



A Study on Decadal Changes of Kambalakonda Lake, Visakhapatnam, India Using GIS Technology

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ABSTRACT

The life on this planet earth depends on the availability of water resources. Water is mystic. The civilizations in the world flourished on the banks of the rivers. Some developed cities are facing acute water scarcity. The explosion of population, urban sprawl and climate change impacts causing huge pressure on water resources. The current study titled 'A Study on Decadal Changes of Kambalakonda Lake, Visakhapatnam, India Using GIS Technology' refers to the temporal change detection for the decade of 2005-06 to 2015-16 is shown in terms of LULC.

Key words: GIS applications, LULC, Change detection, Population explosion, Temporal Changes, Urbanization.

INTRODUCTION

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.

Rapid urbanization is in an alarming state in many developing countries because of the associated problems such as unemployment, economic crisis, health issues, poor sanitation, increase in urban slums, and degradation of ecosystem (Adepoju, 1993; Angotti, 1993). As the civilization evolved, human activity increases and changes occur in the nature of pollutants entering into watercourses (Hussain et al,2014). The

water demands are severely increasing but the demand is not met. India is facing water challenges which supposed to address in a sustainable way.

There are about seven major Sources of water, which supply water to the city include Yeleru /Godavari canal, Raiwada, Thatipudi, Meghadrigedda reservoir, Gosthani infiltrations wells, Ghambiram & Mudasarlova reservoir 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. to 10 Km. The inflows to the some of the water bodies decreased due to some reasons.

Role of GIS in surface water:

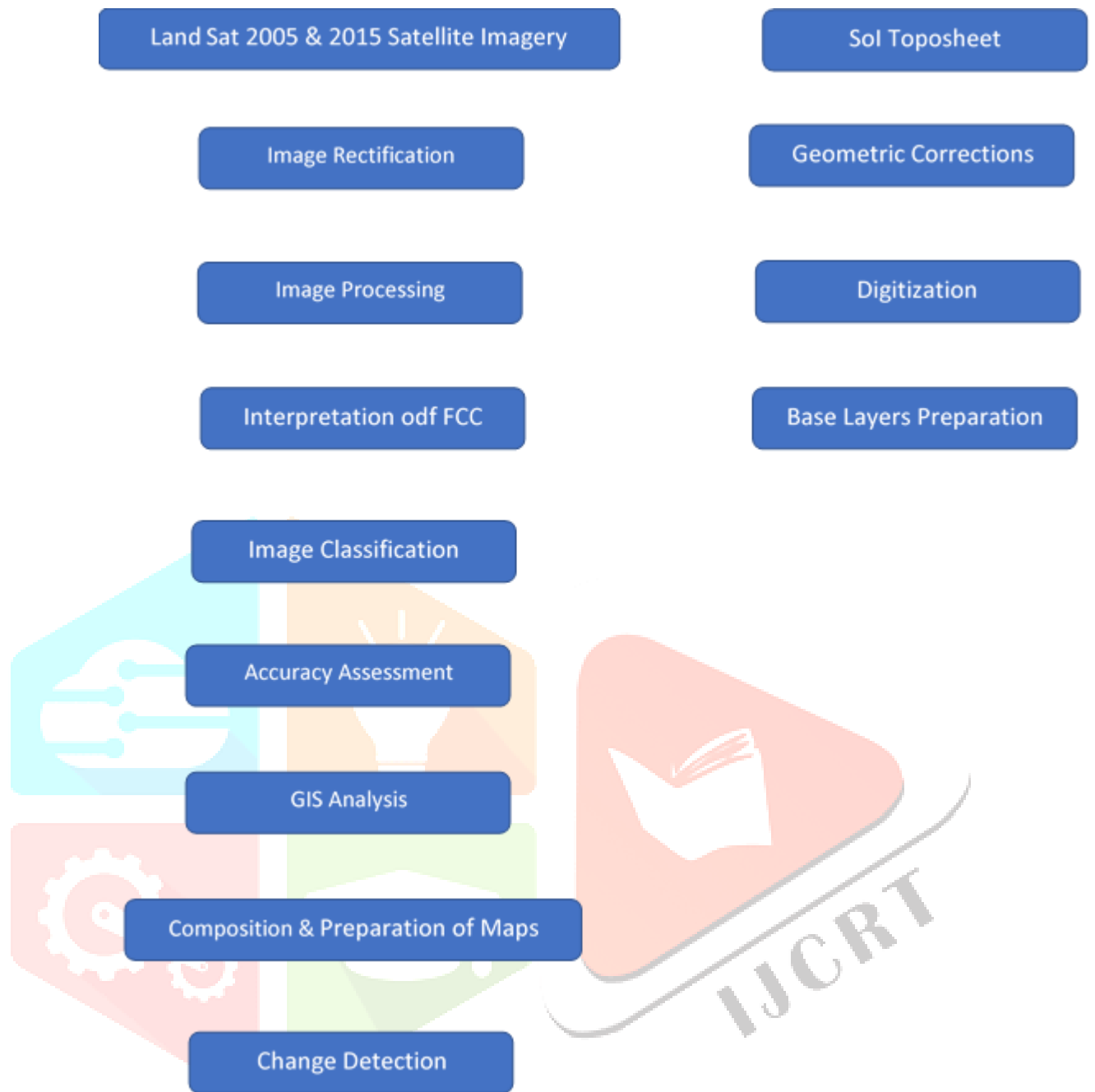
The role of GIS (Geographic Information System) in change detection of water bodies is vast. It is a dominant tool used for computerized mapping and spatial analysis. A GIS provides functionality to capture, store, query, analyse, display and output geographic inform.

