URBAN ENVIRONMENTAL AND HEALTH ISSUES IN ANAND CITY: A GEOGRAPHICAL STUDY

Thesis submitted in
Partial Fulfilment for
the Award of the Degree of
Master of Urban and Regional Planning

by
Amirash Yogeshkumar Pandya

Second Semester, MURP II – 2020-21

Primary Guide: Dr Bindu Bhatt
Secondary Guide: Mr. Pradeep Rajput

सत्यं शिवं सुन्दरम्

Master of Urban and Regional Planning (MURP) Program

Department of Architecture

Faculty of Technology and Engineering

The Maharaja Sayajirao University of Baroda

D. N. Hall, Pratap Gunj, Vadodara, Gujarat, India

JULY 2021

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CERTIFICATE

URBAN ENVIRONMENTAL AND HEALTH ISSUES IN ANAND CITY: A GEOGRAPHICAL STUDY

The contents presented in this Thesis represent my original work and it has not been submitted for the award of any other Degree or Diploma anywhere else.

Amirash Yogeshkumar Pandya

This Thesis is submitted in partial fulfilment of the requirements for the
Degree of Master of Urban and Regional Planning
at the Department of Architecture
Faculty of Technology and Engineering
The Maharaja Sayajirao University, Vadodara, Gujarat, India
The present work has been carried out under our supervision and guidance and it meets the standard for awarding the above stated degree.

Primary Guide:

Dr Bindu Bhatt

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Abstract

Urbanization refers to general increase in population and the amount of industrialization of a settlement. It includes increase in the number and extent of cities. It symbolizes the movement of people from rural to urban areas. Urbanization happens because of the increase in the extent and density of urban areas. Cities around the world face many environmental health challenges including contamination of air, water and soil, traffic congestion and noise, and poor housing conditions exacerbated by unsustainable urban development and climate change. This review emphasizes on the effect of urbanization on environment & health components mainly geographical, land and water resources. With the advent of agriculture, modern technology, and the rise of capitalist mode of economy, the exploitation of land and its resources has increased dramatically. In the last few decades, land use practices (agriculture, mining, logging, housing, recreation, etc.) have become so intensive and predominant that we can see their impacts in forms of uncontrolled development (urbanization and sprawl), deteriorating environmental quality, loss of prime agricultural lands and destruction of wetlands everywhere on the earth. Such impacts have reduced the local capacity of lands to support both ecosystem and human enterprise.

This thesis is dedicated to my parents,

Mrs. Jayshreeben Pandya and Mr. Yogeshkumar Pandya,

For their constant support and encouragement.

Acknowledgements

First and foremost, I would like to thank God, with whose blessings I have finally completed my thesis.

I am extremely grateful to my thesis guides, Dr Bindu Bhatt and Mr. Pradeep Rajput, for their valuable time, support, and guidance. I would also like to express my gratitude towards the head of the department, Dr Bhawana Vasudeva and all the faculties and staff of the department. I thank them all for the extensive amount of time and effort they have spared for me. This would not have been possible without your help.

I wish to express my heartiest regards to my parents and my teachers for their guidance and moral support.

I would also like to thank government official for their selfless support and giving permission to complete my thesis.

Last but not the least, my sincere thanks to all my friends who have patiently extended all sorts of help and motivated for accomplishing this undertaking.

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CHAPTER-1 INTRODUCTION

1.1 BACKGROUND

The rapid growth of urban population and the increasing importance of roles played by the cities in local as well as global economies have drawn much attention in recent years. The centrality of goods & services, proximity to decision-makers & financial markets, availability of skilled and unskilled workers and other amenities have made the urban areas, the growth centres for the country. Due to these "pull factors" the people from the adjoining rural and peri-urban areas are attracted to such urban centres and settle for employment and also in the hope for a better quality of life.

Urbanisation process consists of rapid population growth increase in the proportion of the non-agricultural work-force, and changes in land use from agricultural to non-agricultural pattern.

However in some urban centres decline in population growth rate is observed. This can be due to various urban environmental factors.
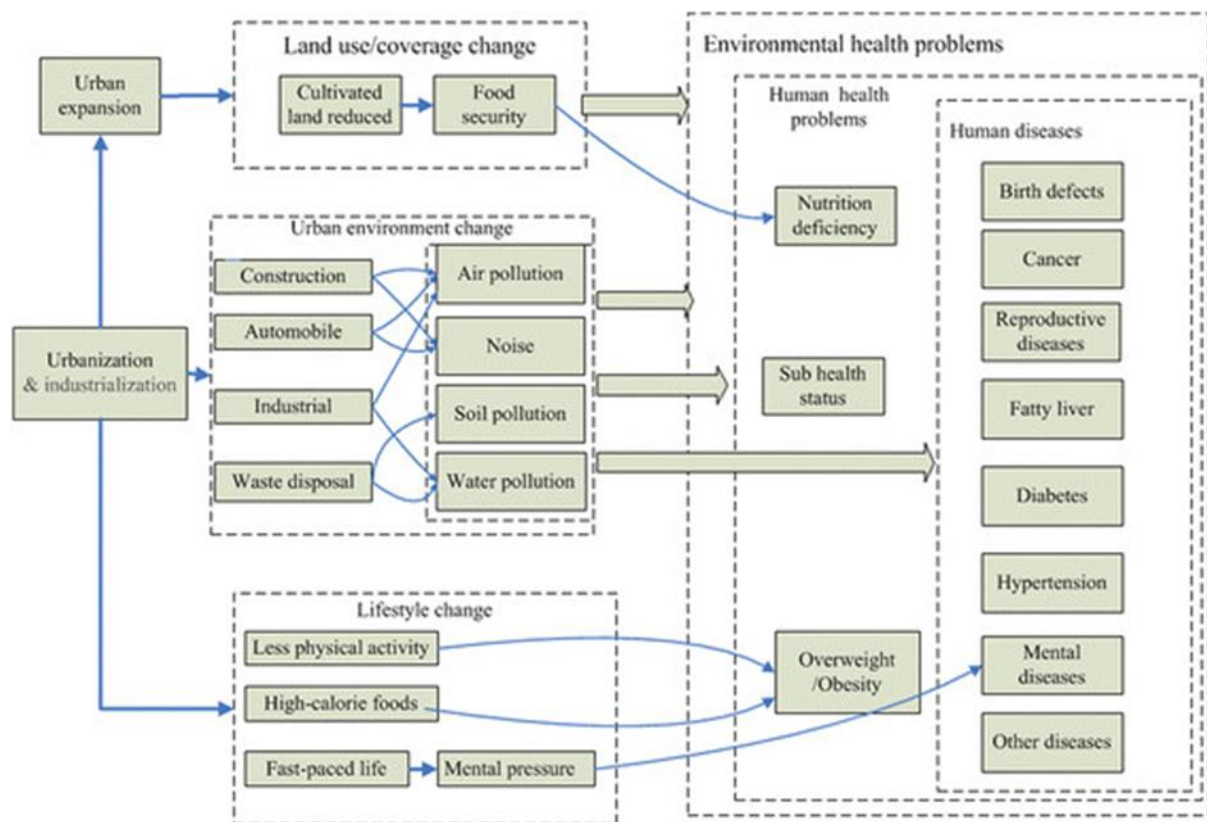
FIGURE 1.1 IMPACT OF URBANIZATIONU

1.2 NEED FOR STUDY

- Urbanization leads to urban expansion creating a imbalance in urban environment.

- Components in the urban environments can have both negative and positive social impacts.

- Despite of having all the urban facilities, decline in growth-rate is observed in some urban areas

- Negative social impacts can lead to a host of social, economic and psychological problems at the individual or community level which then can be detrimental to physical and psychological well-being.

1.3 AIM:

To study the impact on urban environment & health due to urbanisation in Anand.

1.4 OBJECTIVE:

- To examine the trend & pattern of growth and development of the city.
- To examine the change in urban land use/land cover pattern in last three decades.
- To assess the status of public utility and services.
- To identify the major environmental challenges in the city.
- To identify the major health related problems.

1.5 RESEARCH QUESTION:

- How should we approach the increasing urban sprawl in relation to urban environment & health?

1.6 SCOPE AND LIMITATION

This study is specific to Anand city only ("avkuda" boundary).

1.7 METHODOLOGY

METHODOLOGY
Data Collection & Analysis

Data Analysis

Method of data analysis & interpretation

Method of primary Survey

Survey

Preparing data charts & tables & projection the data required

Overlaying of Major Census parameters: Population, Density, Sex ratio, etc.

Meetings with Authority & Departments

Finding trends by comparing the data with previous census data & projection the data required

Selection Of Villages: For Surveys three gradual typology one main town one census town

Secondary

Conducting primary survey to find the problems local demands and other issues

Per Village: To Surveys Per village-3 data led survey [HIG, MIG, and LIG]

FIGURE 1.2 METHODOLOGY

CHAPTER-2 STUDY AREA PROFILE

2.1 City Profile

Anand is a city in the Indian state of Gujarat. Anand is known as the Milk Capital of India. It became famous for Amul dairy and its milk revolution. This city hosts the National Dairy Development Board of India and Anand Agricultural University. Vallabh Vidyanagar and Karamsad, an educational suburb of Anand is located within Anand urban agglomeration.

FIGURE 2.1 LOCATION OF ANAND DISTRICT

Anand is located between Ahmedabad and Vadodara on the Western Railway. It is a railway Junction and a Broad-Gauge Line from here runs to Godhra, covering Dakor, a major Hindu pilgrimage en route. Anand Railway Station has 5 platforms for main line and branch line to Godhra. A new platform is under construction on the branch to Ahmedabad from the Godhra line forming a triangle.

The National Express highway from Ahmedabad to Vadodara also passes through Anand. Anand has seen rapid economic growth along the Anand Vallabh Vidyanagar and Karamsad road belt. It is on track of becoming a Municipal Corporation with the inclusion of various peripheral villages like Karamsad, Chikhodra, Lambhvel, Vallabh Vidyanagar, Bakrol, Mogri and 20

others. Anand is located in midst of the Charotar region known for its industrious development.

