ehp.qld.gov.au/resources/ststic/pdf/.../aw-eco-bio-process.

25 Teacher's Guide to Wetland Activities, Duck's Unlimited, Canada. Retrieved from www.fs.fed.us/outdoors/naturewatch/.../DU-wetland-teacher-Guide.PDF.

Photo Plate 16: Excessive Weed Infestation in Anchar Lake

Thus, shallow lakes like Dal, Hokersar and Anchar are susceptible to excessive weed growth and biological activities as the sunlight penetrates into the entire depth of 2-3 meters of these wetlands and makes the thermal environment conducive for the growth of weeds[26]. Hardly any water area is there where weeds have not covered the surface in Dal, Hokersar and Anchar or Manasbal and Wular Lakes. In order to curb the menace of weed infestation, two Rolobo harvesters were purchased by government of Jammu and Kashmir. However, because of increasing nutrient load and various other pressures of encroachment and siltation etc. the weeds started to grow luxuriantly again and started to increase in their density and coverage. (LAWDA, J&K)[27].

9.2.2 Anthropogenic Problems

Wetlands of Kashmir Valley are the worst hit by the anthropogenic interferences and threats so much so that most of them have disappeared completely and some are at the verge of extinction. Some of the main anthropogenic threats include encroachments, pollution, population pressure and modification of catchment area of wetlands.

9.2.2.1 Land use and Habitation Encroachment

Encroachment has been the main threat to the wetlands of Kashmir Valley with the two major lakes that is the Dal Lake and the Wular Lake shrinking to almost half of their size in the last five decades. The massive habitations around the Wular Lake are

26 Greater Kashmir (08 July,2015). It's the Question of Saving Dal (Retrieved from http://sheldon.greaterkashmir.com/news/gk-magazine/it-s-the-question-of-saving-dal/40704.htl)

27 Lakes and Waterways Development authority, Srinagar, Jammu and Kashmir.

mainly due to expansion of arable fields for paddy cultivation. Whereas those in and around Dal Lake are for housing and vegetable gardens. The Dal Lake traditionally held floating gardens, made from dug up weeds of the lake, along its north western side. These have not only increased in size but also the older ones have been reformed into permanent settlements. The consequences of wetland encroachments are also visible in the Anchar Lake and Hokersar.

Photo Plate 17: Encroachments in Hokersar

A major portion of these wetlands have turned into residential colonies and the remaining portion has turned into swamps. Some time back, Anchar Lake was a major source of reedes and lotus stems (*Nelumbo Nucifera*) used for making mats and consumed as food in Kashmir Valley during winters. However, this lake has now almost turned into a big marsh because of man's greed to encroach and transform the territory of wetlands.

9.2.2.2 Solid Waste Disposal and Pollution

Wetlands of Kashmir Valley are mainly polluted through solid wastes, organic and inorganic pollutants. The solid wastes comprise of non-biodegradable materials like polythene and plastics which are dumped into the wetlands by the tourists and the

local people. Most of the human habitations which are settled in and around the wetlands are the epicenter of organic wastes and night soil which gets dumped directly into these wetlands. Besides, hotels and other resorts mushrooming around wetlands like Dal Lake also discharge the night soil into these wetlands in absence of proper drainage networks. Moreover, houseboats also create organic pollution by their direct discharge of organic waste into the lake.

In addition to the solid and organic pollutants, the chemical fertilizers and pesticides produced from the surrounding agricultural lands of Dal, Wular, Hokersar, Manasbal and Anchar lakes run directly into these wetlands which increases their toxicity and further deteriorates the health of wetlands.

Photo Plate 18: Municipal Non Performance and Local Garbage Dumping in Anchar and Manasbal Lakes

9.2.2.3 Population Pressure

The increasing pressure of population growth is one of the significant anthropogenic factors responsible for deteriorating the wetlands of Kashmir Valley. The population of Jammu and Kashmir has increased from 1,01,43,700 in 2001 to 1,25,48,926 in 2011. This tremendous increase of population by around 23.71 per cent since last decade has resulted in the growth of both rural as well as urban population of the State. Thus, not only the rapid urbanization that has increased by 27.21 per cent in the corresponding period but also the problems of substantial poverty, informal settlement

growth and environmental degradation have challenged the capital city of Srinagar and also other district towns of the Valley. This has created an intensive pressure on the existing infrastructure and the urban public services like water supply, sewerage and sanitation, urban roads and management of solid waste etc.

Secondly, poverty and lack of livelihood opportunities in rural areas have led to the tremendous migrations from rural to urban areas. All this has created problems like overcrowding, increased scarcity of water supply, inadequacies of sanitation and public health facilities and mismanagement of waste materials. Thus, lack of proper sanitation and sewerage system coupled with indiscriminate developmental activities because of intensive population pressure have led to the contamination of water bodies and wetlands of Srinagar city particularly Dal and Anchar Lakes.

9.2.2.4 Modification of Catchment Area

The catchments of wetlands of Kashmir Valley have been modified by deforestation, over grazing and intensive agricultural activities. Kashmir Valley is rich in forest resources and possesses about 50 per cent forest cover of the state of Jammu and Kashmir. These forests provide environmental services like pollution abatement, carbon sequestration, and amelioration of climate, conservation of biodiversity and maintenance of ecological balance. However, because of the high dependence of people on forest for fuel wood and timber and because of several developmental activities in past few decades, deforestation is an ongoing process. On the other hand, the livestock population in the state is 9.90 million that has resulted in huge demand for fodder. Besides, most of the livestock graze in forest areas which create biggest threat of regeneration of vegetation by grazing and trampling of saplings there.

Kashmir Valley is an agrarian economy with 80 per cent of the population engaged with agriculture directly/indirectly. In Kashmir Valley, out of total net sown area of 3.50 lakh hectares, an area of about 2.10 lakh hectares is irrigated with the average land holding size of 0.53 hectares[28]. Thus, all these activities of modification of catchment loosen the top most layer of soil that gets washed away even by the slightest shower of rain. The heavy load of fertilizers from agricultural fields gets added to this runoff and deposits through the streams into low lying wetlands like Dal,

28 JK ENVIS Newsletter (Jan-Mar 2003). Department of Environment and Remote Sensing, Government of Jammu and Kashmir.

Hokersar, Anchar and Wular etc. The Telbal Nallah into the Dal, the Sind into Anchar, the Doodhganga into Hokersar and Jhelum river itself into Wular Lake deposits tons of sediments and fertilizer load into their flat beds. Hence, it creates a great threat to the health and existence of these ecosystems.

9.3 Management of Wetland Ecosystems in Kashmir Valley

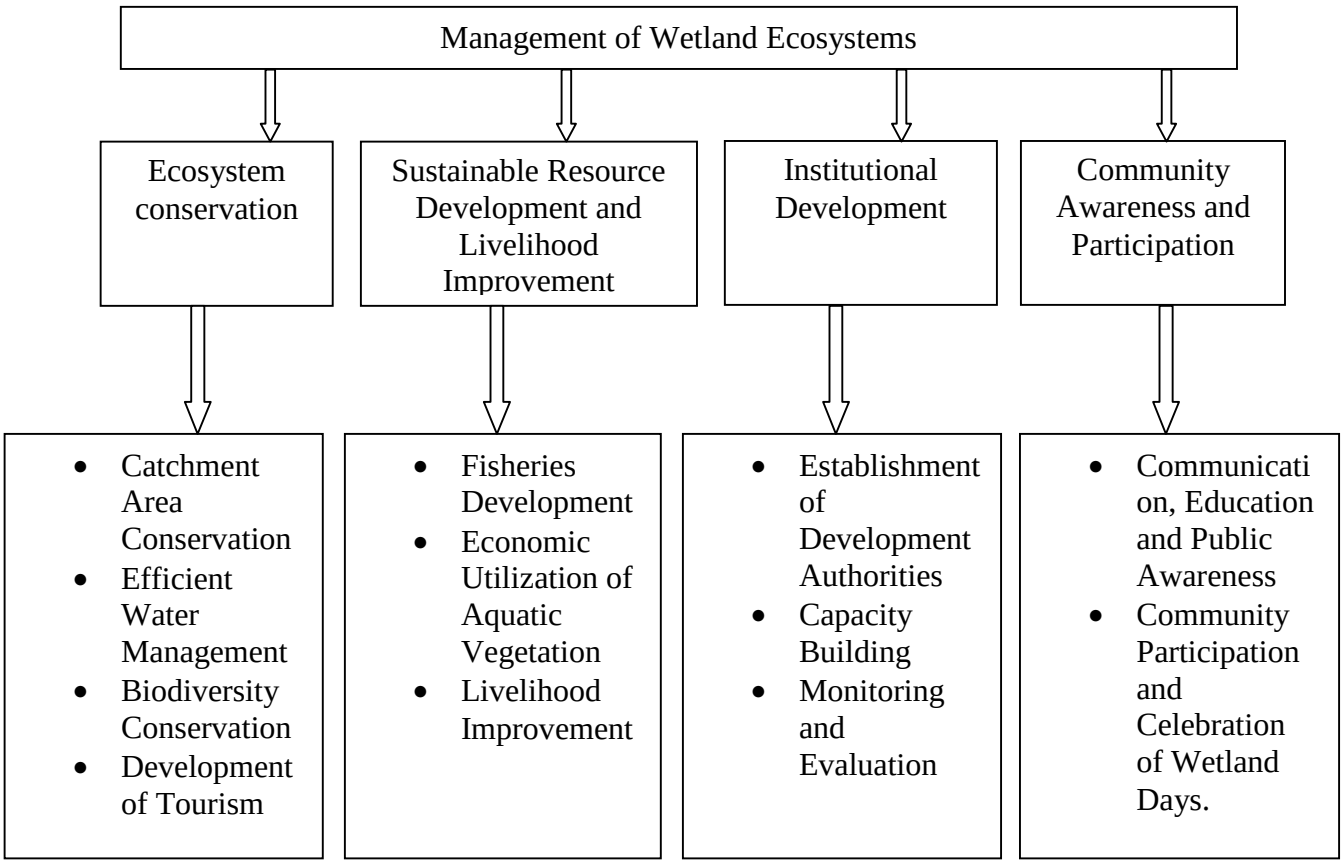
After an exhaustive description of the functions and problems of wetland ecosystems of Kashmir Valley, it was observed that these ecosystems have a great environmental, ecological, social and economic significance. Almost all the wetlands, large or small, sustain a wide variety of life forms; provide a wide range of valuable products and a large number of people sustain their livelihood by making use of them. As a result of their intensive exploitation, these beautiful habitats are on the verge of extinction. Some are rapidly changing into wastelands while others are even in a dying state. Their health is in danger and these are facing a bleak future because of human interferences and their negligence.

Thus, these ecosystems are in dire need of preservation for they are the habitats of many migratory birds, fish, amphibians, reptiles, mammals and various plant species. Besides, these are the storehouses of water and offer protection from storms, mitigate floods, control erosion as well as stabilize local climatic conditions and are a great source of tourist attraction. Moreover, lakhs of inhabitants of the valley are dependent on these waterbodies for their livelihood. Despite the immense significance, they are the most threatened ecosystems as a result of ongoing drainage, land reclamation, pollution and over-exploitation. Villagers or the residents in their immediate vicinity do not preserve them nor do the concerned authorities care for them seriously. Thus, it is essential that we preserve and conserve these resources before it is too late.

The micro level intensive studies of all the large (Wular and Dal) and small (Anchar, Hokersar and Manasbal) wetland ecosystems of Kashmir Valley have revealed that they are under severe threats and some are on the verge of extinction. They are facing the problems of eutrophication, siltation, weed infestation, pollution and over exploitation. It is supposed that the world famous Dal Lake will soon be no more because of the intensive urban land use pressure from its catchment area, huge tourist flow that has saturated its carrying capacity and tremendous influx of domestic and municipal wastes into it. Similarly, Wular Lake is also showing the negative signs of

intensive sedimentation from river Jhelum besides large scale willow plantation in and around it by locals as well as by the state government. The case of smaller wetlands of Kashmir Valley isn't different. Anchar Lake has been a victim of medical wastes and the consequent eutrophication largely from the Valley's largest Medical Institute, Sher-e-Kashmir Institute of Medical Sciences (SKIMS) at Soura besides the immense urban pressure. The other two wetlands of Hokersar and Manasbal are also drying up due gluttonous exploitation of the invaluable lake resources, expansion of agricultural fields and changing land use and land cover. Thus, these ecosystems demand immediate preservation. Their conservation and management on a war footing is the need of the hour.

Figure 9.3-Schematic of Wetland Ecosystem Management in Kashmir Valley



Source: Based on Field Survey by the Researcher, 2014-15

In this part, an attempt has been made to suggest suitable measures for the management of wetland ecosystems of Kashmir Valley. This has been provided under four sub headings. In the first component, measures for the ecosystem conservation

have been provided and in the second component sustainable Resource Development and Livelihood Improvement measures have been given. Similarly the third component of management has dealt with Institutional Development and the last component has focused on the Community participation.

9.3.1 Ecosystem Conservation

The conservation of Ecosystem will focus on catchment conservation, water management and biodiversity conservation.

9.3.1.1 Catchment Area Conservation

The catchment area of river Jhelum which is the life line of the Kashmir Valley is divided into 24 sub catchments or watersheds which form a complex pattern of drainage networks[29]. This hilly catchment on both sides of river Jhelum is highly dissected, broken and erodible which leads to ever increasing siltation in the river as well as in the wetlands like Wular Lake, Dal Lake, Hokersar, Anchar and Manasbal Lake lying in its basin. Thus, appropriate catchment management and conservation plan with the objective of checking erosion and siltation and bringing down the sediment load to its minimum should constitute a significant aspect of the management plan. This management action plan should be executed through following measures:

(a) Restoration of degraded forest lands in the catchment areas of wetlands through deferred rotational grazing, massive afforestation, contour hedge rows and in situ moisture conservation.

(b) Fuel wood and fodder plantation of exotic and indigenous species in village common lands.

(c) Supporting private efforts of raising plants around the banks of wetlands.

(d) Limiting the building activities in uphill catchment and on the banks of rivers and water bodies.

