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Survey and Mapping of Freshwater Bodies from Gadhinglaj Tahsil of Maharashtra (India) by using GPS

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Abstract: *The present attempt of study has been made to reveal the status of fresh water reservoirs from Gadhinglaj Tahsil of Kolhapur District, Maharashtra, India by using Global Positioning System (GPS) with reference to survey and mapping. Emphasis is given to survey, location, mapping and submergence area of major wetlands from the Tahsil. Comparison with secondary data is made available from Government authorities so as to study the percentage of change in the total submergence area of wetlands in this area due to anthropogenic activities and other environmental factors. The study adds multi-temporal GPS information on the reservoirs, which have paramount importance to indicate environmental changes and anthropogenic activities. The finding obtained from the survey can provide valuable information for policy makers and government authorities to implicate initiatives, management related decision-making and environmental impact assessment. The present results indicate reduction in the submergence area and changes in the landscape pattern due to influence of human activities and population pressure. The total reduction observed in water resources in present investigation from Gadhinglaj tehsil is 7.57%.*

Keywords: *Water bodies, survey, mapping, conservation.*

I. Introduction

Since an ancient time, wetlands provide a better settlement of human and his activity, ultimately leads to modification of these wetlands. Wetland habitats are threatened throughout the world (Hammer, 2002). True wetlands are of rarest habitat among all. All over the world, wetland resources have being over exploited and as a result, the habitats were disturbed by the different activities of human. It is most important that accurate and timely information on changing pattern of these wetlands is to be documented or recorded in order to understand physical status and anthropogenic influence over these wetlands. Monitoring wetland landscape change is the basis of almost any resource management planning or regional policy program (Guofu and Shengyan, 2004). For wetland management in the Kolhapur District of Maharashtra, India, there is no accurate data available on water bodies at tahsil level.

Global Positioning System (GPS) offers an ideal tool for the mapping and monitoring of such areas particularly as a mean of updating conventional data gathering techniques (Nellis, 1986). As wetlands are poorly documented features of many landscapes, and there is often little understanding of the geological controls on their origin, development and characteristics. They possess a diverse range of geological and sedimentary features that defy simple definition, characterization and classification (Scott and Jones, 1995). For the need of proper documentary, GPS is an ideal tool as it gives idea about location i. e. high degree accuracy for locating, mapping and estimating the total submergence area. Since the data is scanty on mapping of wetland, the technique of GPS has been standardized for surveying, mapping and estimating area.

II. Materials And Methods

a. Study Area:

The major water reservoirs of Gadhinglaj (16^o 13’ 26” N and 174^o 26’ 9” E) Tahsil of Kolhapur District from Maharashtra, India plays an important role in the settlement of human as well as providing an ideal habitat to different animal and plant species. These water reservoirs serves them for domestic uses like cloth washing, animal washing, bathing, animal water drinking, agricultural irrigation etc. The water is also used for human consumption from some of the water bodies. This Tahsil is one of the important tahsils of the Maharashtra state. The population is about 216257, distributed in 90 small as well as large villages occupying about 48094 ha of area. Throughout the Tahsil, there are number of small and large water bodies are present along with an important River Hiranyakeshi that is lifeline of the Tahsil. The people, who are living away from river are totally dependent on these water bodies for their daily needs. The Tahsil is famous for crops like sugarcane, rice, soybean, wheat, chilies and vegetables as cash crops while sorghum, maize, groundnut etc. as minor crops.

b. Survey and mapping:

i. Field Survey and mapping:

Frequent visits were made to locate the water bodies of Gadhinglaj Tahsil. After preliminary survey, water bodies were identified and classified and accordingly, ecological observations were noted for individual water bodies and mapping of major water bodies was made. Mapping of all major water bodies were carried out by selecting two co-ordinates at each water body individually by using hand held Global Positioning System (GARMIN eTREX vista HCx) and by walking along the perimeter of water reservoir twice a year viz. immediate after monsoon season and at the end of summer season to obtain temporal area of water reservoirs.

ii. Application of Computer:

The obtained field data is analyzed by using computer software MapSource while using different tools from this software, further location and actual submergence area is calculated. Then the primary data is compared with secondary data, which is made available from Irrigation Department and Panchayat Samiti of Gadhinglaj tahsil.

III. Result And Discussion

Table 1 and 2 depicts the morphometric features of seven water reservoirs, which are considered as minor irrigation tanks of Gadhinglaj Tahsil, and two small water reservoirs located at Kadagaon and Mahagaon. All the water reservoirs are manmade and perennial.

The total submergence area of Terani MI tank is maximum (85.24 ha) as per secondary data. However, actual mapped area of Terani MI tank is 59.82 ha during monsoon season and submergence area mapped during summer season is 29.52 ha. The total storage capacity is 3.476 Cu. M, which is the highest among all water reservoirs. Though the Terani MI tank was constructed in 1996, the reservoir is oligotrophic in nature. It has observed that the area of water body is reduced presently. It might be due to anthropogenic activities such as cultivation practices at reservoir area. Approximately 30% of submergence area of this reservoir is reduced due to various anthropogenic activities.

