REVIEW OF RESEARCH
IMPACT FACTOR : 5.7631(UIF) UGC APPROVED JOURNAL NO. 48514 ISSN: 2249-894X
VOLUME - 8 | ISSUE - 7 | APRIL - 2019

NATURAL RESOURCES MANAGEMENT IN THE GARHWAL HIMALAYAS: A STUDY OF ALAKNANDA BASIN

Dr. Sarfraz Hussain[1] and Dr. Ajay Singh Manhas[2]
[1]Department of Geography GDC Thanamandi (J&K)

ABSTRACT:

Natural resource management is the prime concern in the world particularly in the globalization, high growth of population and changing livelihood options. This remains greater in the third world countries where livelihood is depended on subsistence agriculture. The Alaknanda basin of Garhwal Himalaya is very rich in terms of presence of natural resources i.e. flora, fauna, and water. Further, rich agro-ecological conditions are also available for cultivation of various kinds of cross- subsistence and cash generating crops. Water resource has abundance as the major rivers origin and flow from the region. These abundant natural resources and suitable agro-ecological conditions are fully unutilized and are getting attention in the whole basin. The economy of the region is largely depended on traditional agriculture and on remittances. Meanwhile, the optimum utilization of these abundant natural resources can enhance livelihood and the people of the basin can attend food security. This paper aims to discuss on the management of natural resources in the Alaknanda Basin of Garhwal Himalaya and to give suggestion for optimum utilization of natural resources in the Garhwal Himalayas.

KEYWORDS: *Globalization, agro-ecological, livelihood, remittances.*

INTRODUCTION:

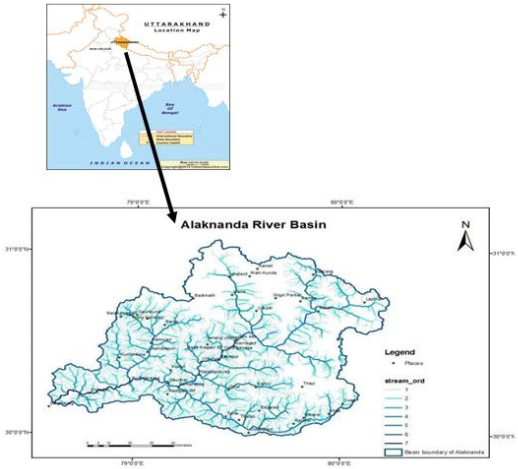
Appropriate management of the natural resources is especially important in developing countries that cannot afford the consequences of irreversible losses of natural resources and ecological degradation. Nor can they afford highly cost efforts to remedy environmental damages. Our objective should be to create economic environment in which it is more rewarding to conserve resources than to destroy them, because growth derived from rapid resource depletion is neither ecologically nor economically sustainable. Any objects can be termed as a resource provided a suitable technology is available for its conversion into more precious goods. The growth of the technology is directly related with the scientific knowledge and technical skills of the people. Zimmermann (1951) defines resource as means of attaining ends, the ends being the satisfaction of individual wants and attainment of social objectives. Natural resources are properties of the physical environment that is considered useful for satisfying human wants (Jonston et, Ed). Ramade (1984) define resource, as any form of energy or matter vital for the fulfillment of physiological, socio-economic and cultural desires both at the individual and community level.

ABOUT THE STUDY AREA:

The Alaknanda Basin is extended between 30° 0' N and 78° 45' E to 80° 0' E covering an area about 10882 Km^2, represents the eastern part of the Garhwal Himalaya. Out of the total area of the basin, 433 Km^2 is under glacier landscape and rest of 288 km^2 is under fluvial landscape. The total

number of villages is approximately 2310. The land under agriculture is 644.22 km^2 which is 5.9 percent of the total geographical area while only 64.8 km^2, (0.6 percent) land is under the horticultural crops.

Fig.1: Location Map of Alaknanda Basin



Physiographic Division of the study area:

The Alaknanda Basin is characterized by hilly terrain deep gorges and river valleys. The region is broadly divided into four major divisions (i) The Great Himalayan Ranges (snow covered region) (ii) Alpine and pasture and (covered with snow during the four months of winter season). Middle Himalaya (characterized by high concentration of populations) and (iii) River valleys (characterized by mushrooms service centers and institutions). Among the major rivers of India, the Alaknanda river and its tributaries (Dhauli Ganga, Vishnu Ganga, Nanadakani, mountain peaks of the Himalayan ranges such as Nandadevi, Kamet, Trishul, and Chaukhamba are also located in the study area.