2.2 Context & Connectivity

Anand is located near the Gulf of Cambay in the southern part of Gujarat. Anand holds a very strategic location, boundary being surrounded by Kheda district to North, Ahmedabad district to West, Baroda district to south and Bharuch district to East. NH- 8 passes through Anand.
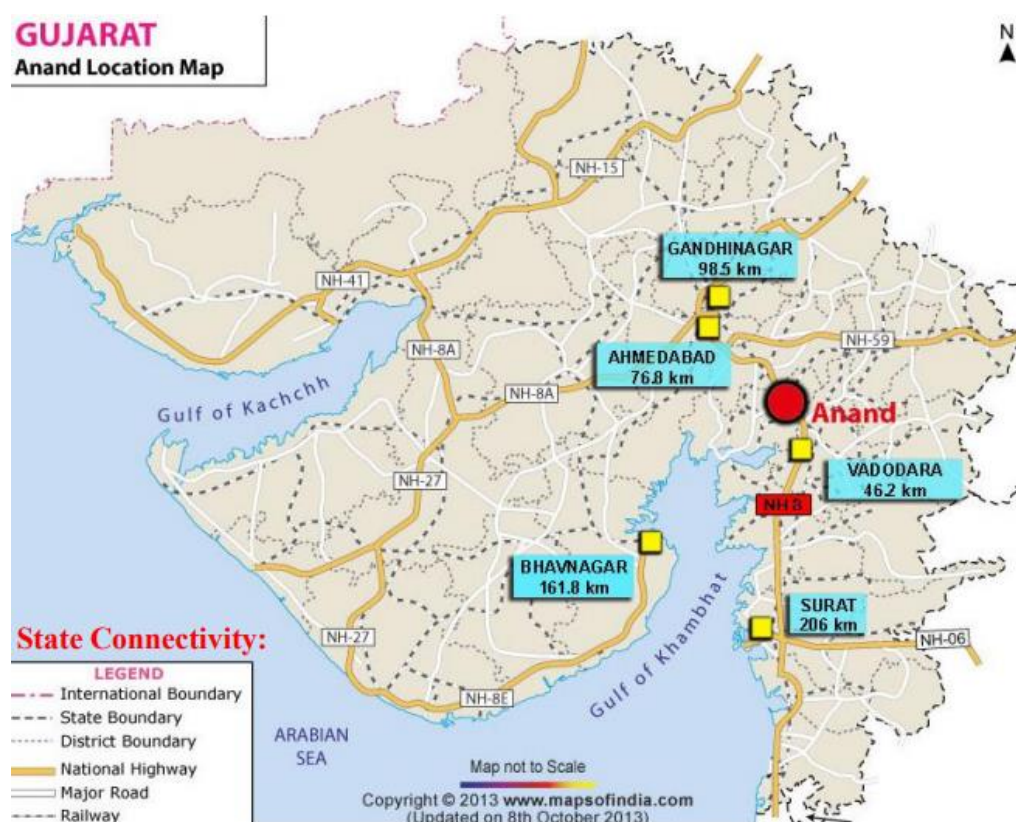
FIGURE 2.2 STATE CONNECTIVITY

The D.M.I.C corridor passes through Anand. There are many existing industrial estates along the DMIC corridor. The objectives include developing and improving the industrial infrastructure. To achieve the objectives, the government plans to develop new industrial estates, clusters and export hubs in the region.
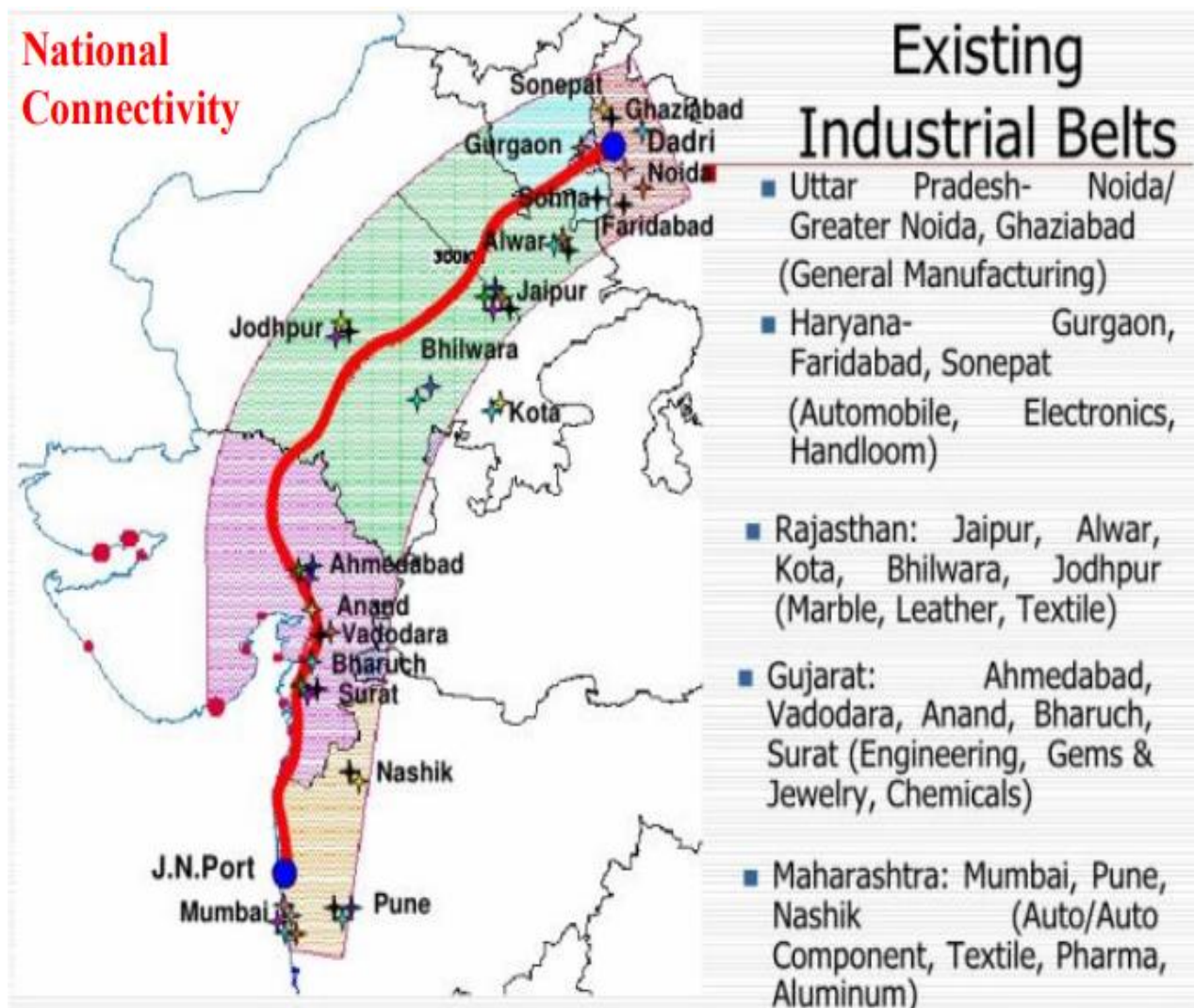
FIGURE 2.3 NATIONAL CONNECTIVITY

This will not only increase the employment opportunities but also increases the exports. Development of agro-processing industries, packaging and cold-storage industries is also important for achieving the overall improvement in industrial yield and exports.
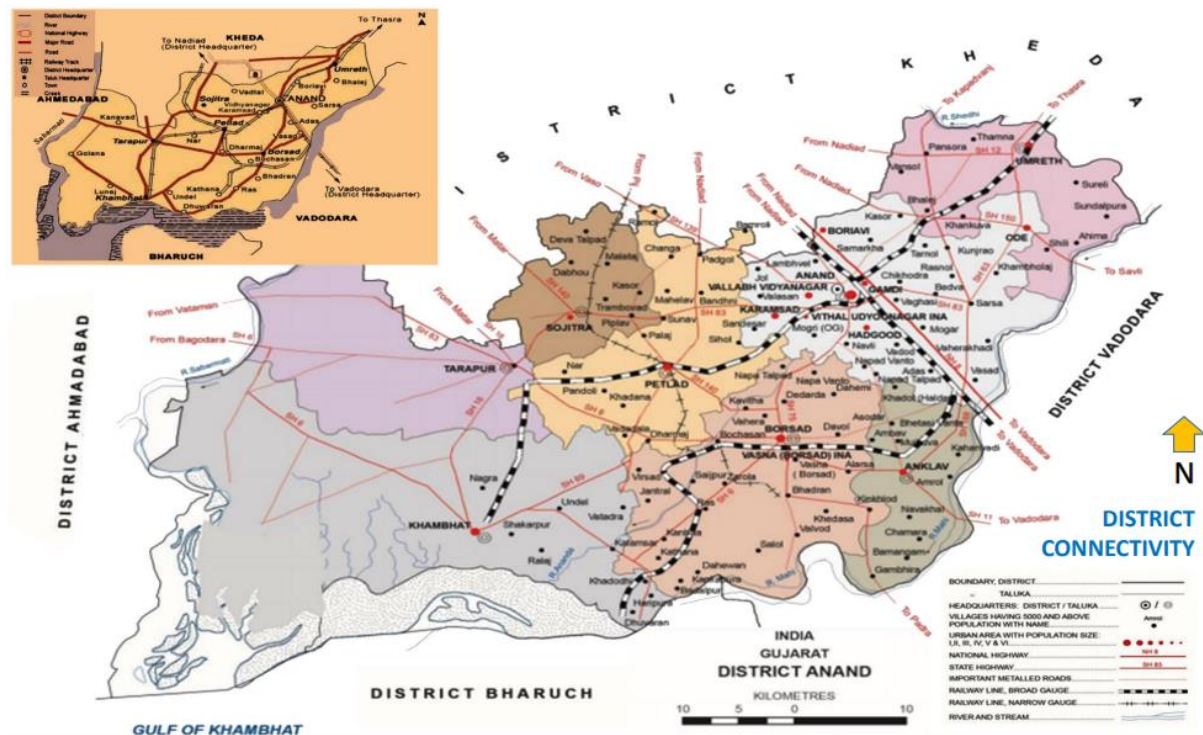
FIGURE 2.4 DISTRICT CONNECTIVITY

2.3   Administrative structure

NAGARPALIKA GOVERNANCE STRUCTURE

President &elected board (Municipal councillors)

Chief Officer Office

Superintendent

Departmental head

(PWD, road, town planning, standing committee, tax, sanitary, account, etc.)

