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A STUDY ON TEMPORAL CHANGES OF MUDASARLOVA RESERVOIR, VISAKHAPATNAM, INDIA USING GIS APPLICATIONS

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ABSTRACT

Water is a driving force of life. Water is an essential element. The population explosion, urbanization and climate change impacts crating a tremendous pressure on existing water bodies. The current study titled 'Study on Temporal Changes of Mudasarlova Reservoir Using GIS Applications' shown in terms of LULC. The urbanization and population growth impacts on water body in Visakhapatnam city are visibly shown in the study.

Key words: GIS applications, LULC, population explosion, Temporal Changes, Urbanization.

INTRODUCTION

Fresh water is a critically vulnerable, renewable resource on the planet earth, and plays significant role in our living environment, without this, life is impossible. All the civilizations in the world flourished in the banks of the water bodies. Since the beginning of the industrial revolution, increasing human population, economic activities as well as shortcomings in their management have resulted in more pollutants being introduced into watercourses. (Mohd. Muzamil et al, 2009).

A "Water Body" is a structure where water from ice-melt, streams, springs, rain or drainage of water from residential areas is accumulated or water is stored by diversion from a stream, nala or river. Water exists in different forms such as rainfall, river water, ground water, ponds and lakes etc. About 71 percent of the Earth's surface is water covered, and the oceans hold about 96.5 percent of all Earth's water. Two third of water is locked up in glaciers and permanent snow cover, remaining one third is distributed regionally with wide disparities. (Bindu and Abdul Razak Mohamed,2015).

Surface water bodies are dynamic in nature as they shrink, expand, or change their appearance or course of flow with time, owing to different natural and human-induced factors (Karpatne et al,2016). Traditionally, these water bodies have played an important role in supply of drinking water, water for domestic needs and agriculture purposes etc. besides rivers and ground water.

Urbanization is a process where people migrate from rural to urban areas. Ultimately it leads to horizontal or vertical growth of urban areas. The criteria used to define urban can include population size, space, density and economic organization (Grannis, 1998).

India second Populus country in the world holds only about four percent of its required annual water resources. In urban areas, 50 million people in 15 cities have no access to safe, affordable water. In India, more than 600 million people are facing an acute water shortage. The water demands are drastically increasing but the demand is not meet by the supply. Currently India is facing water challenges which supposed to address in a sustainable way.

There are about 7 major Sources of water supply to the city which include Yeleru, Godavari, Raiwada, Tatipudi, MGR, Gosthani,Ghambiram & Mudasarlova which supply about 395.5 MLD (87MGD) water to the city for both domestic and industrial usages. The distance of sources ranges from 153 Km. to10 Km. The inflows to the some of the water bodies decreased to some extent which leads to decrease in the changes of water bodies is noticed.

