



## ECONOMIC ACTIVITIES AND LAND CAPABILITY CLASSIFICATION IN THE ALAKNANDA BASIN OF UTTARAKHAND

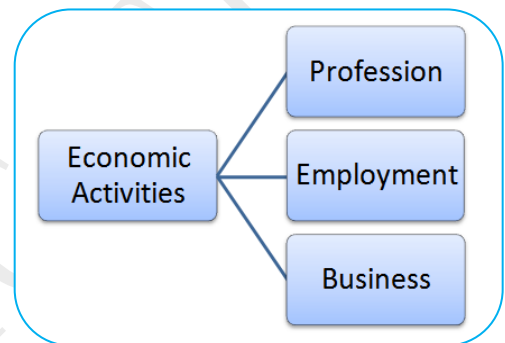
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### ABSTRACT:

The Land is the most important natural resource in the Himalayan region, supporting complex natural ecosystems and human life and civilization. In fact, all human life depends on land for its survival. Thus, the land is the most important natural resource for mankind. India is a subcontinent with a great diversity of topography, soils, vegetation, and crops. It stretches from the Himalayas in the north to Cape Comorian in the south. In Alaknanda Basin the land use, in general, and agricultural land use, in particular, have numerous limitations due to drainage pattern, nature and degree of slope, types of soil erosion, nature and degree of slope, irrigation facilities and distance from town and road head. In flat and gently sloping land the proportion of agricultural land is more than the other land uses. On the other hand, in remote and steep sloping land, forest cover has more shares to the total land as compared to agricultural uses of land. Therefore, land use pattern varies from one location to another in the Alaknanda basin. As land use pattern is the outcome of many factors, it has been considered as an important indicator for land Capability Classification based on data, maps, and other available information's the basin has been divided into six Land use Zones, viz. cultivation; Forests and open Scrubs; urban centers and other main Settlements; grasses, alpine pastures and Sparse bushes; barren land, and permanent snow.



**KEYWORDS:** Topography, Capability, Ecosystem, Drainage.

### INTRODUCTION:

Land Capability Classification system refers to a systematic arrangement of different kinds of land according to those properties that determine the ability of the land to reproduce on a virtually permanent basis. The lands under different capabilities can be classified into groups, class's subclasses

and units from higher to lower levels of generalization. There are two broad groups, namely: land suitable for cultivation, which includes class I to class IV lands, and land not suitable for cultivation but very well suited to forestry, grassland, and wildlife, this includes class V to class VI lands.

The classes show the location,

amount and general suitability of the soils for agricultural use. Information concerning general agricultural limitations in soil use is obtained at capability class level. Sub-classes are groups of capability units which have the same major conservation problems, such as e-erosion and runoff, w-excess water, s-root zone limitations, c-climatic

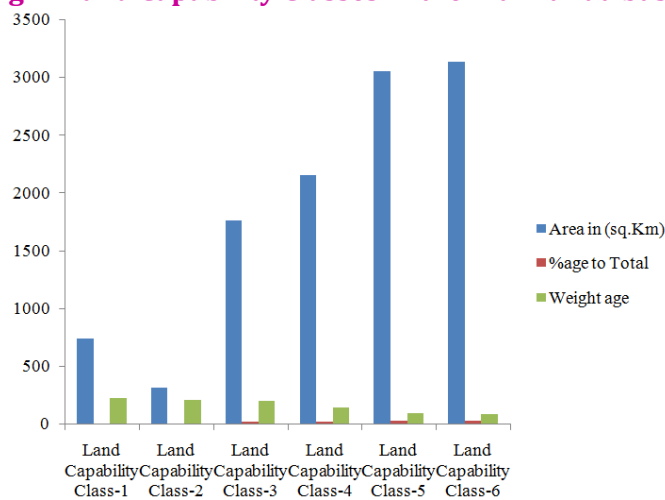
limitations.