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29 Comprehensive Management Action Plan for Wular Lake, Kashmir. (2007). Final Report prepared for the Department of Wildlife Protection, Govt. of J&K, *Wetlands International, South Asia*. Retrieved from http://www.wetlands.org

(e) Forage production through silvi-pasture, pasture development and on-farm fodder development.

(f) Drainage line treatment through properly designed structures like stone walls, check dams, retards, R.C.C, trenching and fencing etc.

(g) Stabilization of quarrying area particularly around Manasbal Lake near Kondbal.

(h) Controlling the increasing grazing pressure on the alpine pastures of Valley which are subject to indiscriminate grazing by sedentary and migratory livestock population.

9.3.1.2 Efficient Water Management

This component includes enhancing water holding capacity and improving uality of water of wetlands of Kashmir Valley.

9.3.1.2.1 Enhancing Water Holding Capacity

Water holding capacity of wetlands of Kashmir Valley and their channels can be enhanced through dredging and de-weeding, removal of barriers and construction of silt detention basins.

9.3.1.2.1.1 Dredging and De-weeding of Wetlands and Water Channels

In order to improve hydrology of the wetlands, their dredging and de-weeding is necessary. The field surveys have revealed that most of the outflowing and inflowing channels of Kashmir Valley wetlands like Nullah Amir Khan of Dal Lake, Doodhganga of Hokersar, Sind River of Anchar Lake and Ningli outfall channel of Wular Lake are silted immensely and choked with weeds which affect not only their water circulation but also the overall water holding capacity. Thus, the silt and the unwanted weeds should be dredged out both from the wetland beds and from their inflow or outflow channels. Some of the areas that are in dire need of dredging comprise Bod Dal and Hazratbal Basin of Dal Lake, North Eastern area of Wular Lake from Banyari to Garoora, whole Hokersar and Northern area of Anchar Lake near the mouth of river Sind. Likewise, the inlet and outlet channels and the peripheral areas of Hokersar, Anchar, Dal, Wular and Manasbal Lakes need to be de-

weeded and the dredged material should be used in the agricultural fields in order to improve the fertility of the land.

9.3.1.2.1.2 Removal of Barriers

Barriers like Ningli plantation along the Wular occupying around 28 sq. Km of land need to be removed. This will help in improving water level by at least one meter which is of utmost significance in enhancing water holding capacity and restoring biodiversity of the wetland. Similarly, removal of almost 48,000 Dal dwellers from Dal Lake in phases will also enhance water holding capacity and improve the overall quality of this water body.

9.3.1.2.1.3 Construction of Silt Detention Basins

A huge amount of sediments get added to the wetlands of Kashmir Valley through the inflow of rivers and rivulets which leads to the reduction of their water depths[30]. In order to reduce the sediment load, detention basins should be constructed on the mouths of rivers like Doodhganga, Erin, Madhumati and Sind. One such basin has been constructed on the mouth of Telbal Nullah that falls into Dal Lake but that is unable to retain sediment load beyond 42 per cent[31].Thus, the maintenance of already constructed detention basins should also be taken into account. Moreover, the diverging weirs should also be constructed along all the sediment detention basins.

9.3.1.2.2 Water Quality Improvement

The quality of water of the wetland ecosystems can be improved by construction of low cost sanitation units, implementation of Jhelum River Conservation Plan and Community based solid waste management plan.

9.3.1.2.2.1 Construction of Low Cost Sanitation Units

Due to poor or non-existent sanitation facilities in the neighboring villages around the Dal, Wular, Anchar, Hokersar and Manasbal lakes, garbage/solid waste in the form of plastic items, polythene, clothes, rubber, metallic items as well as waste water finds

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30 Kundangar,M.R.D and Sarwar, S.G. (1997). Dal Lake, Kaashmir, A report sponsored by environmental Engineering Department, J&K Government.

31 Management of Dal Lake. Audit report for the year ended 31 March 2011: Jammu and Kashmir. (Retrieved from http://iced.cag.gov.in/wp-content/uploads/2014/02/6-Management-of-dal-lake-jk-2011.pdf)

its way into these water bodies. All these additions of excreta, sewage and garbage have rendered their water unfit for human or domestic use. At present, only 15 per cent of 21,516 households residing in 44 villages on the northern and eastern periphery of Wular Lake have access to adequate sanitation facilities and the sewage generated from rest of the villages around the Wular catchment finds its way directly/indirectly into it[32]. Similar is the case with Dal Lake and other wetlands of Jhelum Basin which receive huge amounts of sewage from their surrounding catchment areas. Thus, sewage generated from the peripheral villages of whole Jhelum catchment should be intercepted using low cost sanitation units as per World Health Organization's design which comprises twin leaching pits with pour flush latrines. This will surely reduce leaching of nutrients in and around the wetlands of Kashmir Valley.

9.3.1.2.2.2 Implementation of Jhelum River Conservation Plan (JRCP)

State Pollution Control Board monitors water quality at only 10 stations in the whole Kashmir Region which covers mainly Srinagar and Anantnag Districts. The downstream of Srinagar including Wular has been neglected totally despite the fact that after Srinagar and Anantnag, the maximum solid and liquid wastes get discharged from Sopore and Baramulla. Thus, Jammu and Kashmir State Government has formulated Jhelum River Conservation Plan to include all these important locations. The proposal of this plan has been submitted to Ministry of Environment and Forests, Government of India, which has not approved it yet for financial assistance. The total cost of this project is 284.42 crores for a period of five years. However, it lays too much emphasis on engineering measures without integrating ecological dimensions in a comprehensive way. This plan needs to be implemented by Jammu and Kashmir Lakes and Waterways Development Authority.

9.3.1.2.2.3 Community Based Solid Waste Management Plan

The solid waste generated from human settlements within the wetlands like Dal Lake and on their periphery is one of the significant contributing factors for the degradation of these ecosystems. Almost forty eight thousand people reside within Dal Lake in houseboats as well as settlements and further two lakh and thirty thousand people live

32 Comprehensive Management Action Plan for Wular Lake, Kashmir (2007). Wetlands International, South Asia.

on its periphery who keep on polluting this lake on daily basis through the disposal of solid and liquid wastes into it[33]. Likewise, the average generation of solid waste in areas around Wular Lake is about 0.35 kg or 350 grams per capita per day which amounts to around 30 tons of waste annually from its 31 peripheral villages of around one lakh population.

Thus, solid waste gets generated immensely in the whole catchment area of river Jhelum but its management system isn't well organized. Almost all the peripheral villages lack proper dumping provisions and garbage is unnecessarily handled at several places and even put on ground before being transferred to the trucks and tractors. Similarly, the menace of polythene, which is non-biodegradable, is also unchecked and community awareness and participation is lacking.

It is, therefore, proposed to develop community based solid waste management plan for all the peripheral villages of Kashmir Valley wetlands. This would require construction of waste collection centers at common locations which should be provided with community bins and garbage gobblers etc. Moreover, specially designed carriages should be operated through community based organizations or N.G.O's (Non-Governmental organizations) for the collection of waste from individual households.

9.3.1.3 Biodiversity Conservation

This component includes conservation of water birds and wildlife and management of aquatic vegetation.

9.3.1.3.1 Water Bird Conservation

This will focus on inventory and assessment of water birds, strengthening the existing network of protected areas, control of poaching, establishment of new bird sanctuaries and monitoring and research.

9.3.1.3.1.1 Inventory and Assessment

This proposes carrying out of inventory and rigorous assessment of diversity of water birds, hydrological regimes and impact of human activities on the survival of water

33 Detailed Project Report for Conservation and Management of Dal Lake, AHEC Roorkee (2000) (Retrieved from http://jklda.org/restoration.aspx)

birds. These studies should be undertaken by an expert research agency with the support of concerned state government agencies and departments.

9.3.1.3.1.2 Strengthening Existing Network of Protected Areas

Protected areas can be strengthened by restoration of habitats and rehabilitation of threatened species. Habitat restoration of wetlands and their inflow/outflow channels can play an important role in manipulation of water levels as per the requirement of different species and rehabilitation of threatened or rare species will enhance the number of water birds. It can be undertaken by identifying potential areas of habitats that may be improved or restored to increase the carrying capacity of water birds. Secondly, planting of certain native food crops like Trapa natans (*Nadru*) will provide nesting sites as well as food for the visiting migrants and in the long run will attract and sustain larger populations of water birds to these wetlands. Thus, a detailed inventory of each wetland ecosystem should be carried out and habitat maps should be prepared.

9.3.1.3.1.3 Control over Poaching

This requires an understanding of the scope and intensity of the activity, type of people involved, patterns of sale, marketing and consumption, main locations of poaching, seasonality and main species taken. Thus, in order to control this activity, protection staff should be strengthened and bird committees should be formed. These committees could play an important role in raising the awareness and shifting the attitudes of poachers who could be provided some economic incentives such as habitat restoration and involved in the conservation of wetland ecosystems.

9.3.1.3.1.4 Establishment of New Bird Sanctuaries

Besides Hokersar, which is a protected area in Jhelum Basin and declared as bird sanctuary by the government of Jammu and Kashmir State, all other wetlands and associated water bodies (except Haigam) are unprotected areas and are being used for agriculture, construction of settlements and various other purposes. With the result, large scale poaching of visiting birds takes place which is a matter of grave concern and needs to be addressed. Thus, rapid survey and declaration of these wetlands especially Malgam to Sadrakote -Bala to Ajas as bird sanctuaries should be made in order to provide legal status to their protection and conservation.

9.3.1.3.1.5 Monitoring and Research

Information on water birds and their habitats is mainly collected by University of Kashmir and State Wild life Department. These agencies should undertake a detailed assessment and research of current water bird composition and abundance, breeding concentrations of species, migratory flyways, habitat improvement studies, water birds health and their relationship to different wetlands. The information collected and developed from the monitoring and research of all these aspects of water birds should enable realistic estimates of their population, the trends and patterns to be developed and should provide guidance for their management. This work needs to be undertaken by a team of well trained and equipped staff.

9.3.1.3.3 Wildlife Conservation

Biodiversity conservation would also focus on conservation of wildlife within and outside the protected areas of Jhelum Basin. This will include demarcation of new wildlife sanctuaries within Vishav, Bringi, Erin, and Pohru catchments, construction of rescue and rehabilitation centres at strategic locations, fencing existing sanctuaries, construction of breeding center for Hangul, Pheasants and Musk Deer at suitable locations like Chatternar and Bandipora. There is a need for improvisation of infrastructure for land transport and patrolling and provision of compensation of conflict between man and animals.

9.3.1.3.3 Management of Aquatic Vegetation

This component of biodiversity management should focus on optimization of economically important plant species through enhancement of water level, control of invasive plant species through effective flushing of lakes and maintenance and regeneration of wetlands to enhance their ecological role. Aquatic vegetation is very sensitive to changes in water levels and plant communities stabilize in accordance to the profiles of water depth. Thus, increasing the level of water by one meter will have profound impact on the reestablishment of vegetation belts in different areas. Secondly, enhancing flushing rate and preventing stagnation of water would prevent growth of invasive plant species like Azolla. Moreover, manipulation of water level would be economically and ecologically feasible.

9.3.1.4 Development of Tourism

Sound Eco-tourism and wetland tourism needs to be developed to ensure minimal impacts on the environment and maximize visitors' opportunities to enjoy the beauty of wetlands and their biodiversity. This may include exploring tourist carrying capacity sites, development of recreational facilities and visitors educational facilities and facilities for the development of tourism infrastructure.

9.3.1.3.3 Exploring Carrying Capacity of Existing Tourism Spots

Every tourist spot, anywhere in the world, supports a limited number of tourists up to its saturation point beyond which it loses its charm and attraction. Similar may be the case with the tourist spots of Kashmir Valley. However, the carrying capacity can be enhanced by improved provisions. The carrying capacity of various tourist places of this region is given in table 9.5.

Table 9.4- Carrying Capacity of Various Tourist Destinations in Kashmir Valley

Town	Destination	Existing Load (2010)	Carrying Capacity	Available Daily Capacity (Persons) 2010	Estimated Load (2020)	Available Daily Capacity (Persons) 2020
Srinagar	Cheshma Shahi, Botanical Garden	1,325	6,563	38,050	2,513	18,695
Srinagar	Nishat Garden	16,868	6,143	-488	20,684	-4,304
Srinagar	Shalimar Garden	12,682	4,784	76	15,577	-2,819
Srinagar	Dal Lake	23,667	16,659	22,980	46,248	-6,963
Srinagar	Dachigham National Park	131	342	554	248	437
Srinagar	Hazratbal Shrine	31,204	2,925	37,046	48,456	19,794
Gulmarg	Gulmarg	9,093	11,250	2,157	23,190	-11,940
Watlab	Wular Lake	3,646	60,275	96,812	7,191	93,268
Sonmarg	Sonamarg	5,170	67,500	62,330	13,002	54,498
Manasbal	Manasbal Lake	4,376	16,439	23,022	8,629	18,769
Tangmarg	Tangmarg	2,553	15,000	1,17,447	6,810	1,13,190

Source: State Action Plan on Climate Change: Jammu and Kashmir. *Department of Ecology, Environment and Remote Sensing,* Government of J&K.

A perusal of table 9.5 shows that existing tourist destinations like the Winter hill resort Gulmarg, world famous Dal Lake and Mughal gardens namely Nishat and Shalimar have crossed their saturation limit of their respective carrying capacities

which is evident by the existing loads of these tourist spots. Thus, any further addition or inflow of tourists to these tourist sites will prove detrimental for their physical and ecological health. In contrast to it, there are various other destinations like Wular Lake, Manasbal Lake, Botanical Garden, Hazratbal Shrine and Tangmarg which are yet to be brought on the tourism map of the Valley and have immense carrying capacities. If these places with huge carrying capacity and immense tourism potential are explored and utilized properly, these will surely prove as boosters in tourism development of the Valley

9.3.1.3.4 Development of Recreational Facilities

This component will be focusing on the development of road walks and nature trails, guided boat rides, watch towers, angling spots, landscape gardens and improving sports facilities. The roar walks and nature trails will give the visiting tourists a chance to breathe in fresh air and enjoy the peaceful environment of Wular, Manasbal and the adjoining lakes. Two nature trails can be developed within Ajas-Malgom Rakh area and adjoining marshes of Haigam. Guided boat rides shall be arranged for nature lovers to help them explore different aspects of Wular, Manasbal, Hokersar, Anchar and associated lakes. For the benefit of day visitors as well as organized groups and school or college students, watch towers should be proposed and enteries to these locations should be charged very nominally. Similarly angling spots and landscape gardens should be developed around Manasbal lake and at Hajan and Ningli shores. In addition to this, facilities for sports like para sailing, pedal boating and wind sailing should be developed at Wular and Manasbal shores near Laharwalpora, Garoora, Sadrakote and Gratbal.

