4 STUDY AREA

Vadodara district derives its name from the Vadodara city being central to the district administration. Vadodara District is located in Central part of Gujarat state of Western India between the 21°50' to 22°50' latitudes and 72°50' to 74°10 longitude. It has an average elevation of 37.5 m from the mean sea level. Vadodara district has a spread of 7546 km^2, which is approximately 3.8% of the total area of Gujarat. Vadodara district has varied topography including plains, hills, gorges, valleys, hillocks as well as undulating topography in parts of Chhota Udaipur and Nasvadi talukas. Since larger part of the district is plain, there are ample of opportunities for agriculture. The three major types of soil viz., sandy loam, besar and black are of prime importance. Food and cash crops like bajra, cotton, tobacco and vegetable crops are grown where black soil covers nearly 45 % of the total soil.

The district is characterized by three major rivers viz., Narmada, Mahi and Vishwanitri which particularly snakes through the city of Vadodara. Apart from these major rivers, there are a number of rivers such as Orsang, Dhadhar, Heran, Dev, Karjan, Karadm, Mesari, Bhukhi, Kaveri, etc. Apart from the lotic freshwater systems, Vadodara district has a number of major lentic water bodies such as Wadhwana, Ajwa and Pratappura. Wadhwana is a famous destination for bird watchers, whereas, Ajwa and Pratappura reservoirs are major sources of water supply system. Based on existing requirements, two types of irrigation facilities are available in Vadodara district namely; canal irrigation and well irrigation. However, the usage of well irrigation facilities is more than five times compared to canal irrigation facilities. This can be attributed to the excessive pressure on ground water resources of the district. There are more than 650 check dams in the district which occupy more than 4000 hectare of area which are being used for irrigating adjoining field as well as field which can be reached via the network of canals.

Vadodara District experiences hot summer and drier conditions round the year except in monsoon season. In this part of India, December to February are winter months, March to May are the summer months, Monsoon sets up from mid-June extending upto September month, and from October to November post monsoon season is experienced. On an average, the maximum temperature in summer rises up to 46 ° Centigrade and minimum upto 10 ° Centigrade. Nearly 95 % of annual rainfall is concentrated between

June to September and is characterized by the south-west monsoon pattern. The annual rainfall in Vadodara district from 2014 to 2018 is as follows (Figure 4.1). The typical weather in Vadodara District can be considered to be dry with March to mid - July being hotter months and November to February are the cooler to colder months. However, during the monsoon season expanding from mid –June to mid – September, the humidity remains high and most of the annual rain fall is also concentrated in this period. Some typical weather parameters are shown in Table 4. 1.

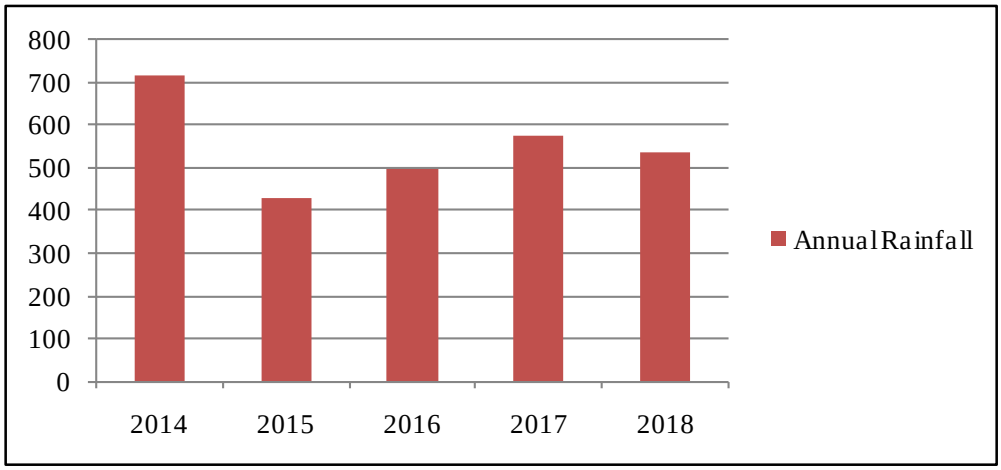

Figure 4.1 Annual Rainfall (mm) in Vadodara District from 2014 to 2018 (IMD, GoI, 2019)

Table 4.1 Indicative Air Temperature in Vadodara District
(source: https://en.climate-data.org/asia/india/gujarat/vadodara-764414/)

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Avg. Temp (°C)	20.7	22.9	26.9	31	33.4	32	28.9	28.1	28.3	27.8	24.4	21.6
Min. Temp (°C)	12.2	13.7	18.1	22.7	26.6	27.2	25.6	25	24.2	21	15.9	12.9
Max. Temp (°C)	29.2	32.1	35.8	39.3	40.3	36.9	32.2	31.2	32.5	34.6	32.9	30.4