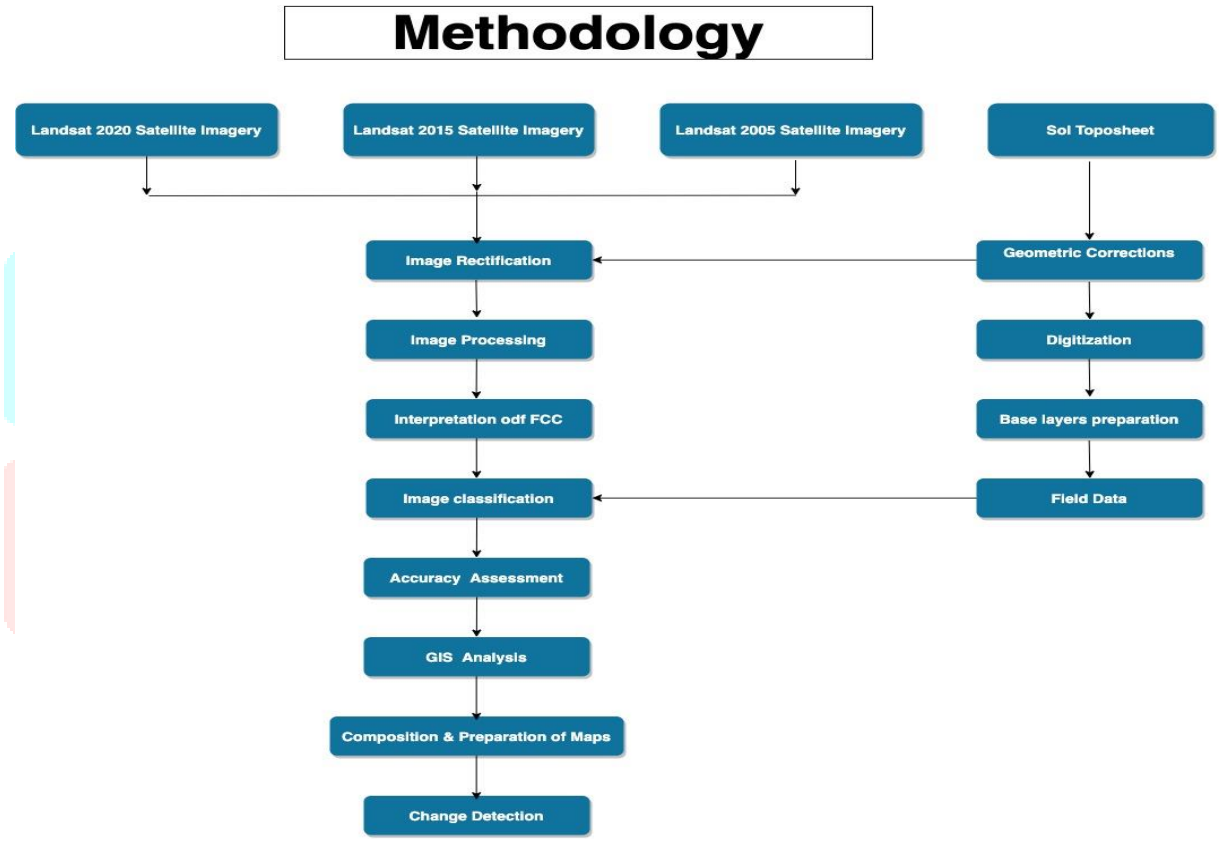
Role of GIS in surface water:

A GIS (Geographic Information System) is a powerful tool used for computerized mapping and spatial analysis. A GIS provides functionality to capture, store, query, analyse, display and output geographic inform. Geographic information systems (GISs) have become a useful and important tool in hydrology and to hydrologists in the scientific study and management of water resources.

The land use/cover pattern of a region is an outcome of natural and socio-economic factors and their utilization by man in time and space. Land use/cover resulting the demands of increasing urbanization and results to increasing of population in presents years. (Rjasekhar et al., 2017). Change detection is a process that observes a phenomenon or feature at different times to categorize the differences in its state. Change detection has various useful applications associated with land cover/use changes such as coastal change and urban sprawl (Shalaby and Tateishi, 2007).

METHODOLOGY

- Data used for location maps of the tank is from Water Resource Department (WRD), Andhra Pradesh Integrated irrigation and Agricultural Transformation Project (APITATP).
- Survey of India - Topo sheets, latest satellite data of Low Imaging Sensing satellite — IV (LISS - IV).
- Thematic maps like soils, land use/land cover, drainage, catchment boundaries are drawn on LISS — III.
- The non-spatial data like command area, beneficiaries, meteorological data are taken Department of Earth Sciences and Indian Meteorological Department (DES/IMD).
- The Resolution that used for mappings are 2.5 for Toposheet and 23.5 for LULC Changes and soil types.



Study Area:

Mudsarlova Reservoir

Introduction: -

The reservoirs in the urban area are useful for storage of drinking water to the city. The Mudasarlova Reservoir in the Visakhapatnam city limits is situated between the Kailasakonda, Kambalakonda and Simhachalam Hills.

Location: -

It is located in Visakhapatnam city limits in Visakhapatnam District of Andhra Pradesh State, India. The catchment area of the Mudsarlova reservoir basin is 17.06 sq km (1706.364 hectares or 4093.12 acres). This catchment is located between Kailasa Konda, Kambala Konda and Simhachalam hill.