9.3.1.4.3 Development of Visitors Awareness Facilities

Education and interpretation services constitute an important aspect of a visitors experience in the natural environment. Plans for awareness generation among visitors regarding the functions and values of wetland ecosystems of Kashmir Valley should be designed keeping in mind the different target groups like foreign tourists, local youth, school children, fishermen, planners and decision makers. Visitor Interpretation Centers should be developed at Hokersar, Manasbal, Hajan, Bandipora and Sopore with the facilities for exhibition of posters and models depicting ecosystems, food chains and food webs as well as viewing gallery depicting

ecological, cultural and socio economic dimensions of wetlands. Moreover, hydrological models of wetlands of Jhelum Basin, children's play area, auditorium and souvenir shops displaying wetland products, wetland biodiversity replicas, photographs, reading materials and maps should be made available for the visitors to take away with them on some nominal charges.

9.3.1.4.4 Development of Tourism Infrastructure

Infrastructural development constitutes the backbone of tourism industry of Kashmir Valley. The provisions of easy access, clean accommodation, convenient local travel and opportunities for relaxation and entertainment determine the popularity of a tourist destination. In order to promote ecologically friendly tourism, it is necessary to ensure good communication and transportation facilities including telephone and internet services to enable people to stay connected while on the visit. Secondly, present accommodation facilities in an around Kashmir Valley wetlands are not adequate. There is a need to construct rest houses at main locations like at Manasbal, Hokersar, Watlab and Garoora etc. The accommodation for tourists must be clean, comfortable and affordable along the lines of log huts or tents instead of permanent multi storied buildings. Thirdly, emphasis should be laid on the development of good signage boards at important places like entry gates, sites of historical importance and high biodiversity and dangerous places etc with clear cut messages.

9.3.2 Sustainable Resource Development and Livelihood Improvement

This comprises another significant dimension of management of wetland ecosystems of Kashmir Valley and involves sustainable fisheries development, economic utilization of aquatic vegetation and livelihood improvement.

9.3.2.1 Sustainable Fisheries Development

The major aspects of this component includes enhancement of fish yield through the development of fish culture at captive fisheries, improvement of fish harvesting and post harvesting infrastructure and strengthening of fish cooperative societies for collective ownership and management of fisheries through a community driven process.

9.3.2.1.1 Enhancement of Schizothorax Fish Seed Farms

Commercially important Schizothorax species of fish are fast dwindling in the wetlands of Kashmir Valley which need to be protected by establishment of fish seed farms in the catchments of all the major tributaries of Jhelum River like Vishaw, Bringi, Lidder, Madhumati, Erin, Sind and Pohru. Besides, the village springs and small water bodies in and around Jhelum Basin can provide immense opportunities for enhancing production of culture fisheries which can be done by the construction of hatcheries on small scale and establishment of hatchery management committees.

9.3.2.1.2 Improvement of Fish Harvesting and Post Harvesting Infrastructure

This comprises strengthening of landing centers, provision of improvised gears and crafts, enhancing storage capacity of live fish and post-harvest management. Since, Wular lake alone accounts for 60 per cent of the fish production of Kashmir Valley. There exist 9 landing centres around it at S.K Colony, Ningli-Bala, Lankrishpora, Kulhama, Kehnus, Ashtangoo, Watlab, Sopore-Ghat and Laharwalpora which need to be strengthened for collection and provision of post-harvest infrastructure and quick transportation facilities for captive fisheries. This can be achieved through construction of boat jetties and landing sheds for storing fish catch and equipments. Secondly, motorized boats and insulated vans are required for faster transportation of fish catch to the distant markets of Srinagar, Bijbehara, Pulwama, Anantnag, Shopian and Kupwara and Qazigund. Post-harvest measures would comprise construction of ice plants at Watlab, Sopore and Banyari as well as establishment of fish processing units at Laharwalpora and value added techniques like canning, fish curring and pickling.

9.3.2.1.3 Strengthening of Fish Cooperative Societies

This includes establishment of Fish Farmer Cooperatives (FFC) and development of fisheries policy. FFC’s should be established for designing and implementation of sustainable development programs for fisheries in order to achieve all-round progress in this sector. Secondly, a separate fund which will ensure equitable and timely delivery of credit facilities should be developed. Moreover, four to five fish farmer cooperatives should be registered under the Societies Registration Act of J&K State.

Above all there is an utmost need for the development of a fisheries policy for J&K State to ensure management of fisheries at basin level.

9.3.2.2 Economic Utilization of Aquatic Vegetation

Several floral species are used for manufacturing of mats and rags and weaving of baskets and fire pots. The yield from the cultivation of trapa (*water chestnut*) is further processed and transported through a chain of middlemen and finally sold in the markets of Srinagar, Pulwama, Anantnag, Budgam and other towns. Similar is the case with Nelumbo nucifera (*Nadru*), which has, however, showed rapid decline in its production recently. Thus, it is proposed to organize 15 to 20 enterprise units in lakeshore villages of all the wetlands of Jhelum Basin on the basis of aquatic vegetation which should be registered as a society. These units should invest some part of their proceeds into group capital that can be used for credit saving operations.

9.3.2.3 Livelihood Improvement

This comprises of providing alternate sources of income generation to the surrounding communities of wetlands for the diversification of their livelihoods and reduction of their vulnerability to natural changes that exist in the form of depleting lake resources. These ventures will support credit needs as well as provide help in achieving financial self-reliance. This can be brought through micro enterprise development for hill communities as well as lakeshore communities in addition to the improvement in their quality of life.

9.3.2.3.1 Micro Enterprise Development for Hill Communities

This focuses on development of enterprises like mushroom cultivation, cultivation of medicinal plants, sericulture, apiculture and minor forest produce. The hilly villages provide ideal weather conditions for the commercial cultivation of mushrooms like highly valued *gucchi* (Morchella) variety. Likewise, cultivation of Lanendar, a medicinal plant, can be undertaken on hilly slopes and in the lower altitudes of hilly villages, sericulture and apiculture can be developed.

9.3.2.3.2 Micro Enterprise Development for Lakeshore Communities

The lakeshore communities are engaged in fisheries and aquatic vegetation which are, however, declining rapidly because of immense natural and anthropogenic pressures

on the wetlands. Thus, alternate methods of livelihood improvement should be provided to those communities in the form of development of poultry, provision of incentives for apiculture and floriculture development and production of natural dyes based on the existing plant species in conjunction with promotion of organized weaving units.

9.3.2.3.3 Improvement of Quality of Life

Quality of life of the people living in or around wetlands should be improved by providing them the basic necessities of adequate housing, safe drinking water and proper sanitation besides provisions for educational facilities, flush latrines and connectivity through all weathered roads. Moreover, government should take steps to strengthen rural markets and provide smokeless chullahs (stoves) in order to reduce demand of fuel wood and fire wood.

9.3.3 Institutional Development

This component focuses on the establishment of wetland development authorities, capacity building and monitoring and evaluation aspects of management.

9.3.3.1 Establishment of Development Authorities

The lone development authority of wetlands functioning completely in Kashmir Valley is Lakes and Waterways Development Authority (LAWDA), located at Miskeen bagh, Srinagar. This authority is responsible for the management of Dal and Nageen Lakes only. Thus, separate development authorities for Wular, Manasbal, Hokersar, Anchar and other smaller wetland ecosystems which are at the verge of extinction should be established under the administrative control of department of wildlife protection, department of forests and department of irrigation and flood control etc. of the State government. These development authorities should be semi-autonomous bodies registered under Society Registration Act and their main objective should be to undertake improvement of the concerned wetlands along with development of fisheries, agriculture, tourism, and rural development with the concerned state government agencies.

9.3.3.2 Capacity Building

Lakes and Waterways Development Authority should serve as executive board chaired by Chief Minister or Commissioner Secretary and responsible for policy directions and performance. This executive board should be assisted by various committees and groups like steering committee, project implementation committee, scientific and community advisory groups and project management units etc. for the development, conservation, planning, management and implementation of specific projects related to the sustenance of wetland ecosystems.

Capacity building of all the concerned development authorities, state government and local communities should be undertaken through professional training in integrated and sustainable wetland management. Moreover, necessary infrastructure such as adequate staff, technical hands, communication equipment and networking of offices should be provided for the effective functioning of these development authorities.

9.3.3.3 Monitoring and Evaluation

This consists of establishment of wetland monitoring laboratories and monitoring the effectiveness of management plans.

9.3.3.3.1 Establishment of Wetland Monitoring Laboratory

Lake monitoring laboratories should be established at Dal Gate, Nishat, Soibug, Soura, Gratbal, Bandipora, Watlab and Sopore for monitoring the hydrological and ecological dimensions of the wetlands and the consequent changes out of the implementation of various developmental activities. These laboratories should be assisted through a network of field stations established within the catchment areas of all the major and minor wetlands. A team of experts should be utilized for monitoring the wetland management under the supervision of a senior wetland ecologist who should be provided the required help and support by a team of ecologist, environmentalist, chemist, biologist, hydrologist, remote sensing and GIS specialist, microbiologist and wildlife specialist.

9.3.3.3.2 Management Action Plan Monitoring

This holds utmost significance in monitoring the effectiveness of implementation of a management plan and in suggesting necessary corrections and rectifications as and

when required. This should essentially be carried out through an independent agency by utilizing a methodology which is very transparent and makes sure the involvement of local communities as well.

9.3.4 Community Awareness and Participation

This comprises one of the most significant but mostly ignored aspects of management of wetland ecosystems. This focuses on communicating, educating and disseminating information and awareness among the common people as well as celebrating and organizing some important days for the management of wetlands of Kashmir Valley.

9.3.4.1 Communication, Education and Public Awareness

This will generate awareness about the activities carried out under various management plans and sensitize the common people at various levels about the need for conservation and management of wetland ecosystems. The main activities to be carried out may include organizing nature camps, rallies and marathon runs as well as developing resource materials like pamphlets, brochures, posters and education kits etc. to highlight the sustainable development of these ecosystems and need for their conservation and management.

9.3.4.2 Community Participation and promotion of Wetland Days

In order to implement any developmental or management plan, people's participation holds utmost importance as these are the first hand informers who are well acquainted and informed about various aspects and dimensions of these ecosystems. Moreover, World Wetlands Day and other special occasions like Wular Day or Manasbal Day or Kashmir Wetlands Day should be promoted annually and local people should become the part and parcel of these promotions.

Summary

In this chapter an attempt has been made to an extensive and in depth assessment of various functions, problems and management aspects of wetland ecosystems. Here, it has been found that wetlands are the kidneys of Biosphere which play a number of hydrological, biological, economic and ecological roles in environment. These act as sites of flood mitigation, ground water recharge and discharge, water purification, protectors of shoreline and mitigation of global warming as well as valuable habitats

for the diversity of flora and fauna. Besides, these are also used as storehouses of food, fishery and irrigation potential and can also be utilized as potential destinations of migratory birds, tourism and recreation. They are also sites of education and research. However, despite their innumerable functions and values, these ecosystems have been the victims of natural as well as anthropogenic pressures and problems which range from erosion, siltation, weed infestation and eutrophication to encroachments, population pressure and the complex modification of their catchment areas creating problems and pollution of their waters and deteriorate their health. Thus, in order to conserve these highly valuable ecosystems, certain management plans are presented in the form of conservation of ecosystem, sustainable resource development and livelihood improvement, institutional development and community awareness and participation. All these aspects can be implemented through the conservation of their catchment, water management, biodiversity management, tourism development, fisheries development, economic utilization of aquatic vegetation and livelihood improvement. Wetlands are need of research and its implementations for their monitoring and evaluation through public awareness as well as community participation and celebration of wetland days.

CONCLUSION

The assessment and analysis of Tourism and Management of Wetland Ecosystems in Kashmir Valley has arrived at the following conclusions:

Chapter I deals with the Geographical Personality of Kashmir Valley (33˚20´N to 34˚40´N latitude and 73˚45´E to 75˚35´E longitude) which has rightly been called as the "Paradise on Earth" and "Switzerland of Asia". Geographically speaking, Kashmir is core of the mighty Himalayas receiving in abundance the grace in the form of captivating scenic beauty, lush green pastures and lofty glistening snow covered mountain peaks. Historians say that Kashmir Valley was originally known as 'Kashyapmar' or the Abode of Kashyap Rishi-a saint, who once went on a pilgrimage to Kashmir and some are of the opinion that when the people of "Kash" caste settled here permanently the valley came to be known as Kashmir. The Greeks called it Kaspeiria, while the Chinese named it Shie-in or Kia-shi-lo. The Tibetans called it Kanapal and Dards named it Kashart. Geologically speaking, Kashmir Valley is tectonic in origin (Krishnan, 1968). Geologists believe that about 100 million years have passed when Kashmir Valley was once a lake. Subsequently, it was called "Satisar", the lake of goddess Sati that came into present form.

The Valley of Kashmir presents an interesting morphology in the form of the Valley floor, known as "The Rice Bowl of Kashmir", The Karewas, lacustrine deposits spreading over half the area of Kashmir Valley but reduced to highly dissected mass with a confusing network of ravines and intermingled gullies, the Side Valleys, undulating terraces and *kandi* tracts occupied by *Gujjars* and The Mountain ranges which are the unbroken ring of mountains giving the Valley an enclosed character and forming a strong barrier around it.

In its administrative setup, Kashmir Valley consists of 10 Districts of Anantnag, Badgam, Bandipora, Baramullah, Ganderbal, Kulgam, Kupwara, Pulwama, Shopian and Srinagar which are further sub-divided into lower administrative units called 'Tehsils' (41 in number). Out of the total area of the valley about 260 sq. kilometers is under various water bodies. Of the physical features of Kashmir, mountains are the predominating features and have affected the history, habits and agriculture of the people. People have linked the climate of Kashmir to that of Switzerland until the end

of May and of Southern France in July and August. But it is impossible to speak of Kashmir as possessing any one climate or group of characteristics. Every thousand feet of elevation brings some new phase of climate and vegetation.