Significance of the study:

The present study aims at a micro and meso level analyze of environmental conditions in the Alaknanda Basin on various levels of investigation. This aims at providing preparation of comprehensive environmental impact assessment report envisaged collection of secondary data, generation of baseline data for three seasons, formulation of environmental impact statements and prediction and evaluation of impacts to formulate environmental management plan for the collection of information about site of hydroelectric projects, land requirement for submergence and project components the project; characteristics, biodiversity, surface, and ground water resources, evaluation of muck to be generated due to construction of the project etc.

Research Methodology:

The Scientific study of environmental requires a comprehensive methodology to analyze the geo-factors, biological complexes and anthropogenic process. It demands disciples in the area of study as well as identical geo-identity in other areas of the world. The following tools and techniques have been used the completion of the work. To make a comprehensive analysis of the present study the under a mentioned methodology will be adopted. A research work is always based certain procedures in the beginning of the research data primary and secondary will be collected which are further analyzed to get a meaningful results and strategy. As such, research methodology forms a vital link between the crude data and final analysis. The study will incorporate both empirical and interdisciplinary approaches.

Natural Resources Management in the Alaknanda Basin:

1. Climate-Temperature and Rainfall:

The altitudinal differences coupled with varied Physiography contributes to climatic variations in the Alaknanda Basin. The climate varies from sub-tropical to alpine. Despite diverse physiographic characteristics, sub-regional variations in the average seasonal temperature are not striking. Temperature varies from season to season and from valley regions to highly elevated regions as highest temperature is recorded in Srinagar in the month of June (30°C) and lowest in Tungnath in the month of Jan (0.5°).

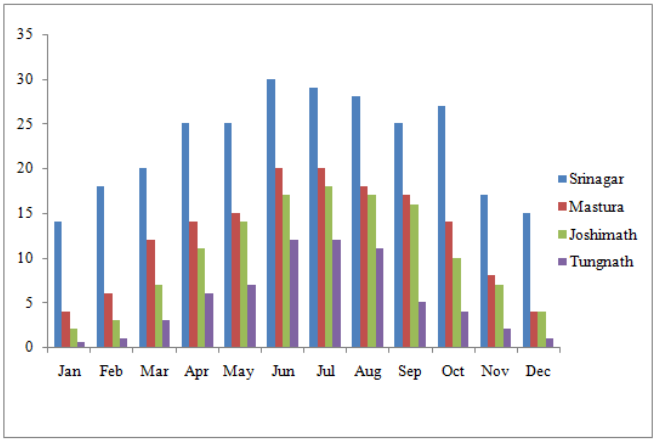
As shown in Table 1 the whole Alaknanda Basin receives lowest temperature and the area above 200m receives heavy snowfall during four Months is of winter. Global impact of climate change can be noticed in this basin as heavy snowfall occurred in Jan 1993 when the low-lying areas (900m elevation), have covered by snow. Summers are conducive and favorable for health except a belt extending between Karanprayag to Devprayag comprising (low-lying areas) where monthly temperature remains about 30° average. The farming community, during this period, migrates to upland for pastoralist. During summer, heavy flow of tourist can be seen in the basin mostly pilgrims because this basin has two world famous pilgrimages; Badrinath and Kedarnath, five Prayagas (confluence points of major rivers), and other places of cultural interest. Similarly, there are many natural places of tourist interest.

Table.1: Mean Monthly Temperature in Alaknanda Basin

Name of place	Altitude (m)	Mean monthly temperature °c											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Srinagar	550	14	18	20	25	25	30	29	28	25	27	17	15
Mastura	1800	4	6	12	14	15	20	20	18	17	14	8	4
Joshimath	1875	2	3	7	11	14	17	18	17	16	10	7	4
Tungnath	3600	0.5	1	3	6	7	12	12	11	5	4	2	1

Sources: HAPPRC Srinagar Garhwal (Uttarakhand)
India Metrological Department, Pune.
Vertical Horticulture in the Alaknanda Basin. ANNALS, NAGI.

Fig. 2: Bar Diagram between name of places and mean monthly temperature



Rainfall mostly occurs during Monsoon season from June to October. It also varies from the valley regions (low) to highlands (high) and north-facing (leeward) to south-facing (windward) slopes. Rainfall recorded in four stations of the basin (Table 1). These stations are located in different altitudes varies from (550mm and 92.5 cm). Highest rainfall is recorded in Ukhimath (1578 mm and 99.5 cm).