The second highest area is covered by Shendri MI tank. The total area according to secondary data is 41.09 ha while the actual mapping depicts that the submergence area is 50.76 ha. Regarding this MI tank, the total submergence area during monsoon season is more than that of secondary data. This increased area might be due to mining activities occurring in the adjoining area for the exploitation of soil. During summer season, the water body shrinks to 26.15 ha due to evaporation. The total storage capacity of this reservoir is 1.86 cu. M and this reservoir is constructed in the year 1981.

Kumari MI tank is covered by 38.43 ha of submergence area obtained from secondary data while actual GPS mapping is near about same submergence area of 38.45 ha during monsoon season whereas during summer season it is reduced to 20.71 ha. The water reservoir is constructed in the year 1998 with storage capacity of 2.59 cu. M.

The total submergence area of Vairagwadi MI tank according to secondary data is 29.87 ha whereas actual mapped area is 34.7 ha during monsoon while during summer it is reduced to 3.17 ha. Approximately 90% water from this reservoir is drained out for irrigation of agricultural fields during summer season may be the main reason for heavy shrinkage of reservoir during season. It is interesting to note here, the rise the submergence area during monsoon season in the actual mapped area. This may possibly due to extended agricultural fields in the reservoir area and ultimate erosion leads to formation of small pits and digs continuous to the reservoir. This MI tank was constructed in the year 1981 with the water storage capacity of 1.5 cu. M.

Narewadi MI tank occupies 32 ha as per secondary data while actual mapping depicts 33.66 ha area. The actual submergence area is negligibly raised than that secondary data during rainy season and in summer season actual mapped area is 28.48 ha. This tank was constructed in the year1981 with water storage capacity of 2.21 cu. M.

The total submergence area of Karambali MI tank obtained from secondary data is 27.34 ha while by actual mapped area during rainy season is 25.89 ha. There is slight decrease in actual submergence area than that of secondary data. During summer season, the total submergence mapped by GPS is 18.12 ha. This MI tank was constructed in the year 2007 with total storage capacity of 3.91. Being less submergence area than that of other reservoirs, the total water holding capacity of this reservoir is more as compared to other may be due to depth of the reservoir.

The total submergence area of Yenechavandi MI tank was reduced to 23.3 ha from actual mapping from 29.15 ha by secondary data. The reduction of total submergence area during monsoon season is due to leakage of the dam and dam was under maintenance during the year of survey and mapping. The submergence area of this MI tank during summer is 6.28 ha. This tank was constructed in the year 1996 with 1.55 cu. M of total storage capacity.

On global basis, it has been estimated that more than 50% of the wetlands have been degraded or destroyed by land use practices like overgrazing and over burning, by development processes e.g. drainage modification, land reclamation or by exotic invasive vegetation or feral of animals (Dugan, 1993). Urban, agricultural and water resources developments still threaten many wetlands, with other threats coming from the possible negative effects of global climate change on wetland structure and function (Winter, 2000).

The actually mapped submergence area of two selected small water reservoirs, Kadagaon and Mahagaon are 6.15 ha and 4.65 ha respectively. The total submergence area obtained from secondary data is 3.25 which is increased to double in the actually mapped area may be due to mining activities at adjoining area while secondary data is not available for the Mahagaon small reservoir. Kadagaon water reservoir was constructed in the year 1996 whereas Mahagaon water reservoir was constructed in the year 2003. Total storage capacity for both the water reservoirs is not available.

The investigations highlights the present status of submergence with accurate estimations i. e. there is 7.57% of total submergence in the water reservoirs of Gadhinglaj Tahsil has reduced.

IV. Conclusion

Based on the present study, it has been concluded that the Terani reservoir is under threat of degradation and need attention for protection of this natural ecosystem by reclamation. However, other reservoirs are in quite good position but still, overall 7.57% reduction in total submergence area, which can be made under control in near future by adapting best management policies of conservation.

References

[1]. Dugan PJ (1993). Editor wetlands in Danger. London: Mitchel Beazley and IUCN (World Conservation Union).
[2]. Hammer D A (1992). Creating freshwater wetlands. Boca Raton: Lewis Publishers.
[3]. LIANG Guofu and DING Shengyan (2004). Impacts of human activity and natural change on the wetland landscape pattern along the Yellow River in Henan Province. Journal of Geographical Sciences, 14 (3): 339-348.
[4]. Nellis M. (1986). Remote sensing for monitoring rangeland management strategies in the Kanas Flint Hills. Proceedings of the Symposium of Commission IV, 370-375.
[5]. Scott DA and Jones TA (1995). Classification and inventory of wetlands: a global review. Vegetatio,118: 3-16.
[6]. Winter AC (2000). The vulnerability of wetlands to climate change: a hydrological landscape perspective. J. the American Water Resources Association, 36: 305-311.

