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Research Paper

Analysis of Deforestation and Landslides along Hellon Nallah (river), Bhaderwah

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ABSTRACT:
Deforestation in Bhaderwah valley poses major threat to natural habitat of thousands of species living within. Destruction of forests in order to make the land available for other uses is a common practice along the river sides due to availability of fertile land as well as freshwater. Deforestation is removal of forest where the land is thereafter converted to non -forest use. Deforestation in simple terms means the felling and clearing of forest cover or tree plantation in order to accommodate agricultural, industrial or urban use. It involves permanent end of forest cover to make that land available for residential, commercial or industrial purpose. Construction of modern day infrastructure costs thousands of Deodar trees in Bhaderwah area of Doda district.
Deforestation leading to several imbalances ecologically and environmentally in study area which ultimately leads to landslides along the roads, rivers. hillslops and streams. Deforestation occur due to several reasons in Bhaderwah, but the main concern is infrastructure development projects in the valley.

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I. INTRODUCTION

Deforestation, clearance, or clearing is the removal of forest or stand of trees where the land is thereafter converted to non-forest use. Examples of deforestation include conversion of forestland to forms, ranches or urban use. The most concentrated occur in tropical rainforests, about 30% earth's surface is covered by forests.

A landslide occurs when stability conditions of the slope is disturbed either by the increase of stress imposed on the slope and / or by the decrease in strength of the earth material building up the slope and it involves enemas downward movement of earth material under the influence of gravity. It is important to determine the causes of the landslides, as this will help in formulating effective remedial measures. Determination of causative factors of landslide in any given area will also help in demarcating the landslide prone zones.

Study area:

Bhaderwah is a Town in the state of Jammu and Kashmir. The Bhaderwah Valley is Located in the foot hills of the Himalayan Mountain and 30 Km away from Doda District. The Bhaderwah is also known as "Mini Kashmir" or "Nagon ki Bhoomi" which means "Land of Snakes''. Bhaderwah is situated at a height of 5422ft A.M.S.L and is located on 75^0 .40' E longitude and 33^0.4' N latitude.