FIGURE 2.5 ANAND NAGARPALIKA

AVKUDA GOVERNANCE STRUCTURE
AVKUDA Chairman
1 JTP
2 Planning Assistant
Surveyor
Nagar Niyojak

2 Planning Assistant

Surveyor

FIGURE 2.6 AVKUDA

Chapter-3 Data Collection and Analysis

3.1 Demographic Profile

3.1.1 Population

The population of the Anand district was 14.48 lakhs in 1981 (5.51 percent of the state) which increased to 16.42 lakhs (5.56 percent of the state) in 1991. In 2001 it was 18.56 lakhs (...% of the state), and in year 2011 it amounted to 22.9 lakhs (3.73 percent).

The average decadal growth rate in Anand District has been recorded to 13.04 % in 1991-2001and 12.57% during 2001 – 2011 and Anand taluka has been recorded to 17.48% in 1991-2001 and 18.05% during 2001-2011.

As per 1991 census, the urban population of the district was 2.86 lakhs in 1981 census which rose to 3.89 lakhs as per the 1991 census. In 2001 it was 5.07 lakhs, and in 2011 it amounted to 6.34 lakhs.

The total population of the villages other than the urban areas within the authority limits was 1,64,372 persons in census 1991, which has increased to 1,85,872 in year 2001 census and 2.19 lakhs in year 2011.

According to 2011 Census, the total population of Anand district is 20,92,745 comprising 10,87,224 males & 10,05,521 females, 3.46% of total State population. Out of total population of Anand district, 69.66% of Population lives in rural areas while 30.34% lives in urban areas. The rural population of the district is distributed in 374 inhabited villages of 8 talukas while the urban population is spread over in 15 towns. AVKUDA population (2011) is 501536 (23.96 % of district population).
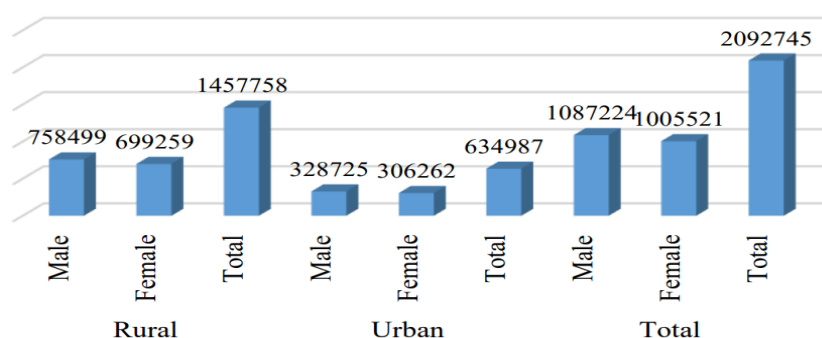
FIGURE 3.1 URBAN - RURAL DISTRICT POPULATION

| Village wise Population		Years					
Town / Village	Status	1961	1971	1981	1991	2001	2011
Adas	Rural	6789	8330	10546	10996	10946	12876
Anand (M/UA)	Urban	40458	59155	83936	110266	156050	198629
Ankalwadi	Rural	1229	1524	2029	1938	2281	3011
Bakrol	Rural	6327	8426	11125	12095	22782	Marge to Anand
Boriyavi (M)	Urban	8340	10960	14113	15033	17861	19853
Boriya	Rural	2238	2782	3405	4036	3852	4966
Chikhodra	Rural	7728	9328	11841	11848	13734	15889
Gamdi	Urban	4467	6771	9001	10978	12855	14577
Gana	Rural	1770	2267	2954	3108	3569	4079
Gopalpura	Rural	-	-	-	2100	2288	2666
Hadgood	Outgrowth	2216	2976	3927	6359	8937	14311
Jakhariya	Rural	-	-	-	1744	1448	2327
Jitodiya	Rural	1514	2065	2717	3051	4101	4796
Jol	Rural	2341	2811	3803	4582	5493	5944
Karamsad (M)	Urban	9282	11678	15896	21132	28970	35298
Khandhli	Rural	1175	1276	1676	1509	1664	1904
Lambhvel	Rural	2064	2456	3323	3420	4208	5572
Meghva(Gana)	Rural	988	1345	1570	1529	1584	1715
Mogar	Rural	3716	4937	5907	7933	7568	9021
Mogri	Rural	3076	4173	6064	6411	8488	9865
Morad	Rural	2209	2394	3232	3561	3936	4577
Napad Talpad	Rural	3960	4566	5954	5567	5344	5620
Napad Vanto	Rural	5524	7610	9423	10179	11300	14113
Navli	Rural	4053	4922	5564	6127	6808	6750
Rajupura	Rural	233	294	1889	2764	3600	4179
Samrkha	Rural	10702	13113	16449	17967	20148	21265
Sandesar	Rural	3113	3831	4708	5355	5091	6114
Vadod	Rural	7830	9223	12116	9123	10336	12007
Vaghasi	Rural	2162	2372	2802	3482	4053	5321
Valasan	Rural	3407	4069	5375	6242	7164	8371

Vallabh Vidyanagar (M)	Urban	6782	15509	18197	21560	29260	23516
Vanskhiliya	Rural	1312	1552	1993	2260	2589	3011
Vasad	Rural	5541		9757	10203	12487	14357
Vitthal Udhyog Nagar	NIA						5036
AVKUDA		162546	212715	291292	344458	440795	501536

TABLE 3.1 VILLAGE WISE POPULATION

Source: - Anand District Hand book, 2011
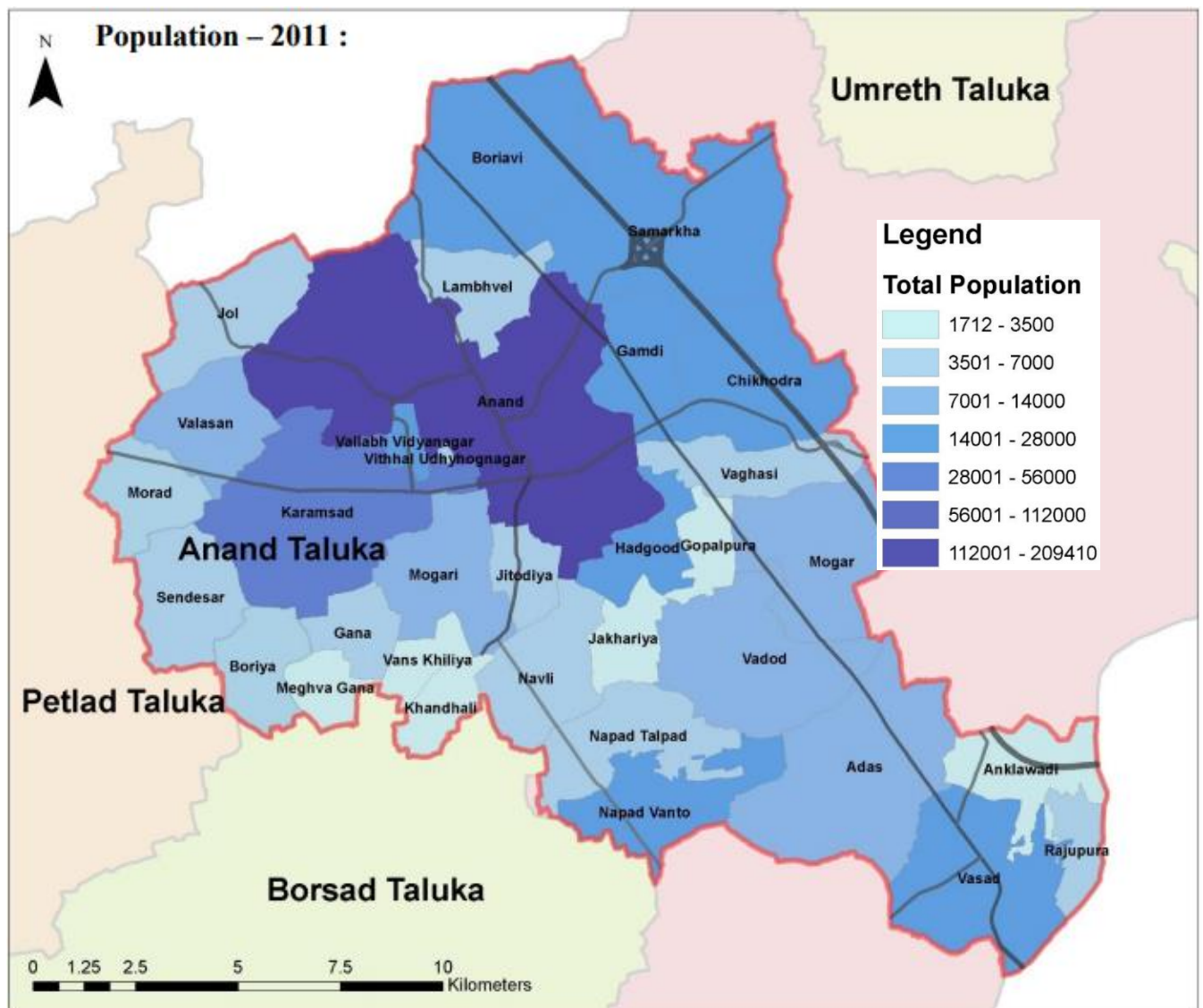
FIGURE 3.2 AVKUDA POPULATION 2011
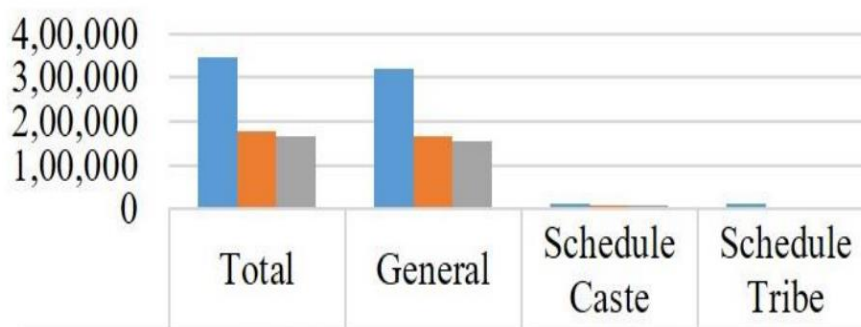
TABLE 3.2 SC, ST POPULATION