Location: Mudsarlova Village, Visakhapatnam Mandal

Longitude: 83° 15' 50'atitude: 17°45’ 50"Spread Area:- 62 acres

Catchment Area: 4093.121 Acres

3. Utility: -

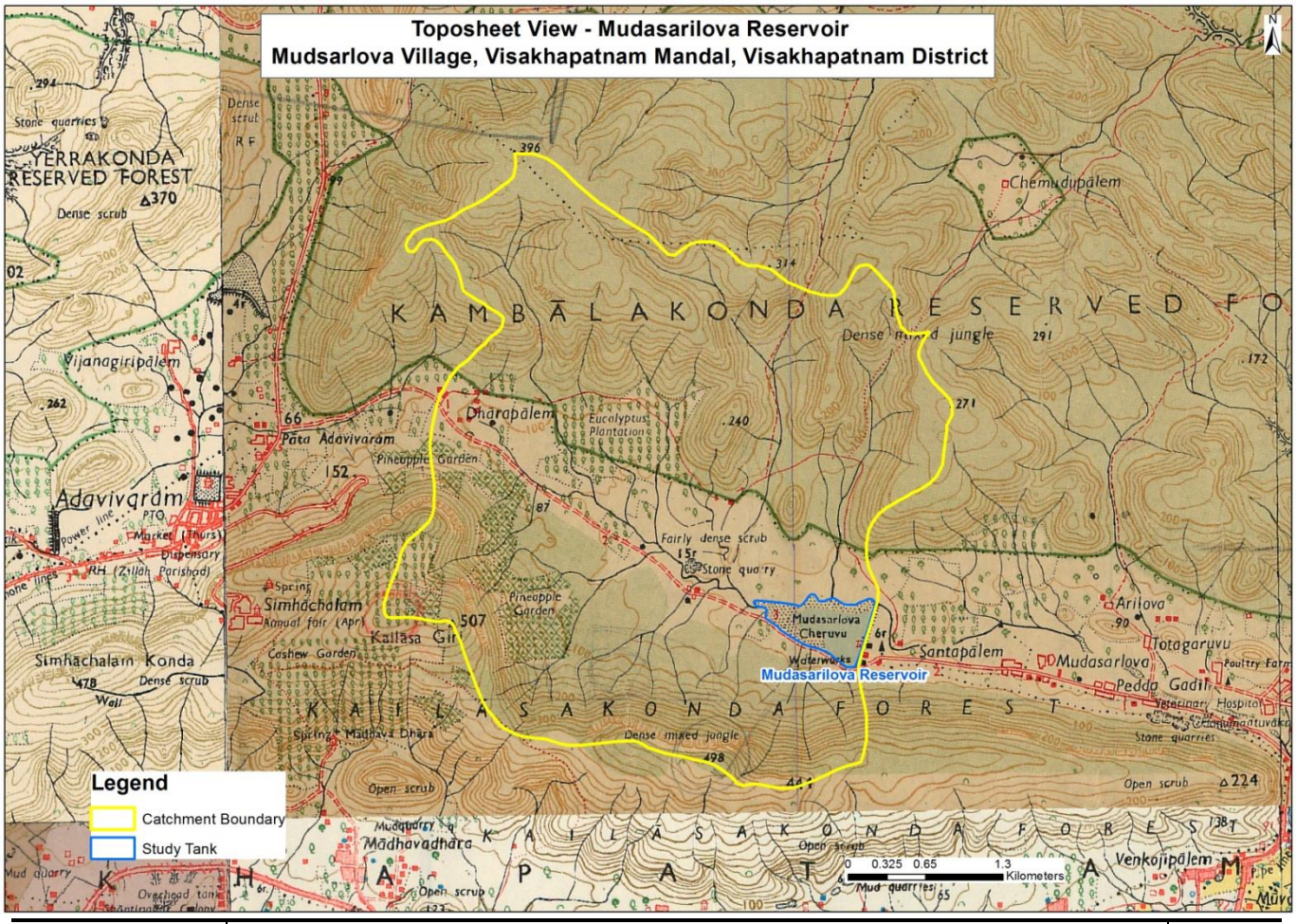
The Mudasarlova Reservoir and park is set up in the one of the pleasant valleys of Vizag. So close to clamouring town however so quiet. Created as Mudasarlova Lake which is sustained by the Springs starting from Kambalakonda and Kailasa Hill Ranges. Mudasarlova is the real Source of Drinking Water to Vizag. The recreation centre has the most ideal set up for picnicking. This excellent site close to the lake settles in the midst of slopes and palm trees. There are pretty stops loaded with delightful blossoms and diverse sorts of trees, wellsprings, feathered creatures in confines and additionally a few excursion spots.

