GEO-INFORMATICS AIDED CHANGE DETECTION STUDY OF TRADITIONAL SURFACE WATER BODIES IN MAHENDERGARH DISTRICT, HARYANA

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ABSTRACT

Water is necessary for survival of living being on the planet earth. From ancient times habitations have been settled near a water source. Traditional surface water bodies mainly ponds in villages have tremendous utilities in terms of rainwater harvesting, groundwater recharge, biodiversity, ecological balance, drought and flood proofing, recreational and other day to day need of villagers. The present study has been carried out in Mahendergarh district of Haryana with an objective to know the changes in traditional surface water bodies mainly village pond. Survey of India toposheets and IRS P6 LISS-III satellite data of 2010 (pre-monsoon and post-monsoon) have been used to know the changes. On the toposheets of the year 1966-1973, there were total 577 traditional surface water bodies which includes 545 ephemeral and 31 perennial which covered 398.55 hect, 22.29 hect area i.e. 420.84 hect ane one perennial wetland covered 22.60 Hect. area while on the satellite data of the year 2010, there were total 668 traditional water bodies observed which includes 362 dry, 122 ephemeral, 92 perennial, 23 new ephemeral, 68 new perennial which covered 369.89 hect. area and one ephemeral wetland covered 21.42 hect.area. It is observed that the total number of traditional water bodies had increased but total area had decreased. The data generated can be used for monitoring of these water bodies, assessing availability of surface water in the villages in terms of rainwater harvesting, groundwater recharge, future requirements, drought proofing, biodiversity conservation, micro-climate controller and employment generation such as pisciculture and tourism sites.

INTRODUCTION

Water is prime requirement for survival of living being on the planet earth. Though, there is plenty of water on the planet earth, but the drinkinable water is very less. From ancient time, traditional water harvesting sites i.e. ponds are playing vital role in various natural systems like groundwater recharging, drought and flood proofing, ecosystem and biodiversity maintenance. The increasing developmental activities and modern living standard have adversely affected these natural water storage. The need of the hour is to conserve and maintain these water harvesting structures for the benefit of human beings as well as other living beings. The satellite remote sensing data have tremendous scope in mapping and monitoring of these water bodies. In the present study, Survey of India toposheets and satellite data have been used to know the change detection of traditional water bodies in Mahendergarh district of Haryana state. Many workers [1],[2],[3],[4],[5],[6],[7] have used satellite data in the study of change detection as well as monitoring of water bodies.

STUDY AREA

The study area Mahendergarh district falls in the southwestern part of the Haryana state having geo-coordinates $27^0$48'N to $28^0$28'N latitude and $75^0$54'E to $76^0$22'E longitude. The district covers 1899 sq. km. area. The climate of the district is semi-arid type. The mean daily maximum temperature varies from 41^0C to 45^0C. The average annual rainfall in the district is 346.9mm (2002-2006). About 80% of annual rainfall is received during the south-west monsoon months i.e. July to September.

METHODOLOGY

Survey of India Toposheets for the year 1966-1973 have been used for reference and IRS P6 LISS-III satellite data for the year 2010 to know change detection study. ArcMap-ArcInfo 9.2 has been used for digitization, data storage and interpretation. Ground truth has been done at selected locations and final change detection maps have been prepared.

RESULTS AND DISCUSSION

In the district, there were 545 water bodies which covered 398.55 hect. area, 31 perennial water bodies which covered 22.29 hect. area and one wetland which covered 22.60 hect. area during the year 1966-1973. Table 1 and Fig.1.