The land use/cover pattern of a location 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 water body 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.

Methodology



Study Area

Kambalakonda Lake

Location: -

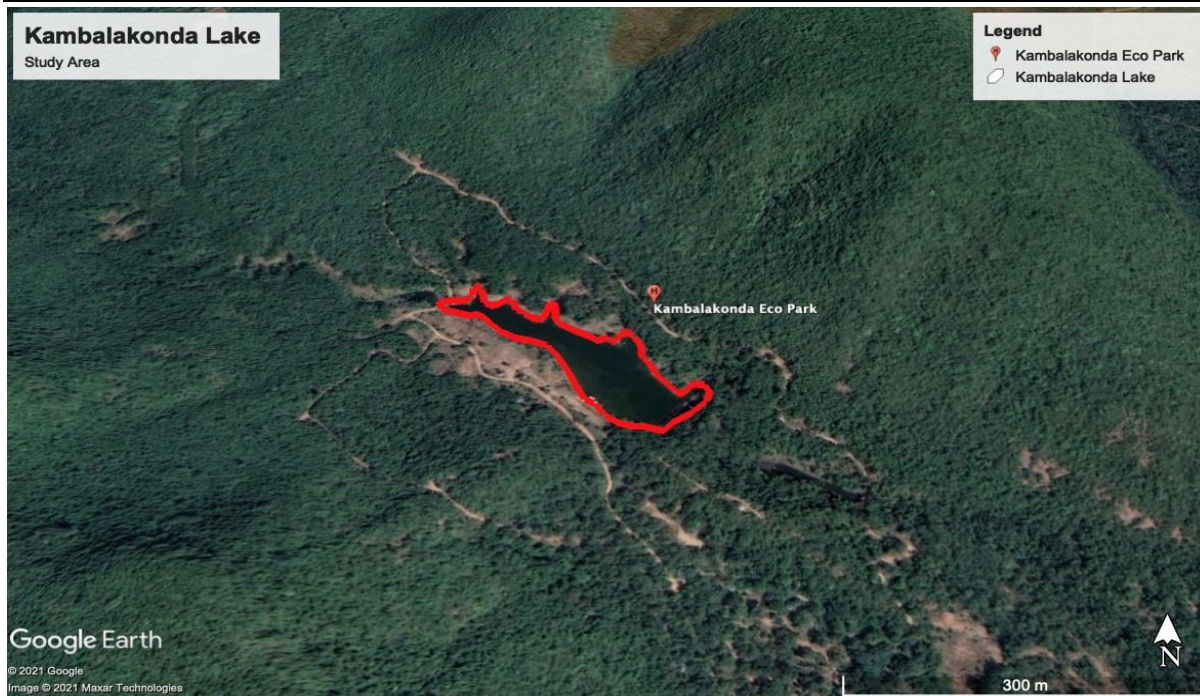
Kambalakonda Tank is surrounded by pothunamallayapalem towards North, Adarsh Nagar towards South, Endada towards East, and Sambhuvanipalem towards west. Visakhapatnam is the nearby Cities to Kambalakonda Tank.