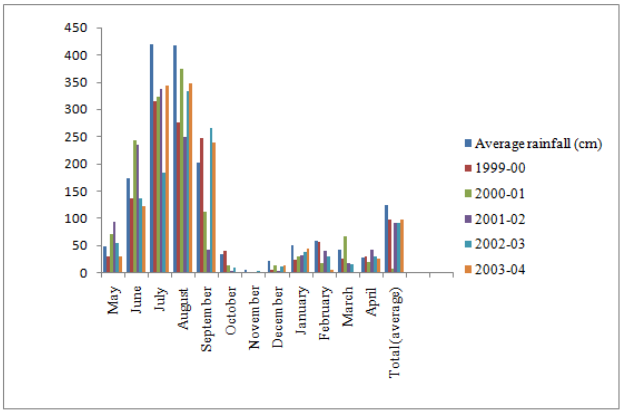
This data reveals that in high altitude, rainfall is high and vice-versa. In case of Joshimath, which is located at 1875 m, annual rainfall is 107.5 cm, which is very less than Karanprayag. The only reason is behind that Joshimath is located at leeward direction.

Table.2: Rainfall Data of the Alaknanda Basin

Months	Average rainfall (cm)	1999-00	2000-01	2001-02	2002-03	2003-04
May	49	28.9	70.47	93.03	55.87	30.23
June	172.96	135.94	242.65	235	136.36	121.58
July	419.38	314.02	323.99	337.31	183.69	343.48
August	417.41	275.22	374.47	248.84	334.34	347.63
September	201.67	246.6	111.41	40.88	266.9	239.94
October	34.98	39.91	12.97	2.51	10.16	0
November	6.78	0.88	1.36	0.23	3.93	1.8
December	21.92	4.78	13.3	2.56	11.64	13.42
January	51.9	23.54	30.86	30.8	39	45.45
February	59.9	56.15	17.48	39.11	29.69	5.95
March	43.52	24.84	66.82	16.46	16.12	0
April	28.51	28.67	19.09	42.11	30.16	26.33
Total (average)	125.7	98.23	07.1	90.7	91.1	97.9

Source: compiled by the authors from different sources

Fig. 3: Rain fall data in Alaknanda basin



2. Soil Resources:

Soil contains and texture varies from the Greater Himalaya to the mid-slope and valley regions and accordingly their potentials of growing crops are also varied. Soil of greater Himalaya consists of very steep to steep slopes, are dominantly occupied with very shallow to moderate shallow, excessively drained, sandy- skeletal and loamy skeletal, natural to slightly acidic with low outcrops. In the Lesser Himalaya, soil is encountered on steep to moderately steep slopes, is shallow to moderately shallow, excessively drained, sandy/ loamy- skeletal/loamy with moderate erosion and moderate to strong stoniness. In the side slopes or terrace slope, soil are moderately deep, excessive drained, fine loamy slightly too moderately acidic with slight to moderate erosion and stoniness. Soils in glacio- fluvial

valley consists of moderately shallow excessive drained, coarse loamy, slightly acidic eroded and Typic Dystrochrepts (Velayutham 2001).

Table 3 shows the chemical analysis of ten sample areas of the Alaknanda Basin. These sample areas are located in different elevation ranging from 660 m to 3000 m and characterized by various contains and texture of soils.

Table.3: Chemical Analysis of Sample Areas of the Alaknanda Basin

Situs structure of localities	Elevation	PH value	EC mm/hr	Organic material	Nitrogen	Lithos-stratigraphic groups
Mana glacial drift	3000	6.50	1.10	2.40	0.01	Central crystalline Group
Malari glacial drift	2760	5.40	0.11	2.50	0.30	
Jelum structural terrace	2700	7.05	0.05	2.60	0.13	
Joshimath terrace	1880	7.05	0.10	4.52	0.22	Main central Thrust
Helang	1800	6.50	0.11	5.00	0.30	
Pipalkoti terrace	1210	7.50	0.10	1.77	0.06	
Gaucher alluvial terrace	1135	8.00	0.14	10.67	0.56	Garhwal Group
Nagrasu alluvial terrace	1000	7.20	0.13	9.51	0.47	
Kaliasaur alluvial terrace	660	7.00	0.11	11.26	0.56	Pudhatoh Group