Table 1: Scenario of Water Bodies in Mahendergarh District (Based on SOI Toposheet, 1966-1973)

Categories	No. of Water Bodies	Percentage of Total Water Bodies	Area (Hect.)	Percentage of Total Area
Ephemeral Water Bodies	545.00	94.46	398.55	89.88
Perennial Water Bodies	31.00	5.37	22.29	5.03
Perennial Wetland	1.00	0.17	22.60	5.09
Total	**577.00**	**100.00**	**443.44**	**100.00**

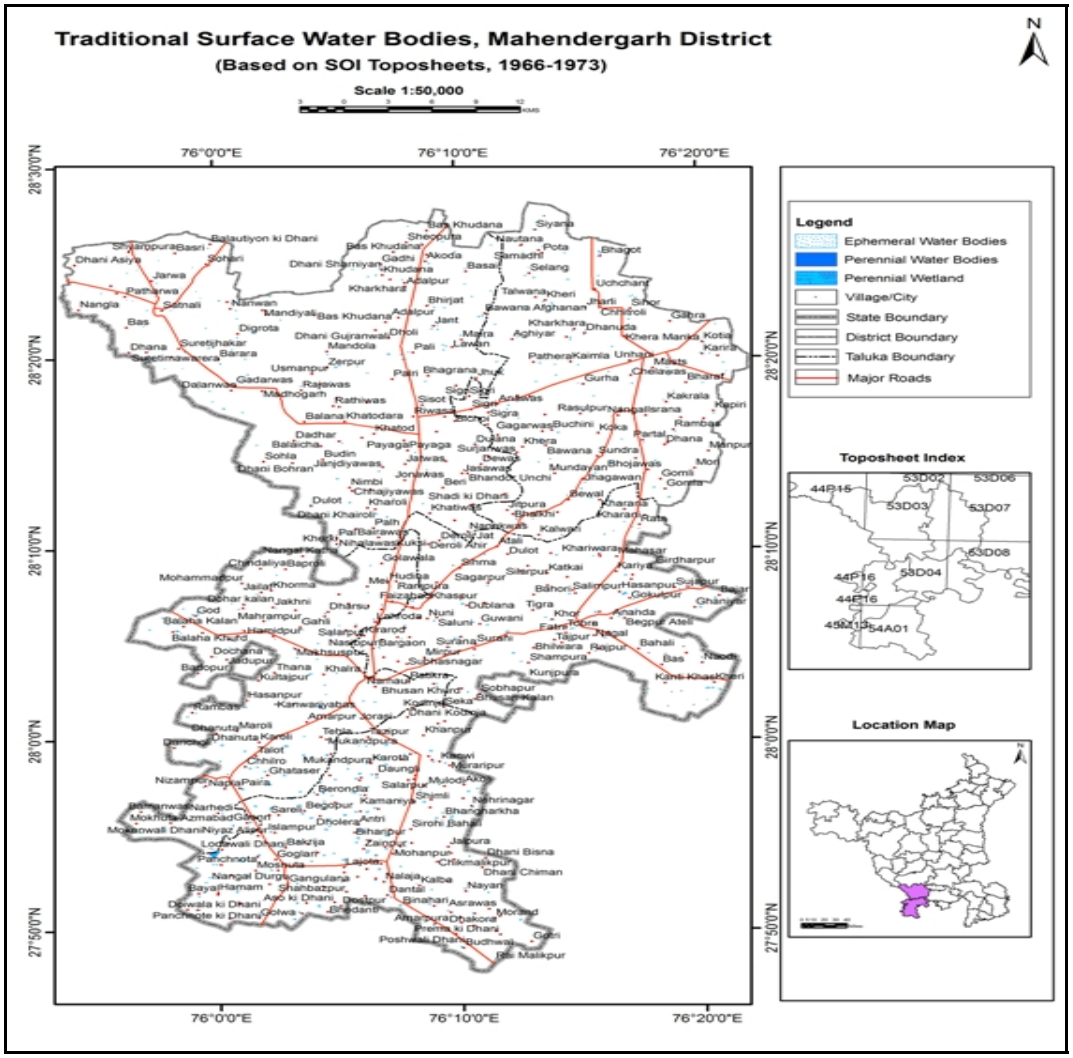

Fig.1: Traditional Water Bodies Mapped on Toposheet (1966-1973)

During pre-monsoon 2010, there were total 650 water bodies which covered 386.06 hect. area. There were 362 dry water bodies which covered 224.70 Hect. area, 109 ephemeral water bodies which covered 59.20 hect. area, 105 perennial water bodies which covered 46.51 hect. area, 73 new water bodies covered 34.23 hect. area and one ephemeral wetland covered 21.42 hect. area. Table 2 and Fig.2.

