SOCIO ECONOMIC RANKING SYSYTEM FOR COASTAL AQUIFER WATERSHED PRIORITISATION USING REMOTE SENSING AND GIS; A CASE STUDY FROM ANDHRA PRADESH (INDIA)

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In INDIA rural area development is one of the prime concerns. It can be achieved through systematic and integrated natural resources monitoring and management. The best suitable physiographic unit is the drainage basin(watershed).Watershed approach for the development of rain fed areas was initiated during the seventh five year plan (1987-1992) by the Govt. of India. The technical committee constituted by the Ministry of Rural development on reviewing the implementation of various Natural Resources Management programs has recommended a set of revised operational guidelines. The short comings in the management of water resources are still prevailing leading to fragmented and unscientific practices. An attempt is made in this study to develop an ideal integrated drainage basin management model in view of the DUBLIN principles for an area confined in between 78 45 and 79 15 E Longitude and 15 10 and 15 50 N Latitudes, which predominantly relied on rain fed agriculture.

IRS (Indian Remote Sensing Satellite) 1C –LISS III (Linear Imaging Self Scanner) satellite data were used along with collateral data including Survey of India toposheets (1:50,000 scale) climatological information from Indian Meteorological Department. In addition socio economic data along with demographic inputs as recorded in census reports have also been used. The GIS software used is ARCINFO. Watershed quantitative characterization was carried out through land and water resources evaluation besides analysis of existing problems like soil erosion. The thematic layers such as land use /land cover practices, hydro geomorphology, soil, slope, geology, drainage, ground water potential zones and sub watershed delineation are generated. Hydro geomorphology was considered as a base besides other information to delineate the study area into different ground water potential zones. Morphometric analysis for all the sub-sheds of the area is carried out in terms of Linear, real and Relief aspects. The sub sheds are prioritized based upon morpohometric characteristics such as stream frequency, bifurcation ratio, form factor, circularity ratio and elongation ratio. Sub sheds with high erosion risks are assigned higher values. Seven significant parameters have been picked up for analysis and evolving a model. These include economically backward and reserved categories of population (such as concentration of schedule casts and schedule tribes), literacy, basic amenities, health facilities, education institutions and the occupational status of the people. The village boundary map is overplayed on the watershed map and all the villages are prioritized in terms of socio-economic backwardness. The different villages within the study region have been ranked in terms of their present status. Villages with lower level of development have been assigned low marks. Socio-economic ranking system and quantitative ranking system of the natural resources potential of the drainage basin were finally fused.

The logarithm of the cumulative length when plotted against the respective stream order has indicated a near straight line plot indicating a constant ratio between them. Bifurcation ratios in the present case range between 2.4 and 10. Higher values of bifurcation ratio are characteristic of higher slopes. Low drainage density is noticed in regions of low relief will least surface runoff. High drainage density is observed in impermeable and high relief regions. Stream frequency values indicated relatively moderate to high runoff condition. Form factor conveys the intermediate peak flows of medium to shorter duration. Higher erosion Intensive sub watersheds were identified and placed on top of priority list by assigning high priority numbers. The quality of ground water belongs to Na-K type (Hill-Pipe classification). Gypsum treatment is recommended for the soils since the groundwater of this category results in a low permeability.

Based on the quantitative study of the various thematic maps for different sub watersheds, action planning has been evolved for soil moisture conservation, treatment plants for agricultural and non-agricultural lands. Appropriate vegetative species are identified as per the soil characteristics to adopt as top feed plant varieties. Based on the derivative information, such as land suitability, land irrigability and land capability classes, obtained from Soil map characteristics crop varieties are suggested accordingly. The recharge and discharge areas have been identified based on which structures (Rock fill dams, check dams, percolation tanks, gabion structures etc.) in the recharge zones for infiltrating water have been proposed.

For each of the sub sheds, the socio-economic data have been fused with the above quantitative data. This has enabled to list the areas in order of the priority. In lieu of social justice and for drought relief measures the methodology and the model developed in the present work would be of use for drought analysis and for its replication in other watersheds.

Key Words: Watershed Management, Sustainable Development, Social Justice, Integration