SOIL EROSION SUSCEPTIBILITY ASSESSMENT USING MORPHOMETRIC PARAMETERS AND SEDIMENT YIELD IN THE RIVER AGHANASHINI, UTTARA KANNADA, KARNATAKA : AN APPROACH OF REMOTE SENSING AND GIS

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Introduction:
Of all the planet’s renewable resources, water has a unique place and it is essential for sustaining all forms of life. Watershed is an area of land that has a set of streams and rivers that drain into a single larger body of water such as a larger river, lake or ocean. A watershed becomes ideal for the management of natural resources such as land, forest, soil etc. Watershed management and development is very important in various aspects such as conservation of water, avoiding pollution of soil and land, optimum usage of water etc. The applications of RS and GIS are also used in various other fields. Applications of Remote Sensing and GIS stand out in Digital Elevation Model (DEM), stream network, Land Use and Land Cover, watersheds, recreational areas and parks, ground water data, climatic zones, soil triangles, road and transportation and many more.

The morphometric analysis of the drainage basin and the channel network play an important role in understanding the geo-hydrological behaviour of drainage basin and express the prevailing climate, geology, geomorphology, structural antecedents of the catchment. Sediment yield is the amount of eroded material that moves from a source to a downstream control point, such as a reservoir, per unit time. A quantitative assessment is needed to infer on the extent and magnitude of soil erosion problems so that sound management strategies can be developed on a regional basis with the help of field measurements. Watershed prioritization is the ranking of different sub-watersheds of a watershed according to the order in which they have to be taken for treatment for water and soil conservation measures. It is the ideal step towards watershed management and development. Here in this study the prioritization of the River Aghanashini is carried out based on morphometric analysis and sediment yield analysis.

Objectives:
Aim of the project is to understand the nature, characteristics and sediment yields of Aghanashini Watershed. In order to fulfill the aim, the following objectives are considered:

1. Demarcation of watershed boundary and extraction of drainage map and various other thematic maps.
2. Study of morphometric analysis of watershed and its influence on hydrological regime.
3. Quantification of sediment yield of sub-watersheds by Empirical method.
4. Prioritization of sub-watersheds based on morphometric analysis and sediment yield approach

Methodology:

- The toposheets under which the study area falls (48J06, 48J07, 48J10, 48J11, 48J14, 48J15) were brought from Survey Of India, Bangalore. These were scanned to obtain the softcopy.
- The geometric corrections were done to these so obtained topomaps and used in the GIS platform. From this the boundary of the watershed was demarcated and then the base map, drainage map and the micro-watershed map were extracted.
- From the DEM data of the study area various thematic maps were prepared such as the slope map, contour map, aspect map, hillshade map etc. The different thematic maps were integrated in the GIS platform and in depth analysis can be carried out easily.
- With the help of IRS LISS III satellite imagery the Land Use / Land Cover map was prepared. Based on this the vegetative cover factor was determined which is required for the quantification of sediment yields in the sub-watersheds.
- Morphometric analysis was carried out by taking into consideration the Linear, Shape and Relief morphological parameters. Based on this the geo-hydrological nature of the watershed can be analysed.
- The Sediment Yield analysis was carried out by employing an empirical model suggested by Rao and Mahabaleshwara (1990). Based on this model the sedimentation of each sub-watershed was determined.
- The prioritization of the sub-watersheds of the Aghanashini watershed was done separately based on Morphometric analysis and Sediment Yield analysis. For more accurate results the prioritizations based on both the analyses were compounded and final prioritization was carried out and the final prioritization map was prepared.

Results and Conclusions:

The morphometric analysis of the drainage basin and the channel network plays an important role in understanding the geo-hydrological behaviour of drainage basin. Remote Sensing and GIS have proved to be very efficient and accurate in the delineation of the drainage and in the quantification of the morphometric parameters. The stream ordering was carried out based on Strahler (1964) stream ordering technique and the maximum stream order obtained was seventh order stream. Based on our study and the results obtained it is evident that the Aghanashini watershed and its sub-watershed has dendritic drainage pattern. The development of the drainage pattern is not affected by the geological structures. It has permeable subsoil, low relief and is having a rich vegetation cover and very less runoff from the basin. The texture of the sub-watershed is fine to moderate.

The majority of the sub-watersheds have elongated basins with lower peak flow of longer duration. Based on Sediment Yield Index it is possible for us to understand the sedimentation occurring and also to analyze the regions with maybe under distress due to high sedimentation. Based on the prioritization it is possible to know the areas that require conservative measures to be undertaken to avoid further distress. In our study we have carried out prioritization based on morphometric analysis and also sediment yield analysis. By integrating the priority ranks from both the analysis the final prioritization of the sub-watersheds is carried out. From our study we found that five sub-watersheds from the Aghanashini watershed fall under high priority range and are in need of immediate preventive control measures whereas other three are in moderate priority range and the erosion is in manageable terms and remaining five are in low priority range and are of not of major concern. This study is very much helpful for the local administration and also in deciding the construction of erosion preventing structures.
Scope for future work:

Morphometric analysis based on Remote Sensing and GIS is a competent tool for the geo-hydrological studies. This study is very useful in the identification and planning the ground water potential zones and watershed management. This study is also of major importance in selecting the suitable sites and planning of the rain water harvesting structures. it provides a basis for the watershed management of the region and for the future planning and management of the water resources for the sustainable development of basin. The predicted amount of soil loss and its spatial distribution can provide a basis of comprehensive for watershed.

The study is expected to be very useful for the future researchers in the field of water resources, geology and geomorphology etc. If our study is implemented properly then it is very bountiful to the local people of that region who mainly are dependent on agriculture as their prime occupation, as they will have abundance of water without any problems of depletion or degradation. This study is very much helpful for the local administration and authorities in deciding the construction of erosion preventing structures as there is no previous engineering research work in our study area.