Table 2: Scenario of Water Bodies in Mahendergarh District (Based on IRS-P6 LISS III Satellite Data, Pre-Monsoon, June, 2010)

Categories	No. of Water	Percentage	Area	Percentage of

	Bodies	of Total Water Bodies	(Hect.)	Total Area
Dry Water Bodies	362.00	55.69	224.70	58.20
Ephemeral Water Bodies	109.00	16.78	59.20	15.33
Perennial Water Bodies	105.00	16.15	46.51	12.05
New Water Bodies	73.00	11.23	34.23	8.87
Ephemeral Wetland	1.00	0.15	21.42	5.55
Total	**650.00**	**100.00**	**386.06**	**100.00**

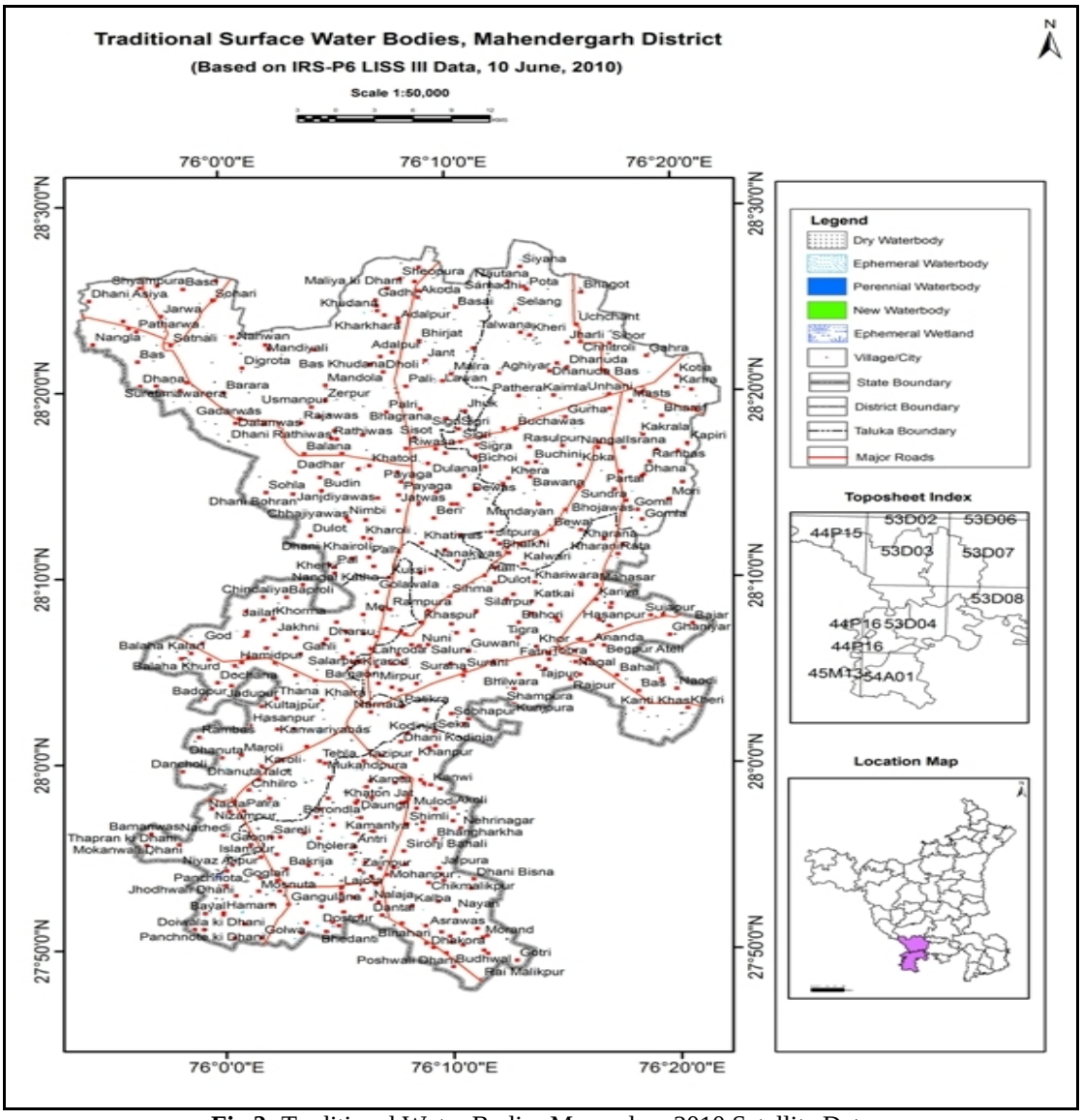

Fig.2: Traditional Water Bodies Mapped on 2010 Satellite Data (Pre-Monsoon)

During post-monsoon 2010, there were 663 water bodies which covered 389.41 hect. area. 362 dry water bodies covered 224.70 hect. area, 13 ephemeral water bodies covered 3.68 hect. area., 201 perennial water bodies covered 102.02 hect. area, 86 new water bodies covered 37.59 hect. area and one perennial wetland covered 21.42 hect. area. Table 3 and Fig.3.

Table 3: Scenario of Water Bodies in Mahendergarh District (Based on IRS-P6 LISS III Satellite Data, Post-Monsoon, October, 2010)

Categories	No. of Water	Percentage	Area	Percentage of

	Bodies	of Total Water Bodies	(Hect.)	Total Area
Dry Water Bodies	362.00	54.60	224.70	57.70
Ephemeral Water Bodies	13.00	1.96	3.68	0.95
Perennial Water Bodies	201.00	30.32	102.02	26.20
New Water Bodies	86.00	12.97	37.59	9.65
Perennial Wetland	1.00	0.15	21.42	5.50
Total	**663.00**	**100.00**	**389.41**	**100.00**