Table 1: Morphometric Features of water bodies of Gadhinglaj Tahsil

Reservoirs/Parameters	Karambali (1)	Shendri (2)	Yenechavandi (3)	Terani (4)	Narewadi (5)
Latitude	16 11'690"	16 16' 130"	16 11' 252"	16 07' 319"	16 08' 460"
Longitude	74 17' 906"	74 20' 596"	74 20' 447"	74 28' 288"	74 25' 006"
Type of stream	Local	Local	Local	Local	Local
Year of Completion	2007	1981	1996	1996	1981
Top Bund Level in meters	51.5	117	106.5	105.5	123.3
MWL in meters	50	115	105	102	121.5
FTL in metes	49	112	104	102	120.3
Silt Level in meters	92	101	92.5	93.63	109.1
Storage Capacity in cu. M	3.91	1.86	1.55	3.476	2.21
CCA in ha	545	283	494	727	480
Height of dam in meters	27.44	17.5	21.85	20.66	23.17
Length of Dam in meters	549	223	611	960	570
Catchment Area in sq. km	3.24	6.67	6.5	17.09	14.56
Submergence Area in ha	27.34	41.09	29.15	85.24	32
Actual Submergence area by GPS	25.89	50.76	23.3	51.79	33.66
Ecological Category	Freshwater	Freshwater	Freshwater	Freshwater	Freshwater

Table 2: Morphometric Features of water bodies of Gadhinglaj Tahsil

Reservoirs/Parameters	Vairagwadi (6)	Kumari (7)	Kadagaon(8)	Mahagaon(9)
Latitude	16 09' 305"	17 39' 504"	16 15' 221"	16 07' 526"
Longitude	74 21 279"	74 18'236"	74 18 122"	74 21' 167"
Type of stream	Local	Local	NA	NA
Year of Completion	1981	1998	1996	2003
Top Bund Level in meters	67.6	100.5	52	NA
MWL in meters	66.3	99.5	NA	NA
FTL in metes	65.3	96	NA	NA
Silt Level in meters	54.2	83.2	NA	NA
Storage Capacity in cu. M	1.5	2.59	NA	NA
CCA in ha	314	730	NA	NA
Height of dam in meters	20.34	23.64	17.27	15.4
Length of Dam in meters	491	510	174	260
Catchment Area in sq. km	4.79	3.37	0.32	NA
Submergence Area in ha	29.87	38.43	3.25	NA
Actual Submergence area by GPS	34.7	38.45	6.15	4.65
Ecological Category	Freshwater	Freshwater	Freshwater	Freshwater