According to the last decadal census data, the total population of Vadodara District was 41, 65,626 out of which, approximately 51.7% were males and 48.3% were females. The population was distributed in 12 Talukas comprising of 1533 villages. Out of the total population, nearly half of the population resides in rural areas. The average population density of the district was 552 individuals per km^2 (GOI Census, 2011). Depending upon the existing physiographic conditions, soil, topography, water resources as well as climatic conditions, the major crops grown in the district are cotton, pigeon pea, paddy, castor, wheat, sugarcane, banana, tobacco as well plenty of different types of vegetables. Considering the geo-environmental conditions, opportunities in agriculture, implementation of "Krishi Mahotsav" programme etc., nearly 52.11% of the total working population of the district was engaged in agriculture (GOI Census, 2011).

The current study was taken-up considering in detail the importance of agriculture and surface water resources present in the district. Since the study was designed to be conducted on three reservoirs and to understand the patterns of variation in selected water quality parameters and soil/sediment quality parameters; the reservoirs under investigation must be comparable in basic aspects. Hence, they were selected by keeping in mind certain specific criteria, which are listed below:

a) The reservoirs should be similar with respect to area.
b) There should not be large scale variation in the climatic conditions at all the reservoirs.
c) The peripheral activities and the land use should be reasonably analogous.
d) The reservoirs do have similar utilities viz., Irrigation and Aquaculture.

Based on the above criteria, three reservoirs viz., Timbi, Vadadala and Dhanora were selected for the current study (Figure 4.2).