**Table-1: Land Capability Classes in the Alaknanda basin**

Land Capability	Area in (Sq.Km)	%age to Total	Weight age
Land Capability Class-1	746.00	6.68	230
Land Capability Class-2	315.00	2.81	210
Land Capability Class-3	1765.04	15.81	200
Land Capability Class-4	2157.50	19.32	150
Land Capability Class-5	3053.00	27.34	100
Land Capability Class-6	3130.75	28.04	90
Total	11167.29	100.00	

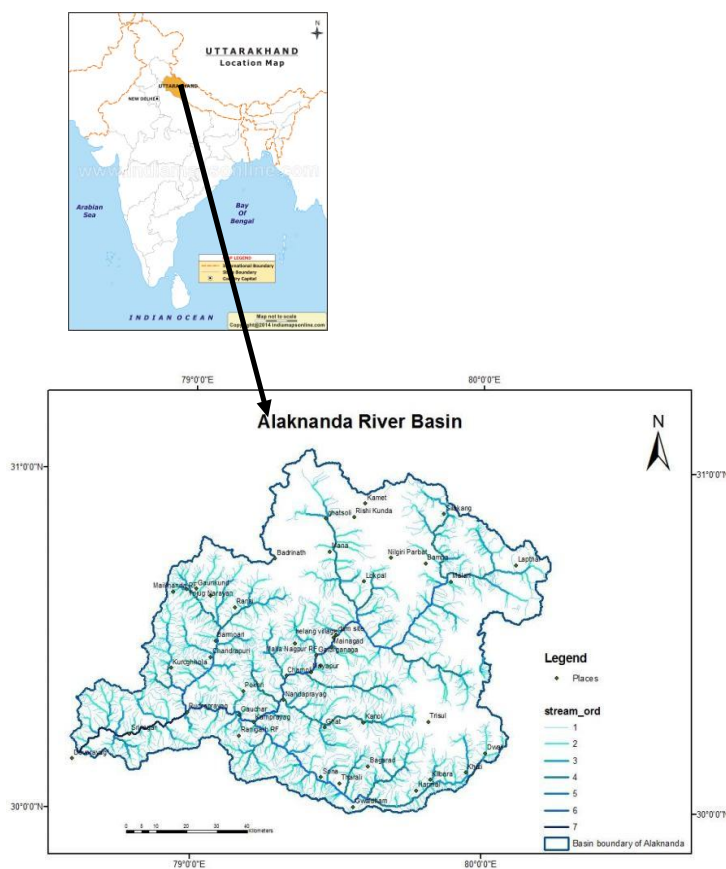
Source: Compiled by Researcher

**Fig-1: Land Capability Classes in the Alaknanda basin**



**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<sup>2</sup>, represents the eastern part of the Garhwal Himalaya. Out of the total area of the basin, 433 Km<sup>2</sup> is under glacier landscape and rest of 288 km<sup>2</sup> is under fluvial landscape. The total number of villages is approximately 2310. The land under agriculture is 644.22 km<sup>2</sup> which is 5.9 percent of the total geographical area while only 64.8 km<sup>2</sup>, (0.6%) land is under the horticultural crops.

**Fig-2: Location map of Alaknanda Basin**

## Land Capability Classes in the Alaknanda Basin:

### 1. Land capability class-1:

It is found in very few areas, and it nearly occupies seven percent area of the basin. It mainly occurs along the river valleys in the south and central parts of Alaknanda river near Maletha, kirtinagar block and central part of mandakini river between lastar gad and Rawan Ganga river in Jakholi and Augustmuni blocks, also have land capability class-I. It is also located near Gaucher, Nandprayag, Nagal gad, along the middle part of Alaknanda river in Karanprayag and Dasoli blocks and in three patches along Pinder river i.e. near Baramgad, Narayan Bagar and near Tharali blocks. Land capability class-I zone is a densely populated area of the basin where main urban and market centers are situated. Apart from agriculture as the main activity, tertiary activities are also found in this zone.