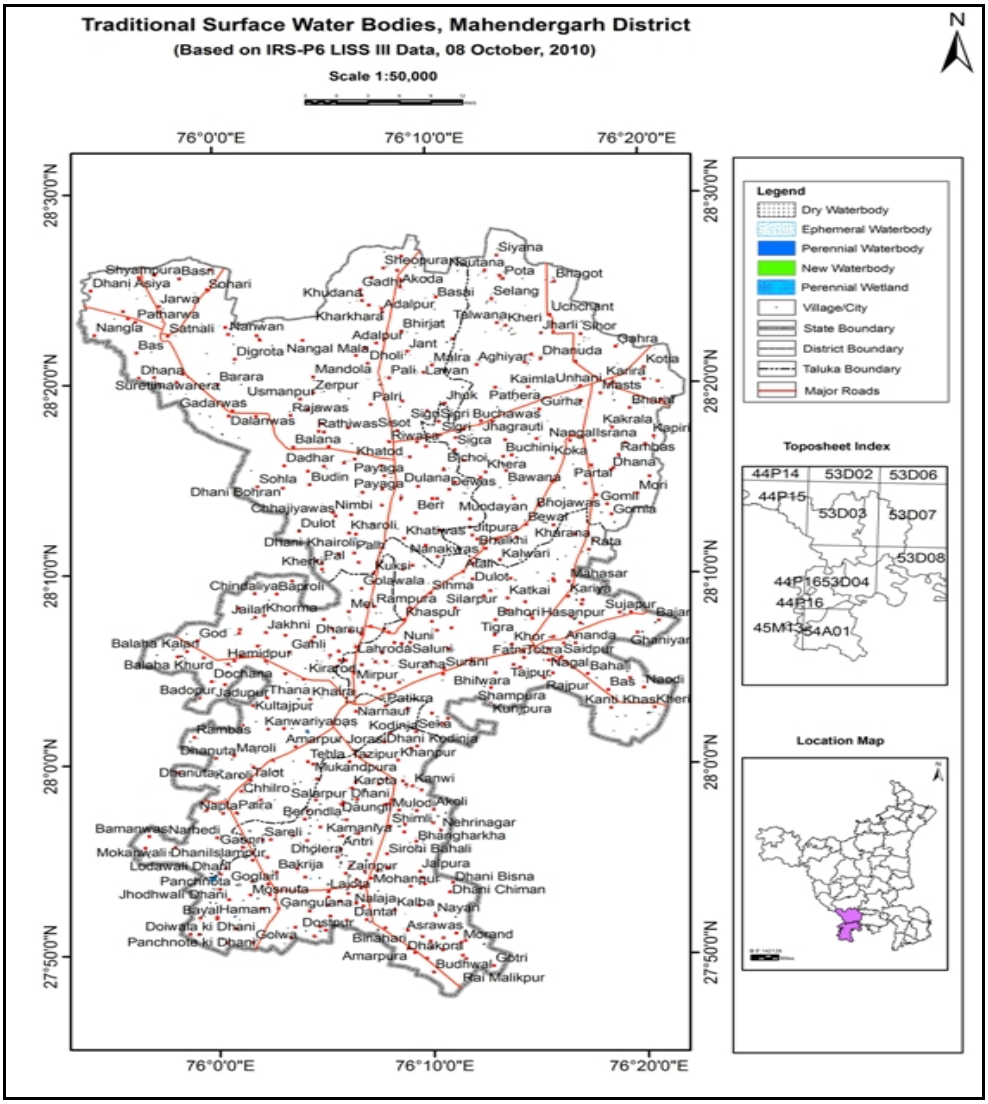

Fig.3: Traditional Water Bodies Mapped on 2010 Satellite Data (Post-Monsoon)

The overall scenario in the year 2010 was that there were total 668 water bodies which covered 390.89 hect. area. There were 362 dry water bodies which covered 224.70 Hect. area, 122 ephemeral water bodies covered 62.89 hect. area, 92 perennial water bodies covered 42.82 hect. area, 23 new ephemeral water bodies covered 6.31 hect. area, 68 new perennial water bodies covered 32.75 hect. area and one wetland covered 21.42 hect. area. Table 4 and Fig.4.

Table 4: Overall Scenario of Water Bodies in Mahendergarh District (Based on IRS-P6 LISS III Satellite Data, 2010)

Categories	No. of Water Bodies	Percentage of Total Water	Area (Hect.)	Percentage of Total Area

		Bodies		
Dry Water Bodies	362.00	54.19	224.70	57.48
Ephemeral Water Bodies	122.00	18.26	62.89	16.09
Perennial Water Bodies	92.00	13.78	42.82	10.95
New Ephemeral Water Bodies	23.00	3.44	6.31	1.62
New Perennial Water Bodies	68.00	10.18	32.75	8.38
Ephemeral Wetland	1.00	0.15	21.42	5.48
Total	**668.00**	**100.00**	**390.89**	**100.00**

