

Chapter 11

Site–Suitability Analysis for the Identification of Potential Sites to Construct Rain Water Harvesting Systems

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ABSTRACT

Remote Sensing and Geographic Information Systems are a boon to the modern scientific domain as it provides a strong base for understanding the Earth's behavior in so many ways and help us to understand its response to certain conditions. With the exploitation of these two modules important spatial decisions can be made at ease with quite a satisfactory accuracy level. With the context of global warming water scarcity is being identified as sector demanding strategical implementation of plans for sustainable development. To ensure water supply water conservation is required. Runoff harvesting could be an option to that if the area under plan experience substantial runoff in a year. Lower Kasai Keleghai interfluve situated in West Bengal falls under monsoonal climatic regime. GIS based site-suitability analysis was adopted here based on LULC and Curve Number to identify potential zones for runoff harvesting. The result shows that 18.71% of the interfluve is suitable for providing a base for runoff harvesting.

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INTRODUCTION

India being a country of climatic variability has a versatile rainfall regimes ranging from highly precipitated to arid (Auffhammer, Ramanathan, & Vincent, 2012). Moreover, across most of the parts of the country precipitation is concentrated over the monsoon months of the year only (Loo, Billa, & Singh, 2015), though if planned properly the amount of water received in a year of normal monsoon precipitation could be sufficient to sustain the regional demand of water to a certain level. However, suitable conservation system is required to store the water of rainy season to meet the demand for the rest of the year. Runoff or groundwater restoration techniques are implemented to serve this purpose. However, the conservation Environmental statistics indicating repetitive flood in Indian subcontinent ensures a possibility of rainfall/runoff harvesting to support water conservation system in some regions in India (Şen, Al Alsheikh, Al-Turbak, Al-Bassam, & Al-Dakheel, 2013). Rainfall or runoff harvesting has now been treated as one of the most dominant methods of water resource conservation that doesn't only control flood, but also controls soil erosion and accelerates the rate of groundwater recharge (Kadam, Kale, Pande, Pawar, & Sankhua, 2012). Runoff is the most dominant parameter capable of predicting potential sites for rainwater harvesting. Runoff potential zone delineation and targeting them to arrest the water in a storing reservoir or any other structure therefore is an excellent solution to the water scarcity (Traboulsi & Traboulsi, 2015). However, identification of the runoff potential of a region considering its geological set-up is a spatial task and needs a thorough analysis of the spatial conditions of various factors in temporal dimensions (Kadam, et al., 2012). Dependence of runoff primarily on soil, landuse landcover, slope, etc. makes the investigation even more complex (Kizza, Rodhe, Xu, & Ntale, 2011; Whigham & Crapper, 2001; Wissinger, Shankar, & Restrepo, 2014). A combined methodological framework of Remote Sensing and GIS could provide a very convincing tool to deal with this problem and has been proved very effective in Spatial Decision Support System of many societies (Ramakrishnan, Bandyopadhyay, & Kusuma, 2009; Rolland & Rangarajan, 2013). Remote Sensing can identify environmental parameters at different spatio temporal scale, while GIS has a proven functionality to analyse the parameters as information to deduce various solutions to a number of problems. A framework based on a combined interplay of RS/GIS helps assess a number of factors responsible from runoff variations.

Runoff predictions are usually executed using runoff models, which in terms of spatial domain can be classed as lumped, distributed and semi-distributed models (Carpenter & Georgakakos, 2006). Among these three models, lumped model is based on an assumption that representation of hydrologic parameters of sub watershed within a watershed can be efficiently done using weighted average method (Seiller,

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