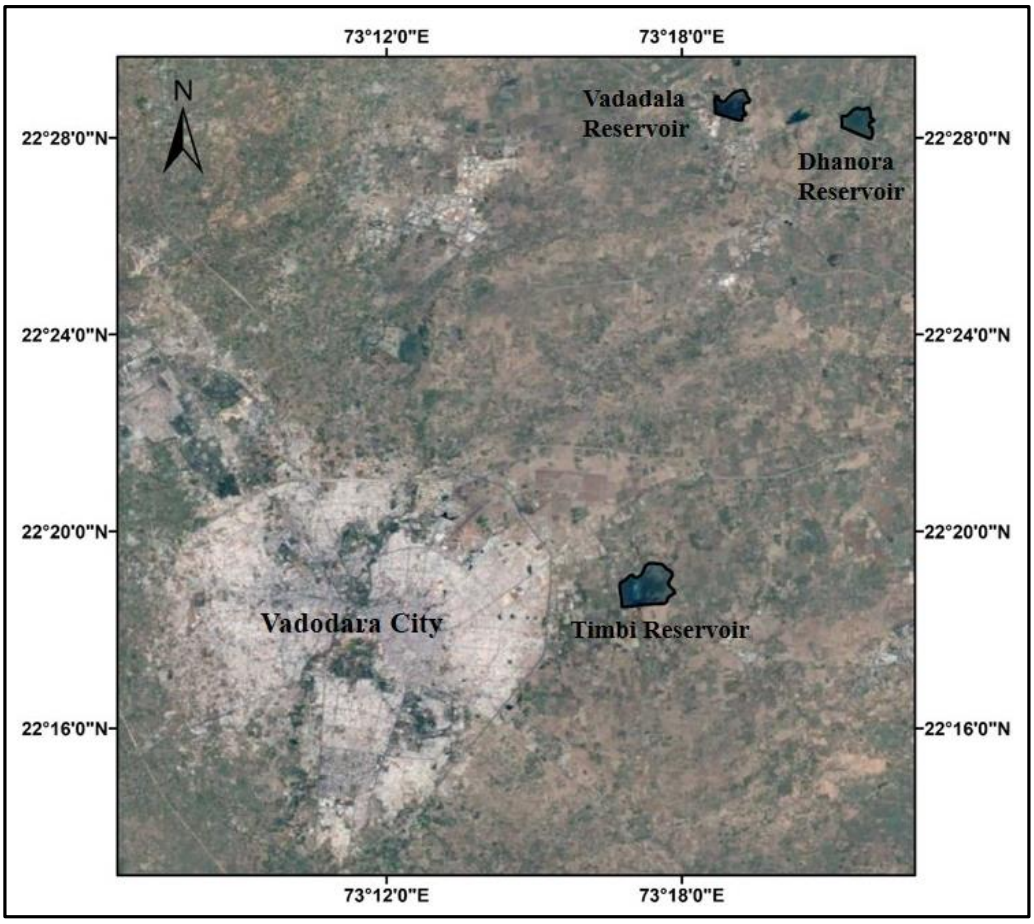

Figure 4.2 Location of Freshwater Reservoirs

4.1 Timbi reservoir:

It is located in the East of Vadodara city between 22º19'19"N to 22º18'28"N latitude and 73º16'42" E to 73º17'46" E longitudes, The reservoir is characterised by an approximate area of 1.6 km^2 and Approximate Perimeter: 5.6 km at full water capacity (Figure 4.3). The major source of water for the reservoir is rain-water, however, it also fed by canals from Ajwa Reservoir in minor quantity. The western and southern boundary of the reservoir is elevated northern and eastern parts are having natural gradient with a gentle slope. The water of the reservoir is supplied to surrounding agricultural fields by canals and is a major source of irrigation water in the vicinity. Fishing is also carried out in the reservoir and when the water recedes in summer months, the otherwise inundated area is used for grazing of cattle. Apart from its importance to human settlements, the reservoir also provides habitat for a variety of wetland birds, both native and non-native species. This makes it an important reservoir both from an economic as well as ecological point of view.

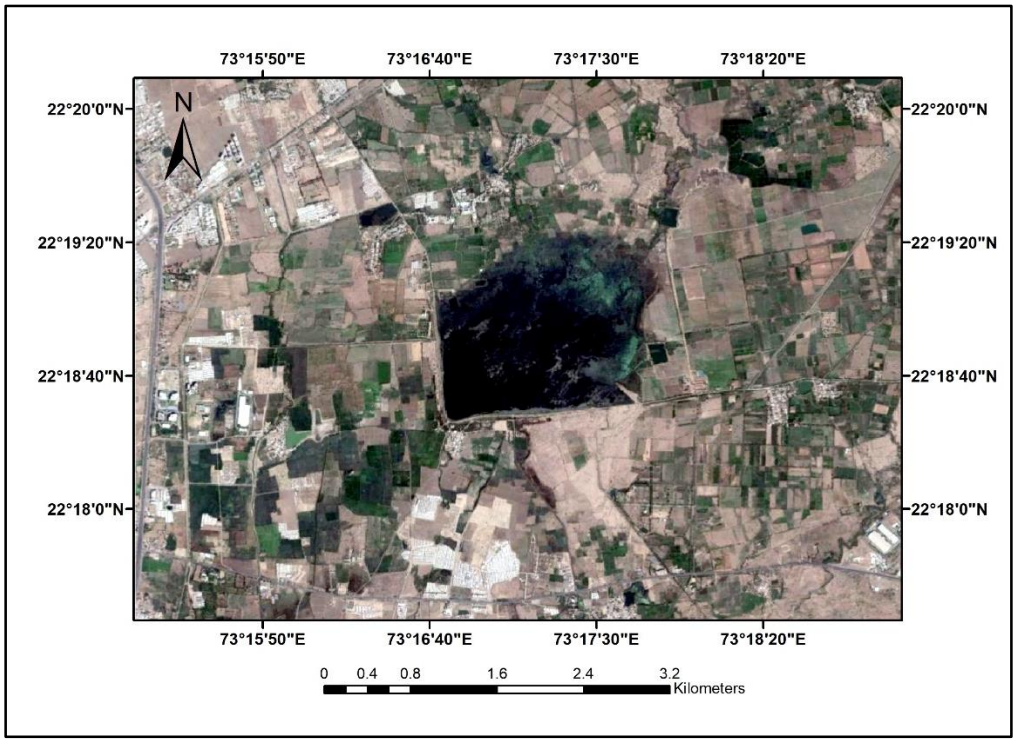

Figure 4.3 Timbi Reservoir (Image source: Google earth)

4.2 Vadadala Reservoir:

Located between 22°28’27”N - 22°28’38” N latitudes and 73°18’39” E – 0 73°19’ 15” E longitudes in the North - East of Vadodara city (Figure 4.4). This reservoir is made by constructing an earthen dam. Major source of water for the reservoir is rainwater. During the summer season, the water is fed to this reservoir by a canal system. Majorly, the water is used for agriculture but the reservoir is also used for fishing. The Western, Northern and Eastern periphery of the reservoir has gentle slope and agriculture is carried out on such lands from where the water has receded.