Other features are viz. low altitude, subtropical climate, developed infrastructural facilities, etc. The altitude on which land capability class-I is located is less than 900 and 1800 meters in the basin. Two types of soil are found in this class of land capability zone. The First medium textured gravity and pebbly deep and fertile soils in flat areas, and second, the soils are of medium to moderately fine texture. Runoff potential is prone to only slight erosion. This type of erosion of various slightly to moderate sheet erosion. Different types of natural vegetation is found in the classes-I category of land, which varies from dry deciduous in the south to warm temperate in Pinder, Mandakini and upper Alaknanda on whole, land capability class-I of Alaknanda basin is famous for valley and terrace cultivation as well as for larger number of urban centres as compared to other zones.

On the basis of the above mentioned characteristics, this zone has the highest aggregate of 230 points. Two types of soil are found in this class of land capability Zone. The first medium *textured* gravity and pebbly deep and fertile soils in flat areas, and second the soils are of medium to a moderately fine texture. Runoff potential is low (50-59) in all areas and therefore, the areas are prone

to only slight erosion. The type of erosion varies from slight to moderate sheet erosion. Different types of natural vegetation are found in the class-1 category of land, which varies from dry deciduous in the south to warm temperate in Pinder, Mandakini and upper Alaknanda to scrubs and grasses in upper Alaknanda. On the whole, land capability class-1 of Alaknanda basin is famous for valley and terrace cultivation as well as for the larger number of urban centers as compared to other zones. On the basis of the above mentioned characteristics, this zone has the highest aggregate of 230 points.

## 2. Land capability class-II:

Very low area of the basin falls under land capability class-II that is the 2.81 percent area of the basin shows table 1. One large patch is found near Devprayag, Diwani gad and Chamanpur gad in Kot and Pauri blocks respectively. One small zone is found along the south western border in Devprayag blocks. Another very small zone is found in south of Joshimath town in Joshimath block and it is located in lower altitude, which has subtropical to warm temperate climate as well as adequate agricultural land, and dense population is the additional features of this class. Class-II land zone is situated in lower middle valleys and in lower mountains, which have altitude of 901 and 1800 meters.

It is mainly located on gentle to moderately sloping areas in valleys and surroundings hills have 3 to 10 percent slope. But at few places, the slope is more than 10 percent. Precipitation is mainly in the form of rainfall, which is average in the southwest and average to higher near Joshimath. The area of class-II type of land has very high drainage density in the south, and low to medium in the basin. Such area can be very easily eroded because it is made up of rocks and has very less vegetative cover. Soils in this category are medium to moderately fine textured with medium depth in agricultural and forestland. Runoff potential is low with 50 to 59 index value. The rate of erosion is slight to moderate in the form of sheet and rill and occasional landslides are also noticed. Sub-tropical Sal, pine and broad-leaved trees mixed with conifers are the main natural vegetative cover of class-II land. Main land use type is in the form of terrace cultivation, forests, open scrubs, grassland and settlements. On the basis of various characteristics, this zone has the 210 points.

## 3. Land capability class-III:

Land capability class III occupies 15.81 percent area which is mainly located in Kirtinagar, Khirsu, Pauri, and Jakholi, Augustmuni, Karanprayag, Narayan Bagar and Basoli Blocks in south and central parts of the basin. In these blocks, main areas are Takoli gad, Chanderbhaga, Dhunder, Nakur and Kharda, gads; west of later gad; between Rudraprayag and Gaucher; Narayanbager, Tharali, Gwaldom in south-east; small patches in eastern Pinder (e.g. two patches in Kali Ganga basin, one at confluence of Sunderdhunga, one at confluence at Kaphini river); between river Birahi and Nandakhni, Deoligad in north of Chamoli; Large area in south of Joshimath and one small area at Dhauri Ganga near confluence with Gorpaknala gadhera. Class-III zone has warm and cool temperate climate due to which it is densely populated. Agriculture and forest cover are the main land use type of this zone. The middle valley and mountains are the main physiographic features of class-III land. Mountains are mainly located in the South-west and valleys in the north and south-eastern parts of the basin. The altitude in this class ranges between 900 metres and 2700 metres and due to which the slope is moderate to steep (15 percent to 33 percent) but at few places in the west of Luster gad, it is more than 33 percent. Drainage density varies from medium to high at places, with few exceptions where it is very high in the south west and low in south-eastern part of the basin. Soil texture is medium and can be easily eroded as it has developed under heavy forest cover. The rate of soil erosion is low precipitation is average in southern parts and high to very high in the remaining parts of the basin. Main soils are having medium to moderately fine texture and their depth is medium in agricultural and forest areas. At places, medium textured soils with gravelly and pebbly condition are found in north-western part of the basin. The rate of erosion is class-III. Land varies from slight to moderate in the form of sheet and gully. Main types of trees, which are found in this zone, are Sal, pine, upland hardwood, fir-spruce and conifers. Terrace cultivation, forests, open scrubs and barren land are the