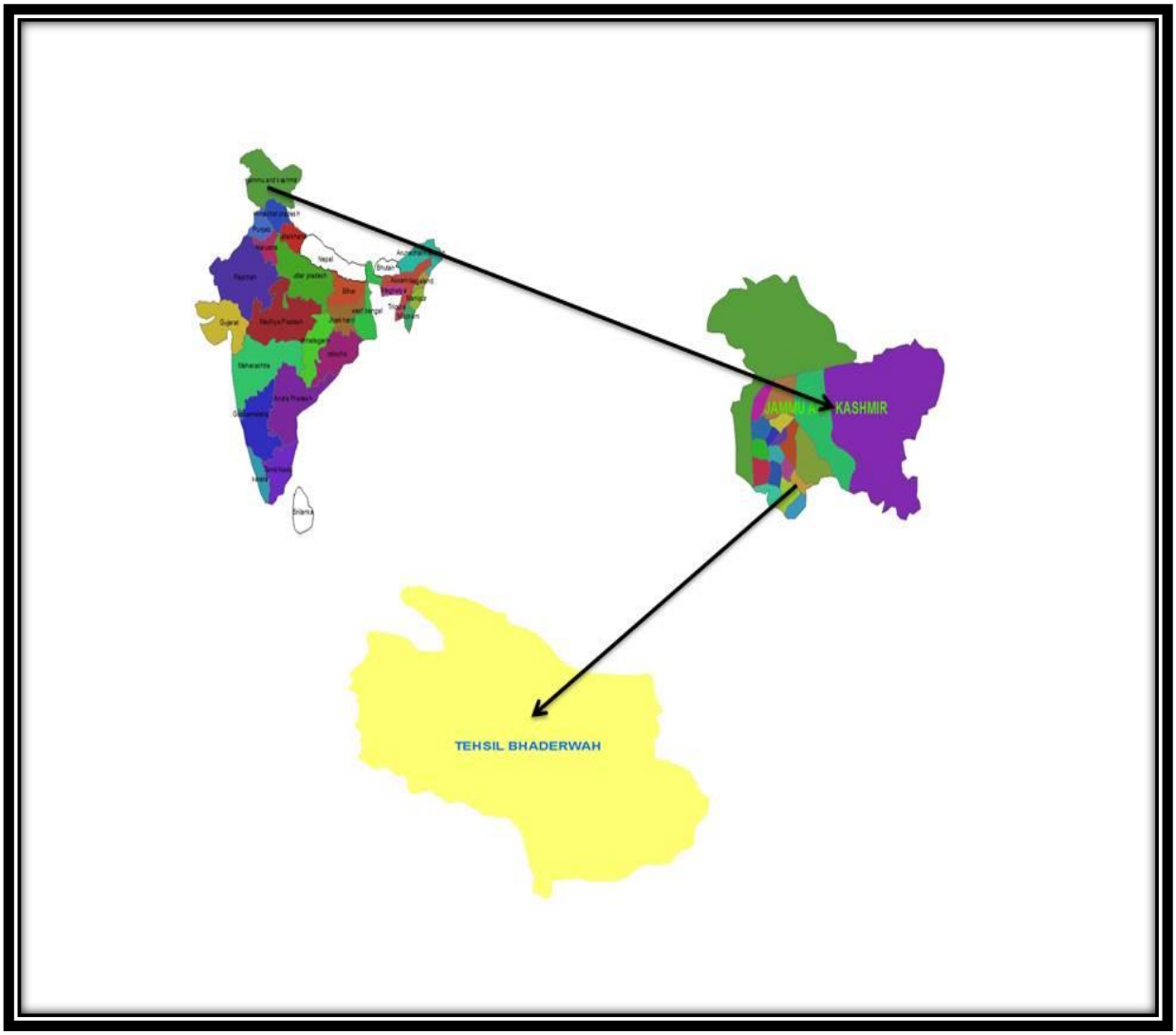
Plate No. 1 View of Bhaderwah Valley

The Bhaderwah town was also known as "Hettary Nagar" and prior to that, there were two other towns namely "Donga Nagar" and "Udhonagar" .Both the nagar was situated around village Mondha which is about 5 Km in the East of present town Bhaderwah was Flooded due to torrential floods from Himalayan range. Bhaderwah has also become *a Hub of pilgrimage activity. The people of Bhaderwah could speak 4 to 5 languages. The Bhaderwah's are intelligent people, deeply interested in Education and acquiring of skills and many of them are at key posts in the State Administration.

Plate No. 2 View of HELLON NALLAH

The Hellon Nallah is situated in the Nalthi village of Bhaderwah in district Doda of Jammu and Kashmir state. It is located 24 km towards south from district Doda. The Hellon Nallah is the tributary of Neeru River. Hellon Nallah is located on 75°43″ E longitude and 32°57″ N latitude.

MAP No. 1
LOCATIONAL MAP OF BHADERWAH



MAP No. 2
GOOGLE EARTH MAP OF NALTHI

II. Methodology

This physical survey report is based on empirical observation. The study is completely based on primary observation. Various causes and impacts of deforestation have been identified along the Hellon Nallah and analyzed through the instruments and equipments.

Different maps and photographs has been used to show the various causes and effects of deforestation in study area.To know about the deforestation and its causes and effects in the study area. In the month of May, a field visit was conducted. During the field visit we have observed various types of deforestation along the Hellon Nallah Bhaderwah.

During the field visit, slope has been analyzed through the instruments. Photography of the study area has been taken. So the present physical report is based on empirical observation. Since, the study area has least information, so other secondary published material has been also used in the compilation of this report.

III. Objectives

1. To analyze the causes of deforestation.
2. To analyze the impact of deforestation on landslides.
3. To analyze the gradient of Hellon Nallah.
4. To analyze landslides, causes and mitigation measures.

Interpetation

Deforestation occurs for multiple reasons.Trees are cut down to be used for building or sold as fuel sometimes in the form of charcoal or timber while cleared land is used as pasture for livestock and plantation. The removal of trees without sufficient reforestation has resulted in habitat damage, biodiversity loss, and aridity. It has adverse impacts on bio sequestration of atmospheric carbon dioxide. Deforestation regions typically incur significant adverse soil erosion and frequently degrade into wasteland.

Disregard of ascribed value, and deficient environmental laws are some of the factors that allow deforestation to occur on a large scale. In many countries, deforestation -both naturally occurring and human induced is an outgoing issue. Deforestation causes extinction, changes to climatic conditions, desertification,

and displacement of populations as observed by current conditions and in the past through fossil record. More than half of all plants and animals species in the world live in tropical forests.
Between 2000 and 2012 2.3 million square kilometers of forests around the world were cut down. As a result of deforestation, only 6.2 million square kilometers remain of the original 16 million square kilometers of forests that formerly covered the earth.