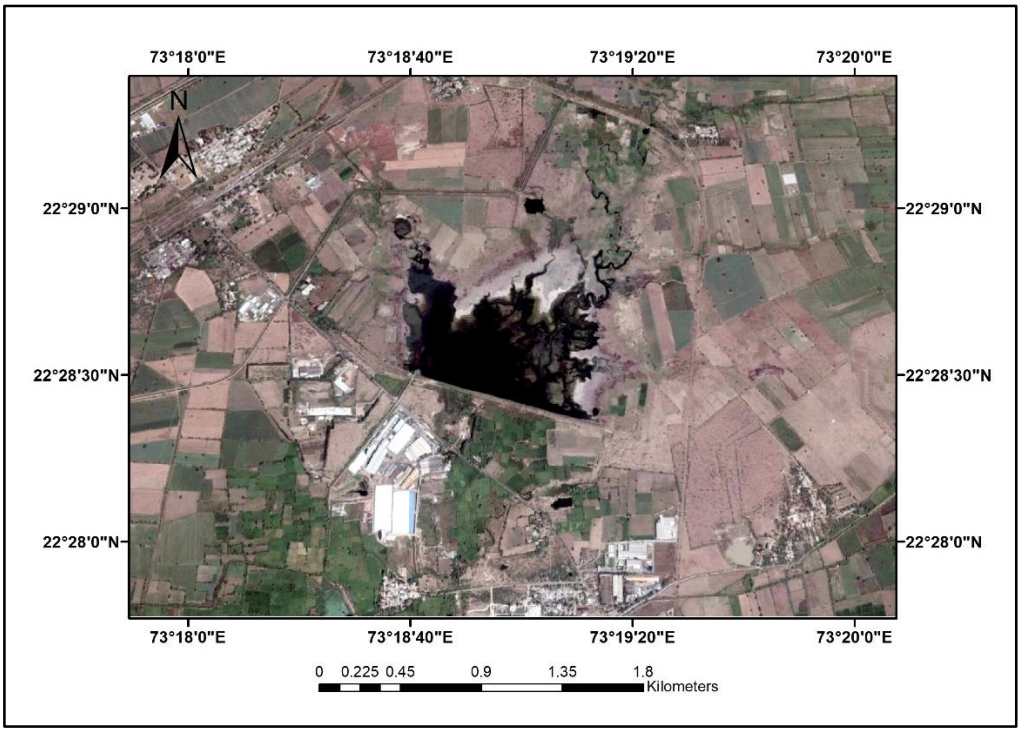

Figure 4.4 Vadadala Reservoir (Image source: Google earth)

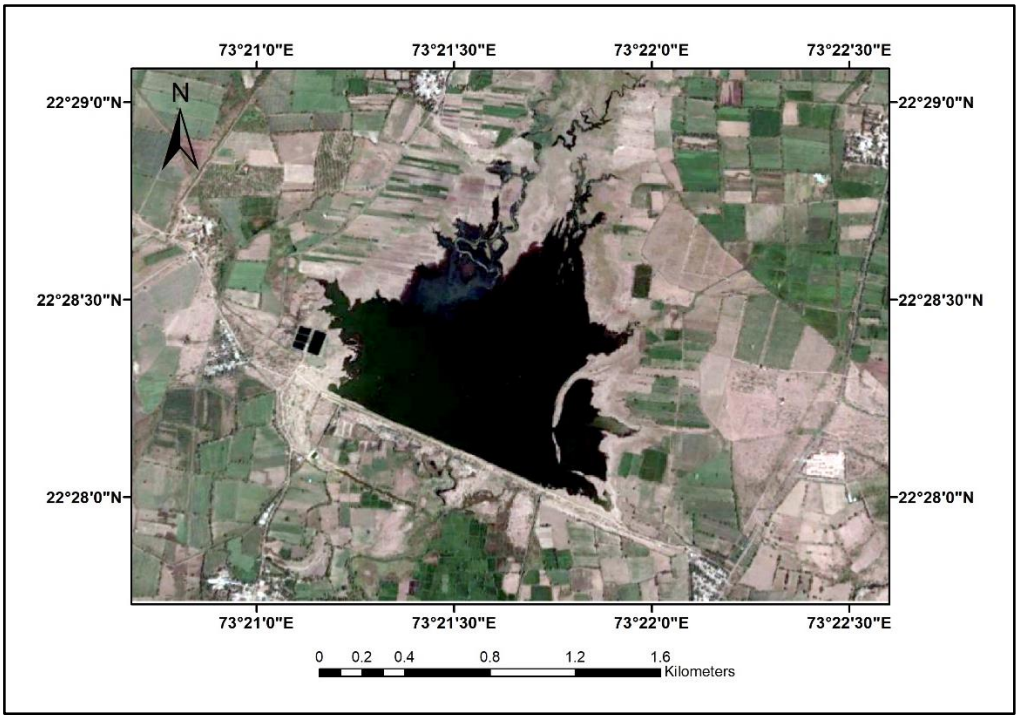

Figure 4.5 Dhanora Reservoir (Image source: Google earth)

4.3 Dhanora Reservoir:

This reservoir is located between 22°28’13”N - 22°28’16” N latitudes and 73°21’09” E – 73°21’58”E in longitudes the North East direction of Vadodara city (Figure 4.5). The reservoir, similar to Vadadala reservoir, is mainly used for irrigation purpose as well as

fishing. Grazing of cattle is a common sight at the end of the reservoir when the water recedes. The southern boundary is an earthen dam which holds the water. The other three boundaries are open and have gentle slope. When the water recedes, agriculture is carried out on such lands, similar to Vadadala.