Decadal Population Growth in AVKUDA (1961-2011)					
VILLAGE	**1961-71**	**1971-81**	**1981-91**	**1991-01**	**2001-11**
Anand (M)	44.45	40.66	28.72	46.15	11.07
Boriavi (M)	31.41	28.77	6.52	18.81	11.15
Karamsad (M)	25.81	36.12	32.94	37.09	21.84
Vallabh Vidyanagar (M)	128.68	17.33	18.48	35.71	-19.63
Other Villages	17.11	38.36	11.04	13.08	17.93
AVKUDA	30.86	36.94	18.25	27.97	13.78

TABLE 3.3 DECADAL POPULATION GROWTH IN AVKUDA

3.1.2 Population Density

Anand is a fast-growing medium sized Class A city which has a major educational and cooperative type setup. Due to this Anand is having different density wise population distribution. Density depends on linkages, social pattern, past experiences and accessibility resources. Population density distribution of Anand seems to be spatially influenced by the major transportation routes and links, as well major social institutional setup.

The population is distributed all over the city. The residential densities are seen to concentrate more near the activity areas due to the fact that corresponding areas near these centres are still being developed to accommodate the residential activity. The high densities near the core and the south-western portion of the city are the indicators of this.
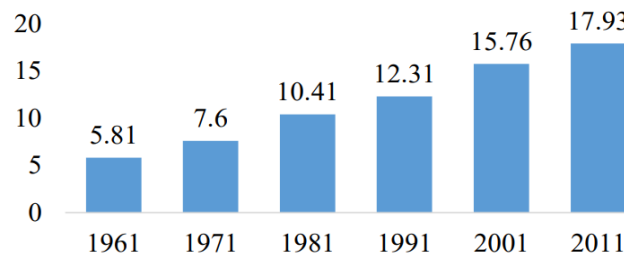
FIGURE 3.3 AVKUDA POPULATION DENSITY
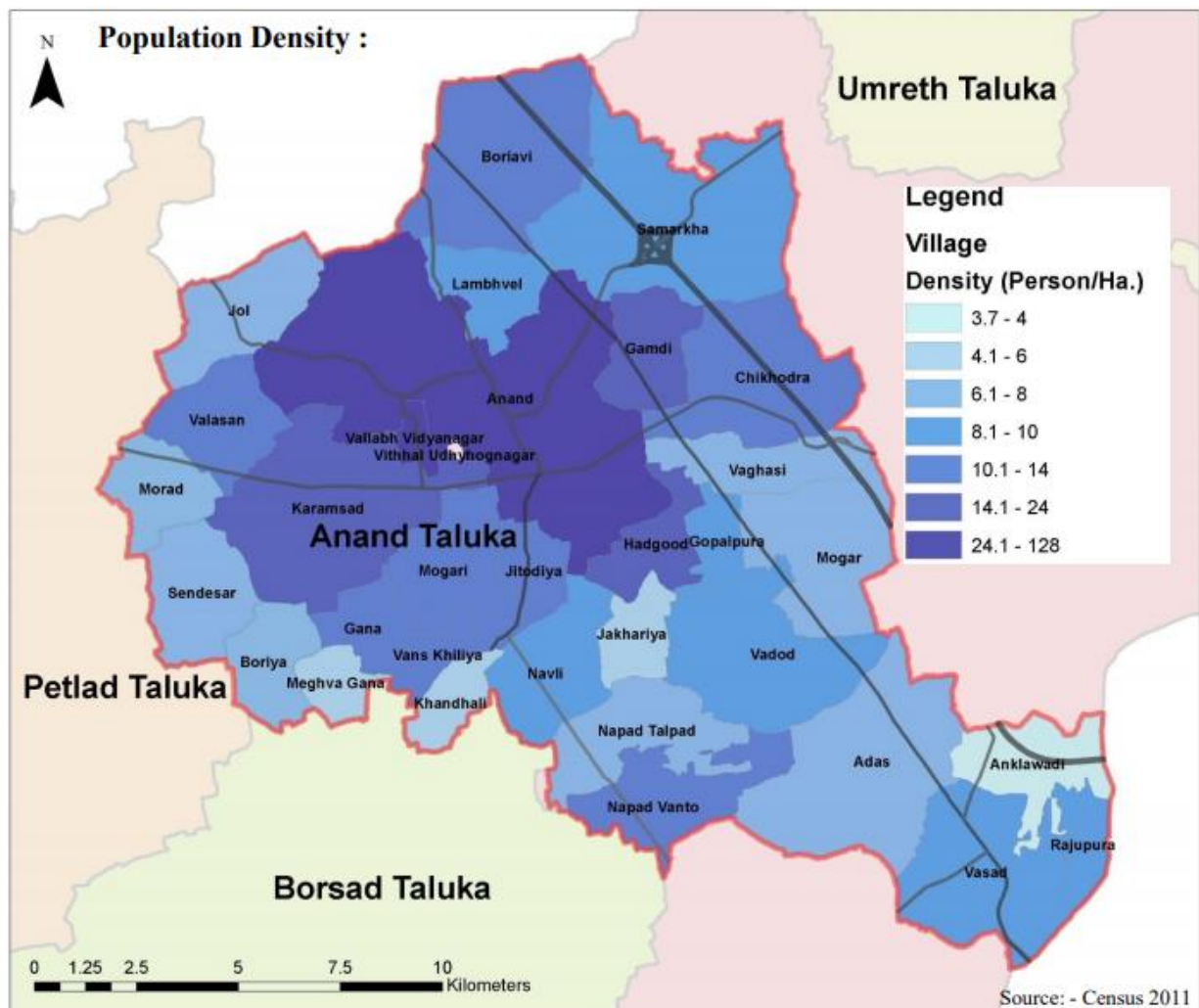
FIGURE 3.4 POPULATION DENSITY

3.1.3 Growth Rate

The average decadal growth rate has been registered to 29.12 percent in 1961-1971, 46.40 (1971-1981), 12.74 (1981-1991), 15.54 (1991- 2001) and 18.19 percent during 2001-2011. This shows decline in growth rate during 1971-1981 and 1981-1991, however there has been rise in absolute number of persons. There has been an addition of 50,169 persons during 1961-1971, 78,577 (1971-1981), 53,166 (1981-1991), 96,337 (1991-2001) and 60741 persons during decade 2001 – 2011.