CAUSES OF DEFORESTATION

1. Agricultural activities
2. Logging
3. Urbanization
4. Desertification of land
5. Forest fires
6. Road construction
7. Landslides

1. Agricultural activities:

Agricultural activities are one of the major factors affecting deforestation. Due to overgrowing demand for food products, huge amount of trees fell down to grow crops and for cattle grazing.

2. Logging:

Apart from this, wood based industries like paper, match-sticks, furniture etc. also need a substantial amount of wood supply. Wood is used as a fuel both directly and indirectly, therefore trees are chopped for supplies. Fire wood and charcoal are example of wood being used as fuel. Some of these industries thrive on illegal woodcutting and felling of trees.

3. Urbanization:

Further on order to gain access to these forests, the construction of roads are under taken and here again trees are cut down to creates roads. Overpopulation too directly affects forests covers, as with the expansion of the cities hence more land is needed to establish housing and settlements, therefore forest land is reclaimed.

4. Desertification of land:

Some of the other factors that lead to deforestation are also a part of nature and part of anthropogenic like desertification of land. It occur due to land abuse making it unfit for growth of trees. Many industries in petrochemical release their wastes into rivers which results into soil erosion and make it unfit to grow plants and trees.

5 Mining:

Oil and coal mining require considerable amount of forest land. Apart from this, roads and highways have to be built to make way for trucks and other equipment. The waste that comes out from mining pollutes the environment and effect the nearby species.

EFFECTS OF DEFORESTATION

1) Climatic imbalance:

Deforestation also affects the climate in more than one ways. Trees release water vapor in the air, which is compromised on with the lake of trees. Trees also provide the required shade that keeps the soil moist. This leads to the imbalance in the atmospheric temperature further making the conditions for the ecology difficult. Flora and fauna across the world are accustomed to their habitat. This haphazard clearance of forests has forced several of these animals to shift from their native environment. Due to this several species are finding it difficult to survive or adapt to new habitats.

2) INCREASE IN GLOBAL WARMING

Trees play a major role in controlling global warming. The trees utilize the greenhouse gases, restoring the balance in the atmosphere. With constant deforestation the ratio of greenhouse gases in the atmosphere has increased, adding to our global warming woes.

3) SOIL EROSION:

Also due to shade of trees the soil remains moist. With the clearance of trees cover, the soil is directly exposed to the sun, making it dry.

4) FLOODS:

When it rains, trees absorb and store large amount of water with the help of their roots. When they are cut down, the flow of water is disrupted and leads to floods in some areas and drought in other.

5) WILDLIFE EXTINCTION :

Due to massive felling down of trees, various species of animals are lost. They lose their habitat and force to move to new location. Some of them are even pushed to extinction. Our world has lost so many species of plants and animals last couple of decades.

LANDSLIDES - CAUSES AND MITIGATION

CAUSES OF LANDSLIDES

Many of the landslides are natural phenomenon that occurs independently of any human actions. There are also landslides that have been induced by the very actions taken to make land suitable for some human purposes. Landslides can be triggered due to external causes or internal causes.

External Causes

1. Undercutting of the foot of the hill slope due to river erosion, quarrying, excavation for canals and roads, etc.

2. External loads such as buildings, reservoirs, highway traffic, stockpiles of rocks, accumulation of alluvium on slopes, etc.

3. Increase in unit weight of slope material due to increased water content.

4. Vibrations due to earthquakes, blasting, traffic, etc., causing increase in shearing stresses.

5. Anthropic changes caused by deforestation

6. Undermining caused by tunneling, collapse of underground caverns, seepage erosion, etc.

LANDSLIDE DUE TO ROAD CONSTRUCTION

Landslide due to Increase in unit weight of slope material due to increased water content .

Anthropic changes caused by deforestation

Internal Causes

1. Increase in pore water pressure.

2. Reduction in cohesive strength caused by progressive laterization.

3. Hair cracks due to alternate swelling and shrinkage from tension.

4. Presence of faults, joints, bedding planes, cleavage etc., and their orientation.

5. Freezing and thawing of rocks and soils.

6. Material properties such as compressive strength, shearing strength, etc., of earth material.

Effect of Increase in Water Content

There is clear correlation between landslide activity and storms, as the saturation of earth material increases the pore water pressure. The addition of water to clay-bearing materials decrease cohesion and the angle of internal friction as well, leading to a decrease in shear strength (resisting force) and decrease in weight (driving force).

