

Surface Water Proximity Analysis for Villages of Pithampur Planning Area Using Geospatial Technology

Shyam Avtar Agarwal¹, Jyoti Sarup², D.C. Gupta³, Vivek Katare¹

1: MP Council of Science and Technology, Bhopal

2: Maulana Azad National Institute of Technology, Bhopal

3: Barkatullah University, Bhopal

ABSTRACT

Surface water is the easiest way of getting water to human being for fulfilling the daily need of lifestyle. In planning concern it can play a major role considering the availability and conservation of such surface waterbodies. The study carried out in Pithampur Planning area is mainly highlighted the proximity of surface water to villages of planning area. All waterbody included small ponds, lakes, reservoir and river streams are delineated in and around 10 km of planning area boundary. The village boundaries are extracted from cadastral obtained from commissioner landrecord of Madhya Pradesh. Proximity analysis reveals that 37 villages having waterbody within their boundary, 19 villages are under the availability of 0-1 km distance of waterbody, 13 villages are 1-2 km far from waterbody, 4 villages are 2-3 km far from waterbody and only one village Tarapur doesn't have any waterbody within 3 km surrounding.

INTRODUCTION

The world's water exists naturally in different forms and locations: in the air, on the surface, below the ground, and in the oceans. The water on the Earth's surface as surface water occurs as streams, lakes, ponds, reservoirs and wetlands, as well as bays and oceans. Surface water also includes the solid forms of water snow and ice (Thomas C. Winter, 1998). Improved fundamental understanding of the quantity, quality, distribution, and use of water resources is necessary to increase the reliability and utility of water-resource assessment and management tools (GSA, 2012). A surface water resource includes mainly river, lakes, ponds and tanks present on earth surface. These resources are one of the major sources of fresh water available to population for drinking purpose and other activities. Urban planning requires information about villages having proximity to water resource; the number of villages having surface waterbodies and the villages

which are at a far distant from waterbody. Planning needs information about feasibility of land with available water resources. Geospatial technology with its tools can help up to an extent in this regard. Satellite data interpretation integrated with GIS software can reveal various parameter and statistics essential for the analysis.

Study area

The study area is positioned in Indore and Dhar districts of Madhya Pradesh and covers an area of 367 Sq km. It lies between 22° 34' 4" N to 22 ° 42' 32" N latitudes and from 75° 29' 34" E to 75 ° 49' 9" E longitudes. Pithampur planning area is declared by Town and country planning department under section 13 and subsection (1) of Town & Country Planning Act 1973, MP. Govt on 10.06.1985. Study area comprises of total 74 villages which are a part of four tehsils, one of Dhar district and 3 Tehsils belongs to Indore

district. Location map of the study area is shown in figure no. 1 and spatial distribution of villages in planning area is shown in figure no 2.