Note: NA indicates Not Available

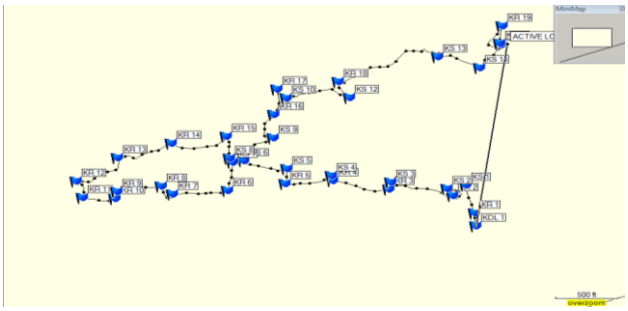

Fig. 1 : GPS Map of Karambali Minor Irrigation Tank

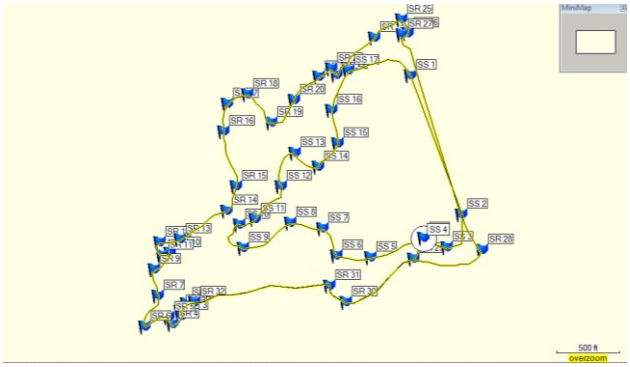

Fig. 2 : GPS Map of Shendri Minor Irrigation Tank

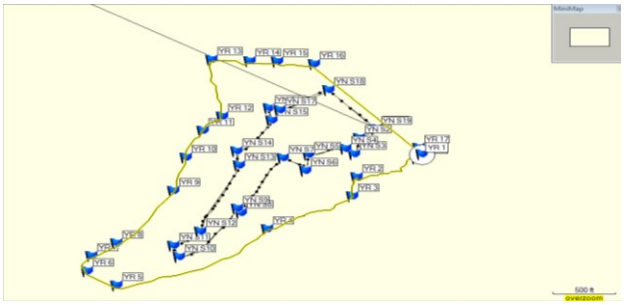

Fig. 3: GPS Map of Yanechiwandi Minor Irrigation Tank

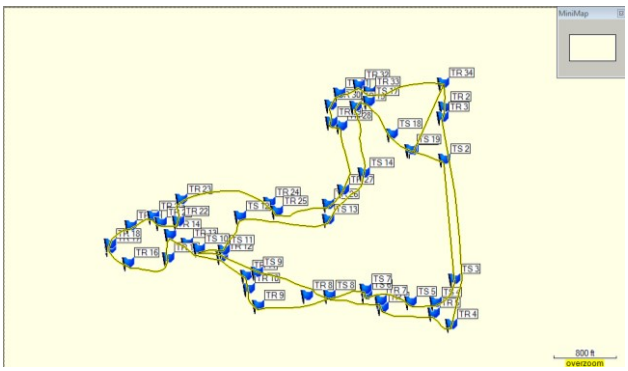

Fig. 4: GPS Map of Terani Minor Irrigation Tank

Fig. 5 : GPS Map of Narewadi Minor Irrigation Tank

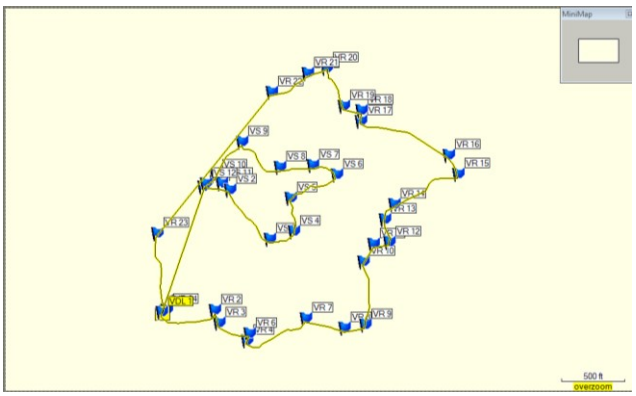

Fig. 6 : GPS Map of Vairagwadi Minor Irrigation Tank

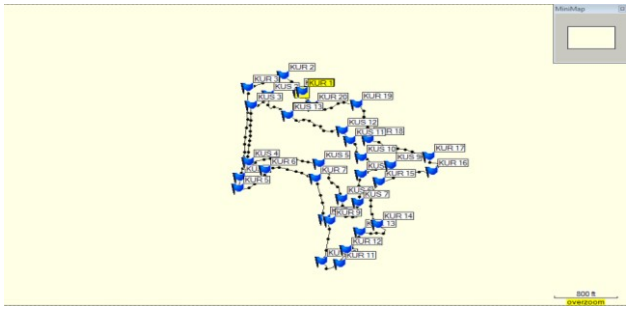

Fig. 7 : GPS Map of Kumari Minor Irrigation Tank

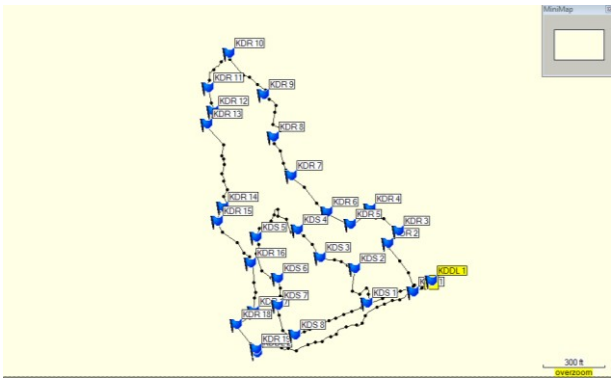

Fig. 8 : GPS Map of Kadagaon Tank

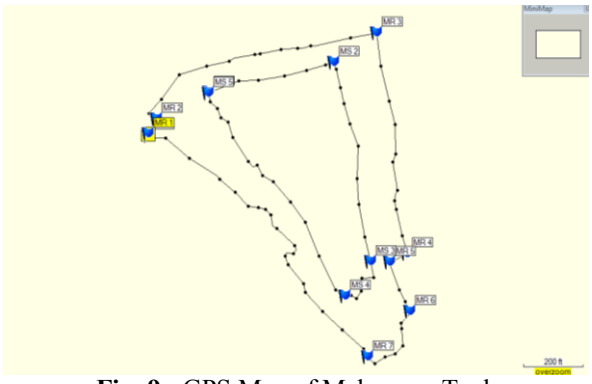

Fig. 9 : GPS Map of Mahagaon Tank