# SURFACE WATER AND GROUND WATER ASPECT FOR ENVIRONMENT DEGRADATION

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## ABSTRACT

*Remote sensing method seem to be efficient for investigating surface water and ground water. With this method, researcher can get easily general information.*

*Specially studying surface water and ground water due to earthquake, remote sensing method brings many advantages. By Laying out satellite data and transference of data taken before and after earthquake researcher can get easily general information about features of topography, geomophology, geology in order determine for different purposes.*

## 1. INTRODUCTION

The area selected for the project work, forms a part of inner lesser and higher Himalayas and constitute a major portion of Alaknanda River basin between Helang to Karnaplayag. It is cover an area about 900 sq.km having the major tributaries like Nandakini and Barahi Ganga. The major towns are confined to the Alaknanda River bank like Karnaprayag, Nandaprayag, Chamoli, Gopeshwar, Belakuchi, Helong, Pana and Irani.

## 2. MATERIAL USED

- Aerial photograph of 1: 10,000

- IRS 1C, LISSIII of 1: 50,000 and PAN, hard copy and CCT digital data.

- Toposheets of 1:50,000 - No 53N/3 and 53N/7.

## 3. METHODOLOGY

For systematic study the following steps were taken for interpretation to finalzation of the project work.

- Laying out of Aerial photos and annotation was done with toposeets.

- Scanning of Photos under mirror Stereo Scope for Geology, Geomorphology and structural aspect.

- Laying out satellite data and transference of data with help of aerial photogrphs, delineation of structure and lineaments.

- With help of toposeet base map preparetion on 1:50,000 and visual data transference on it from aerial photos as well as satellite Images.

- Slope map, land-use map drainage map prepared from toposheet for DTM generation and mosphometeric analysis work.

- Litho Contact and lineament extraction from digital data through digital image procesing techniques.

- The prefield map taken to field for verification and ground truth data and other imformation collected for project work, like various lithology ( dip strike joints ), earthquake effect related to crack development, quantity of water flow in springs and Nalas. Water charged zones and post earthquake effect for creation of instability by water and probable dangerous zone which will be facing in coming monsoon.

- Post field work and data analysis for finalisation of out put through GIS technique.

## 4. FINAL RESULTS

Environment consists number of factors, which hold the natural condition in a dynamic equilibrium. By and large, if some factor increases or decreases. This natural state of equilibrium disturbs from various angles and with the result degradation start quickly. It is quite obvious, if degeneration starts, it is very hard to check and it multiply as time span passes.

Present study area has experienced some natural disaster like earthquake tremor. In reference to instability of terrain, the area has badly shaken, cracks have developed in consolidated and unconsolidated material, existing cracks have enlarged, and in some area rock fall has taken place. Jungle fire have roasted the rocky surfaces and made somewhat fragile. Vegetation and grass cover is also removed. So this is actual position of the area but worst part of it. Will come now. As this happened prior to monsoon period. During raining season, superficial and ground water will act outside as well as inside of the rocks present in the area. Running water and its action is famous for its worst action. What will be the speculation during monsoon and later to it. It is being discussed in the following chapter.

Water that too running inside or outside, create adverse condition in a hilly area. Surface erosion like sheet, rill and gully erosion are major work which create havoc and seen clearly. Percolated water i.e. moving in joints, fractures and weaker plane slowly remove packing and create lubrication between two blocks. Removal of packing enlarge the cavities and when base become unstable the material fall / slide down bring adjoining material also. Rock fall, mass movements are major frequent pronounced action, generally carried out by flowing water. Mass movement may broadly be grouped into:

- Rock falls or debris falls.

- Sliding and slumping.

- Debris and mud flows.

In upper (high altitude) areas rock falls or debris falls dominated over other process. In middle areas, Sliding and Slumping are more common. And, in lower areas, debris or mudflows are characteristic. Creeping is a very slow movement develop due to moderrate to steep slope. In all the cases, surface and/or under ground water act as triggering factors for these movements.

Rock falls are abrupt movements of the slope material that becomes detached from steep slopes or cliffs. Most of the movements occur by free fall or by rolling/bouncing.

Depending upon the type of slope material involved it may be called as rock fall or debris fall.

In the upper part, areas of high altitude near ridgeline and at steeper slopes are very prone to rock falls. Areas surrounding Mandal, Ghat, big block of rocks was found to fall down from the main rock mass.

Rock falls also depend on types of rock (hard/soft rock), attitude (dip aspect of rocks in relation to topographic slope), fractures/joints and rain fall. On monsoon, huge quantity of rain water go in side fracture of rock masses and thrusts the blocks of rock to get detached from the main mass and let them fall down under the action of gravity.

In middle part i.e. areas of intermediate altitude, landslide and slumping mass movements are more probable. Landslide may be translational or rotational. Translational slide is controlled by weak surfaces such as beddings, joints, Faults and shear zone where as rotational slide is controlled by sliding movement on a circular surface of failure. Areas between Bhatwari and Akhodi, active slides are found to occur in the gneissic rocks. In Kandra, the opening and widening of cracks and mass movement are observed. In middle areas mainly surface water and some trickled down under ground water act as driving agent for mass wasting.

In Lower (low altitude) part, debris flow and mudflow are very common. It refers to a rapid movement of material as a viscous mass, where inter-granular movements predominate over shear surface movements. It may be called as debris or mudflow, depending upon the nature of material whether predominantly debris or mud involved in the movement. This is a rapid movement of material, which contains a high proportion of coarse fragments, other granular, soilds, water and air. It often possesses pronounced levees and may have a sinuous ridge form on hill Slope and Fans and advances chiefly by flowing which involves uneven displacement of its components.

This is very pronounce in areas like Tagni village, school and surrounding areas where cracks developed on valley section along the length of road due to settlement of loose accumulated materials particularly on the road sides. In lower areas, both surface and under ground waters act as driving agents in saturating the material with water and cause mass wasting in the form of flows.

Effects of earthquake:

Due to earthquake in the study area widening of existing fractures and development of new cracks occurred.

In Bhatwari, wide cracks are found in schist and Quartzite rocks. From Chopta to Mohankhal, new crack is found to develop in Quartzite, which is 400m long, and 3cm wide. In and around Akhodi new crack is observed in loose cultivated land which is about 2 - 3cm wide and extended up to 1km in schists and gneisses. Below Talli, Akhodi along the Scarp face a mega fracture of 15cm with and 0.6cm observed vertical extension in gneisses is noticed. Similarly development cracks above Nandaprayag Bhatkula and in market area, 3 km ahead Mayali, Kandara school (Gair), below Kandara village Sera, Pipalkoli, Pipaldhar, Kinjani, Kuntha, Machkandi, etc. are prone zone for sliding / subsidence.

In the coming monsoon, this area will be more prone to mass movement activities viz, rock/debrisfalls, landslide and slumping and debris/mud flow in upper, middle and lower areas respectively. Huge surface run-off from monsoonal precipitation and percolated under ground water will go in side rock masses through widened fractures, cracks through newly developed fractures or accumulated unconsolidated mass or widened existing fractures. This

will act as the driving force for more mass movement in the study area in the coming monsoons.

In areas like Bhatwari where new cracks developed due to earthquake existing spring water discharge has been increased by 40 - 50%, in Ghat at same appreciable quantity after the earthquake. On personal enquiry to most of the villages of the area, have reported increased in flow of Nalas / Springs water after the earthquake. In these areas, added surface water from appreciable increase in spring discharge along with natural precipitation will probably lead to mass movement in the coming monsoons of serious concern.