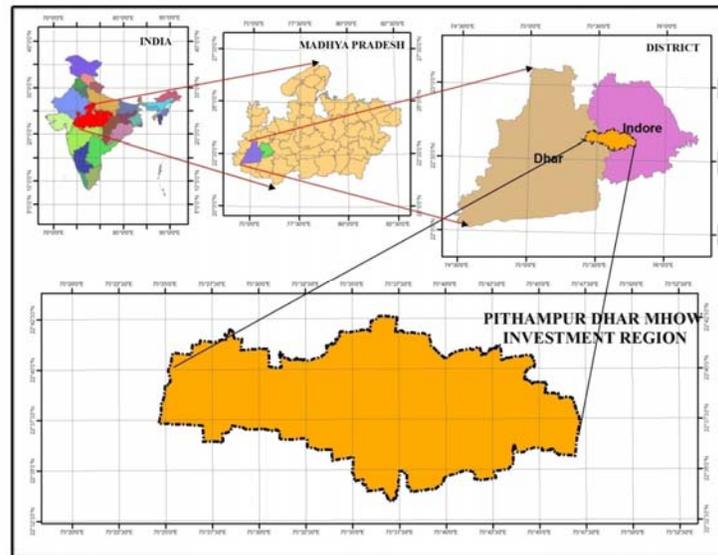


Figure 1 Location Map of The Study Area

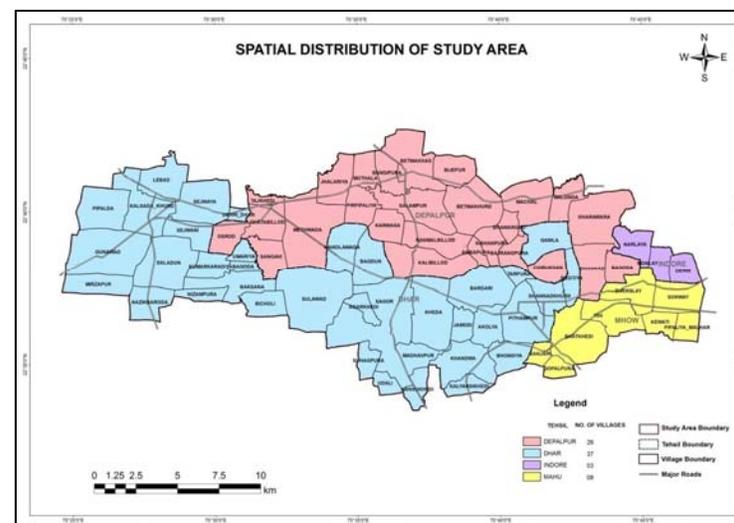


Figure 2 Spatial Distribution of Study Area

Material and Methodology

A very short methodology is adopted to analyze proximity between surface water bodies and administrative boundaries. Here village boundaries are considered as administrative unit. Satellite image of Cartosat satellite is used to interpret the landuse/landcover within the 10 km of study area. The buffer

of study area is taken because waterbody may be present outside the study area which influences the nearest village. After that all surface waterbodies are extracted from landuse, these waterbody includes all rivers, drainages, lakes, ponds and other reservoirs. Administrative boundaries of the villages are produces using cadastral maps of the land record department, it gives an accurate and authenticity to the administrative boundaries. The both layers, waterbodies and village boundaries are used for proximity analysis and it reveals the fact that how much villages are within the range of availability of water. Brief methodology is given in Figure.