main landuse types of class-III zone. On the basis of relative importance of such characteristics, this zone has attained 200 points.

**Figure- 3:**



#### 4. Land capability class-1V:

Land capability class-IV is mainly found in patches in south and central parts of the basin. It occupies nearly 19 percent area of the basin. The main areas lie between Maletha and Chamanpur gad (Kirtinagar block), northern Chanderbhaga river, large tract from Badiyar gad to southern border (Kirtinagar, Augustmuni and Khirsu blocks); Southern Laster gad (Jakholi block), northern mandakini Sub basin in Ukhimath block (near Madhyameheshwar, Meru and Gabnigad); north of Gaucher and east of river Mandakini (Nager-pokhri block), narrow tract from Gopeshwar in the west to Pinder basin in South-east (Dasoli, Tharali and Kapkot blocks) and small scattered areas in the north of Chamoli, around Joshimath, Khir Ganga micro-sub-basin, Bhyundar valley, Jumagad, Amit Ganga and east of Badrinath (all in Joshimath block). On the basis of its size, this land capability occupies third largest area in the basin. The climate in this class varies from warm to cool-could temperate. Density of population is average, except at few places, Where it is high e.g. Rudraprayag. Class-IV land is found between 1800 and 3600 meters in areas of upper middle valley and mountains. Mountains are mainly in the southern parts whereas; valleys along with mountains are in central northern parts of the basin. Steep to very-very steep slopes with 15 to 50 percent gradient are the main features class-IV land categories. But at few places, it is more than 50 percent. Amount of precipitation is high to medium (800-1600 metres) with a few exceptions of very high amount of precipitation. Drainage density is medium in many places with few exceptions. Texture of the rocks is very coarse to fine and due to hard rocks and dense forest cover, they are not easily eroded. Soils are of medium texture with acidic conditions in the land capability class-IV zone.

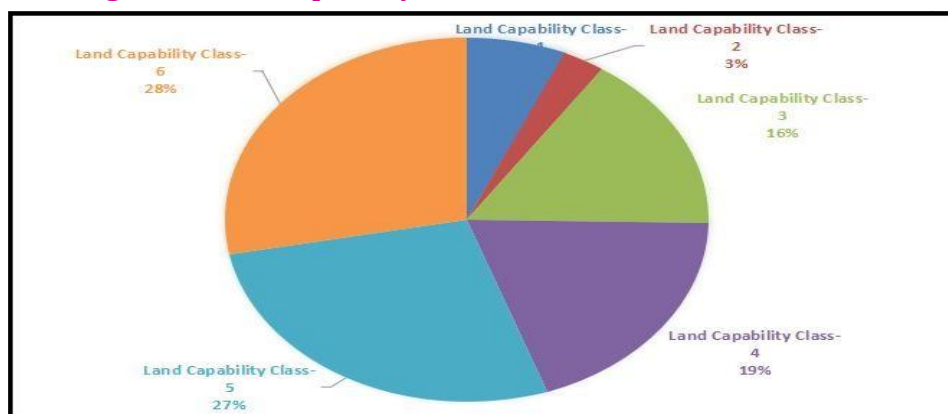
Moreover, medium to moderately fine textures arid skeletal soil are also found in this class. Runoff potential is high (70-79) and in some places, it is medium to low in the basin. The rate of soil erosion is moderate in the form of sheet and rill with occasional to moderate land and snow slides. Alpine pasture and scrubs, Warm temperate, cool temperate and mixed conifers are the main natural vegetations in this class. Further, forest and open scrub, terrace cultivation, grasses and barren land (below 3000 m) are the main landuse prevailing in class-IV land capability zone. On the basis of relative importance of such characteristics, this zone has attained 150 points.