From 1981 - 1991 to 1991 – 2001, growth rates of the villages have declines such as Adas, Boriya, Gamdi, Hadgood, Jol, Mogar, Rajupura, Sandesar, Vaghasi, and Valasan. Whereas Anklavdi, Bakrol, Chikhodra, Gana, Jitodiya, Khandhli, Lambhvel, Meghvagana, Mogri, Morad, Napad Talpad, Napad Vanto, Navli, Samarkha, Vadod, Gopalpura, Jakhariya, Vanskhiliya and Vasad has shown increasing growth rate in population.
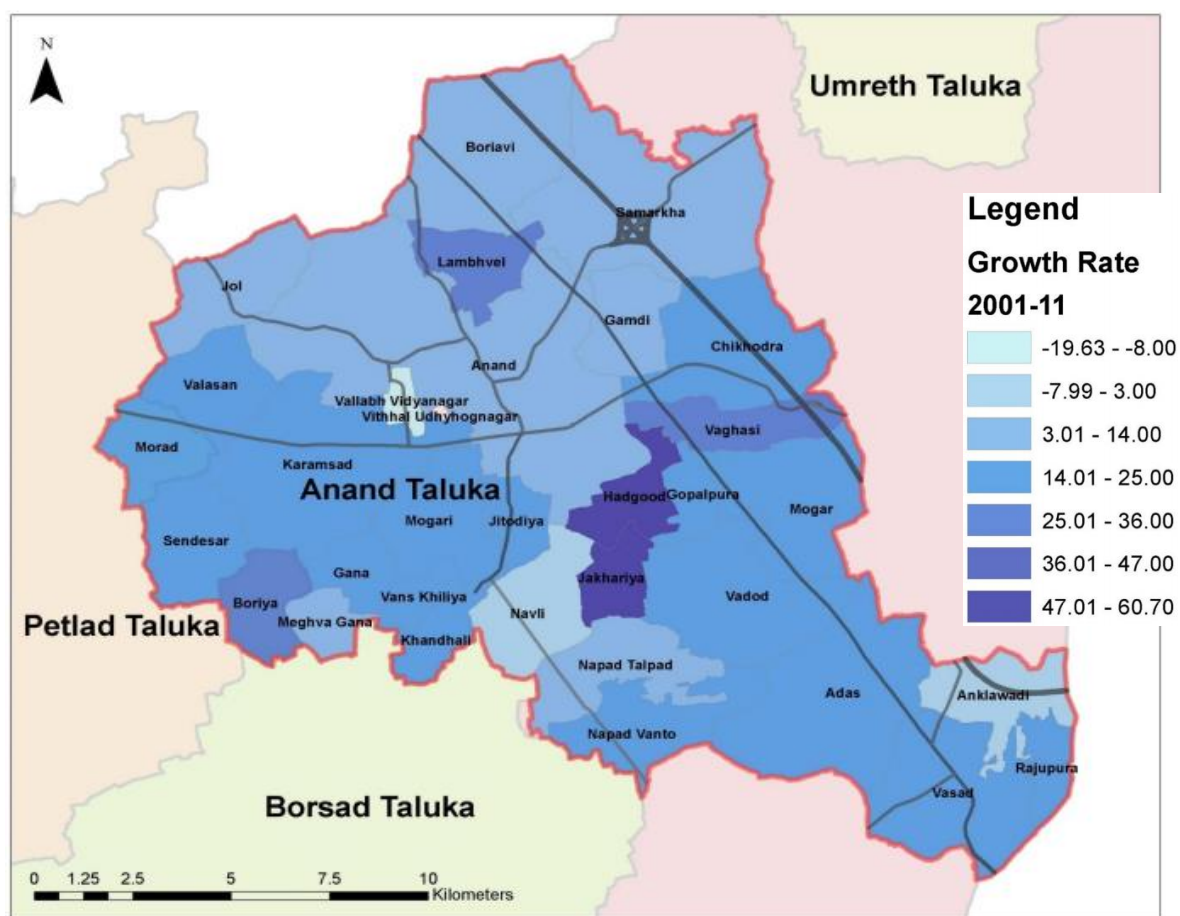
FIGURE 3.5 GROWTH RATE
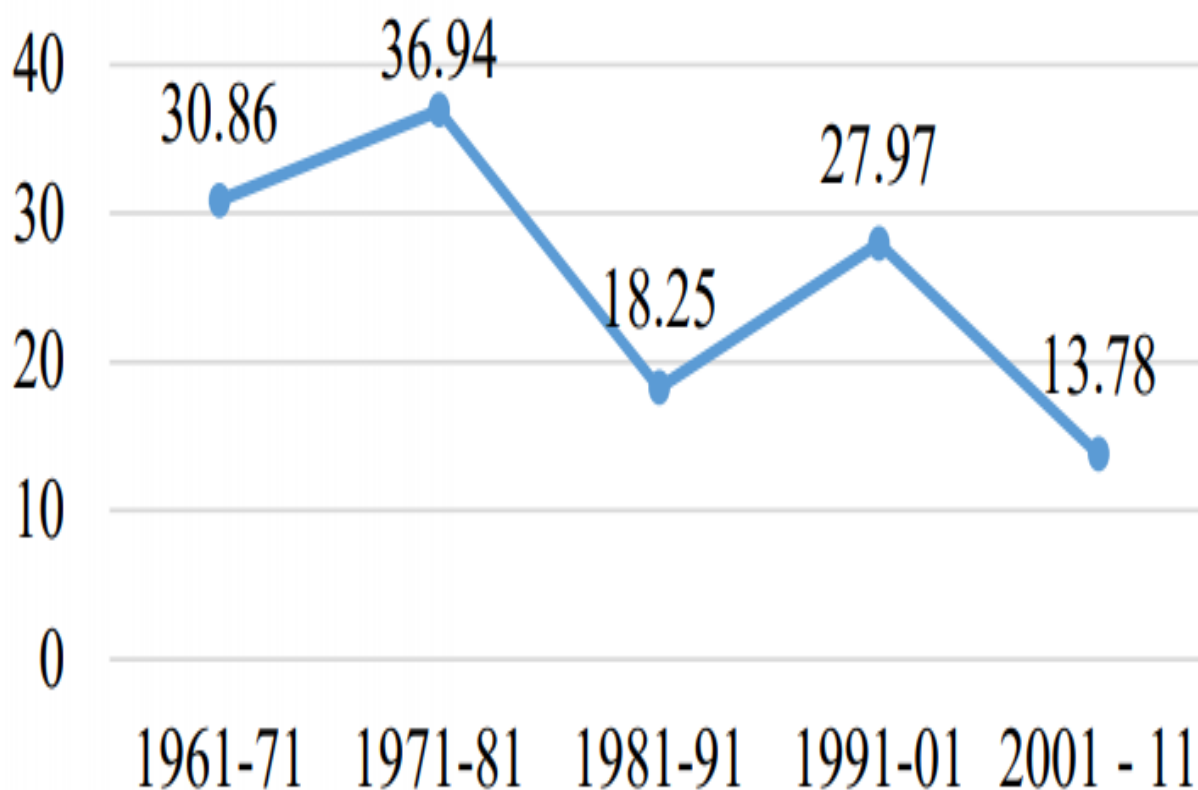
FIGURE 3.6 GROWTH RATE

The spread of population within the authority has been mainly within the urban limits and out growth areas. The adjoining villages has experienced spill over from the city and are experiencing urbanization along the periphery of the city. This has resulted in to higher population growth in respective villages.

3.1.4 Mortality & Birth Rate

Total number of births are 11919. Total number of deaths are 5587. Maximum number of deaths are 223 due to heart attack. Due to accident number of deaths is 33.

In Anand taluka birth rate is gradually falling. Anand taluka has higher mortality rate (9.16) than Gujarat (6.6) & Anand dist. (8.4).

Anand taluka shows gradual rise in mortality rate. In 2014, when Gujarat state & Anand district experienced a fall in mortality rate, Anand taluka saw a gradual rise.

	Birth Rate 2010	Mortality Rate 2010	Birth Rate 2014	Mortality Rate 2014	Birth Rate 2019	Mortality Rate 2019
Gujarat	21.8	6.7	20.6	6.2	20.4	6.6
Anand	24.68	7.92	21.51	8.35	19.56	9.16
Anand Dist.	22.96	7.4	18.66	5.9	18.04	8.4

Source: - Jilla ni ankdakiya ruprekha
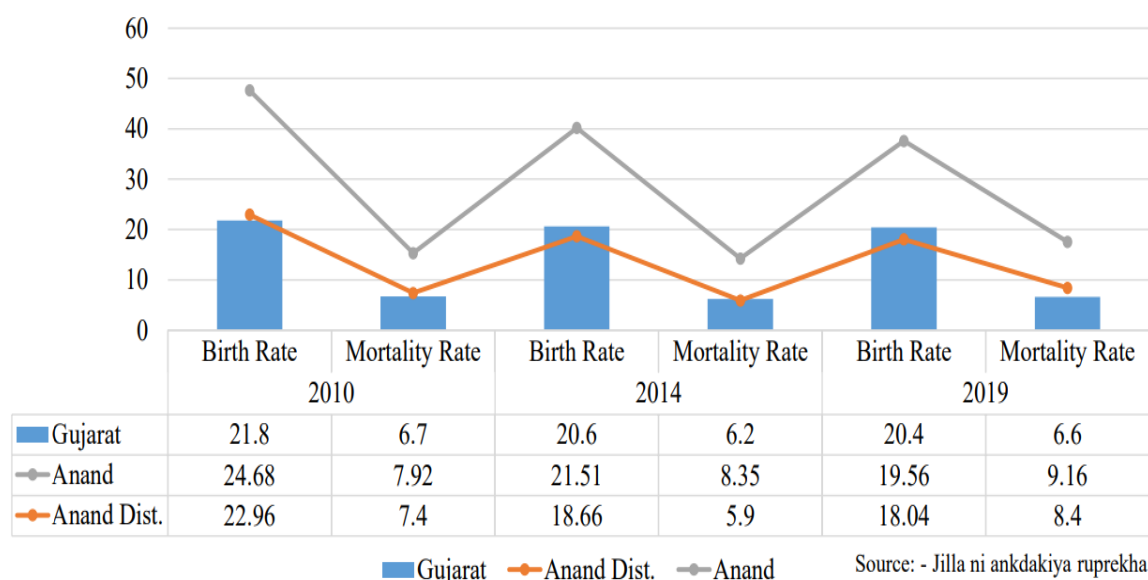
FIGURE 3.7 MORTALITY & BIRTH RATE

Source: - Jilla ni ankdakiya ruprekha

3.1.5 Workforce Participation

Within the authority area the average participation rate has increased from 38.58 percent in 1991 to 39.60 percent during 2001 census. The participation rate of Chikhodra, Gana, Jitodiya, Khandhli, Lambhvel, Mogar, Navli, Vallabh Vidyanagar, and Vanskhiliya has decreased whereas for other villages and urban area is increased.

The maximum decrease in participation rate is in Vanskhiliya village i.e by 16.82 percent. There has been a maximum rise in the participation rate in the village of Morad i.e., by 10.50 percent.

The average participation rate has increased from 38.58 percent in 1991 to 39.60 percent during 2001 census. The participation rate of Chikhodra, Gana, Jitodiya, Khandhli, Lambhvel, Mogar, Navli, Vallabh Vidyanagar, and Vanskhiliya has decreased whereas for other villages and urban area is increased.

	Anand	Boriavi	Gamdi	Hadgood	Karamsad	Ode	Vallabh Vidyanagar	Vithal Udyognagar
■ Cultivators	1296	935	78	142	266	2196	61	5
■ Agricultural Labour	2929	4080	645	519	1240	3394	170	12
■ Household Industries	1140	118	47	51	146	121	330	18
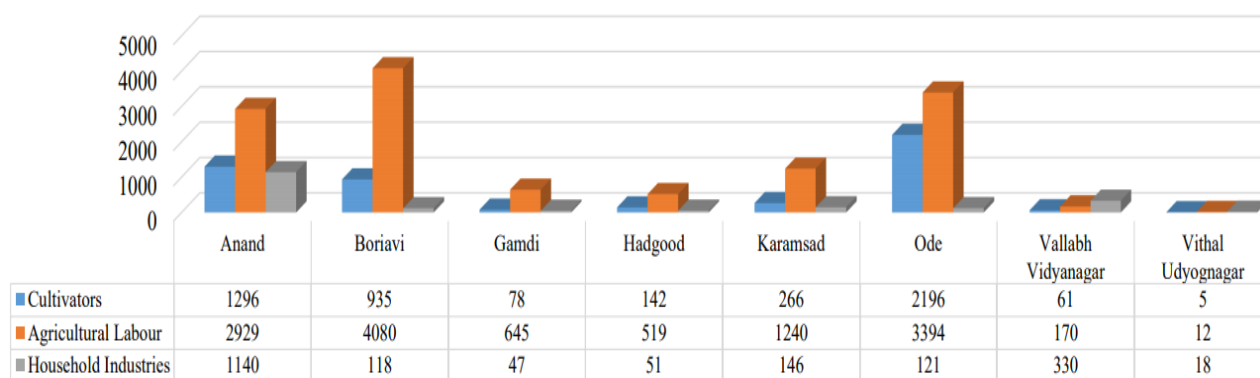
TABLE 3.4 CATEGORY OF WORKERS

Source: - Census 2011

The maximum decrease in participation rate is in Vanskhiliya village i.e by 16.82 percent. There has been a maximum rise in the participation rate in the village of Morad i.e by 10.50 percent. In Authority area 17.56 percent workers are Cultivators, 32.61 percent are Agriculture Laborers, 1.56 percent are in Household Industries and 48.57 percent are Other Workers. More than 67 percent of the workforces in the AVKUDA area are workers other than the primary sector, indicating increased demand of secondary and tertiary activities.