The Jhelum and a host of its right bank tributaries (Sandran, Bringi, Arapat kol, Liddar, Arapal, Harwan, Sind, Erin, Madhumati, Pohru and Viji) and left bank tributaries (Vishav, Rembiara, Romoshi, Doodhganga, Sukhnag, and Ningil) that drain the bordering mountain slopes together constitute the drainage network of Kashmir Valley. Set within the frame of disparate geomorphic and geological locales, the Kashmir fluvial systems have distinctive characteristics of their own. They have evolved in the course of a chequered history marked by remarkable changes in the level and rejuvenating at one time while becoming sluggish or even choking their channels with their own debris with consequent diversions and the ever threatening process of mutual piracy. River Jhelum has a paramount importance in the regional structure of Kashmir Valley. It has a binding force that gives coherence to the Kashmir region.

The elongated valley of Kashmir is well known throughout the world for its Natural beauty. Here nature has been prodigal enough in crowning this ancient land with all its splendor and glory. Gulmarg, Pahalgam and Mughal gardens attract visitors from all over the world. Its lakes, green meadows, dancing and foaming streams, majestic forests full of fir and pine, snow-capped peaks are common attractions to the outsider as well as to the native.

The Valley of Kashmir has a unique geographical personality. On the basis of altitude it can be divided into five zones. Zone I (1,250-1,850 meters) is a land of average slope (5-10º) and low relief consisting of low lying plains and flat lands. This zone covers about 37% of the total area of Valley. Lakes, rivers and nullahs, springs, floating gardens, marshes and swamps, cultivated fields and orchards, plantation sites, graveyards, roadsides and *Karewa* lands are the main characteristic features of this zone. Zone II (1,851-2,451 meters) is a land of undulating slope (10-20)º embraces about 30 per cent of the total area of Valley. Being a transitional zone between the Hills and the Valley Floor, it displays an intermingling of the land use characteristics of both. While a good proportion of area is given to crops, an equally sizeable area lies under forests or is used as grazing land. Zone III (2,452-3,052 meters) is a land of

moderate to steep slope (20-30)º and extends over 16.4 per cent of the total area of Valley. World famous places like Gulmarg (2,690 meters) and Khilanmarg (3,100 meters) are the main spots of tourist attraction in this zone, Zone IV (3,053-3,653 meters) lies higher-up in the hills where the angle of slope ranges between 30˚-40˚. It can't be put into any productive use. The slopes facing the river beds are, however, occasionally used for grazing purposes. The land is devoid of any vegetation cover except a variety of poor grasses which don't invite much grazing activity and Zone V (Above 3,654 meters) which constitutes the topmost altitudinal zone of the Kashmir Valley which is suitable for Adventure Tourism like Trekking. Skiing, Rock climbing and Shooting etc. It is the steepest (slope above 40˚) and coldest zone where winters are very severe and temperatures even dip to -20ºC. Thus, while making a vertical ascent from the floor of the Kashmir Valley towards the mountains, the clear cut changes in the geographical phenomena become distinctively visible in case of the settlement patterns, production of crops, forest density, grassland cover, natural vegetation and density of transportation and communication etc.

Besides, Kashmir Valley presents a highly varied picture of natural vegetation. It has its own distinctive type of vegetation cover which is different to that of middle mountains and forms one of its greatest charm. The delightful pine trees, the magnificent walnuts; the endless Willows, the poplars and the elms, the countless orchards of apples, pears and apricots give the Valley the appearance of a well-wooded park.

Thus, the geographical personality of Kashmir Valley reveals that Kashmir is a land of fabled beauty and eternal romance. It is blessed by nature with beauteous scenery, wondrous fertility and salubrious climate. It is rightly described as one of the finest countries upon which the sun shines and "the Sub-Alpine region of Asia's Italy". Unsurpassed land for its scenery, Kashmir is verily "the Terrestrial Paradise of the World". A fairy land, where each fold presents a grand picture and every horizon a new scene, each leaf a distinct lesson and each flower a new book.

Chapter II draws focus on the literature survey and its review. Survey of related literature constitutes the foundation of a scientific enquiry. It is the most prerequisite to actual planning and conducting a research. Unless it is learnt what others have done and what still remains to be done, the present investigator cannot contribute to the

further knowledge in the field. It also helps in avoiding the mistakes done by others and locating the gaps in the earlier works by others.

Almost all the studies have tangentially touched upon few broad aspects of Tourism like spatial and temporal growth of tourism, trends and prospects of tourism and the impacts and problems associated with this phenomenon. So for as the studies on Kashmir Valley tourism are concerned, special focus has also been given on the setback to tourism. Besides, Most of the studies have focused upon the positive as well as negative impact of tourism wherein it has been highlighted that on one hand tourism can act as an employment generator and can be used as a planning tool for providing regional development and fostering peace by reducing world poverty and promising cross cultural understanding.

On the other hand, a number of studies highlighted that tourism has brought a plethora of environmental degradation that have also been reviewed. These studies focus on the crimes, traffic Jams and pollution as the menace of tourism growth. At regional or local level, adventure tourism, eco-tourism and religious tourism have been highlighted as few broad prospects of tourism in Kashmir Valley. The growth and smooth development of tourism industry in Kashmir Valley that has been a prey to the severe setbacks of insurgency and political gimmicks besides infrastructural loopholes and inaccessibility bottlenecks has also been reviewed.

Similarly, almost all the reviewed studies on Wetlands focused mainly on the problems of wetlands, their spatial and temporal dimensions and few broad aspects of management. It has been clearly pointed out that wetlands are among the most productive ecosystems of the world which have not only an important role to play in hydrological cycle but also act as vital ecosystems for storing flood waters, enhancement of water quality, storage of carbon and are used as buffers.

However, a large number of works have focused on the wetlands as the most threatened ecosystems of the world. These studies highlight the processes of industrialization, urbanization and dumping of solid and liquid wastes into these delicate ecosystems as the main causes of their deteriorating health which not only degrade their water quality but also make them unfit and unsafe for human and aquatic consumption.

Thus, need of the hour is to uphold a striking balance between conservation of wetland ecosystems, their sustainable utilization and their conversion.

Chapter III deals with concept and evolution of tourism. The phenomenon of tourism is said to arise from the movement of people and their stay in different destinations. Man has been travelling since time immemorial and travel has been his fascination from the early historical ages despite the fact that a tenacious travel in ancient times was not undertaken for the sake of pleasure but for trade, commerce and seeking knowledge. This implies that tourist is a person who visits an area other than he/she usually resides for a period of at least 24 hours. Thus, tourism is essentially a recreational activity that involves a mobile population of travelers whose stay isn't connected with any remunerative activity. So for as the geographers are concerned, they study the spatial dimension of tourism as a human activity, focusing on the 'tourism generating' and 'tourism receiving' areas.

Kashmir Valley has been the main route of cultural and commercial intercourse between India and Central Asia. In fact, it was the meeting ground for trade and ideas in the old world which is confirmed by the fact that the references to Kashmir and its people are found in the literature of Greeks, Chinese and the Arabs as well as Indian literature.

Kashmir has been ruled by many dynasties in ancient times like Karakota dynasty, Utpal dynasty, Lohara dynasty as well as Sultans of Sultanate Period in which many vihars and rest houses were built for foreign pilgrims and students besides the foundations of many ancient cities like 'Pandrethan' and 'Avantipur'.This period witnessed the immense development of cultural and academic tourism.

The medieval period began with the conquest of Kashmir Valley by Akbar in 1587 who built a new town of Nagar- Magar near Hariparbat mountain. It was in the time of Jehangir that the fame of the Valley spread throughout the country and beauty of the Valley attracted thousands of visitors. The famous gardens of Nishat, Shalimar, Cheshm-e-shahi , Harwan, Verinag and Achabal are the creation of Mughals.

Kashmir Valley Tourism was jolted severely during the tyrant rule of Afghans and Sikhs. However, it was in the British period that the whole administrative machinery was completely overhauled and tourism was again paid attention upon when the

history, manners, customs and the beauty of the Valley was praised by the Europeans. The British not only praised the beauty of Kashmir valley but also boosted infrastructural development for tourism.

In the post-independence era, Tourism in Kashmir valley continued to fluctuate with highs and lows because of partition of the country (India and Pakistan) and subsequent war with Pakistan. This trend continued almost up to 1990s when the graph of tourist arrivals reached lowest ever mark. However, it started to show some positive signs of development after the decline of militancy in Kashmir valley after a decade. Thus, after 2003, tourism sector of Kashmir Valley entered a stage of gradual growth and the arrivals of both the foreign as well as domestic tourists started to increase. However, tourism growth was yet to attain its pace, when in the year 2013 the political turmoil witnessed in Kashmir after the hanging of Afzal Guru and the September, 2014 floods of Kashmir Valley paralyzed the growth of this sector again. These floods resulted in the loss of more than 100 lives and property worth billions of rupees.

Chapter IV focuses on the problems, prospects and motivation for Kashmir Valley tourism. The concept of tourism motivation and motivators of tourism like pleasure, rest, relaxation and recreation, health, participation in sports, culture and curiosity, ethnicity and family ties, spirituality and religion and status and prestige have been analyzed and it has been tried to understand as to why a person travels and what are the driving forces that make him/her to travel from one region or place to another.

Secondly, an analysis of 450 tourists (300 Domestic, 150 Foreign) who visited Kashmir Valley during 2014 was undertaken which comprised of 310 males and 140 females. Their age structure, educational structure and occupational structure was analyzed. Similarly, the analysis of their motives of visits, frequency of visits, Source of information, mode of transportation, most beautiful tourist spot preferences and their daily expenditure was made. It was seen that significant variations exist between domestic and foreign tourists in their educational status, occupational structure, daily expenditures, means of information about Kashmir valley tourism and modes of transportation as well as season of arrival in Kashmir.

Likewise, the growing scope for the development of Adventure tourism, pilgrim tourism, rural tourism, heritage tourism and wetland tourism has also been focused

upon. Besides, the problems of infrastructural development, political instability, improper management of existing tourist spots and some societal constraints which act as obstacles in the way of smooth functioning and growth of tourism in Kashmir valley have also been brought under discussion and it has been suggested that smooth development of Kashmir valley tourism is the responsibility of everyone concerned and people from all sections of society should be consulted and given due cognizance for development and sustainable management of Tourism.

Chapter V deals with Distribution of Wetlands: Nature, Characteristics and Classification. Here, the researcher has argued over the point that can water bodies be treated as 'wetlands in making'? After that, wetlands have been said to consist of the areas of marsh, fen, peat land or water, that is static or flowing, the depth of which doesn't exceeds to 06 meters at low tide (in case of coastal wetlands) and which are characterized by a broad water based ecosystem where a peculiar nexus between land and water is formed with the presence of hydrophytes, hydric soils, bacteria and animals in a state of flowing water.

An in-depth account of the various classifications propounded by different scholars and academicians at different levels in different periods of time wherein the wetlands have been broadly categorized into Natural and Man-made, Coastal and Inland, Fresh water and Salt water types based on different criteria like wetland hydrology, vegetation cover, altitude, location and size of wetlands have been mentioned. Besides, the researcher has also tried to contribute to the literature by giving his own classification of wetlands of Kashmir Valley on the basis of altitude (low, medium, high), size (very small, small, medium, large and very large), status (marshy, plantation, habitation, agriculture), location (rural, semi-urban, urban) and source of water (river, stream, spring, glacier).

Moreover, the distribution of wetlands in general, in India as well as in Kashmir Valley has been taken up which has highlighted that wetlands are distributed over the whole globe and are found on every continent except Antarctica in every climate from tropics to tundra. In India, they are distributed almost in every state in the form of rivers, lakes, ponds, marshes, salt pans, reservoirs and tanks and in Kashmir Valley, most of the wetlands are found in and around the Jhelum basin in the heart of Valley. The state of J&K has two types of wetlands - Inland (Natural) and Inland (man-

made). However, the former is the dominant category. The natural wetlands are in dominance in the state occupying around 93 per cent area. Under the inland-Natural wetlands, riverine wetlands and the lakes are of utmost significance. The high altitude wetlands mainly occur in the elevation range of 3000m to 6500 meters. These lakes are in general devoid of any aquatic vegetation and the wetland boundary and open spread of water is almost same.

A perusal of the district-wise distribution of wetlands in Kashmir Valley shows that Kashmir Valley abounds in the wealth of Wetlands and most of them are in and around the Jhelum Basin in the heart of the Valley. A large 93 per cent area is under natural Wetlands. Largest area under wetlands lies in Baramulla District (16,360 Sq. Ha) which constitutes 38.6 per cent of the total wetland area of the Valley. This is mainly because of the presence of Wular Lake in Baramulla District.

Chapter VI deals with A Micro-level Environmental and Socio-economic Analysis of Dal Lake. Dal, the second largest fresh water wetland of Kashmir Valley, located in the flood plain of river Jhelum holds a significant position in the history, culture and economy of the people of Kashmir Valley. It is famous not only for its beauty but also for its vibrancy as it sustains within its periphery a population of about 48,000 people that is unique to anywhere in the world .

With its large mountainous catchment area of around 316 square kilometers and water spread of over 1620 hectares, it is surrounded by huge mountains on its three sides- By Zabarwan Hills from its eastern side, by Shankar Acharya Hills from its Southern side and by the hills of Kohi-Maran from its western side.

Dal Lake is a multi-basined lake with trellis and dendritic drainage pattern flowing from East-Southwest. Besides being fed by a number of underground springs, the main feeding channel of Dal is the alpine Marsar Lake that enters into it on its northern side as Telbal Nullah. The average inflow has been estimated to be 292 million cubic meter of which 80 per cent is contributed by Telbal Nullah by draining an area of around 145 sq.kms

The lake has two outlets, one being the Dal Gate which discharges into a link channel called ‘Tsehunt kul’ for final discharge into river Jhelum and the other called Nullah Amir Khan which connects Dal Lake via Nageen Lake to Lake Gilsar and Anchar and

then discharges water into river Jhelum. The total outflow through these two channels is around 213 × 106 cubic meters and 27×106 cubic meter respectively.

