

Development of Sensitive Area in A Selected Watershed of Vadodara District

Ravi K Rathod

PG Student

*Department of Civil Engineering
Shantilal Shah Engineering College , Bhavnagar*

Prof. N. D. Acharya

Assistant Professor

*Department of Civil Engineering
Shantilal Shah Engineering College , Bhavnagar*

Dr. G. I. Joshi

Assistant Professor

*Department of Civil Engineering
M. S. University of Baroda, Vadodara*

Abstract

The aim of the project is to develop an action plan for watershed development. Watershed development is the process of creating and implementing plans, programs, and projects to sustain and increase watershed functions that affect the plants, animal and human communities inside watershed boundary. The recent technologies like remote sensing and GIS support us to giving a quicker and cost effective analysis of various applications with accuracy for planning. The present study is an attempt to develop watershed by using remote sensing and GIS in rural area of Vadodara district land. Study area selected by using Grouping analysis in Arc GIS. Agricultural data taken and understood the crop pattern and conclude the benefits from changing crop pattern and generate watershed and suggest the check dam.

Keywords: ArcGIS, Global Mapper

I. INTRODUCTION

Water systems are life supporting, and a healthy water system is essential for a robust economy and a good quality of life. History has demonstrated that almost every action we take on the land shows up in the water systems, for better or for worse. This thesis is written from the perspective of local watershed; it describes the need for the same.

One of the driving forces for water management planning is development pressure. Therefore it is important to develop water management plans so future development can be allowed without significant harm to the environment. In assessing ecosystem system response to expansion of living habitation, the most logical planning boundary is the watershed.

A watershed is defined as the land area drained by a river and its tributaries. It is used to define the surface water drainage boundary. The concept of watershed originates from surface hydrology where a river is assumed to be affected primarily by its surface drainage area. In fact, both surface and subsurface hydrology define a river and the importance of subsurface hydrology should not be overlooked. For instance, river base flow is supplied primarily by ground water. However, it is generally assumed that the subsurface watershed be similar to the surface watershed.

II. STUDY AREA

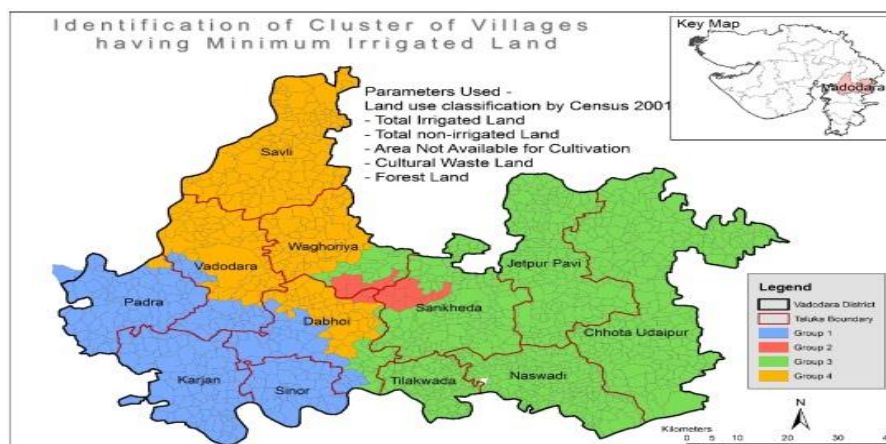


Fig. 1:

Study area selected by the group analysis and cluster villages of Vadodara district which have minimum irrigated land and other sources also minimum. Group 2 selected from below figure which have 22 villages and 3 talukas

III.METHODOLOGY

Table – 1

Stage	Task	Sub-tasks
1	Preparation of dissertation proposal	The proposal would contain details of the project, relevance of the study, aims, objectives, scope and methodology for the research.
2	Literature Review	The literature review would contain study of concept of Geographic Information System, Grouping Analysis and Watershed Analysis. It will also detail the role of watershed development in rural areas.
3	Data Collection	The Digital Elevation Model (DEM) for the watershed analysis, various documents pertaining to the existing watershed development in the selected villages, census data including statistical information and maps for GIS database preparation and analysis.
4	Grouping Analysis	The analysis would lead to multiple groups based on set geographical parameters. These groups have specific features. Based on the criteria which indicate the need for watershed would lead to selection of a specific group for which further analysis will be executed.
5	Analysis	Selection of cluster of villages Status of un-irrigated land cover in the selected villages Status of dependence of various sources for irrigated land. Possible gains due to availability of water. Attaining the watershed using DEM Understanding the role of watershed in improving the availability of total irrigated land
6	Suggestion	Suggesting the probable stop dams for the storage of water.

IV. ANALYSIS

A. Selection of Villages Which Have Minimum Irrigated Land:

As discussed in the previous section of study area, by group analysis selected group 2 which have minimum irrigated land and which covers 157 sq.km and three talukas with 21 villages.

B. Agriculture Status:

The selected villages are dispersed in three talukas with 21 in number and total area of 157 sq. km. The total agriculture land in the selected villages is 132.1 sq. km. out of which only 16.2 sq. km. (12.2%) is irrigated. The major source of irrigation are – Government canal (which irrigates 8% of total irrigated land), Well (covers 41% of irrigated land), tube well (43% of irrigated land) and river (7% of of irrigated land). Table 3 and figure 5 highlights the area and %age of land covered by various sources.