Mandals Benefited: Visakhapatnam

Cropping Pattern: Nil

Ayacut: Nil

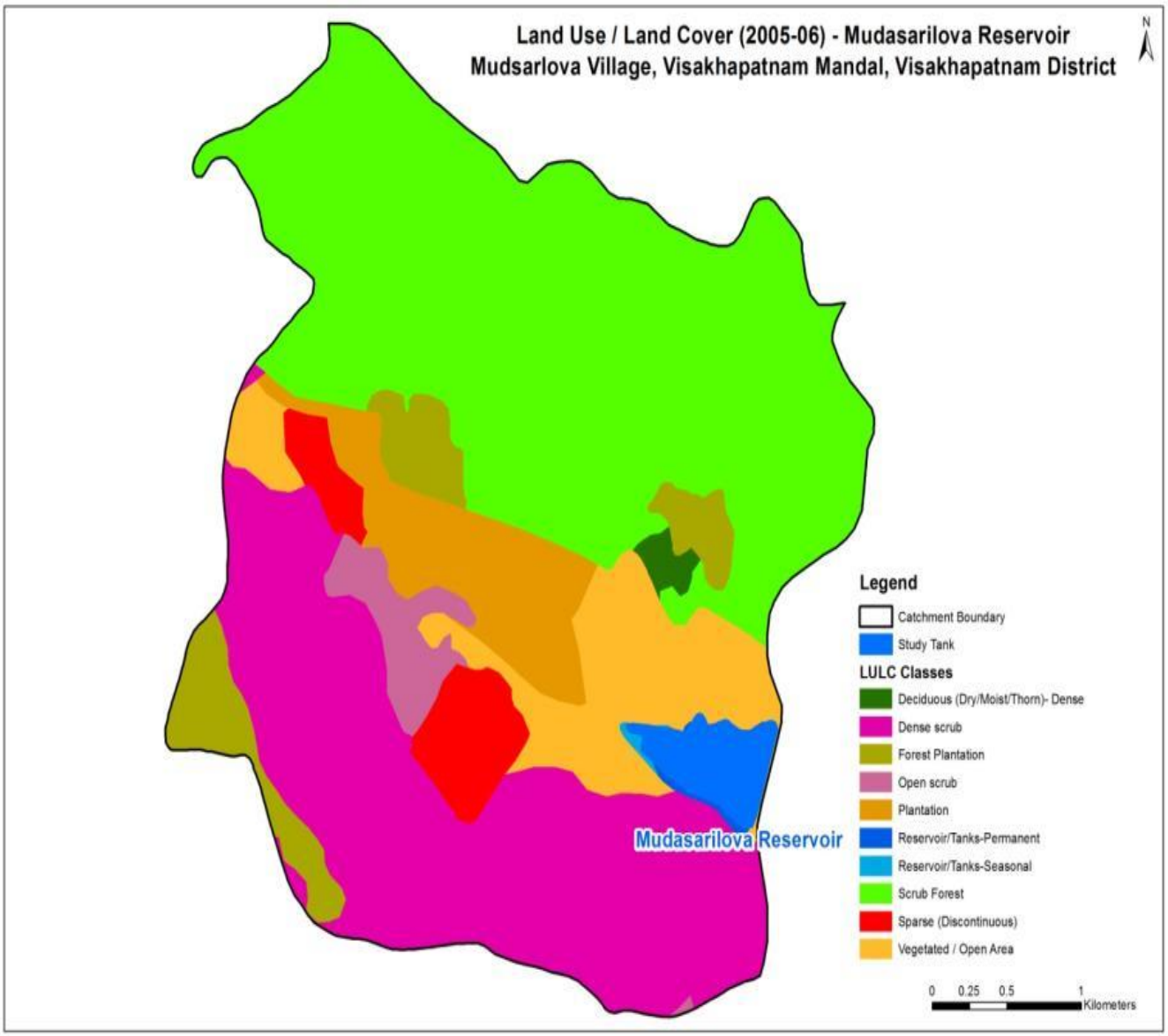
Vegetated / Open Area



These are vegetated areas within urban agglomeration (situated within or in contact with urban areas). Vegetation cover of trees, shrubs, and herbs covers at least 0.33% of the total surface area, which has been delineated. Parks, sport and leisure facilities, camping grounds, sports grounds, leisure parks, golf courses, race courses, including formal parks etc are considered in this category..It involves a region of 369.70 Acres, which is around 9.03% of the total catchment area of the Tank in the LULC of 2005-06 and 425.59 Acres (10.40%) in LULC of 2015-16.

Deciduous (Dry/Moist/Thorn)-Dense

This category is predominantly composed of species, which shed their leaves once a year, especially during summer. These are mostly broad-leaved tropical forests with a tendency to shed their leaves annually. This category includes all the areas where the canopy cover/density is more than 75 % and It involves a region of 21.98 Acres, which is around 0.54% of the total catchment area of the Tank in the LULC of 2005-06 and 573.50 Acres (14.01%) in LULC of 2015-16.