3. Water Resources:

Water is the most underutilized, at the same most abundant resource of Himalaya. It is estimated that about 11,00,000 million cubic meters water flows every year down the Himalaya offering a potentiality of generating electricity to the tune of 28,000 MW and making as much as (valdiya,1985). Per capita fresh water availability in the Himalayan Region is evaluated to range from 1757 m^3/Yr in Indus, 1473m^3/Yr in Ganges, 18417 m^3/Yr in Brahmaputra with an all India average of 2214m^3/Yr. The Alaknanda Basin is endowed with bounty of water resources accounting for about 8 percent of the total water resources in the country. Unfortunately, this vast potential has not been rationally exploited yet. Endowed with huge water resources potential, it has also the worst water resource problems rendering untold suffering to millions every year. The region experiences excessive rainfall and high flood during monsoon months and also suffers from acute shortage of drinking water in many areas due to lack of management. The Alaknanda river and its numerous tributaries; Dhauli Ganga, Vishnu Ganga, Nanadakani, Pinder, and Mandakini and sub tributaries, which are perennial and sub tributaries provide ideal sites for micro-hydropower projects. Since the area of unlimited water resources facing acute water shortage for drinking and irrigation purposes, sustainable utilization of water through construction of micro-hydropower projects will surely save the duo problems (Sati, 2008a). The basic issue underlying the water resources problems are: recurring floods, drainage congestion, soil erosion, human influence on environment and so on and calls for its integrated use for drinking, irrigation generation of hydropower, and recreation. Management of water resource in the basin is a crucial issue because of the undulating terrain and fragility of landmasses, which does not permit for construction of macro-level dams. Developmental interventions at micro-level considering drinking water, irrigation, and hydroelectricity generation in an integrated manner have yet to be properly designed and tested. Traditional management of water resources as a form of Gharats (water mills) and goals (small canals) did not involve any advance technology, while they are absolutely fit in this ecologically fragile mountain terrain (Sati 2006). Their values and efficiency is rest in low levels of

financial investments, local controls, and quick responses in taking corrective action in the event of damages.

4. Forest Resources:

Forests are most important, both economically and environmentally among the other natural resources in the Alaknanda Basin. The geographical area covered by forest is reported as 1021156 hectares, which accounts for around 42.2 percent. Ownership of the forest in the state is mainly shares between the forest department (69.1 percent) and civil and soyam (community forest 23.4 percent). Forest panchayats (6.9 percent) and private including cantonment forests manage the remaining area. The alpine, temperature and sub-temperate forests that cover most parts of the task make natural habitats of some of the best known wildlife creatures. Alpine forests in the region include Valley of Flowers National Park known for its amazing variety of flowers, Nanda Devi National Park, Govindghat national park, and Gangotri National park. The Alaknanda Basin is very rich in terms of forest, and its diversity. Right from the valley region to highly elevated Alpine meadows, locally known as Kharak or Bugyal, the diversities in plants are found extensively. In the middle altitude, pine (Chir) are found a while in the upper reaches, temperate coniferous forest mainly kharsu (Quercus Semicarpifolia) Tilong (Q. lanuginose and bang oak (Q. leucotricophora) are abundantly found (Sati 2006). Except these forest types, many other folder plants like, Bhimal and Khadik, are also grown along with edges of agricultural fields. The main forests are (I) Deodar forests (Cedrus deodar) are found between the heights of 1650 m and 2300 m in the basin, (II) Blue pine forests are also known as kali. It is found in Joshimath areas. These are found mostly mixed with Deodar Forests. The tree occurs between 1650 and 2300 m. Timber is used in making sturdy cupboards and pelmets in houses, (III) Chair Forests (Pinus Roxbunghil) are found in the entire basin. Its forests exist mostly between the altitudes of 1000 m and 1650 m. It is used for making packing cases and paneling in interior decoration. It is also used as fuel wood, (IV) Oak Forests (Quercus species) are found in the basin between the heights of 1325 m and 1625 m. It is used for fuel wood and charcoal manufacturing. It is the best firewood having high caloric value. It is a broad-leaved tree, (V) Fir (Abies Pindrew) and Spruce (Picea Smithiana) Forests are found mostly between 2300 m and 2950 m. Altitude regulates diversity in flora in the Alaknanda Basin. According to altitudinal zones, various kinds of flora with great economic value are found. Most of the forest belts in the basin is inaccessible. Consequently, their economical use is just negligible. In the high altitude, these forests help to increase in soil fertility, which is brought with rainwater and deposited in the lowlands. The entire basin is ecologically fragile. Landslides and landslips are very common, particularly during the rainy seasons. Due to heavy rains (known as cloudburst) and steep slopes, this situation is further accentuated. Forests are the main tool for conserving soil and land. To conserve the soil and land, diversity in flora is required. Diversity in flora is found in all altitudinal zones, dominated by oak, and pine forests. Forest covers about 42.2 percent of land, and it is increasing constantly. A study on land cover change shows that about 1.3 percent forest covers increased in the last three decades (Sati, 2008b). Forest is the main source of livelihood of the populace. It provides fodder, firewood, timber, non-timber products, herbs, and environmental services. Altitudinal variations in forest resources are due to changes in the climatic conditions. The region characterizes subtropical to temperate, alpine, and cold climatic zones resulted in diversity in natural vegetation gradually from valley regions to uplands. Oak, and pine forests are useful for firewood, fodder, and timber and the farming community of the region is highly depended on them for their livelihood. Pine forest found mostly in the valley regions and mid-altitude patches while Oak forests have monopoly over highlands. The impact of global change can be noticed here as pine trees invaded Oak in many areas. Animal resource implies wider and for more roles in livelihood as it is the second main occupation after farming of subsistence crops. On the other, it helps agriculture systems as plowing the field and providing manure. For centuries, organic fertilizer, as manure, is used for the production of crops that avail only from animals. Besides the production of milk plays a substantial role to run livelihood activities in the Alaknanda basin. While mostly consumed