In Authority area 17.56 percent workers are Cultivators, 32.61 percent are Agriculture Laborers, 1.56 percent are in Household Industries and 48.57 percent are Other Workers. In Jakhariya maxumum i.e., 35.70% workers are cultivators. In Napad Vanto 66.72 percent workers are Agriculture Laborers. In Valasan 3.01 percent Workers are in Household Industries. In Vallabh Vidyanagar has 96.93 workers are in secondary and tertiary sector.

More than 67 percent of the workforces in the AVKUDA area are workers other than the primary sector, indicating increased demand of secondary and tertiary activities. The villages like Chikodra, Gamdi, Gana, Hadgood, Jitodiya, Lambhvel, Mogri, Navli, Vaghasi and Vasad has been transformed into semi-urban areas with more people moving out for work. The locations mentioned would require sufficient investment in employment opportunities in future given the land transformation due to shift from agriculture to non-agricultural activities.

3.1.6 Household

In AVKUDA area, Vallabh Vidyanagar has highest family size of 5.81 and Khandhli has smalled family size of 4.61 persons. Average family size in the urban area is of 5.16 whereas in rural area it is 5.07 persons.

Household size wise population distribution			
Area	No. of Household	Population	Household Size
Anand M/UA	30496	156050	5.12
Karamsad	6179	28970	4.69
V.V.Nagar	5034	29260	5.81
Boriyavi	3559	17860	5.02
Other Villages	41147	208654	5.07
AVKUDA	86415	440795	5.10

TABLE 3.5 HOUSEHOLD SIZE

Source: - Anand District Hand book, 2011

Anand district has a 5.12 % HH size.

Among sub-district, Vallabh Vidyanagar has the highest HH size as 5.81 and Karamsad has lowest as 4.69.

FIGURE 3.8 HOUSE HOLD SIZE
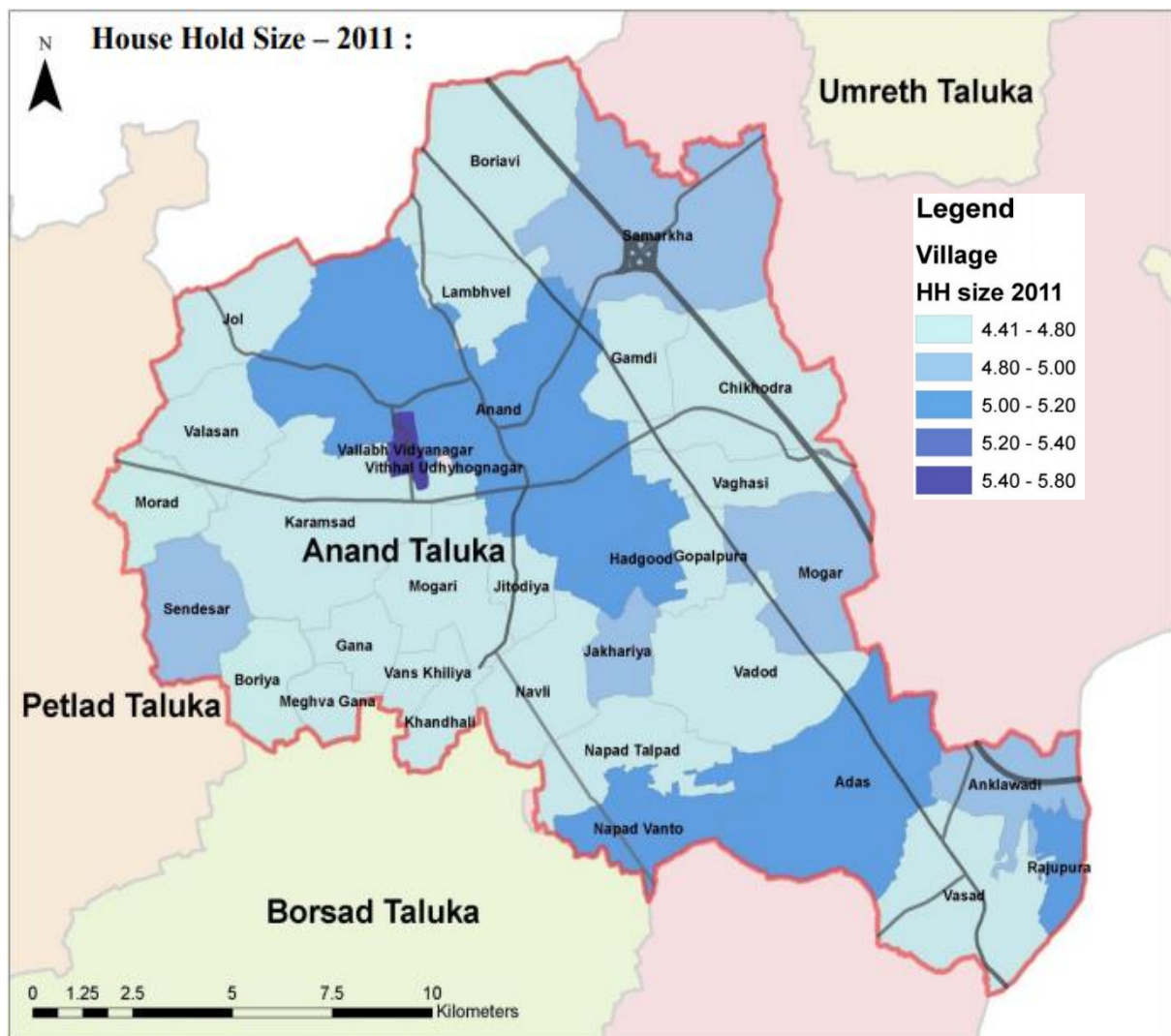
House hold size decreasing in general.

In urban areas slight fall in house hold size where as in urban fringes and out growths significant fall in house hold sizes.

This indicates urban sprawl towards the fringes is rising.

3.1.7 Migration Pattern

Within the authority area there has been a large-scale movement of the people for the purpose of employment or trade and commerce purpose. There has been large agricultural labor com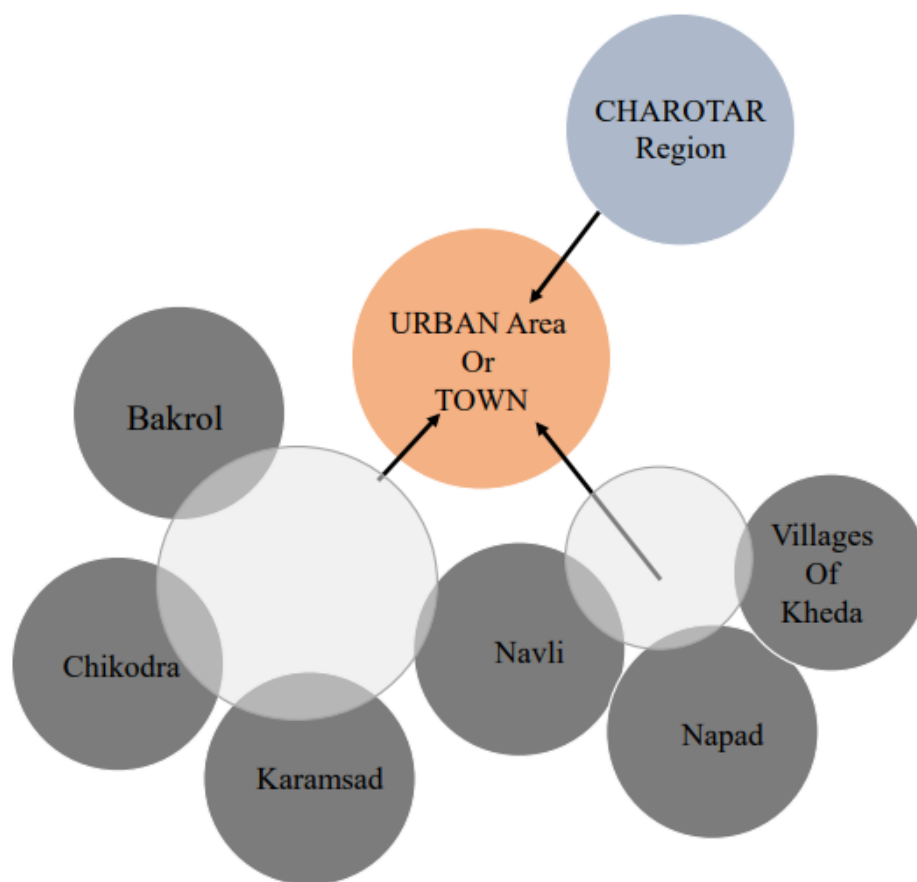munity staying in the surrounding villages that also come in the town for the livelihood. Apart from this, there has been large scale rural to rural workers movement for those working in the agriculture fields in the villages in the Charotar region.

FIGURE 3.9 MIGRATION PATTERN

Another specific pattern of migration had been observed during the decades of seventies and eighties. During these periods, migration of the population from Bakrol, Karamsad, Navli, Napad ,Chikodra, and some villages of Kheda districts to the town were observed.

This feature had been specifically on account of the dwindling employment opportunities and the increasing agricultural potentiality in Charotar due to

green (agriculture) and white revolution (milk) from late 1960s to mid 1970s.

This can be observed in the growth rate of village population also. During these periods the growth rate has increased in urban as well rural areas, certain migration trends from rural areas to outside the district may also be assumed during the same period.