Deciduous (Dry/Moist/Thorn)-Open

This category is predominantly composed of species, which shed their leaves once a year, especially during summer. These are mostly broad-leaved tropical forests with a tendency to shed their leaves annually. This category includes all the forest areas where the canopy cover/density ranges between 20 - 60 percent. It involves a region of 2462.88 Acres, which is around 60.17% of the total catchment area of the Tank in the LULC of 2005-06 and 1906.65 Acres (46.58%) in LULC of 2015-16.

Dense scrub

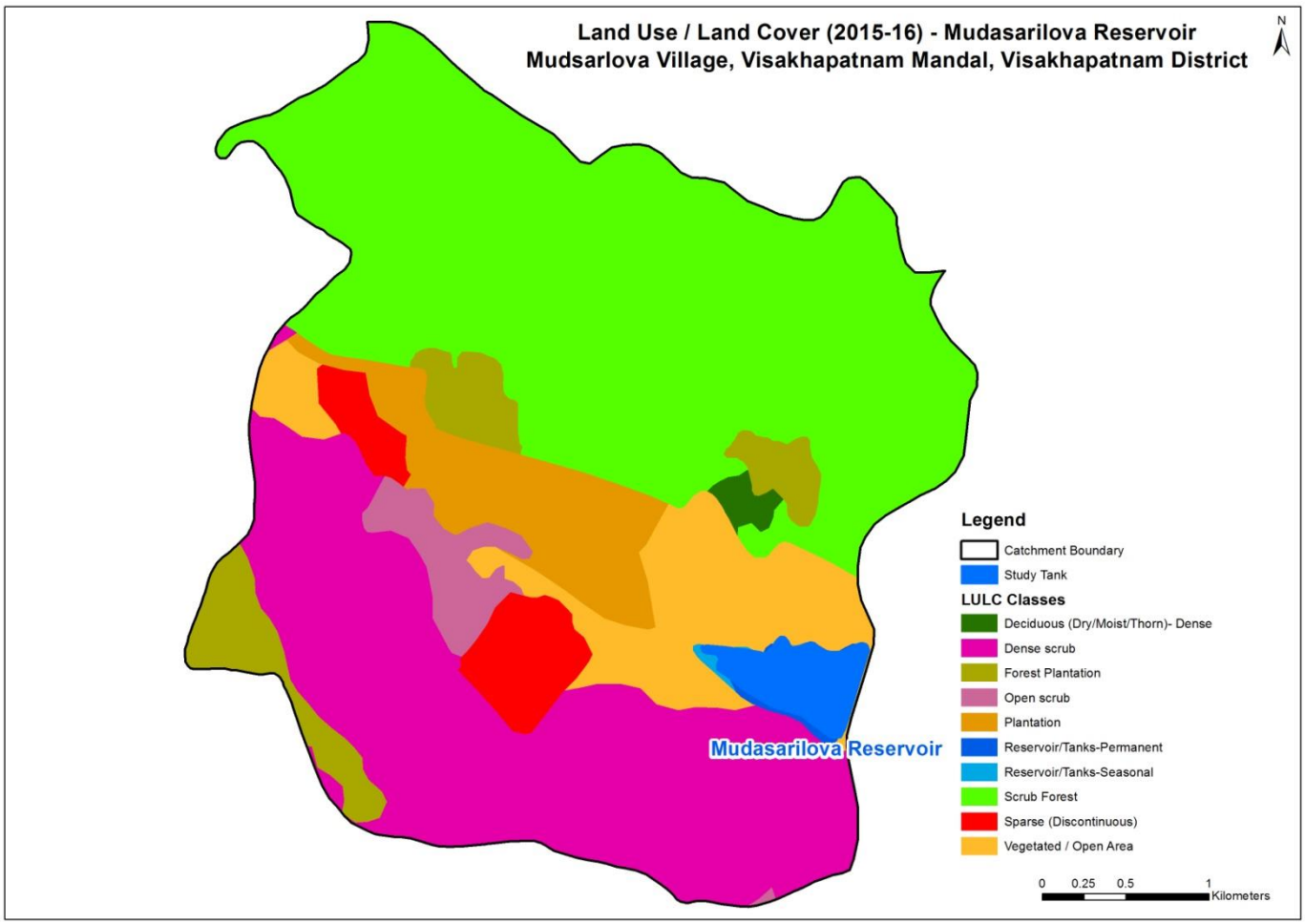
The scrub is usually confined to topographically elevated areas, on the hill slopes generally surrounded by agricultural lands. These areas possess shallow and skeletal soils, at times chemically degraded, extremes of slopes, severely eroded and lands subjected to excessive aridity with scrubs dominating the landscape. It is found with varying sizes of small to large areas having a contiguous or dispersed pattern. The dense scrub is mostly identified on the hills and It involves a region of 369.70 Acres, which is around 9.03% of the total catchment area of the Tank in the LULC of 2005-06 and 425.59 Acres (10.40%) in LULC of 2015-16.