Dal Lake is notable not only as an important tourist destination but also for providing habitat for aquatic flora and fauna as well as its utilization as an important source of food and water. However, being an urban lake it is vulnerable to both point and non-point sources of pollution. Thus, inflow of municipal and domestic wastes, excessive sedimentation, eutrophication and weed infestation have deteriorated its water chemistry and drastically reduced its ecosystem health.

The socio economic analysis of the sampled settlements (737) that are located in and around this lake and the sampled population (4,663) that is dependent on this lake has clearly revealed that there is lack of basic facilities and social amenities such as drinking water, housing, education, means of disposing waste and toilet facilities etc. Around 54.42 per cent of the sampled households depend on lake water for various purposes and 27.55 per cent of the houses are of *Kutcha* type. Besides, 66.07 per cent of the sampled population is uneducated, 51.43 per cent do not have any proper means of disposing their solid waste and 84.53 per cent lack basic toilet facilities and use to dispose their toilet waste in open which finds its way directly into the lake. The survey also reveals that around 28.25 per cent people from the sampled settlements are engaged in agriculture and only 2.46 per cent are engaged in government jobs. Hence, the dependency of the sampled population on the lake resources is high.

Although Dal Lake plays an important role in the ecological and economic security of the region, it is, however, under intensive stress mainly due to anthropogenic pressures and partly because of natural causes. The intensive weed growth, encroachments and changing land use/ land cover dynamics in and around Dal Lake coupled with tourism pressure has reduced its carrying capacity and deteriorated its health and water extent.

The unchecked deforestation on its catchment, intensive erosion, continuous siltation, weed infestation, addition of fertilizers and domestic and municipal effluents have left no stone unturned in changing this fresh water body, of once a high glory and grandeur, into a marshy and stagnant water body devoid of its sheen.

Thus, if this lake isn't saved at this critical juncture of time, it is going to prove detrimental not only for the environment, but also for the state economy and for the people as well. Hence, need of the hour is to take necessary and concrete measures in a positive direction to save this wetland at priority.

Chapter VII focuses on Micro Level Environmental and socio-economic analysis of Wular Lake. The micro level intensive assessment of catchment area, hydrological regimes, water quality, land Use/ Land Cover dynamics and biodiversity of largest wetland of Kashmir Valley, Wular Lake, has given a clear picture of the importance of Wular Lake in the Socio economic setup of Kashmir Valley. It has been held that this lake acts as a huge absorption basin for the flood waters of Jhelum River as well as acts as reservoir of food and fodder for the huge population living on its periphery.

However, it has also been noticed that the catchment area of this wetland is highly degradable which leads to the loosening, transportation and the consequent deposition of huge amounts of silt into its bed. It also acts as a receptacle for the pollutants flowing down from the highly urbanized areas of Srinagar as well as from all its surrounding settlements. In addition to it, Wular Lake has also lost extensive portion of its area to willow plantations. Thus, all these factors have deteriorated the water quality and overall health of this wetland and have reduced its areal extend and water levels.

The socio economic analysis of the 9 villages' located and dependent on Wular Lake has clearly revealed that Wular Lake is surrounded by the poor and deprived section of people. The surrounding population is deprived even of the basic necessities of housing, water and infrastructure. Only 38.06 per cent of the sampled population is educated and even from that almost 47 per cent are educated up to primary levels only. Secondly, 34.40 per cent of the sampled population resides in *Kutcha* or flimsy houses and around 44 per cent depend on lakes and rivers for drinking purposes.

The sampled population does not have any means of disposing their solid and liquid wastes as well. Almost 66.73 per cent of them use rivers and wetlands for the disposal of their solid waste. Thirdly, 42.45 per cent of the sampled population disposes their toilet waste directly/ indirectly into Wular Lake and only 8.73 per cent have septic tanks. Similarly, the occupational structure of these households shows that 38.29 per

cent of them is engaged with fishing and fish marketing and only 4.03 per cent is associated with government jobs.

The sampled population is so poor and deprived of the socio economic opportunities that around 54.72 per cent have their average monthly income below 3000 rupees followed by 35.85 per cent of population which lies between an income group of 3000 – 6000 rupees per month. Only a population of 9.43 per cent was having an average monthly income of above 6000 rupees.

Few things about Wular Lake need to be highlighted here. Firstly, the Wular Lake is passing through a deplorable state of degeneration. It is under severe threat of siltation and waste deposition from its catchment as well as from the surrounding settlements. Secondly, the condition of its surrounding population is very pathetic that contributes to the degrading health and deplorable status of this wetland. Thus, need of the hour is to take both these aspects into consideration and come out with some positive and concrete steps in order to save this wetland from further degradation.

Chapter VIII deals with micro level Environmental and Socio-economic Analysis of Minor Lakes: Anchar, Hokersar and Manasbal. Kashmir Valley is dotted with number of Small and Large Wetlands. However, most of them have lost their magnificence and some of these wetlands include Anchar Lake, Hokersar and Manasbal Lake. Anchar Lake, a shallow basined lake with fluviatile origin, is situated near Soura, 10 Kilometers to the North-West of Srinagar, at an altitude of 1583 meters above m.s.l. Sprawled over a wide swath of the area in the flood plain of river Sind, this wetland lies in pathetic condition with its alkaline waters.

The littorals of the lake are surrounded by a thick canopy of poplar and willow trees that supply the base material for the manufacturing of cricket bats, baskets and wood-carvings etc. However, a major portion of its peripheral areas on the eastern side has been encroached by the local population who have constructed residential plots and other concrete structures as well as changed it into vegetable gardens. Secondly, due to continuous inflow of nutrients from the catchment, this lake has reached the state of eutrophication which has resulted in disappearance of sensitive species of macrophytes from this wetland.

The complex of Sher-e-Kashmir Institute of Medical Sciences (SKIMS), located at its South-Eastern side, drains much of its effluents into this lake. Above all, the Wetland receives huge amount of sludge from its adjacent localities of Buchpora, Sangam, Soura and Ellahibagh through a chain of open drains. Consequently, the depth of the lake has been reduced considerably and as such much of the lake has been converted into marshland.

Hokersar, the Queen of Wetlands in Kashmir Himalayas, located at 34° 05'N and 74°43'E at an altitude of 1584m a.m.s.l. in North-West of Srinagar City on left side of Srinagar Baramulla National Highway, is one of the renowned Wetlands and Waterfowl habitats of Kashmir Valley. It is a permanent eutrophic lake with an area of 4.5 km^2 surrounded by fresh water marshes on the flood plains of river Jhelum.

The goods and services of Hokersar are of high socio-economic importance like conservation of Biodiversity, pollution abatement, trapping sediments and nutrients, flood mitigation, ground water recycling and climatic stability. Besides, it harbors about 2-million migratory waterfowl during winter that migrate from Siberia, China, Central-Asia, North Europe and Other parts as well as summer migrants coming from Indian Sub-continent

There are a number of orchards, crop fields and willow plantations in its catchment and Doodhganga, a perennial feeding channel, constitutes the main source of water to Hokersar wetland. The total water budget of this area is 10 million cubic meters which keeps fluctuating on seasonal basis with the different periods of a year in response to different factors, like rainfall, evaporation, groundwater movement and surface water inflow. , silt and clay constitute the major components of Hokersar wetland sediments. Around 21,630 tons of sediments from various channels find their way into this ecosystem and 4,783 tons go out through Sozeith outlet, leaving a balance of 16,862 tons to accumulate in the wetland basin. So for as Hokersar wetland is concerned, its waters are alkaline. The overall high concentration of both phosphate and nitrate nutrients may be as a result of bird excreta on account of the visits by large number of migratory water fowl, ducks and geese that arrive in autumn and reside till the end of winter.

This wetland has shrunken and depleted over a period of time from 18.75 km^2 in 1969 to 13.00 km^2 in 2008 and the depletion in the wetland extent is mainly attributed to

the encroachment by the farmers, increase in the settlements, conversion of wetland area into agriculture, plantation and the built-up landscape. This depletion has serious implications not only on the flora and fauna but also on livelihood of the people dependent on the goods and services provided by the wetland.

Manasbal Lake, an ox-bow type warm mono-mictic lake, is situated about 32 kilometers away towards North-west of Srinagar city in Ganderbal district of Kashmir valley. It lies between 34°15′N latitude and 34°39′-34°41′E longitude at an altitude of 1583 meters above m.s.l. and covers an area of about 280 hectares of which 25 hectares is marshy. The oblong shape of Manasbal Lake extends in North-East to South-West direction with a maximum length of 3.5 kilometers and width of 1.5 kilometers. It is the deepest of all the fresh water lakes of Kashmir Valley. It is fed by surrounding runoff and seepage. It has predominantly a rural ambience with three villages namely Gratbal, Kondbal and Jarokbal in its surroundings.

The lake catchment covers an area of about 22 km^2. The topography of the catchment area is hilly with flat areas at lower elevations. The lake is surrounded by moderately high mountains on its eastern and southern sides. A few limestone Quarries exist towards the eastern part and the northern bank of the lake comprises a raised land or Karewas.

Although Manasbal Lake has no major inflows and its water supply is chiefly derived from internal springs and precipitation. Laar Kul, a small irrigational stream which takes off from Sindh nullah and irrigates the agricultural fields throughout its course, drains into the lake on its eastern-side. However, this stream is operational only during the summer season. As per the tropic status, Manasbal Lake falls under mesotrophic category. pH of water is slightly basic (7.9-10). The dissolved oxygen content of 8.6 depicts that lake waters have good oxygen content enough to sustain fish and other aquatic biodiversity therein.

However, a considerable area of this lake is under built-up (6.76 per cent) and more than 31 per cent area is without any vegetation comprising of Barren land, Bare rock and Stone Quarrying Sites, which bring in tremendous amount of limestone sediments into the lake eco-system and is responsible for the pollution of this ecosystem.

The socio-economic conditions of the surrounding population of these wetlands have also been analyzed and the field studies have revealed that only 44.07% of the population living on the banks of these lakes is educated which comprised more than half (52.53%) who were educated up to primary or elementary level and and only 11.95% of graduates and post graduates. Moreover, 13.48% of the sampled households were of *kutcha* type and 27.15% were deprived of municipality/PHE water for drinking purpose. In addition to this, only 7.42% of the sampled population had access to municipality bins for disposing their solid waste and 12.30% were having facility of septic tanks in their houses. Above all, only 4.37% of this population was engaged with government jobs and 53.12% were having average monthly income of below 3000 rupees.

After taking into consideration all the above physical, hydrological and socio-economic dimensions of the three smaller lakes of Kashmir Valley and their surrounding landscape and settlements, it becomes quite clear that these wetland ecosystems are in a state of continuous degradation and pollution and the socio economic profile of the their surroundings is deplorable and poor which needs to be addressed seriously by the concerned authorities and departments before it is too late.

Chapter IX focuses on Functions, Problems and Management of Wetland Ecosystems.

An in depth assessment of various functions, problems and management aspects of wetland ecosystems has been made and it has been found that wetlands are the kidneys of Biosphere which play a number of hydrological, biological, economic and ecological roles in the environment. These act as sites of flood mitigation, ground water recharge and discharge, water purification, protectors of the environment and mitigation of global warming as well as valuable habitats for the diversity of flora and fauna. Besides, these are used as storehouses of food, fishery and irrigation and can also be utilized as potential destinations of tourism, recreation, education and research.

However, despite their innumerable functions and values, these ecosystems have been the victims of natural as well as anthropogenic pressures and problems which range from erosion, siltation, weed infestation and eutrophication to encroachments,

population pressure and the complex modification of their catchment areas creating problems and pollution of their waters and deteriorate their health.

Thus, in order to conserve these highly valuable ecosystems, certain management plans are presented in the form of conservation of ecosystem, sustainable resource development and livelihood improvement, institutional development and community awareness and participation. All these aspects can be implemented through the conservation of catchment, water management, biodiversity management, tourism development, fisheries development, economic utilization of aquatic vegetation, livelihood improvement and establishment of development authorities in addition to capacity building, monitoring and evaluation, communication, education and public awareness as well as community participation and celebration of wetland days.

GLOSSARY

Vernacular Terms	English Equivalent
Bagh	Garden
Bahil	Loamy Soil
Bakerwaals	Pastoral Nomads of Kashmir
Bukhari	Indigenous Room Heater
Chilla kalan	Period of forty Cold days
Chinar	Maple
Chullah	Stove
Demb	Marshy Area
Gaer	Water Nuts
Glaas	Cherry
Gondola	Cable Car
Grishim	Summer
Gujjars	Ethnic tribes of Mountains in Kashmir
Harud	Autumn
*Kangr*i	Earthen firepot used in winter
Karewas	Lacustrine deposits in plateau form
Koh	Hillock
Kol	Rivulet
Kutcha	Flimsy or Uncemented
Marg	Meadow
Naag	Spring from which water oozes out
Nadroo	Lotus Root
Nullah	Stream
Pheran	A loose woolen overcoat worn in winter
Pony Walla	Horse man
Pucca	Cemented
Radh	Floating Garden
Sar	Wetland
Sheshur	Severe cold
Shikara	Small Boat

Sonth	Spring Season
Tehsil	Smaller administrative unit
Vyeth	River Jhelum
Waadi	Valley
Wahrat	Rainy season
Wandh	Winter
Wudar	Plateau
Yatra	Travel
Yatri	Traveller
Zaffran	Saffron
Zalun	Fuel wood
Ziarat	Shrine

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UNDERSTANDING KASHMIR VALLEY TOURISM- AN INSIGHT INTO ITS MAJOR TRENDS, PROSPECTS AND PROBLEMS

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ABSTRACT:

The Valley of Kashmir, popularly known as "Paradise on Earth" holds a rich and diverse touristic potential that clearly depicts its immense prospects for the development of tourism. In this paper, not only those unmapped and unutilized prospects of tourism have been unveiled by the author but also the problems of unplanned and mismanaged tourism that have taken away the "Sheen" of Kashmir Valley tourism have been exposed and thus the possible regional as well as national policies for adopting measures to tackle them have been simultaneously recommended. This Study is based on the secondary data which has been collected from the Tourism Department of Jammu and Kashmir, Ministry of Tourism GOI and Economic Survey of Jammu and Kashmir and simple tabulation methods have been used for analysis purpose. In nutshell, it has been suggested that tourism in Kashmir Valley has undoubtedly been the victim of undulations right from the India's independence but mere willingness to develop Kashmir Valley tourism can't do the job. Thus, concrete positive steps on the part of everyone concerned, whether administrators, local communities, tour-operators and the policy makers are the need of the hour.