Table -2
Sources of Irrigation

Source of Irrigation	Area (Ha)	%age
Government Canal	131.0	8%
Well	666.0	41%
Tube-well	702.2	43%
River	120.0	7%
Total Irrigated Land	1,619.2	100%

Table – 3
Net Profit per Hectare

Crop	%age Share	Net Profit (Rs /ha)	Net Profit Share (Rs /ha)
Cotton	44%	26,750	11,698
Jowar	13%	29,288	3,674
Paddy	3%	185,961	5,853
Tuwer	31%	155,917	47,805
			69,030

C. Watershed Analysis:

It has now been established that there is no dearth of water in the site but lack of management which can hold and use the resources in the better way. This section will map out the watershed for the site.

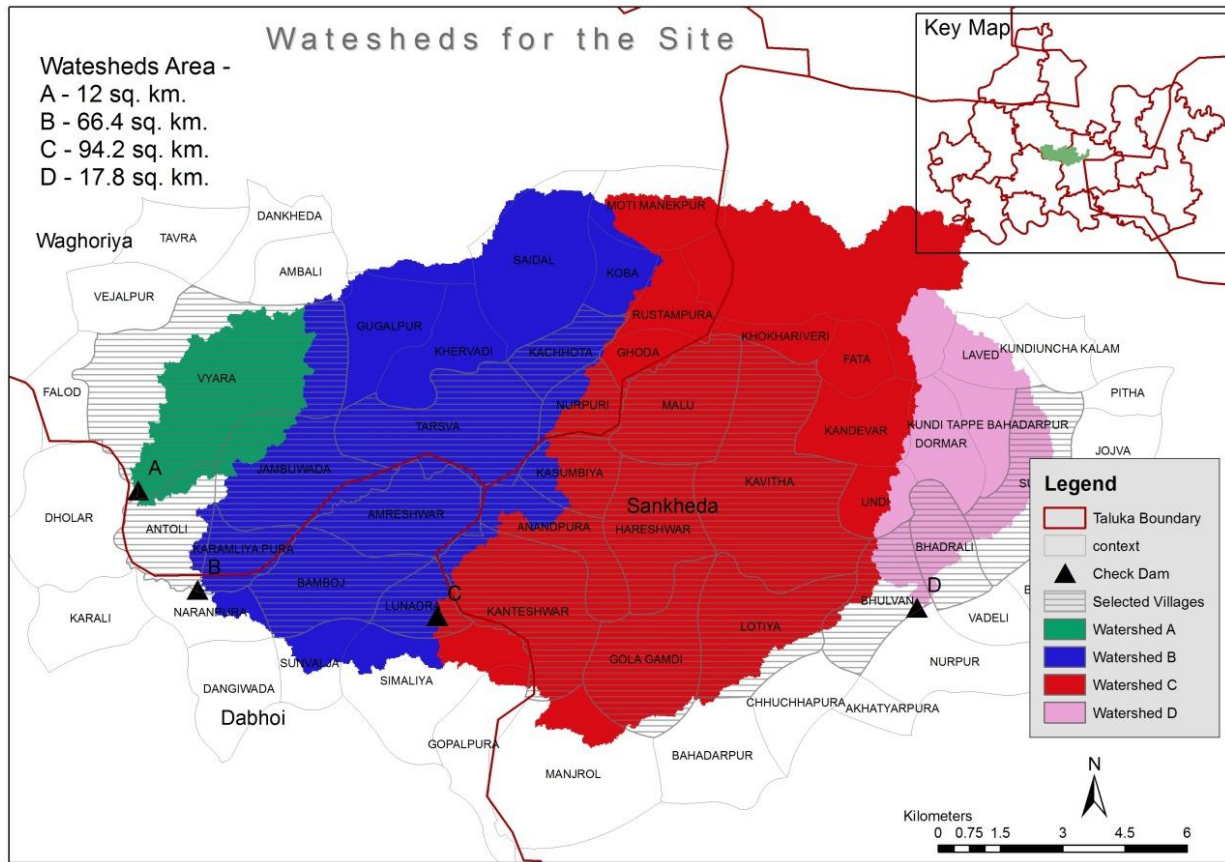


Fig. 2: Watershed Map for the Site

The above figures delineates the probable watersheds for the site. The check dam can be located at point A, B, C and D. Watershed A which shown in fig. by green mark and it's cover 12 sq. km, watershed B with blue which have 66.4 sq. km, watershed C and D have Red and pink with 94.2 sq. km and 17.8 sq. km area. This watershed will increase the total irrigated land in the site. Although, it cannot be estimated that how much the land may convert. If it is to be assumed that 80% of the un-irrigated land is converted into irrigated land, then the net profit per hectare on the site will increase. Currently it is rs. 69 thousand per hectare. The availability of irrigation facility will increase the production to more than double. Hence, the new estimated profit per hectare of profit can be rs. 1 lakh per hectare which is 31 thousand more than the original profit. Hence, watershed can improve the conditions of the farmer considerably.

Table -4
Estimated Net Profit per Hectare after Watershed Development

	Current Production (MT/ha)	Estimated Production after watershed (MT/ha)	Net Profit (Rs./ha)	Net Profit Share (Rs./ha)
Cotton	0.7	2.5	95,536	41,777
Jowar	1	1	29,288	3,674
Paddy	1.9	2.6	254,473	8,009
Tuwer	1.1	1.1	155,917	47,805
				101,266

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