The educated and skilled workers also migrated out to other regions or even outside the country for the work from the Charotar region.

But as a matter of fact, the impact of migration on the housing or other economic activity of the town is noteworthy, as the percentage of population staying in the villages and towns has been more or less equal since 1961.

3.2 Physical Infrastructure

Provision of high-quality physical infrastructure facilities is necessary to make any city more habitable. Various measures had been taken in the previous development plan for improving the physical infrastructure facilities in Anand. However, due to the rapid growth of population within the city and the expansion of developed areas there is a need for constant upgradation and expansion of the physical infrastructure.

Therefore, the current Development Plan introduces several plans, proposals and recommendations taking into consideration the future population growth for improvement in physical infrastructure facilities which include water supply, sewerage system, storm water management and solid waste management.

3.2.1 Water Supply

Below are some major considerations that are useful for various proposals for water supply in AVKUDA area.

- Ensuring water is accessible to all the citizens on a continuous basis.
- Assure availability of 155 litres of water per capita per day for domestic as well as for various civic purposes.
- Increase the treatment capacity of the water treatment plants in order to fulfil the need of the population for the coming 20 years.
- Assure availability of a complete water supply network in entire AMC area as currently our water supply network does not cover the full extent of AMC; primarily the newly added areas.
- Considered surface water as the primary source for water supply so as to prevent the usage of ground water resources by the residents.
- Ensuring the quality and quantity of water is available to citizens confirming to The Central Public Health and Environmental Engineering Organisation (CPHEEO) guidelines or service level benchmarks by Ministry of Urban Development.

Currently, nearly 85 % of the developed area of AVKUDA area is served by water supply network. However, due to increasing population there is constant pressure to upgrade and install the water supply network lines in the new centres of growth such as Jitodiya, Hadgud, Mogri, Bakrol, Lambhvel.

The supply of water within the urban areas can be estimated to be about 25 MLD which is less than the required supply for the urban region. The Urban Areas in the AVKUDA requires a water supply up to 70 MLD per day with average supply of 135 LPCD serving the current population of an estimated 3.0 lakh persons.
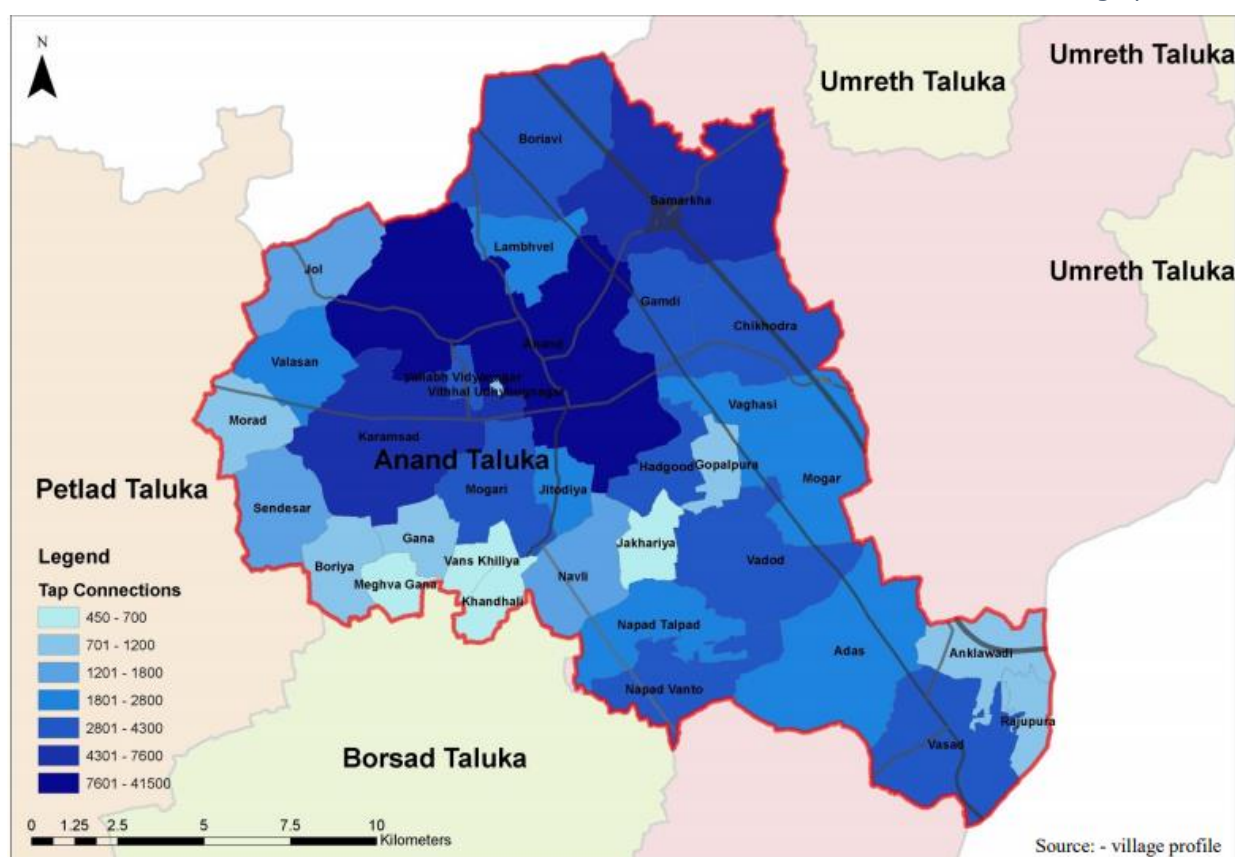
The rural areas are sufficiently supplied water from the rural water works by GWSSB. The individual village water supply schemes covered through pipe / mini pipe water supply, hand pumps, open wells etc. Most of the villages in AVKUDA is covered through this scheme.

Water Demand by AVKUDA		
Location	Population	Water Demand MLD
Anand UA	205286	30.79
Karamsad	36627	5.49
Vallabh Vidyanagar	23570	3.54
Boriyavi	20271	3.04
Other Villages	224639	33.70
Total	510394	76.56

TABLE 3.6 WATER DEMAND BY AVKUDA

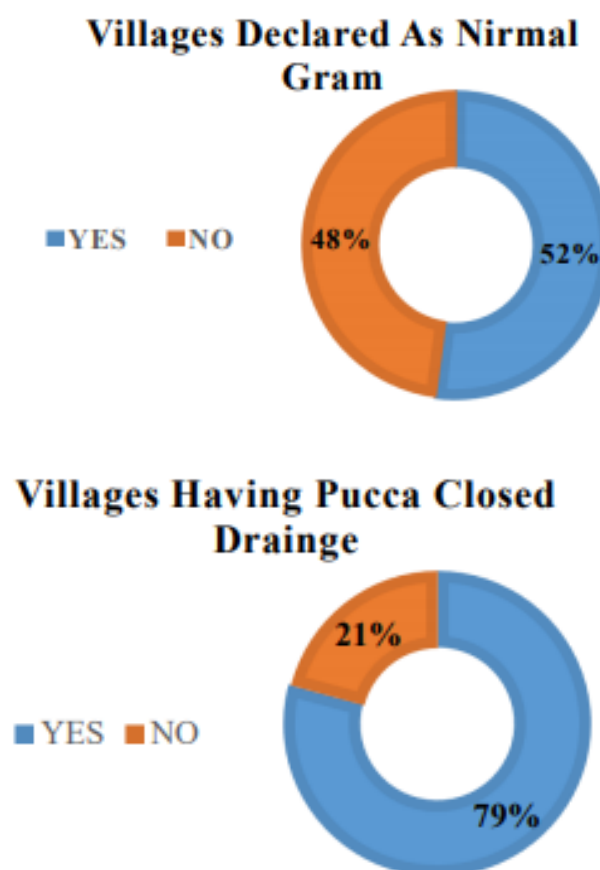*Source: - village profile*

FIGURE 3.10 WATER SUPPLY

The Urban Areas in the AVKUDA requires a water supply up to 25 MLD per day. The rural areas are sufficiently supplied water from the rural water works by GWSSB.

In AVKUDA water supply facility is available in most of the villages. The present storage capacity is inadequate to supply water with the required

effective head at the various places of town of new developing areas. The water supply is depended on ground water as tube well is the source of water. here is problem of nitrate contamination in some of the villages. The problem of pressure and maintenance is prominent.

3.2.2 Sewerage and Sanitation

In AVKUDA out of 34 revenue areas there are 4 urban local bodies and 1 industrial area. All the urban areas and industrial area has planned sewerage facilities. In Anand City Existing Underground Sewerage System Covers Gamtal and Station area under one pumping station at Gamdivad.

Villages Declared As Nirmal Gram

YES NO 48% 52%

Villages Having Pucca Closed Drainge

21%

YES NO 79%

FIGURE 3.11 SEWERAGE AND SANITATION AVAILABILITY

The Waste Water is pumped to the Treatment Plant at Lambhvel which is in non-functioning state since long time, and most of the components are obsolete.