***Keywords**: Kashmir Valley; Tourism; Trends; Prospects; Problems.*

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Introduction

Tourism has been defined by the world tourism organization as the phenomenon involving the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes. Tourism, thus, refers to all activities of visitors, including both "tourists (over-night visitors)" and "same-day visitors" (W.T.O, 1994).

Tourism is one of the fastest growing and single largest industries in the world. The contribution of tourism industry in the global as well as individual perspective is worthwhile. Many countries in the world depend upon tourism as a main source of foreign exchange earnings. The World Tourism Organization recorded a total number of 763 million international tourist traffics in 2004 and earned US$ 623.00 billion. Tourism continues to surge as a world economic force, contributing nearly $5.5 trillion to the world's economy in 2004. The increasing trend of tourist arrivals and earnings is continuing. In 2005, the world tourist arrivals rose to 808 million. The World Tourism 2020 Vision forecasted that this figure will reach to 1,561.1 million in 2020 (Jain, Deepak, 2013).This continued growth in tourism business throughout the world is encouraging and nations are becoming more concerned to attract more tourists to their own destinations and trying to promote this sector as a major source for the economic development of the nation. Indian is not left unaffected by this trend.

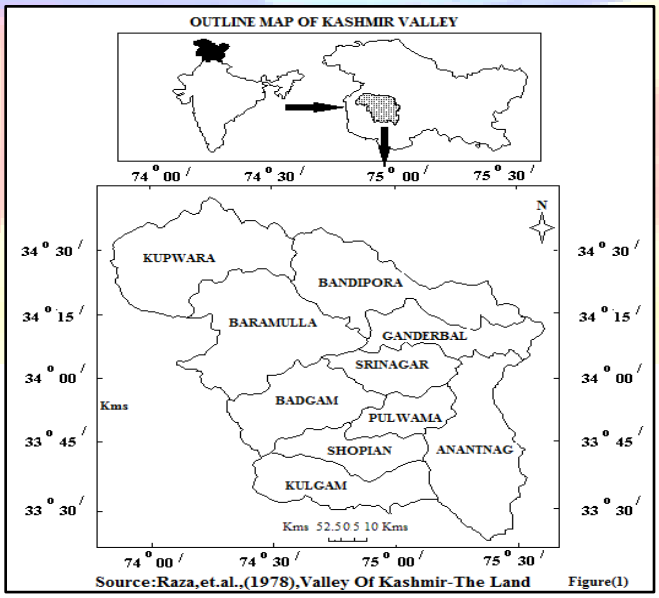
The World Travel and Tourism Council calculated that tourism generated $121 billion or 6.4 percent of the India's GDP in 2011. It was responsible for 39.3 million jobs, 7.9 percent of its total employment. The GDP of the tourism sector has expanded 229 percent between 1990 and 2011. The sector is predicted to grow at an average annual rate of 7.7 percent in the next decade. In a 2011 forecast, the World Travel and Tourism Council predicted the annual growth to be 8.8 percent between 2011 and 2021 (Wani et al.,2013). This gave India the fifth rank among countries with the fastest growing tourism industry. Kashmir being called as "paradise on Earth" is one of the major tourist attractions in India. The state of J&K is known all over the world for its beautiful valleys, lakes ,Snowcapped peaks, invigorating climate,opportunities for trekking, fishing, skiing and number of archaeological, historical, cultural and religious places and hospitable people. Thus, Tourism is an important industry considered to be an economic bonanza for J&K state (Lala and Bhat, 2008).

Study Area

Kashmir Valley,a separate geographical entity- popularly known as "Paradise On Earth"- is one of the three Meso regions (Jammu, Kashmir and Ladakh) of the state of J&K which are separated by the Himalayan mountain ranges from one another. These divisions have been referred to as a 03-storey building in the middle of which lies Kashmir Valley having half closed Ecosystem (Raza, et al.,1978).The oval shaped valley (figure-1) extending between latitudes 33˚20'N to 34˚40'N and longitudes 73˚45'E to 75˚35'E stretches over an area of 15,853 km^2 (out of 1,12,387 km^2 area of J&K), giving the appearance of an old lacustrine bed.

Kashmir Valley has rightly been called "Switzerland of Asia". Bernier, the first European to enter Kashmir, writing in 1665A.D, says: "In truth, the kingdom surpasses in beauty all that my warmest imagination had anticipated."(Younghusband, 1911).Kashmir Valley occupies a special place in India, because of its geographic location, its scenic splendor and its great contributions to the arts and culture of India.

Geographically and climatically Kashmir is the child of the mighty Himalayas receiving in abundance the paternal grace in the form of captivating scenic beauty, lush green pastures and lofty glistening snow covered mountain peaks which capture the changing hues of the brilliant Sun, in a hundred thousand ways, the ever gurgling rivers and rivulets and the great lakes of mythological fame.



Source:Raza,et.al.,(1978),Valley Of Kashmir-The Land Figure(1)

Objectives of the Study

1. To examine the trends, prospects and problems of tourism in Kashmir Valley.
2. To suggest necessary recommendations for the development of tourism in Kashmir Valley.

Materials and Methods

This Study is based on the secondary data which has been collected from the Tourism Department of Jammu and Kashmir, Ministry of Tourism GOI and Economic Survey of Jammu and Kashmir and simple tabulation methods have been used for analysis purpose.

Profile of Kashmir Valley Tourism

Kashmir Valley is an important tourist destination and has been a place of attraction since centuries. History of tourism in Kashmir Valley and its growth and development is closely associated with its ancient civilization. Travelers from far and wide have visited the Kashmir Valley for centuries past. It has been the main route of cultural and commercial intercourse between India and rest of the Eastern World including Middle East and central Asia (Ahmed,2013).

The tourism sector with a revenue generation of more than Rs.3, 000 crores provides employment to about 5 lakh people in J&K. The sector with its potential for employing people across the skill spectrum and positive externalities for other sectors like handicrafts, handlooms and transport occupies an important place in the development and employment strategy of the state. Tourism as an industry not only incentivizes the preservation of culture and heritage but is also in sync with the objective of conserving the fragile environment of the state. (J & K Tourism & Horticulture Report, 2013).

There are various places of tourist attraction in the state being visited both by foreign as well as domestic tourists. Prominent among them are the Mughal gardens, Gulmarg, Sonmarg, Pahalgam, Verinag and Manasbal etc. However, a marked pattern of negative growth in the tourist flow to Kashmir Valley has been seen in 1989-90 and this flow of tourists has not remained the same or kept on increasing continuously because of certain peculiar reasons like insurgency etc. which have drastically impacted on the tourism industry in Kashmir.

Table 1: Showing Year-wise break up of domestic and foreign tourist arrivals in Kashmir Valley (in numbers)

Year	Domestic	Foreign	Total
1951	9933	1246	11179
1956	57341	7012	64353
1966	112127	7149	119276
1971	76612	15240	91852
1976	286412	38078	324490
1981	598555	43745	642300
1986	536598	53118	589716
1991	1400	4887	6287
1995	322	8198	8520
1996	375	9592	9967
1997	7027	9111	16183
1998	99636	10247	109883
1999	200162	17130	217292
2000	104337	7575	111912
2001	66732	5859	72591
2002	24670	2686	27356
2003	182205	8959	191164
2004	358095	18234	376329
2005	585702	19680	605382
2006	412879	20009	432888
2007	417264	24576	441840
2008	550100	22000	572100
2009	577348	23904	601252
2010	710504	25984	736488
2011	1282360	32110	1314470
2012	1274674	37166	1311840

Source: Jammu & Kashmir Tourism Department, 2013

Fig (2) Graphical representation of tourist arrival in Kashmir Valley

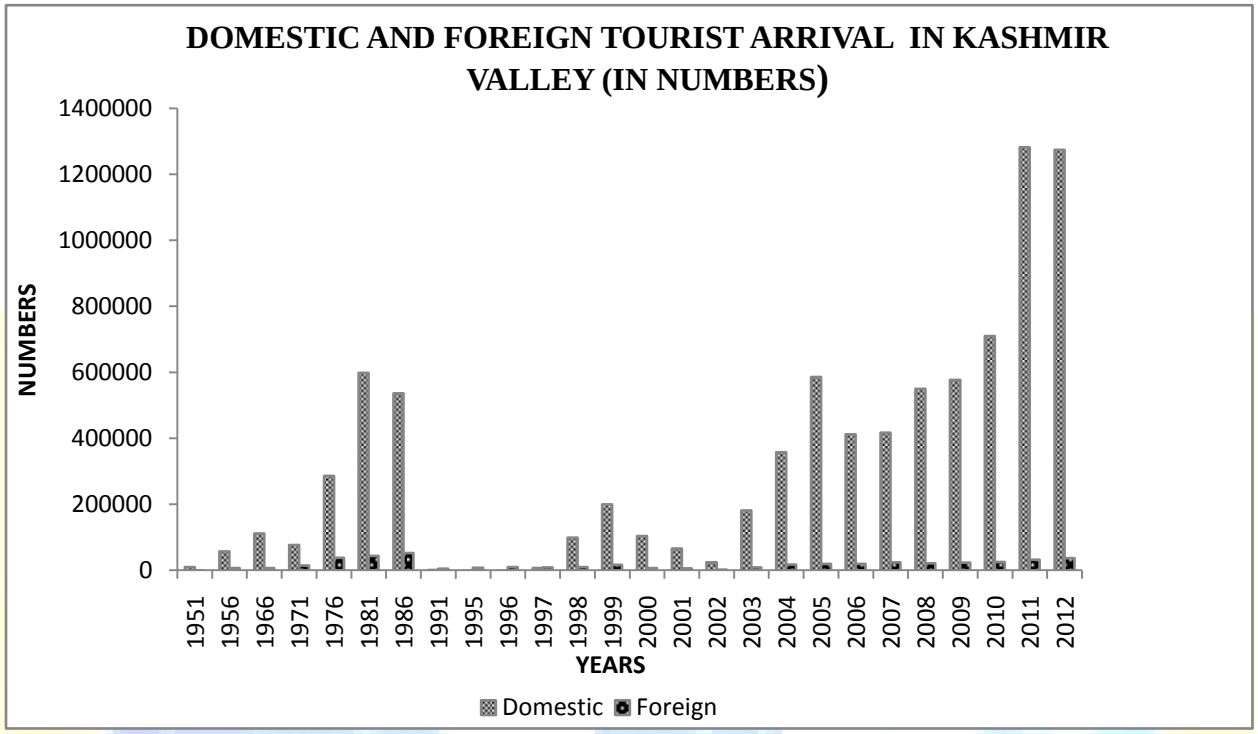


Table (1) reveals the fact that tourism in Kashmir Valley has waxed and waned in tandem with the prevailing circumstances since Independence.Up to 1971 it was one of the major industries providing employment to a considerable population of valley. However, it was in 1971 that this industry suffered a severe jolt because of the indo-Pak war. Kashmir being located geographically quite adjacent to Pakistan was,thus, the main sufferer.

However, this industry recovered itself soon and continued on its path of journey of progress. But, it was in 1989 when this industry again suffered a setback because of rise in political instability in the form of insurgency and militancy which reduced the flow of tourists to the Valley Of Kashmir significantly and it continued up to 2001-02 during which tourist infrastructure suffered a considerable loss. After 2002, when tourism was about to attain pace, few tourists in Kashmir were attacked which again put the prospects of this industry in doldrums.

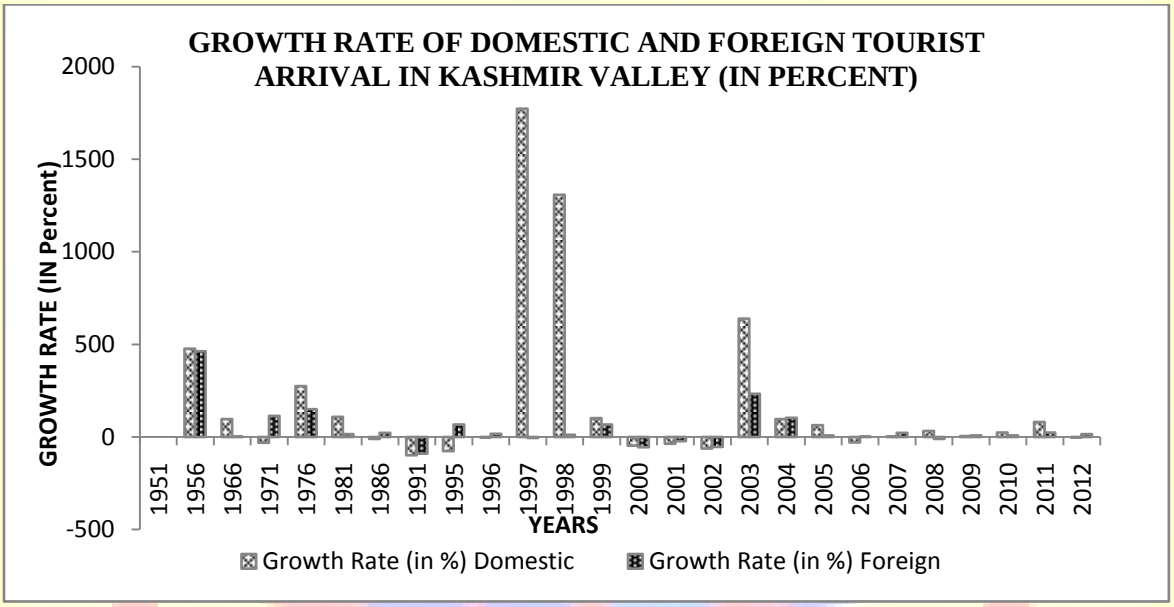
Despite all these undulations and fluctuations, the post 2006 period has witnessed a retardation in the militancy related activities and thus an increase in the tourist arrivals significantly. It was in 2011 that highest number of tourists ever (13,14,470); domestic (1,28,236) and foreign (32,110) visited Kashmir Valley from different countries like China, Hong Kong, Japan, Taiwan, United States of America, Germany and United Kingdom.