domestically milk is seldom sold in the nearby service centers. Draught animal constitutes the composition of domestic animal Kingdom mostly uses in the field of agriculture as drought power.

CONCLUSIONS AND SUGGESTIONS:

Production, consumption, preservation, and distribution are the key processes characterizing resource dynamics. They are also used as social, environmental and economic indicators of development for a given region. Present marginal status of the region is due to lack of economic concerns in the traditional socio-cultural systems of mountain people and partly due to slow pace of industrialization because of physical constraints and preexisting low level of infrastructural facilities. Because of physical stress, isolation, environmental uncertainties, marginal cultural values of monetary profits, rationality in the resource use evolved over ages among the indigenous societies. Consumerism could not proliferate partly because technologies of value addition could advance and partly because exchanges pertained only to minimum needs for securing livelihood in the region. Preservation/conservation owes importance because of fragility of the Himalayan environment and considerable damages, whatever be the causal factors, to the Himalayan landscape in the past. Values for conservation/preservation of resources are deeply embedded in the religion, and culture of traditional societies.

REFERENCES:

Sati, Vishwambhar Prasad a&b. 2008. **Natural Resources Management and Sustainable Development in Pinder Valley, 'ayas.** Bishen Singh Mahenendrapal Singh, Dehradun, P 142**.**

Sati, Vishwambhar prasad. 2006. Water Recourse potentials and Management in the Pinder Basin. Included in Chapter 4 of 2006 Ro: enberg Water Policy forum: Preliminary Public E-Consultation. A focused e-discussion held help from July 31- August28, 2006, http://WWW.banffcentre.ca/mountainculture/mtnforum/conferences/rosenberg/week2.asp.

Sati, Vishwambhar prasad, 2004. Uttaranchal: Dilemma of Plenties and Scarcities, Published by Mittal Publications, New Delhi, WWW.Vedamsbooks.com/38930

Sati, Vishwambhar prasad, 2004. Uttaranchal: Dilemma of Plenties and Scarcities, Published by Mittal Publications, New Delhi, WWW.Vedamsbooks.com/38930

Valdiya, K.S. 1985a. Himalayan trayec/. Bi dams, seismicity, erosion and drying-up of springs in the Himalayan region. Central Himalayan Environment Association Bulletin. 1:pp. 1-24.

Sati Vishwambhar Prasad "The Alaknanda Basin (Uttarakhand Himalaya) A Study on Enhancing and Diversifying in Livelihood options an Ecologically Fragile Mountain Terrain.

Ghildiyal, B.P. (1981): Soils of the Garhwal and Kumaon Himalaya. "The Himalaya Aspect of change, Edt. Op. cit.

Joshi Varun, (1997): Effects of cloud burst in Himalaya, India, Himalaya Occasional Publication No.10. Gyanodaya Prakashan. Nainital.

Kumar G. & Agarwal N.C. (1975): Geology of the Srinagar Nandprayag area Alaknanda valley Chamoli Garhwal & Kumaun Himalaya U.P. Him. Vol. 5 WIHG Dehradun (29-59).