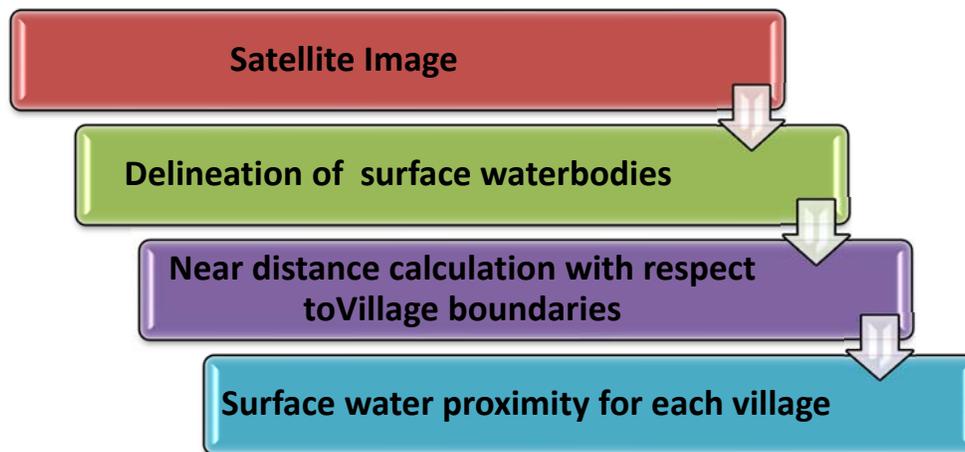


Figure . Brief Methodology

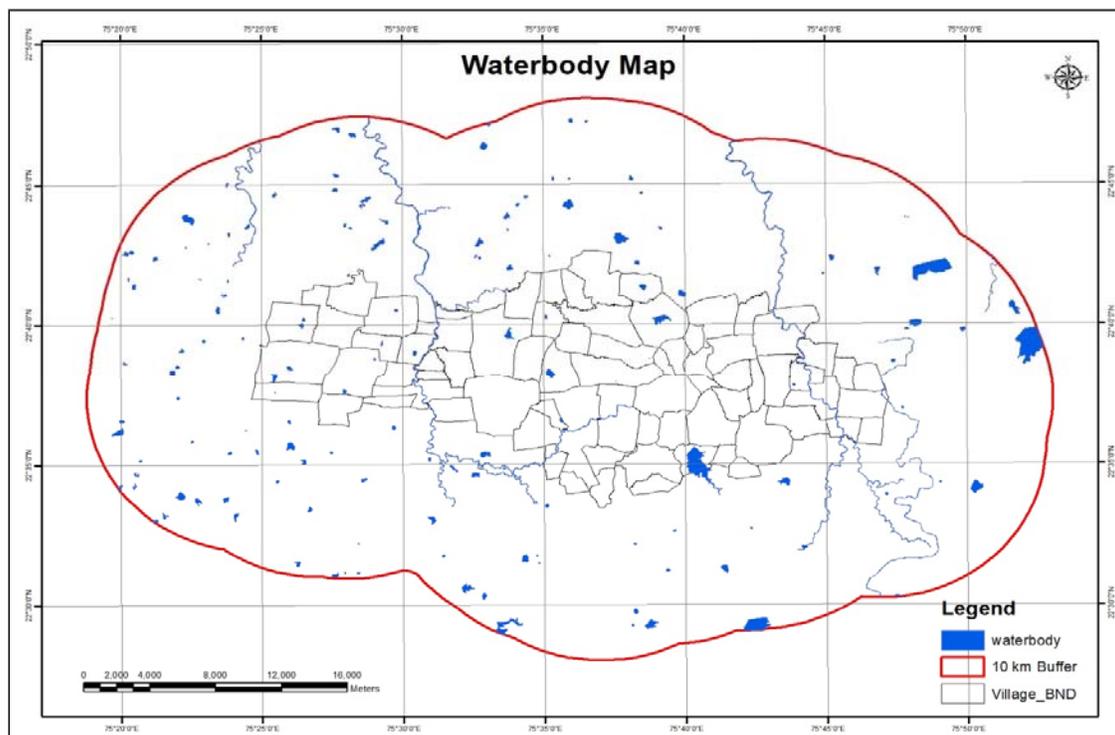


Figure 3 Location of Surface water Body in and Around Study Area

Result & Discussion

There are total 74 villages present in planning area and total number of water body within study area and 10 km around the study area found are 160 in numbers, these waterbody includes lakes, ponds and rivers which may be perennial to seasonal. Location of surface waterbodies and villages is shown in figure no. After doing analysis of surface waterbody proximity with village boundary, it is found that total 37 (50%) village are having waterbody within the village boundary, 19(26%) villages are within a range of 0-1 km from any type of waterbody, 13(18%) villages having waterbody within a distance range of 1-2 km, 04 village having a range of 2-3 km and only one village Tarpura is within a range of more than 3 km. Distance criteria of village are shown in table no.... this analysis will helps in planning in context to water availability in particular village. If a village having good water availability then that village is more suitable for development as it can fulfil the water requirement to the population residing in the area.