Thus, Government has started paying attention towards the development of tourism infrastructure and people have started engaging themselves in the tourism related activities as Receptionists, Hotel and Motel Managers, Shikara and House boat owners, Tour Guides, Photographers, Salesmanship, ponny-wallas (donkey owners) and Tour operators etc.

Table 2- Showing Year wise growth rate of domestic and foreign tourist arrival in Kashmir Valley(in Percent)

Years	Growth Rate (In Percent) Domestic	Growth Rate (In Percent) Foreign
1951	--------	---------
1956	477.27	462.76
1966	95.94	1.95
1971	-31.67	113.17
1976	273.84	149.85
1981	108.98	14.88
1986	-10.35	21.42
1991	-99.73	-90.79
1995	-77	67.75
1996	0.001	17
1997	1773.86	-5.01
1998	1308.88	12.46
1999	100.89	67.17
2000	-47.87	-55.77
2001	-36.03	-22.65
2002	-63.03	-54.15
2003	638.56	233.54
2004	96.53	103.52
2005	63.56	7.93
2006	-29.5	1.67
2007	1.06	22.82
2008	31.83	-10.48
2009	4.95	8.65
2010	23.06	8.7
2011	80.48	23.57
2012	-0.59	15.74

Fig (3) Graphical representation of Growth Rate of Domestic and Foreign Tourist Arrival in Kashmir Valley



Prospects of Tourism in Kashmir Valley

Tourism is highly labor intensive industry of a unique type. It provides different services needed as well as expected by the incoming tourists. According to the latest estimates of the world travel and tourism council, this industry is expected to generate about 6 percent of India's total employment. Looking ahead, the economic impact of all this is expected to generate a total of about 28 million jobs by the year 2014.

It is proper to say that tourism is neither a single nor a specific kind of industry strictly located at a particular site. It is the sum total of a host of services rendered to the tourists as soon as they start gathering information from the host country through any medium. Thus, the development of such a multifarious service industry is least expansive and for less difficult to manage as a part of economic activity. The biggest resource required to operate such an industry is human ingenuity and a creative skill.

So far as the Valley of Kashmir is concerned, it has a vast potential of Tourism because of its natural beauty dotted with numerous lakes and waterfalls, lust green hills and valleys, pilgrimage sites and historical Gardens, torrential rivers and pine trees and vast grasslands that have remained untouched by the man. However, because of a multitude of factors like the lack of interest of Government and other authorities, lack of required technology and funds, unawareness of tourists and to some extent isolation of the region, this vast potential is still shrouded behind the scene. Thus, besides few tourist destinations like Mughal gardens, Gulmarg, and Pahalgam, rest of the huge potential of Kashmir Tourism remains untapped. The main prospects of Tourism in Kashmir Valley can be elaborated as follows:

- **Adventure Tourism**

  "Adventure is an evocative term that speaks of beginning, boldness and power. It connotes participation and active involvement in the life. An adventure, a quest, begins because of a human desire, a drive to experience which is hidden and unknown" (Quinn, 2003).

  Adventure Tourism is an outdoor leisure activity that generally takes place in an unusual or remote geographical setting, involving sometimes unconventional means of transportation and tending to be associated with low or high levels of physical activity (Lala and Bhat,2008). It has been a part of a spectrum of new tourist practices claiming different ethics to those of traditional mass-tourism. It is a special form of tourism that involves risk and excitement and is taken in conjugation with nature. Most of the existing literature on adventurous activities suggests that the pursuit of risk is central to their attraction (Carl, 2004).

  As a result of scenic splendor, Kashmir Valley has got a vast potential to prove as a successful destination in tapping into the increased interest in adventure tourism which can be represented by a plethora of activities like trekking, rafting, mountaineering, climbing, golfing, skiing, paragliding, aero sports, camping and zorbing etc. Being surrounded by towering mountains like the mighty Pir-Panjal, Zaskar and Greater Himalayan Ranges, the Valley of Kashmir can provide joyful experiences and enjoyment to the tourists. Climbing and trekking to these virgin mountain peaks can prove stimulating, breath taking and worthwhile.

Recently trekking routes have been opened from Doodpathri to Yousmarg and from Dangwathi to Aharbal in addition to the already existing ones from sonmarg to Narang and Gurez in Kashmir Valley.

In case, the tourist is more adventurous, he may go for angling in high altitude lakes which are reached by trek. e.g., one of the trek starts from Sonmarg and goes on to high altitude alpine lakes of Vishansar, Kishansar, Gadsar and Gangabal.

Secondly, river rafting in Kashmir on Lidder, Sind, Kishan Ganga and Jhelum rivers provides the best opportunity to enjoy and experience the natural beauty of the spectacular landscape with deep gorges, towering snowcapped peaks, hill side villages and glimpses of unique wildlife.

Despite having all these potentials and prospects for adventure tourism, Kashmir Valley is getting only a small portion of adventure tourists on national as well as international lines.

- **Pilgrim Tourism**

The State of Jammu and Kashmir has been a seat of reference to all major religions of the world. This state is full of holy sites and most of these sites are located in between the scenic surroundings of great Himalayas.

Kashmir is an epitome of harmonious blend of art, religion and philosophy. Religions like Christianity, Buddhism, Islam, Hinduism, and Sikhism etc. has co-existed in J&K since hundreds of years especially in Kashmir Valley that is saturated with various mosques and temples which are just marvel creations. The state stands as an example of religious tolerance. Visiting Hari Parbat Pilgrim Center where a temple, a Gurudwara and a mosque stand side by side gives a feeling of pure brotherhood in between the major religions of the Region(Bhat,2013).

Jammu & Kashmir has various pilgrim destinations for Muslims, Hindus and Buddhists. The very famous Mata Vaishno Devi Shrine and the Amarnath Temple are located in this state. These sites are the most valued and sanctified of Hindu pilgrimage sites where thousands of devotees pay homage every year. For Muslims, there is the Hazratbal Shrine in Srinagar where the sacred hair (Moi-e-Muqqadas) of Prophet

Mohammad (S.A.W) is preserved and the truthful come to pay homage. The Shahdara Sharief located in Rajouri District of the State is like an emblem of communal harmony.

Besides all the above destinations, a number of other religious places that the Valley of Kashmir has been bestowed with include shrine of Baba Rishi (district Baramullah), Kheer bawani, Charari-sharif (district Budgam), shrine of Noor shah sahib and sheikh Noorudin-wali (District Kulgam), Martand temple, shrine of Baba Naseebudin-gazzi (District Anantnag) and KhankahMoalla and Old jamia masjid (District Srinagar)

Thus, looking at the huge untapped potential of Pilgrim Tourism of Kashmir Valley, number of tourist circuits can be developed like:

- Srinagar-Hazratbal shrine-sheikh Noorudin Wali's shrine-Shahdara Sharief via Pir ki Gali.
- Srinagar-Martand temple- Holy Amarnath cave
- Srinagar-Old Jamia Masjid-Baba Rishi
- Srinagar-Kheerbawani
- Srinagar-Shrine of Baba Naseebudin Gazzi-Shrine of Noor shah Sahab.

- **Rural Tourism**

Rural tourism has long been considered a means of achieving economic and social development and regeneration. More specifically, it has been widely promoted as an effective source of income and employment, particularly in peripheral rural areas where traditional agrarian industries have declined. More recently, however, a number of established tourism destinations have also turned to rural tourism in order to diversify their tourism products and markets and to spread the benefits of tourism away from the resorts into the hinterland (Sharpley,2002).Generally, rural tourism is seen as a valuable and growing sector of the overall tourism market, representing a significant source of income to rural economies.

Kashmir is known throughout the world as much for its arts and crafts as for its scenic beauty and bracing climate which are mainly the production of rural Kashmir. Its crafts range from woolen textiles of fleecy soft texture of matchless excellence in weaving, hand-woven carpets of the finest warp and weft, to the exquisite designs worked on papier-mâché, wood work, silverware, etc. They are products of unique

craftsmanship. The skill of the craftsmen and their capacity for intricate workmanship are assets, which can help development on a much larger scale.

Like handicrafts, the handloom industry is also the oldest traditional cottage industry in the state. The importance of this sector lies in the fact that it has enormous employment potential; it does not consume scarce resources, does not cause pollution and is environment friendly. The social cost benefit ratio, therefore of all investment in this sector goes up manifold.

Kashmir Valley is famous for the weaving of specialized fabrics like pashmina and kani shawls, silken, woolen and cotton fabrics. The elaborate kanishawl which was introduced by Zain-ul-Abed in and spanned through the Moghul, Afghan and Sikh rule are primarily found in the tiny village of Kanihama near Magam. Similarly, Main production centers of woolen articles in Kashmir are Gurez, Tillel, Bandipur. Nadihal, Kazipora and Papchal (well known for kandidaror bordered chadars), Lolab valley, Badgam, Beerwah, Chadoora, Inder Gadodar, Pulwama, Tral, Shopian, Sophare, Handwara, Magam and Tarzoo.

In the areas surrounding Anantnag in Kashmir, many people are engaged in embroidering raffal and pashmina shawls, pherans (a loose over gown worn by men and women). Besides, the Kashmir Carpet, Introduced to Kashmir by Sultan Zain-ul-Abedin in the 15th century ranks amongst the finest in the world today. The weaver takes special pride in his ability to accurately reproduce Persian, Turkish, Turkman, Caucasian, antique Kashmir Moghul and Jaipur Moghul patterns.

Moreover, The silver work of Kashmir is extremely beautiful and some of the indigenous patterns, like the chinar and lotus leaf, are of exquisite design. Handmade pieces of high quality workmanship are available in Srinagar. Articles include cups, bowls, plates, tumblers, trays, tea and coffee pots, dinner sets, goblets, boxes, vases, trinket boxes and cigarette cases.

In the rural areas of Kashmir, Utilitarian earthenware is still in demand for domestic use. Low priced and colorful clay containers are used to store water, set curds and cook vegetable and meat. The Kashmir potter also makes symbolic objects linked with the Shivratri festival, clay-containers for the kangri bowls and chillums containing smoldering embers for the hukka. Rural pottery found in Charar-e-Sharif is painted red

and blue and is occasionally decorated with white and green flowers. Mud-pots for storing water and cooking continue to be widely used in every village home.

Above all, beautiful temples, idols and monuments testify to stone carving being an ancient craft in Kashmir. Athwajan, close to Srinagar is known for its stone work, chiseled stone for paths, pillars, grinding stones and gravestones.

Despite having the huge potential for this type of tourism the rural Kashmir is still in a state of underdevelopment which if utilized properly can prove as a boosting factor for the generation of employment and various other skills.

- **Wetland Tourism**

Wetlands represent the interface between land and water. These are areas of land that are either temporarily or permanently covered by water. The Millennium Ecosystem Assessment estimates conservatively that wetlands cover seven percent of the earth's surface and deliver 45% of the world's natural productivity and ecosystem services of which the benefits are estimated at $20 trillion a year.

Kashmir valley nestled in northwestern folds of the Himalayas is replete with diverse types of freshwater bodies (Khan, 2000) which have a tremendous potential for the development of tourism. These consist of both high altitude and low altitude wetlands and Natural as well as man-made ones. Some of these wetlands include the world famous Dal Lake which lies in the heart of Srinagar city. Wular, the largest fresh water lake of India about 16kms long and 9.6 kms wide at a distance of 75 kms from Srinagar in Bandipora district, Anchar lake, a swampy area of about 8km length and 3kms width, Manasbal lake at a distance of 29kms from Srinagar with 5kms length and 1km width and Hokarsar lake on the Baramulla road, about 13kms from Srinagar with 5kms length and 1.5kms width.

All these are the low altitude wetlands (below 3000mtrs) and the high altitude wetlands(above 3000mtrs) having crystal clear and deep blue waters include Sheeshnag lake near vavjan, enroute to Shri Amarnath cave, at a distance of 28kms from Pahalgam, the Neelnag lake in Budgam district at a distance of 10kms from Nagam and Tulian lake etc.

Almost every part of the Valley of Kashmir is abound with larger or smaller water bodies including rivers, streams, ponds, springs, waterfalls, and lakes. e.g., District

Srinagar alone consists of 99 wetlands (lakes-14, streams-7, high altitude waterbodies-29, riverine wetlands-25 and smaller wetlands with area of less than 2 hectares-24) with an area of 10081 hectares. Baramula district consists of 97 wetlands with an area of 16360 hectares (lakes-2, streams-13, riverine- 29, high altitude waterbodies-38 and smaller ones-15), Pulwama district comprises of 266 wetlands with an area of 3561 hectares (streams-5, riverine-7, high altitude wetlands- 2, smaller-252), Kupwara district is abound with 95 wetlands with an area of 2384 hectares (lakes-18, streams- 5, Riverine wetlands-2, smaller wetlands-70), Budgam district consists of 80 wetlands with an area of 3402 hectares (high altitude wetlands-11, Riverine wetlands-9, streams-12, smaller wetlands-48), Anantnag district comprises of 118 wetlands with an area of 6875 hectares (high altitude wetlands- 69, riverine-15, streams-11 and smaller wetlands-23).(National Wetland Atlas, 2006).Rest of the districts of the Valley are similarly rich in the wetland potential tremendously.

Despite these benefits, wetlands in Kashmir Valley are the first target of human interference and are among the most threatened of all natural resources primarily because of increased siltation, eutrophication due to run-off from catchments, agricultural conversion, receding open water areas as a result of expanding reed beds, construction of canals, weirs, levees and over-grazing (Bacha, 2002).

Thus, if these wetlands are managed and brought to the tourist map of Jammu & Kashmir, new prospects and possibilities of tourism which will enhance the vistas of tourism in Kashmir Valley will emerge.

- **Heritage Tourism**

The State of Jammu and Kashmir has its own long and glorious history. Under the Antiques Act, any article that is more than 75 years old is to be declared heritage property. Jammu and Kashmir is a land with more enormous potential for heritage tourism. The land is full of natural beauty that is unique to the state. It is also bestowed with a variety of cultural forms and manifestations that has their distinct flavor. It has diverse practices in religion, rites and rituals, fairs and festivals, landscape and people, language and culture.