Location: Visakhapatnam (U) of Visakhapatnam.

Longitude: 83° 20' 23"

Latitude: 17° 46' 29"

Catchment Area: - 1301.46 Acres.



Introduction

Kambalakonda Tank is a Minor tank which is feeding source for the animals in Kambalakonda wildlife sanctuary. Kambalakonda Tank is an independent tank system which is having zero Ayacut and extended up to 1301.46 acres of the catchment area and no intercepted tanks in the catchment area. The **Kambalakonda Wildlife Sanctuary** is a forest located near Visakhapatnam. It has been under the control of Andhra Pradesh Forest Department since

10 March 1970. Earlier the land was under the control of Maharajah of Vizianagaram. It was named after the local hillock Kambalakonda. It is a dry evergreen forest mixed with scrub and meadows and covers an area of 70.70 square kilometres.

Utility:-

Capacity: - 4.97 Mcft

Ayacut: 164.76 Acres

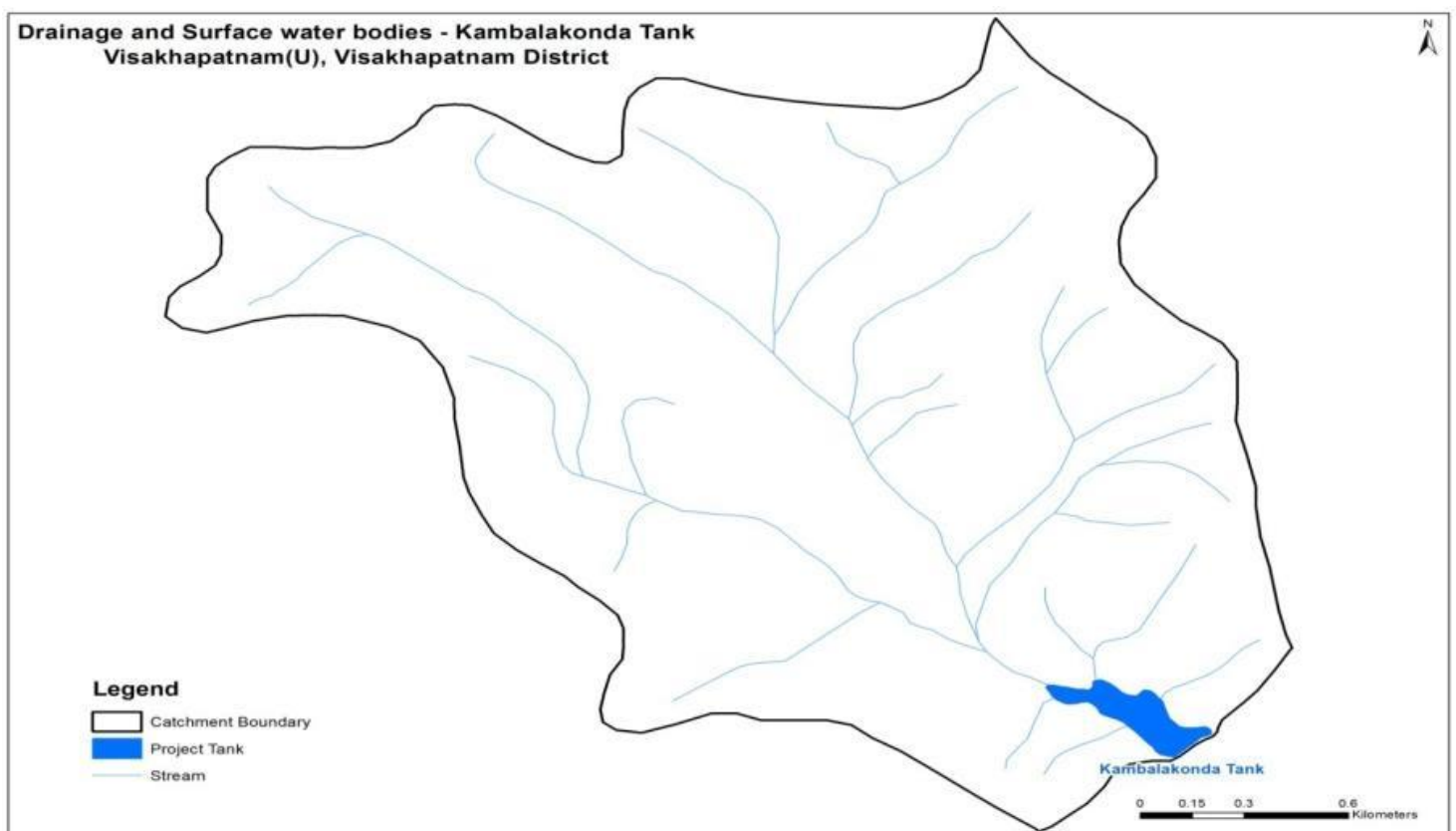
Mandals Benefited: 4 Villages

Cropping Pattern: Paddy, Sugarcane, others

Utilization: Irrigation

Existing Stabilized Ayacut: 250 Acres

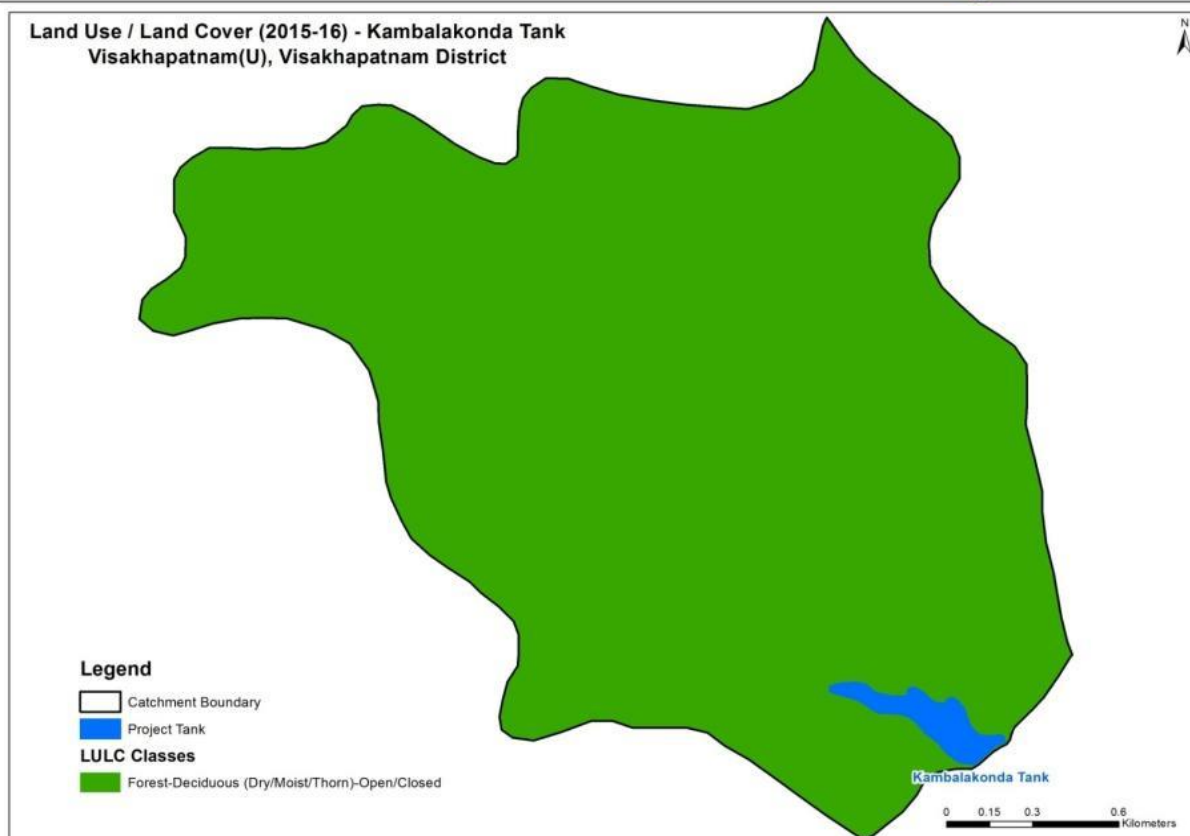
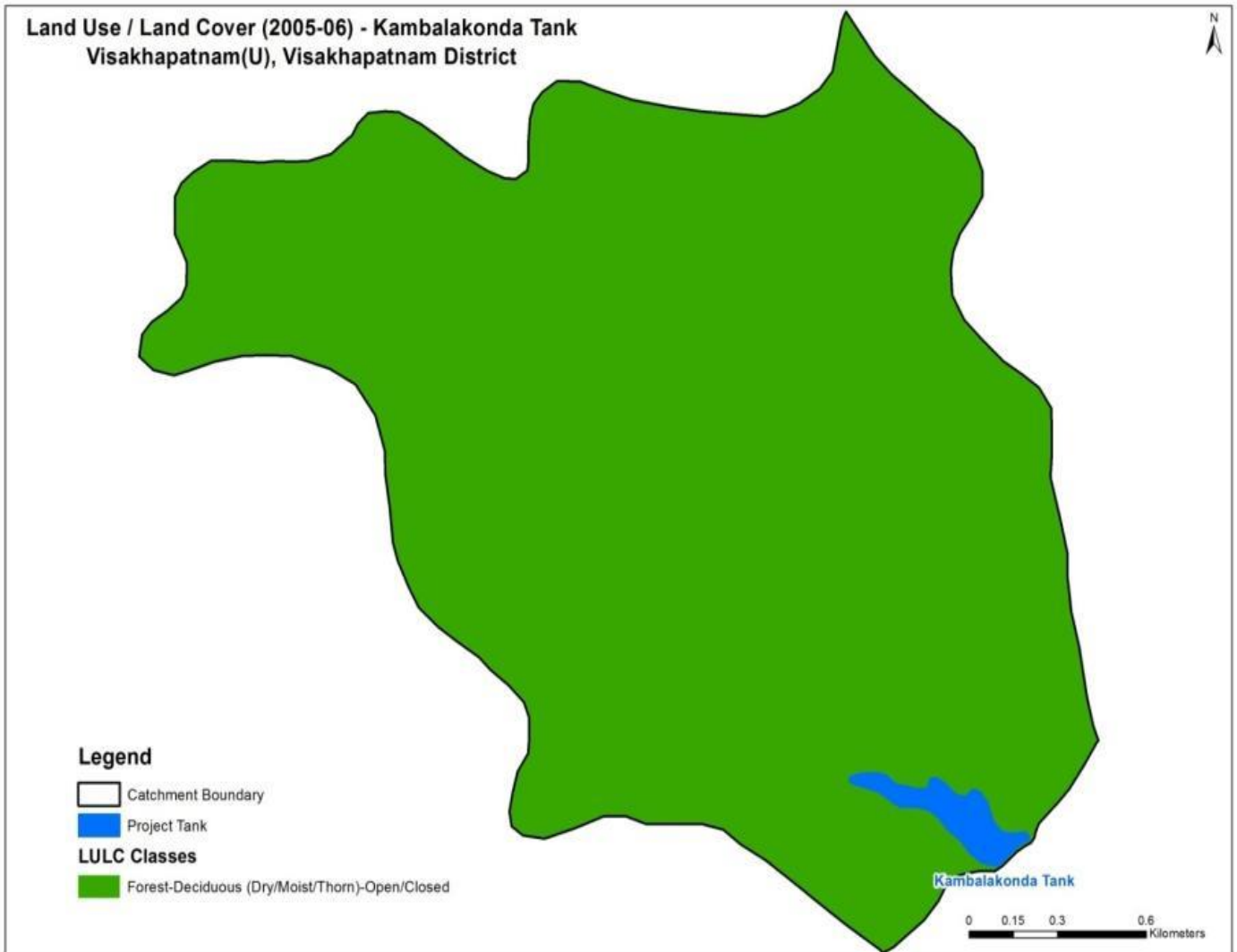
New Ayacut: 164.76 Acres