Reservoir/Tanks-Seasonal

Dry reservoirs/tanks are those which do not have water spread throughout the year are considered seasonal. It is found that many of the tanks are under seasonal category &It involves a region of 78.31 Acres, which is around 1.91% of the total catchment area of the Tank in the LULC of 2005-06 and 11.25 Acres (0.27%) in LULC of 2015-16.

Reservoir/Tanks-Permanent

The reservoir is an artificial lake created by the construction of a dam across the river specifically for hydel power generation, irrigation, and water supply for domestic/ industrial needs, flood control, either singly or in combination. Tanks are small lakes of impounded waterways constructed on land surface for irrigation. They are associated with croplands, low lands and reservoirs surrounded by hills without vegetation. This includes all reservoirs/tanks with water spread seen at least during one season in a year is considered under the permanent category. This category occupies an area of 8.83 Acres (0.22%) in LULC of 2005-06 and 75.73 Acres (1.85%) in LULC of 2015-16.

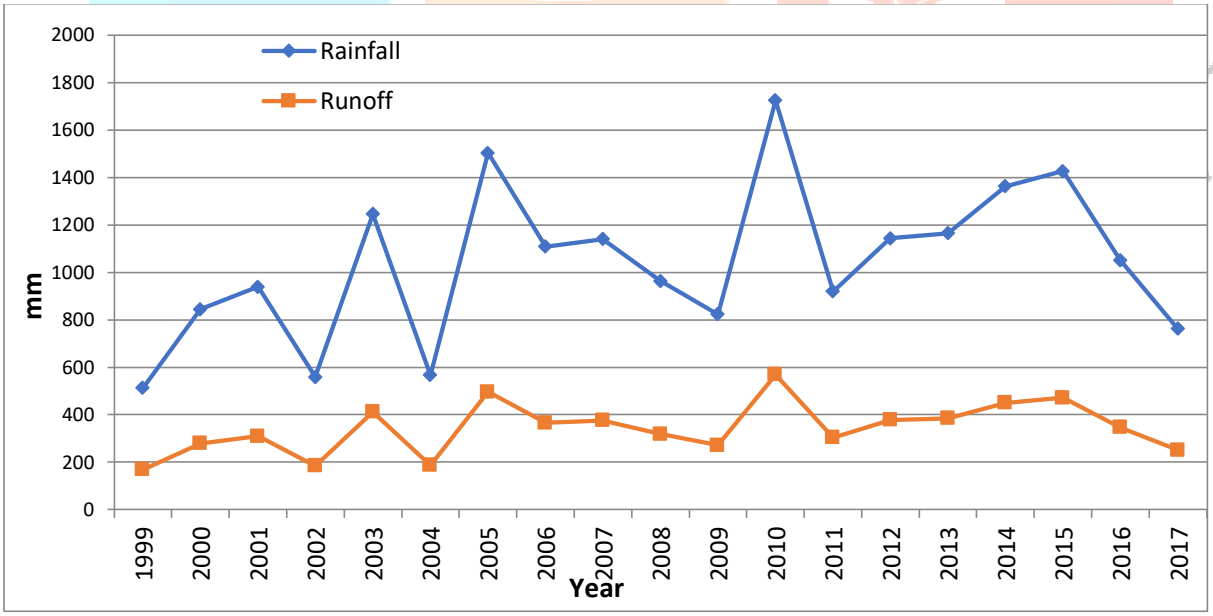


Constrains: -

Based on the study of LuLc of 2005-06 & 2015-16 classification, the observation in changes are as follows

- The LuLc class of Forest-Deciduous (Dry/Moist/Thorn)-Dense/Closed is 0.54 % in its catchment area in 2005-06 & it was increased to 14.01 % in 2015-16.
- The LuLc class of Forest-Deciduous (Dry/Moist/Thorn)-Open/Closed is 60.17 % in its catchment area in 2005-06 but it is decreased to 46.58% in 2015-16.
- The class of Vegetated / Open Area is 9.03 % in its catchment area in 2005-06 and it was increased to 10.40% in 2015-16.
- The LuLc class of Forest-Scrub Forest is 0.59 % in its catchment area in 2005-06 & it was decreased to 0.04% in 2015-16.