Kashmir Valley is blessed with both tangible and the intangible heritage which should be incorporated into the wider tourism circuit. The need is to treat heritage

tourism in this region as the function of the tourism. Only then it can thrive in the true tourism sense. First, the heritage tourism assets of the region should be identified and then a proper documentation mechanism has to be devised so that a proper inventory is developed which can be integrated into a well-defined tourism product by employing the proper marketing strategy with the help of the multidisciplinary approach of the varied professionals, who can constitute task force for the application of the mechanism developed from this integrated process. Once this procedure is brought into action it will lead to the heritage tourism development model that will lead to the bright prospects of the overall tourism business in the region.

Problems of Kashmir Valley Tourism

Looking at the prospects of Tourism in Kashmir, it becomes quite evident that tourism in Kashmir can play an utmost important and significant role in the overall development of Kashmir Valley. With its backward and forward linkages with other sectors of the economy like transport, telecommunication & handicrafts etc., tourism has the potential to not only prove as the economy driver but also as an effective tool for poverty alleviation and ensuring growth with equity.

However, .The tourists are attracted to the destinations not only because of the natural resource or natural beauty of the place, but because of the returns they get on the expenditure they do in the tourist place. These could be satisfaction of psychological needs like proper, safe, hassle free and affordable accommodation, good transport facilities, in and around the tourist place, good water, and hygiene and sanitation facilities. Thus, this sector of Kashmir Economy is ridden with some of the inherent problems and limitations that can be noted down in the following paragraphs as:

- **Tourism Infrastructure**

  The tourist infrastructure is poor in Jammu & Kashmir which impedes the expansion to tourism in two ways. First, the absence of some types of infrastructure such as roads provides an effective block to tourist development. Second, the absence of other types of infrastructure does not preclude tourism, but makes achieving and maintaining service standards more difficult and expensive. Thus, the failure to provide adequate bulk services to the tourist sector is alarming. The Jammu & Kashmir government has tried to invest in building basic

infrastructure such as railways, highways, roads, electric power plants, water supplies, and other related facilities. With the support of central financial assistance some basic physical infrastructure has been constructed but this is still at a very low level. For example, the total number Hotels in Kashmir Valley are 386, Restaurants-104, Paying Guest Houses-75, Registered Guest Houses-406, House boats-910 and Shikaras-4656 (Department of Tourism, J&K) which is very insignificant so for as the tourist flow-both domestic as well as foreign- especially in peak seasons is concerned. Similarly the road length has increased from 18,368 kms in 2007-08 to 26,700kms (surfaced-23,600kms and unsurfaced-3100kms) in 2013-14. However, 10,20, 786 public and private vehicles use to ply over this much of road length the situation of which is further aggravated with the loopholes and bottlenecks during most of the times of the year. Similar is the case with the 119km single rail route of valley from Qazigund to Baramulla. Only 2 trains run over it that too after 4-5 hours of gap. Aviation sector which has created havoc for Kashmir Valley Tourism is worthwhile to be mentioned here. The air tickets to Kashmir from New Delhi become more costly than the tickets from Delhi to Bangkok or Switzerland in peak tourist season. Besides, lack of entertainment facilities like cinema Halls, Swimming pools and cyber cafes at major tourist destinations also spoils the taste of tourists in the Valley.

- **Political instability**

The challenges faced by the Tourism sector particularly in Kashmir Valley are many as the continuous militant activities have led to the decline of tourism industry in the state of Jammu and Kashmir. In order to fight the militant activities, the army and police have been taking several measures. For instance, police routinely stop and search passengers of overcrowded buses. Armed security forces line the roads with sand bagged bunkers at strategic points. Heavy military vehicles are on constant patrol. Moreover, since 1989-90 to 2002-03 over 1151 government buildings, 643- educational institutions, 11-hospitals,, 337-Bridges, 10729-Local Houses and 1953 shops have been gutted down.(Itoo,2011).The Already 24 years of armed militancy in Kashmir is

destroying not only Kashmir Tourism but also its forests, lakes and wildlife. Endangered wildlife is freely poached and human habitation is destroying the area's ecosystem, leaving its fate hanging in the balance environmentally as well as politically. This has cause a fear psychosis both in the minds of domestic as well as foreign tourists. In such a suspicious climate it is natural that the tourist flows have declined.

- **Social ,Cultural and Religious Ethos**

Kashmir Valley is a land of quite distinctive culture, traditions, language and taste because of which people of the Valley are quite reluctant to adhere to it. e.g., the pony-wallas or horse-men in tourist destinations like Pahalgam, Sonmarg and Gulmarg etc look like poor and dirty people in their quite untidy clothing ready to carry tourists for some ride which gives quite bad impression. Similarly, the bad and rude behavior of drivers is also noteworthy to hinder in the progress of tourism development.

Being a Muslim dominated region, tourists feel unsatisfied in not getting things like wine etc. with ease or after long searches that too through illegal means quite unpopular and religiously treated as taboo in the Valley which spoils their taste and acts as an obstacle for tourism success.

- **Lack of proper Management and Utilization of Tourist Spots**

Tourist spots especially the world famous Dal lake are not being managed properly because of political and personal reasons quite unknown to public which has rendered it devoid of its Sheen. Similar is the case with the largest fresh water lake-Wular-of India. It has turned into a callous water body with undefined shorelines filled with huge masses of mud and willow trees and has been left quite unattended and under developed. The authorities are so negligent towards the management of water bodies that these have turned into marshy lands giving bad smell and acting as the epicenters of diseases which has not only affected the health and hygiene of the local people but has also given a setback to the Valley's

Tourism. Furthermore, the somehow developed parks and gardens like Kokernag garden, Achabal garden and Verinag etc, lack in the proper facilities of hotels, stalls and toilets etc which spoils the enjoyment of tourists therein. Besides, An unregulated inflow of visitors to tourist places in the vicinity are so affected by such conditions that they may decide to keep away from them the next time. The debris kept lying for long as a result of any developmental activity, kitchen sewerage unless treated, garbage dumps, landfills and fuel spills distract the tourists. How sensitive is the tourist industry to all the adverse changes in environment if it is not properly conserved are a moot question.

It is aptly described that tourism= nature's beauty + wild life + cultural attractions + ecology. All these are the components of one single and indivisible system. They need to be conserved in order to protect the very resource base of tourism from destruction. Thus, Kashmir Valley, despite being the hub of tourism potential is ridden with innumerable problems that if attended and worked upon could regain its age old epitaph -The Paradise on Earth- for it. To solve these problems and to give tourism industry a fillip in the valley, few suggestions become noteworthy to be mentioned here.

Suggestions for the development of tourism in Kashmir Valley

1. Develop a better connection with the Local Communities of tourist destinations and provide opportunities to the local stakeholders in tourism ventures to work with Governments and other stakeholders to improve the overall environmental quality of destinations.
2. Emphasis must be placed on the security of the entire tourism network. Making tourists feel secure and safe before and after vacations is essential to the international competitiveness of destination.
3. Take a close look at ways and means of improving the existing infrastructure and hygiene conditions at places of tourist interest and public places.
4. Banks and insurance companies can play an important role in the development of tourism by incorporating environmental and social criteria into assessment procedures for loans, investments, and insurance. They can help to finance Environmentally-Sound technologies and provide incentives for sustainable tourism.

5. The marketing strategies at tourist destinations are not in line with the principles of sustainable tourism. The need of an hour is the better involvement of tourism boards in sustainable tourism efforts so that the market sales and purchases can be checked and enhanced.
6. Maintain the number of Tourist arrivals to different tourist destinations according to the Carrying Capacity of the area.
7. Participate and arrange national and international tourism fairs and festivals like Gulmarg Snow Festival at Gulmarg, Shikara Festival at Srinagar, Mughal Rally, rafting championship, Golf Championships and trekking expeditions etc.
8. Develop and update an attractive web site to provide the required information to the potential tourists.
9. Use Social media for tourism promotion and Produce/broadcast quality short films and promos and telecast the same on leading satellite/cable TV channels.
10. Include Archeological Sites in the Tourist Circuit and set up Heritage Conservation and Preservation Authority.
11. Quality assurance is important to attract customers and encourage repeated visits.
12. Promote New Trekking Routes and conduct basic and advanced courses in mountaineering expedition, adventure, rescue and skiing.
13. Establish commendable Master's and Ph.D. programs in hospitality.
14. Organize Familiarization trips of tour operators, travel agents and media persons from time to time.
15. Fix rates of accommodation and services and penalties for malpractices.

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APPENDIX-I

QUESTIONNAIRE

A- FOR VISITORS TO THE REGION

Dear Sir/Madam!

Good morning/afternoon and welcome to this tourist destination. We are pleased that you decided to visit here. We humbly request your good self to participate in a survey that will help us to make your future stay here even more pleasant. The interview will take about 10 to 15 minutes.

A- Background Questions

1. Name of the Tourist: ----------
2. Sex ----------
3. Residence: ----------
4. Age (in Years)
   (a) 15-25 (b) 25-35 (c) 35-45 (d) 45-55 (e) Above 55
5. Educational Structure
   I. Illiterate
   II. Matriculate
   III. Higher Secondary
   IV. Graduate
   V. Post graduate
   VI. Others
6. Occupational Structure
   I. Employed
   II. Unemployed
   III. Retired
   IV. Student
   V. Others

B- Questions related to Tourist Motivation

7. Is this your first visit to Kashmir Valley
   I. Yes
   II. No, How many times have you visited this destination in the past----------
8. How did you arrive to this destination and why you used that means of transportation?
   I. By Aeroplane
   II. By Bus
   III. By Car
   IV. Any other ----------
   Reason: ----------
   ----
9. Source of Information about this tourist destination?
   I. Through internet
   II. Books and Guides

III. Friends and Relatives
IV. Travel agencies
V. It was part of the travel package

10. How long do you plan to stay here?
    I. One day- No overnight stay
    II. 1 to 2 nights
    III. 3 to 7 nights
    IV. Longer
11. What is your level of comfort here?
    (a) Good (b) Average (c) Poor
12. What motivated you to visit this tourist destination?
    I. For rest and relaxation
    II. Culture and curiosity
    III. Sports and Recreation
    IV. Attending a conference, congress, seminar or meeting etc.
    V. Health Reasons
    VI. Religious Motives
    VII. Any other ----------
13. Which period of the Year/ Season do you think is pleasant to visit this tourist destination and why?
    I. Spring…..March 15 to May 15
    II. Summer…..May 15 to July 15
    III. Rainy Season….. July 15 to September 15
    IV. Autumn…… September 15 to January 15
    V. Ice Cold…...January 15 to March 15

    Reason: ----------
    ---
14. What do you miss the most in this tourist destination? ----------
    ---
15. How much is your stay costing you on an average per person per day in this region:
    (a) 2000-2500 Rs
    (b) 2501- 3000 Rs
    (c) 3001-3500 Rs.
    (d) 3501-4000 Rs.
    (e) Above 4000 Rs.

C- Questions related to General Image of Tourist Destination

16. Which is the most beautiful tourist spot in Kashmir Valley?
    (a) Mughal Gardens (b) Gulmarg (c) Pahalgam (d) Sonamarg (e) Others
17. Do you wish to add anything on the topic of Kashmir Valley Tourism?

    ---
18. Do you wish to add anything on the Management of Wetlands in Kashmir Valley?

B- For Residents/ Belongers

A- General observation of the selected villages/ localities/ households and sampled respondents:

1. Name of the District: ----------
2. Name of the Village: ----------
3. Total number of households in the village: ----------
4. Total number of population in the village: ----------
5. Total number of Workers in the village ----------
6. Name of the respondent: ----------
7. Age: (a) Below 30 years (b) 30-60 Years (c) Above 60 Years
8. Sex: ----------
9. Educational Structure
   - I. Uneducated
   - II. Educated
10. Levels of Education
    - I. Primary school
    - II. Secondary school
    - III. Undergraduate
    - IV. Graduate
    - V. Post graduate
    - VI. Others
11. Source of drinking water:
    - I. Lake water
    - II. Hand pump water
    - III. Municipal tap water
    - IV. Spring Water
12. Type of House
    (a) Pucca (b) Kutcha (c) Houseboats or Donga Boats
13. Means of Disposal of Solid Waste
    (a) Lake (b) NGO Bins (c) Burning (d) Municipality Bins
14. Means of Disposal of Toilet Waste
    (a) Lake (b) Used as Manure (c) Septic Tank

B- Livelihood Patterns

15. Occupational structure:
    - I. Houseboat/Shikara Owners
    - II. Cultivation
    - III. Arts & Crafts
    - IV. Business & Trade
    - V. Fishing/Fish Marketing
    - VI. Government employees
16. Your monthly income
    - I. Below 3000 Rupees
    - II. 3000- 6000 Rupees
    - III. Above 6000 rupees

17. Type of floral and faunal species observed in the lake

---

18. Do you get any benefit from the Wetlands?
    I. No
    II. Yes, In what ways:
        a. Flood mitigation
        b. Ground water Recharge and discharge
        c. Floral and Faunal diversity
        d. Irrigation
        e. Fuel
        f. fish
        g. Tourism & Recreation
        h. Others

19. Do you think that the number of both floral and faunal species decreased/ disappeared? If so, give reasons.

---

20. Do you observe any migratory birds? Are these birds increasing or decreasing? Give reasons.

---

21. What are the main factors responsible for the deterioration of these lakes:
    I. Natural
    II. Anthropogenic

    Natural
        a. Eutrophication
        b. Erosion & Siltation
        c. Weed infestation
        d. All the above

    Anthropogenic
        a. Encroachments
        b. Poaching
        c. Solid waste disposal & Pollution
        d. Population pressure
        e. Modification of Catchment area
        f. All the above

22. Do tourists also contribute in the pollution of these lakes? If yes, how?

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23. What are the problems faced by the people by the degradation of these wetlands?

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24. Do you think that there is an urgent need to conserve these wetlands? If so, in what ways?

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25. Have you ever participated in the conservation of these wetlands?
    I. Yes
    II. No, Reason:--------
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26. Do you think that these lakes have economic significance? If so, what suitable management could be done in this regard? Give reasons.

Thank you very much for your cooperation. Have a nice trip.