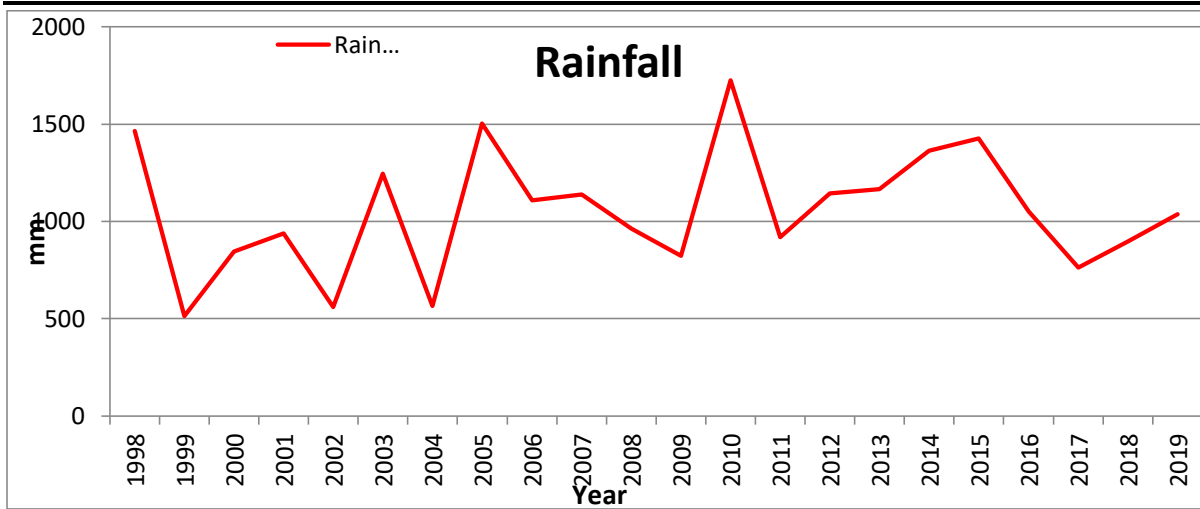
**Transformation of LULC: -****Cropped in two seasons**

These are the areas that are cropped during two cropping seasons that are often seen associated with irrigated areas. Three combinations are possible in this category viz., - Khariff + Rabi, Khariff + Zaid and Rabi + Zaid. It is found that 117.19 Acres (29.98%) in LULC of 2005-06 and changes into 148.02 Acres (37.86%) in LULC of 2015-16.

Agricultural Land-Crop Land-Khariff Crop

Agricultural area cultivated between June/July to September/ October coinciding with SW monsoon season is considered as Khariff crop. It is associated with rain-fed crops under dry land farming with limited or no irrigation and areas of rain-fed paddy and other dry crops. Khariff is found to be the second major agricultural category with an extension of 119.53 Acres (30.57%) in LULC of 2005-06 and changes to 70.45 Acres (18.02%) in LULC of 2015





Rainfall Patterns of Kambalakonda Tank, Visakhapatnam Urban:

LuLc Changes of Kambalakonda Tank During 2005-06 and 2015-16

Kambalakonda Tank	LULC of 2005-06	LULC of 2015-16	Changes	Changes (Percentage)
Forest-Deciduous (Dry/Moist/Thorn)-Open/Closed	1288.71	1286.26	-2.45	-0.19
Water bodies-Reservoir/Tanks-Seasonal	12.75	12.73	-0.02	-0.19

Constraints:

No major changes are detected, as this land is protected under wildlife sanctuary. This shows without human interventions the naturality of water body can be sustained.

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

- The LuLc class of Forest-Deciduous (Dry/Moist/Thorn)-Open/Closed is 29.98 % in its catchment area in 2005-06 it was increased to 37.86 % in 2015-16.
- The LuLc class of Agricultural Land-Crop Land-Cropped in 2 Seasons is 29.98% in its catchment area in 2005-06 but it was increased to 37.86 % in 2015-16.
- The LuLc class of Agricultural Land-Plantation is 15.33 % in its catchment area in 2005-06 it was increased to 22.04% in 2015-16

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