- The LuLc class of Waterbodies-Reservoir/Tanks-Permanent is 0.22 % in its catchment area in 2005-06 & it was increased to 1.85% in 2015-16.
- The LuLc class of Waterbodies-Reservoir/Tanks-Seasonal is 1.91 % in its catchment area in 2005-06 & it was increased to 0.27% in 2015-16.

Mudsarlova	**LULC of 2005-06**	**LULC of 2015-16**	**Changes**	**Changes in %**
Agricultural Land-Plantation	149.59	149.30	-0.28	-0.19
Built Up - Sparse (Discontinuous)	152.24	151.95	-0.29	-0.19
Forest-Deciduous (Dry/Moist/Thorn)-Dense/Closed	21.98	573.50	551.52	96.17
Forest-Deciduous (Dry/Moist/Thorn)-Open/Closed	2462.88	1906.65	-556.23	-29.17
Forest-Forest Plantation	611.24	632.42	21.18	3.35
Forest-Scrub Forest	24.18	1.80	-22.38	-92.57
Vegetated / Open Area	369.70	425.59	55.89	13.13
Wastelands-Scrub Land-Dense Scrub	81.46	24.71	-56.74	-69.66
Wastelands-Scrub Land-Open Scrub	132.71	132.46	-0.25	-0.19
Waterbodies-Reservoir/Tanks-Permanent	8.83	75.73	66.90	88.34
Waterbodies-Reservoir/Tanks-Seasonal	78.31	11.25	-67.06	-85.64



Year	Rainfall	Runoff
1998	1464.3	483.219
1999	512.7	169.191
2000	845	278.85
2001	938.8	309.804
2002	559.2	184.536
2003	1246.2	411.246
2004	566.6	186.978
2005	1503.1	496.023
2006	1108.5	365.805
2007	1140	376.2
2008	964.2	318.186
2009	823	271.59
2010	1724.3	569.019
2011	920.1	303.633
2012	1143.7	377.421
2013	1165	384.45
2014	1362.3	449.559
2015	1426.7	470.811
2016	1051.6	347.028
2017	762	251.46

Conclusions:

- Some residential colonies are developed in the catchment area of the reservoir.
- Due to sewage effluents the quality of the water in the reservoir will be spoiled.
- During the course of these long years the reservoir bottom was heavily silted up thus reducing the storage capacity of the reservoir.

