

Integrating Multi-Criteria Techniques with GIS for Site Suitability Analysis of Water Conservation Structures

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Abstract: - Water scarcity has been widely called the top global issue of concern in the coming century in developed and developing countries alike (Kundzewicz 1997; Rosegrant and Meinzen-Dick 1997; Rosegrant 1997). By 2025, it is estimated that between 46 and 52 countries, with an aggregate population of about 3 billion people, will suffer from water scarcity. Coping with water scarcity is compounded by soil degradation, groundwater depletion, water pollution, and the high costs of developing new water supplies or transferring water from water rich to water poor areas (Rosegrant 1997). Through watershed development we can recognize both the opportunities and limitations of water conservation through vegetative and structural measures. Expanding human populations and their increasing demands for natural resources have led to exploitation and degradation of land and water resources. Revenga et al. (1998), in an assessment of 145 watersheds globally, emphasized that expanding human demands for resources have intensified watershed degradation, with the result that some of the watersheds with the greatest biological production are becoming the most seriously degraded. Development projects and programs by all types of organizations (national governments, multinational and bilateral agencies, nongovernmental organizations (NGOs). Current and expanding scarcities of land and water resources, and the human response to these scarcities, threaten sustainable development and represent paramount environmental issues for the 21st century (Rosegrant 1997; Rosegrant and Meinzen- Dick 1996).

India is one of the countries, which is facing severe water scarcity. This is the important problem on which both the governmental and non-governmental organizations working hard to overcome this mighty problem. The national water policy (1987) provides for

various water uses with priority being accorded to drinking water. Against backdrop of water scarcity faced by some of the states in the country, water use for drinking, being the basic need for survival has to be accorded highest priority.

The Integrated Mission for Sustainable Development (IMSD) gives technical guidelines for site selection of water harvesting structures. These guidelines prepared by National Remote Sensing Agency (NRSA), India and by the guidelines given Indian National Committee on Hydrology (INCOH). The guidelines for the selection of various water conservation structures are discussed in this paper.

The study area known as Watershed No.-BM-63 shown in the Fig. 1, which is one of the sub-watersheds of Ujjani Dam Catchment, constructed on Bhima River. The Watershed No.-BM-63 is fan shaped with the border portion lying in the North and narrower portion tapering towards the South. The water divide is located along the ridge of the high mountains, which can be easily demarcated. The total area drained by the Watershed No.-BM-63 is 169.73 Sq.Km. Ujjani Dam is constructed on Bhima River and Watershed No.-BM-63 is at backwater side of the of the dam reservoir. Study area covers ten villages and two taluks (Tehsils).

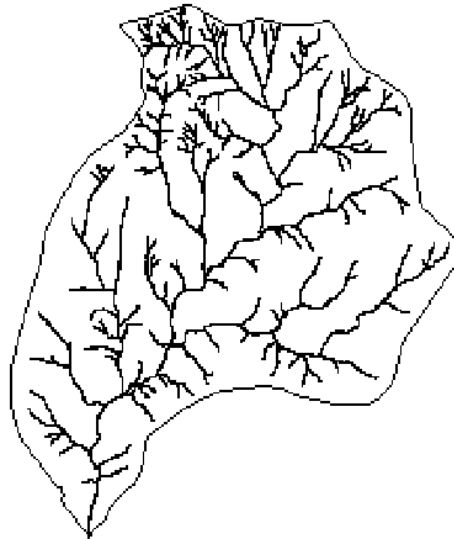


Fig. 1. Fan Shaped Watershed No. BM-63 with Drainage Pattern

In the present study, three types of structures namely check dam, farm pond and percolation tank (Nala bunds) are taken into consideration. To carry out this study, various thematic layers have been generated namely drainage map, slope map, runoff potential map and buffer map of village and agriculture using Arc GIS software and multi criteria analysis was done in ILWIS software. Using the guidelines given by various references, a decision rule was applied for identification of suitable sites for various water conservation structures. Output results show the location map of these structures on the drainage map.

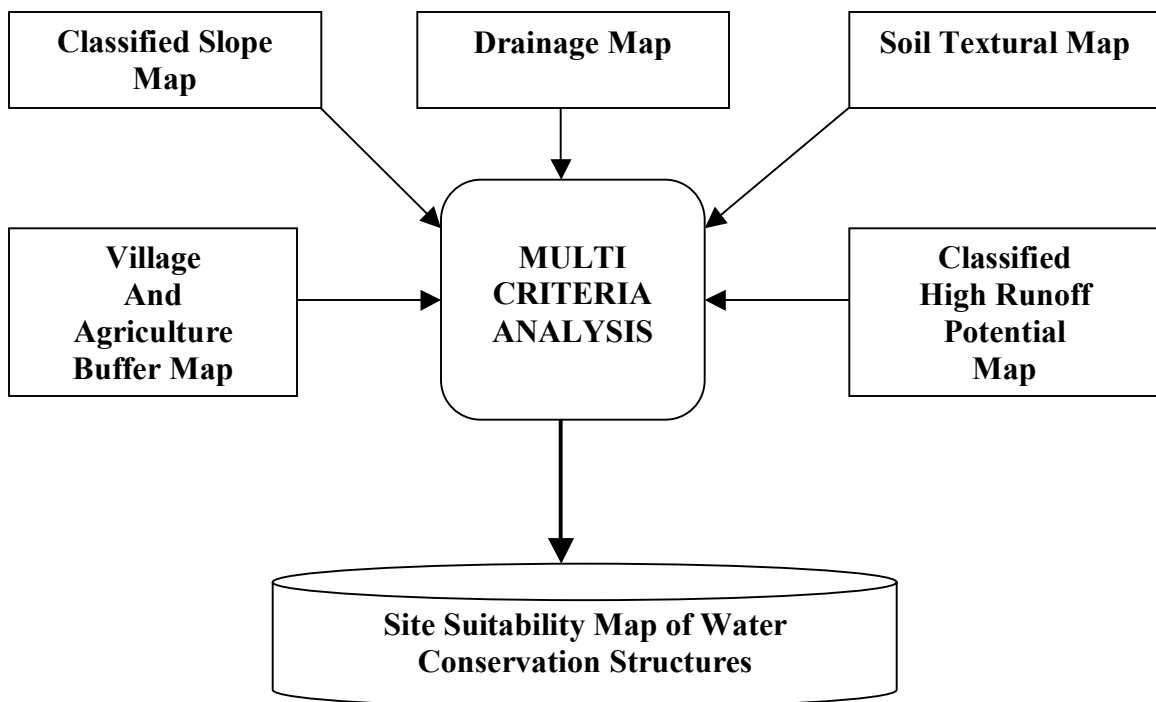


Fig.2. Methodology for site suitability of water conservation structures.

Keywords: - Multi-criteria, G.I.S.

Reference: -

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