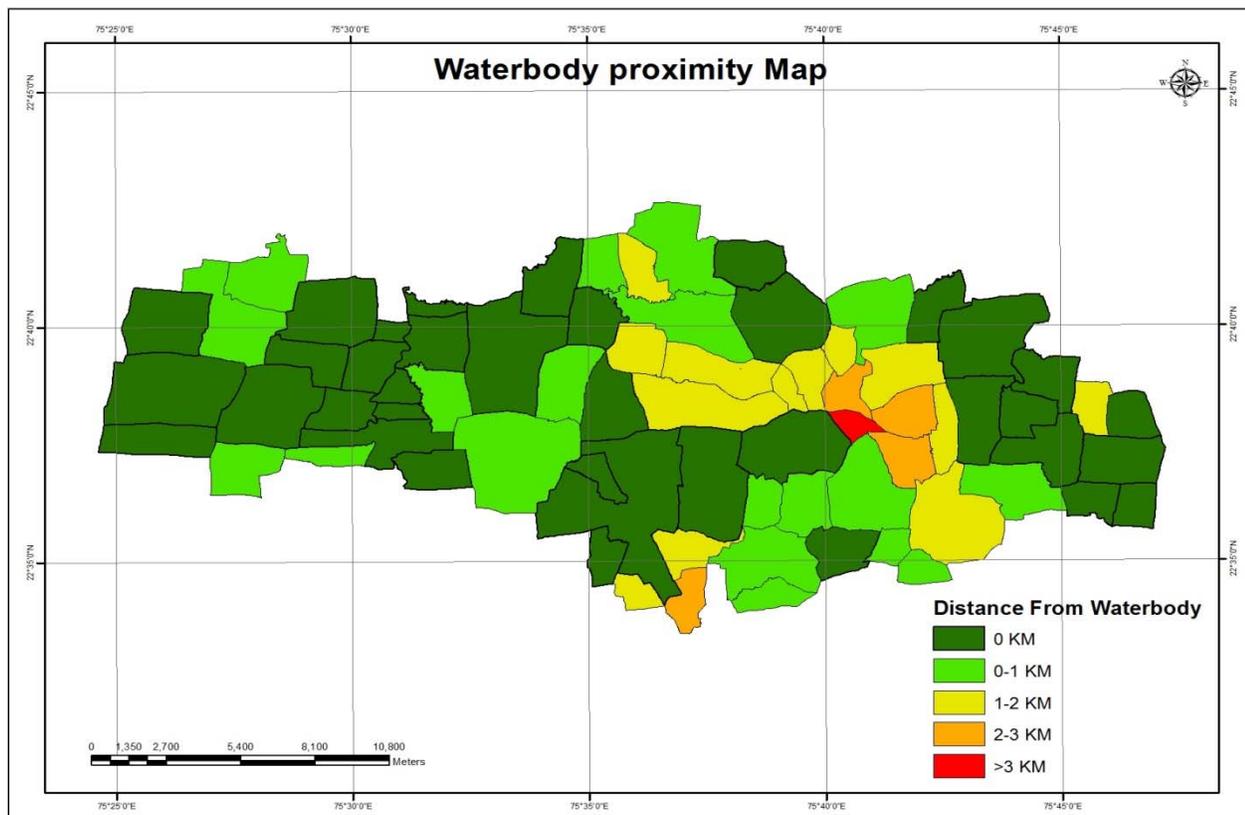


Figure 4 Water Proximity Map

Table no. Surface water proximity to villages

Sr. No.	Distance in KM	Number of village
1	0 KM	37
2	0-1 KM	19
3	1-2 KM	13
4	2-3 KM	4
5	>3 KM	1
	Grand Total	74

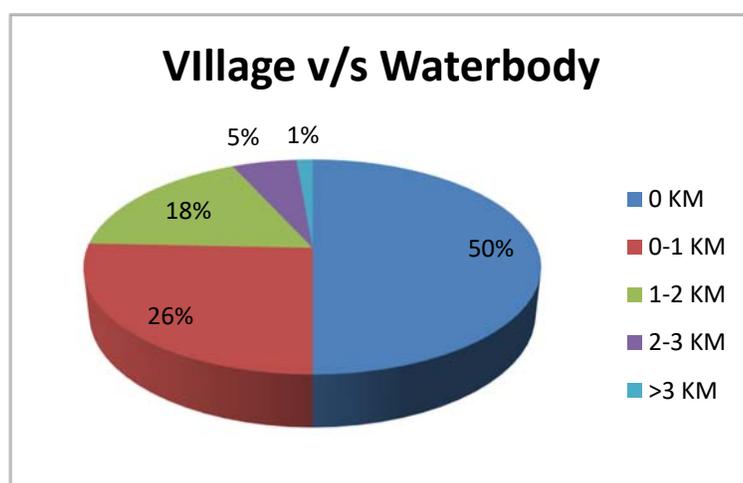


Figure 5 Graph showing percentage of villages with different proximity class

Conclusion

The research concluding at finding villages with availability of surface water resource which plays a major role in planning process. Remote sensing and GIS tools can help in identification and delineation of surface water bodies using high resolution satellite data. Availability of surface water is useful in setup of new urban development in the form of residential, commercial, industrial and recreational activities. Surface water in the form of dams, ponds, lakes and reservoir can fulfil the drinking water and other water requirements of human beings.

Surface water proximity analysis is very much important before any planning and it helps in success of planning.

References:

- Chandra, S., Planning for integrated water resources development project with special reference to conjunctive use of surface and groundwater resources, Central Groundwater Board, New Delhi, 1987.
- GSA, 2012, Water Resources, GSA Position Statement Adopted September 2008; revised April 2012.
- Integrated water resources development – A plan for action, Report of The National Commission for



Integrated Water Resources Development, Ministry of Water Resources, New Delhi, 1999.

National Water Policy, Ministry of Water Resources, New Delhi, 2002.

Seth, S. M., Integrated water resources management – role of research and development in hydrology. Proceedings of the International Conference on Integrated Water Resources Management for Sustainable Development, New Delhi, Organized by National Institute of Hydrology, Roorkee, 2000.

Thomas C. Winter, Judson W. Harvey, O. Lehn Franke and William M. Alley, 1998, Ground Water and Surface Water A Single Resource, U.S. Geological Survey.