REFERENCES

1. Amna Butt., Rabia Shabbir., Sheikh Saeed Ahmad., Neelam Aziz., Mohammad Nawaz., Muhammad Tahir Ali Shah.,2015. Land cover classification and change detection analysis of rawal watershed using remote sensing data. Journal of Biodiversity and Environmental Sciences Vol. 6, No. 1, p. 236-248, 2015.
2. Anuj Karpatne., Ankush Khandelwal., Xi Chen., Varun Mithal., James Faghmous., Vipin Kumar.,2016. Global Monitoring of Inland Water Dynamics: State-of-the-Art, Challenges, and Opportunities.Computational Sustainability pp 121-147.
3. Attaullah Shah, Karamat Ali, Syed Moazzam Nizami 2021.Four decadal urban land degradation in Pakistan a case study of capital city Islamabad during 1979–2019. Journal on Environmental and Sustainability Indicators.
4. Attullah Saha.,Karmat Ali.,Syed .,Moazzam Nizami.,2021. Four decadal urban land degradation in Pakistan a case study of capital city Islamabad during 1979-2019. Environmental Sustainability Indicators 10(2021) 100801
5. Bannar.A., Morin.D., BONN.F., HUETE A. R., 1995.A review of vegetation indices. Remote Sensing Reviews, 1995, Vol. 13, pp. 95-120.
6. BinduC.A., Abdul Razak Mohamed.,2015. Water bodies as a catalyst to growth and development- The case of Kodungallur town, Kerala. International Conference on Emerging Trends in Engineering, Science and Technology (ICETEST - 2015). Procedia Technology 24 (2016) 1790 – 1800.
7. Chamara P. Liyanage., Koichi Yamada., 2017. Impact of Population Growth on the Water Quality of Natural Water Bodies. Sustainability 2017, 9, 1405; doi:10.3390/su9081405.
8. Grannis Rick.,1998.The Importance of Trivial Streets: Residential Streets and Residential Segregation.American Journal of Sociology 103(6):1530-1564.

9. Jagadeeswara Rao, P., Harikrishna, P. and Surya Prakasa Rao, B., 2006. Studies on silt deposition in Gambhiram Reservoir - A Remote Sensing Approach. Journal of Indian Geophysics, 10(4)285-292.
10. Kumar., C.P.,2018. Water Resources Issues and Management in India. Journal of Scientific and Engineering Research, 2018, 5(9):137-147.
11. Mohd. Muzamil Bhat., Taiyyaba Yazdani., Kamini Narain., Mohammad Yunus., Ravinder Nath Shukla.,2009. Water Quality Status of Some Urban Ponds of Lucknow, Uttar Pradesh. Journal of Wetlands Ecology, vol. 2, pp 67-73.
12. Muhammad Abo ul Hassan Rashid., Malik Maliha Manzoor., Sana Mukhtar.,2017. Urbanization and Its Effects on Water Resources: An Exploratory Analysis. Asian Journal of Water, Environment and Pollution, Vol. 15, No. 1 (2018), pp. 67–74.
13. Rjasekhar.M., Dr.Sudarsana Raju.G., Siddi Raju.R., .Imran Basha.U.,2017. Land use and Land cover analysis using Remote Sensing and GIS: A case study in Uravakonda, Anantapur District, Andhra Pradesh, India. International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 04 Issue: 09.
14. Rudresh Sugam., Bhawna Gupta., Diticha Deka., 2018. Dying Traditional Water Bodies in India Struggling to Survive against Unplanned Development. Journal of Water Resource and Protection, 2018, 10, 539-558.
15. Shalaby Adel., Tateishi Ryutaro., 2007. Remote sensing and GIS for mapping and monitoring land cover and land-use changes in the North western coastal zone of Egypt. Journal on Applied Geography. Vol 27, Issue 1.