Recurring landsides usually occurs in the years of high rainfall. Studies have shown that single short periods of heavy rainfall can trigger small landslides such as soil slips and debris flows, which affect only the near surface material. Deeper slides in unconsolidated materials will be triggered only by the cumulative effects of a series of storms. Bedrock slides appear to depend on the accumulation of precipitation over a long period of time during which precipitation consistently exceeds the average precipitation level for the region. A temporary rise in water pressure due to heavy rainfall in the material lying on the bedrock on a slope is sufficient to account for a decrease in strength, leading to debris slips and then debris flows.

Increase in Slope Gradient

Steeper the slope, greater is the chances of its failure. An increase in the steepness or gradient, of a slope leads to an increase in shear stress on the potential rupture plane and to a decrease in normal stress. Such increase in slope gradient may be due to undermining of the foot of the slope by stream erosion or by excavation. Exceptionally, the change of slope gradient may be produced by subsidence and upliftment of the

earth's surface. When the slope are designed, a factor of safety has to be computed and efforts are to be made to construct the slope in such a way as to maintain a factor of safety greater than 1.

Earthquake Vibrations

Vibration due to earthquakes not only triggers devastating landslides but also rock falls and the like. Earthquake shocks, particularly those of shorter duration, acceleration of ground motion, tilt of the slope, modifies the system of forces in a manner that driving forces get the upper hand. The vibrations generated by the vehicular traffic create oscillation of different frequency in rocks and they change the stress pattern, reducing shear strength and inducing mass movement.

Loosely deposited, fully saturated sand (void ratio larger than critical void ratio) may be compacted by seismic tremors (contracting deformation) so that the increased pore water pressure practically balances the effective stress and the soil liquefies, causing grave damages to the construction, pipelines, etc.

Excess Load on the Slope

The addition of weight on the slopes like dumping of debris or wastes and the construction of dams, reservoirs, buildings, etc., increases the intensity of the driving force and reduces the slope stability.

Changes in Vegetation Cover

Vegetation helps in retaining the soil cover firmly. Trees with strong and long roots increase the cohesive strength and effectively hold the formations in to relatively weaker foundations increasing thereby the tensile and cohesive strength. However, surface growths of bushy plants promote greater seepage, which may lead to increasing pore pressure. In the absence of vegetal cover rainfall initiates a set of process like rain slash erosion, sheet erosion and gully erosion, which ultimately results in to slope failure. The degree of effectiveness of the vegetation depends upon the condition of the soil, thickness of the overburden, slope, type of vegetation and climate.

MITIGATIVE MEASURES

Certain steps can be taken to reduce the risk or damage from the landslides:

- Demarcating landslide prone areas and accordingly plan the future development activities.

- Stabilize near-surface soil by preferably fast growing plants with sturdy root system

- Build thick retaining walls at the toe of the slope (high thin walls have been less successful)

By covering the surface completely with an impermeable material and diverting the surface runoff above the slope .

By providing surface drainage

By drilling boreholes (horizontal) to increase sub-surface drainage.

- Driving of vertical piles into the foot of a shallow slide to hold the sliding block (on thin slides and on low angle slopes).

- Use of rock bolts to stabilize rocky slopes (on thin slide blocks of very coherent rocks on low angle slopes)

Post-Landslide Measures

- Clear the debris, especially the huge rock boulders and tree trunks on the slopes .

- Stabilize the depositional area (characterized by loose soil, small rock boulders, etc.) by fast growing trees/plants.

IV. CONCLUSION

All the causes mentioned above may act in sequence or in combination to trigger a landslide. It is important to determine the causes of landslide in a given area, as this will help in understanding the mechanism of the landslide and also the factors, which are influencing the slope failure. Once the mechanism and the factors of landslide are determined, remedial measures can be identified and adopted to minimize the environmental hazards due to landslides.

SUGGESTION:

1. The best suggestion to deforestation is to curb the felling of trees, by employing a series of rules and laws to govern it. The money-churner that forest resources can be is tempting enough for deforestation to continue.
2. Clear cutting of forest must be banned. This will curb total depletion of the forest cover.
3. Cutting by planting young trees to replace thee older ones that were cut must be replaced.

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