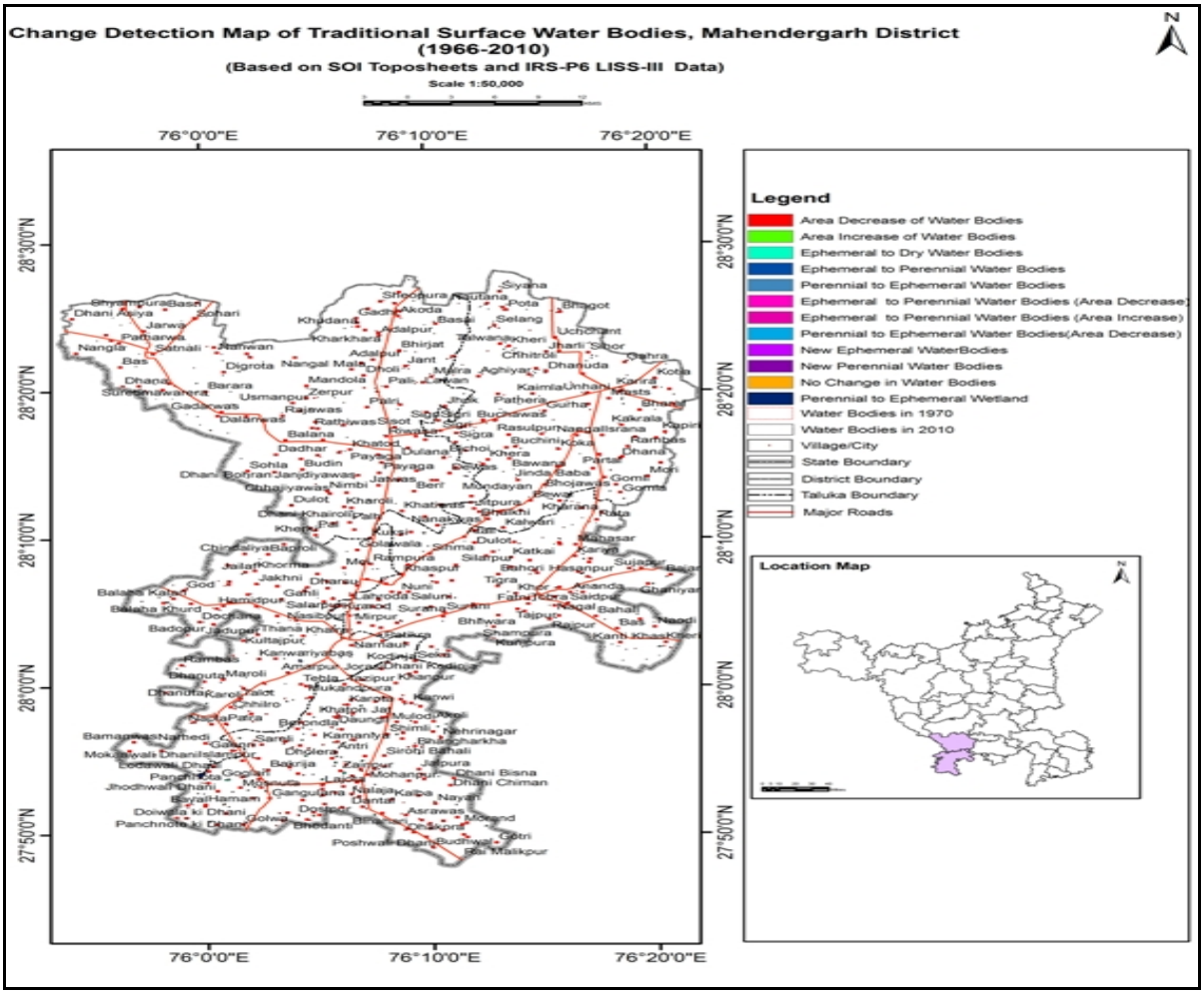

Fig.4: Overall Scenario of Traditional Water Bodies in 2010 (Pre and Post-Monsoon)

Change Analysis

The study shows that during 1966-1973, there were 577 water bodies which covered 443.44 Hect. area while during 2010 there were total 668 water bodies which covered 390.89 hect. area i.e. the number of water bodies had increased but the area of water bodies had decreased. As on the toposheets, only ephemeral and perennial water bodies have been categorized while on satellite data have been categorized into dry water bodies, ephemeral water bodies, perennial water bodies, new ephemeral water bodies, new perennial water bodies and ephemeral wetland. As the other categories could not be mapped on toposheets, new ephemeral, new perennial and dry water bodies were the major observations on satellite data.

CONCLUSIONS

The study shows that during 1966-1973, there were 577 water bodies which covered 443.44 Hect. area while during 2010 there were total 668 water bodies which covered 390.89 hect. area i.e. the number of water bodies

had increased but the area of water bodies had decreased. The study is highly useful for water resource management and planning in the study area.

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