#### 5. Land Capability Class-V:

Land capability class-V occupies nearly 27 percent area of the basin and it is located in north (Joshimath blocks), north- west (Ukhimath blocks), south-east (Kapkot block) and very less in the southern (Devprayag block) parts of the basin. In the north, large continuous tract of class-V stretches from Kedarnath to Birahi, Which is more or less parallel to the class-VI category of land. Other areas are located in narrow tract that extends from central to southern parts in the basin. Similarly, large area in the south of Gaucher, Bharder gad and Takoli gad in Southwest has class-V land capability. It is the

second largest zone, which is influenced by cool, temperate and sub alpine climate. Most of the areas of class-V land remain under snow during winter. Due to lack of agricultural land, the density of population is very low. This class of land capability is found in higher mountain and valleys, where the altitude ranges between 1800 and 4500 meters. Mountains are found in north, and south-east parts of the basin whereas, valleys are mainly located in north, central and north-eastern parts of the basin. Slope is steep to very which varies from 20 percent to 50 percent. Precipitation occurs in both the forms i.e. rainfall and snowfall and its amount vary from location to location in the basin.

**Figure-4: Land capability classification in Alaknanda Basin**



Drainage density is very low to medium due to very coarse texture of rocks. Due to hard rocks, forests and snow cover, erosion work is very difficult in very few areas. But due steep to very steep, maximum area is always under the potential risk of high erosion of this class. Medium to moderately coarse texture soils are found in the southern parts of the basin. But other types of soils are also scattered throughout the zone. Barren land is mainly found in northern parts of the basin. The runoff potential is very high in the areas where vegetation cover is low, slopes are steeper, rocky land and in the soils which have shallow depth. The type of erosion varies from moderate sheet, rill to severe sheet and land and snow sides. Alpine pasture scrubs and grasses cool and temperate forests are main natural vegetative cover on class-V land. Mainly barren land, exposed rocks, grassland (below 300 m), alpine pasture, sparse bushes and open tree are the main landuse type in this zone. Therefore, the aggregate value of this zone is 100 points.

#### **6. Land Capability Class-VI:**

Land capability class-VI is found in Higher and Zanskar Himalaya, which lie in the northern and north- eastern parts of the basin, and it occupies nearly 28 percent area of the basin. The main areas of class-VI land category are located in upper parts of river Khir Ganga, Ganga, Alaknanda, Arwa Nala, Saraswati, Kakkhusand gad and Mana in north (Joshimath block), GaneshGanga, Joti gad, Girthi Ganga, Gorpak Gadhera, Dhauli Ganga, upper Dhauli Ganga and Rishiganga in north-east (joshimath block), Kaphini river, Pinder Sunderbhunga, Nanda Devi, Trishul and other areas in South- east (Ghat Kapkot blocks). Narrow belt surrounding Kedarnath peak in north- west also come under this class. It has the largest area of the basin but is covered under permanent snow and therefore, vegetative cover is nearly absent in this area.

It is uninhabited area of the basin. Because of high altitude (4500m), the slope is more than 50 percent in many parts of this zone. The rainfall occurs due to western disturbance. The texture of the rocks is very coarse and they are very hard. Due to permanent snow cover, very slopes and barren and rocky outcrops, the soil is absent in almost all the places with little exception in valleys. The run of potential is very low (less than 60) mainly due to less rainfall and permanent snow cover. The erosion is in the form of snow slides, avalanches, and rock and landslides. Vegetative cover is almost absent in the whole area except in very few pockets where seasonal flowers and grasses grow during the summer

season. Area under permanent snow, barren and rocky lands is the main landuse type of class-IV land category. Due to very steep slopes, permanent snow cover, low soil cover and harsh climatic condition, the agriculture is not possible. Therefore, the aggregate value of this zone is the lowest i.e. 90 points.

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