FIGURE 3.12 SEWERAGE AND SANITATION

Details of Existing Drainage Pumping Station	
Name of Pumping Station	**Coverage**
Lotiya Bhagol	TPS - 2, 4 & 5
Jalaram Temple	Gamtal
Gamdivad	Gamtal & TPS - 1
Sardar Baugh PS	TPS - 2, 3, 4, 5 & Part
Ellora Park Sub- PS	TPS - 3 Part
Sikhod Sub - PS	TPS - 3 Part

TABLE 3.7 DETAILS OF EXISTING DRAINAGE PUMPING STATION

Source: - village profile
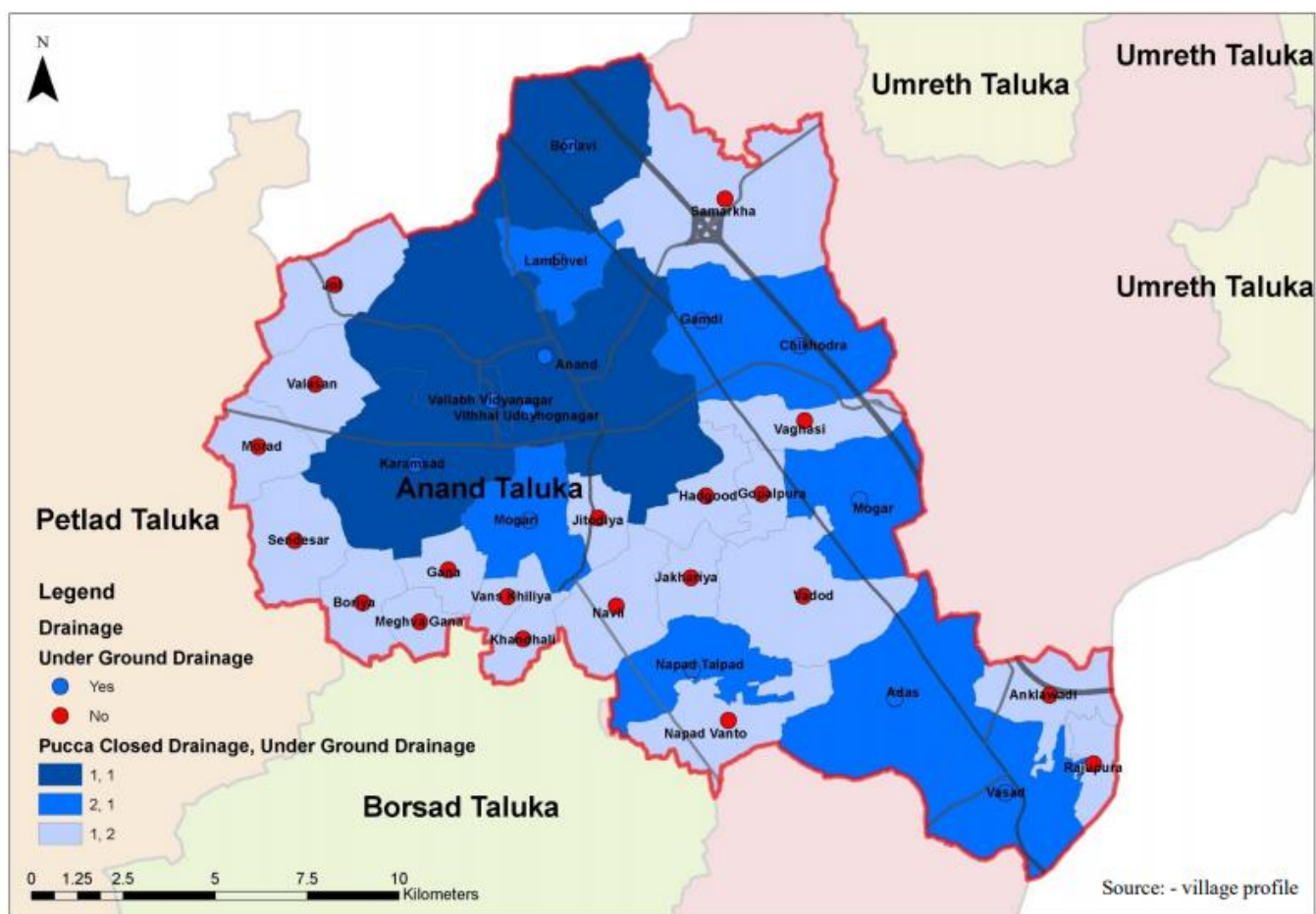
In AVKUDA out of 34 revenue areas there are 4 urban local bodies and 1 industrial area. All the urban areas and industrial area has planned sewerage facilities.

Rural / fringe are devoid of sufficient sewerage and sanitation facilities.

The existing Sewerage treatment plant is of aerated lagoons type which was developed during the sewerage system developed under World Bank program.

3.2.3 Solid Waste Management

In urban agglomeration in AVKUDA a total 875 MT solid waste is generated per day, while in urbanized area of AVKUDA area excluding Anand Municipality 437 MT solid waste is generated per day. In order to develop a sustainable, environment friendly and efficient solid waste management system in AVKUDA area, various efforts have been taken by the development authority in this development plan. The urban areas together are able to have dumpsite with capacity of about 200 MT per day.

Solid Waste Disposal

■ YES ■ NO

44%

56%
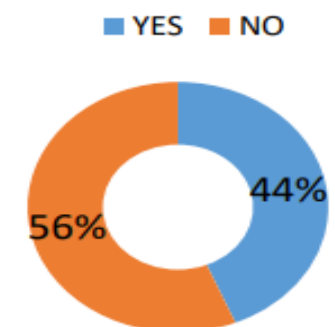
FIGURE 3.13 SOLID WASTE DISPOSAL
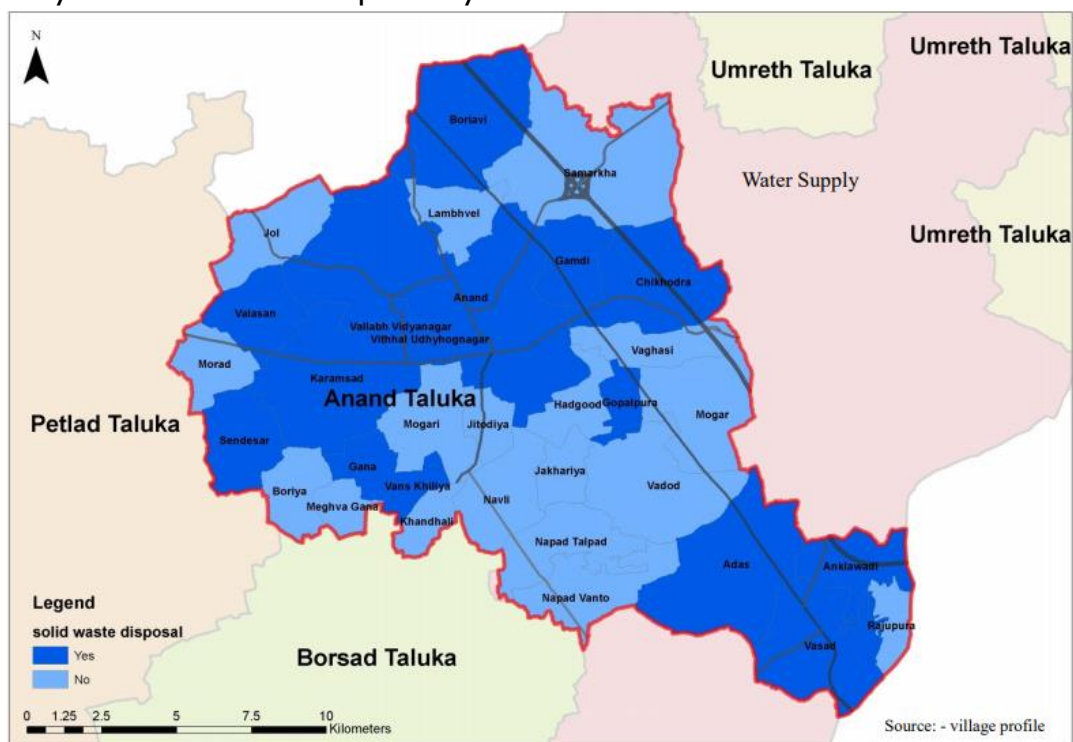
FIGURE 3.14 SOLID WASTE DISPOSAL

30

In Urban areas of the area the collection of the solid waste is done in door-to-door collection method. Street sweeping is carried out regularly.

The major problem faced by urban local bodies is of disposal site availability.

In rural areas in some of the village's door to door collection is being done but it is not regular.

There is lack of scientific approach in dumping of waste.

The solid waste is being dumped in lakes, natural drains and ravines.

3.3   Social Infrastructure

An assessment of social infrastructure facilities in Anand including health (public hospitals and health centres), education (primary and secondary schools, vocational and professional training centres, facilities for Persons with Disability), leisure and sports (parks, playgrounds, swimming pools, community halls etc.), crematoria, and fire and emergency/disaster management services is presented here. The assessment is largely based on secondary data.

3.3.1   Health

Important public health facilities in Anand taluka (which serve the city and the region) include 11 Primary Health Centres (PHC), 1 urban health centre in nagarpalika two sub-district level hospitals, one Civil Hospital is located at Petlad, and other Government Hospitals include the Western Railway Hospital.

Health Facility

- Avaiable
- Partially
- Not Available

13%   16%   71%
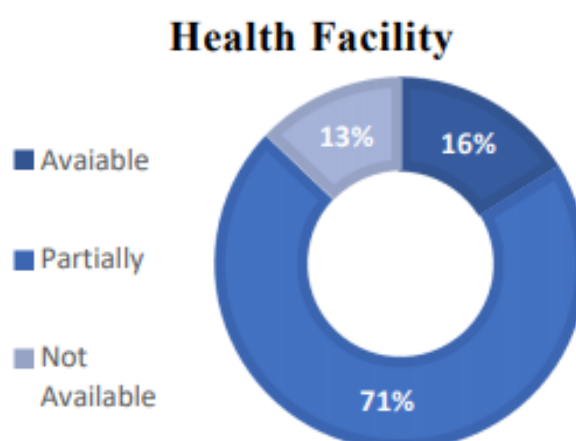
FIGURE 3.15 HEALTH FACILITY AVAILABILITY

Public health facilities are provided free or at nominal cost - the urban poor living in Anand slums largely access the same. Apart from public health facilities, the city is served by private medical practitioners / clinics. There is also provision of 62 Public Health Nurse to support primarily the urban health programmes.

Municipal Corporation is there to provide the services, even though some of the areas are left unserved. There the people are deprived of basic health facilities. Moreover, there is not such facility available to cover the un-served urban areas. With this objective urban health was initiated to cover the urban areas especially the urban slums.

FIGURE 3.16 HEALTH FECILITIES

Basic Health facility is adequate provided to 90 % of villages, fully available to less villages.

Important public health facilities in Anand taluka (which serve the city and the region) include 11 Primary Health Centres (PHC), 1 urban health centre in nagarpalika, two sub-district level hospitals, one Civil Hospital is located at Petlad, and other Government Hospitals include the Western Railway Hospital.
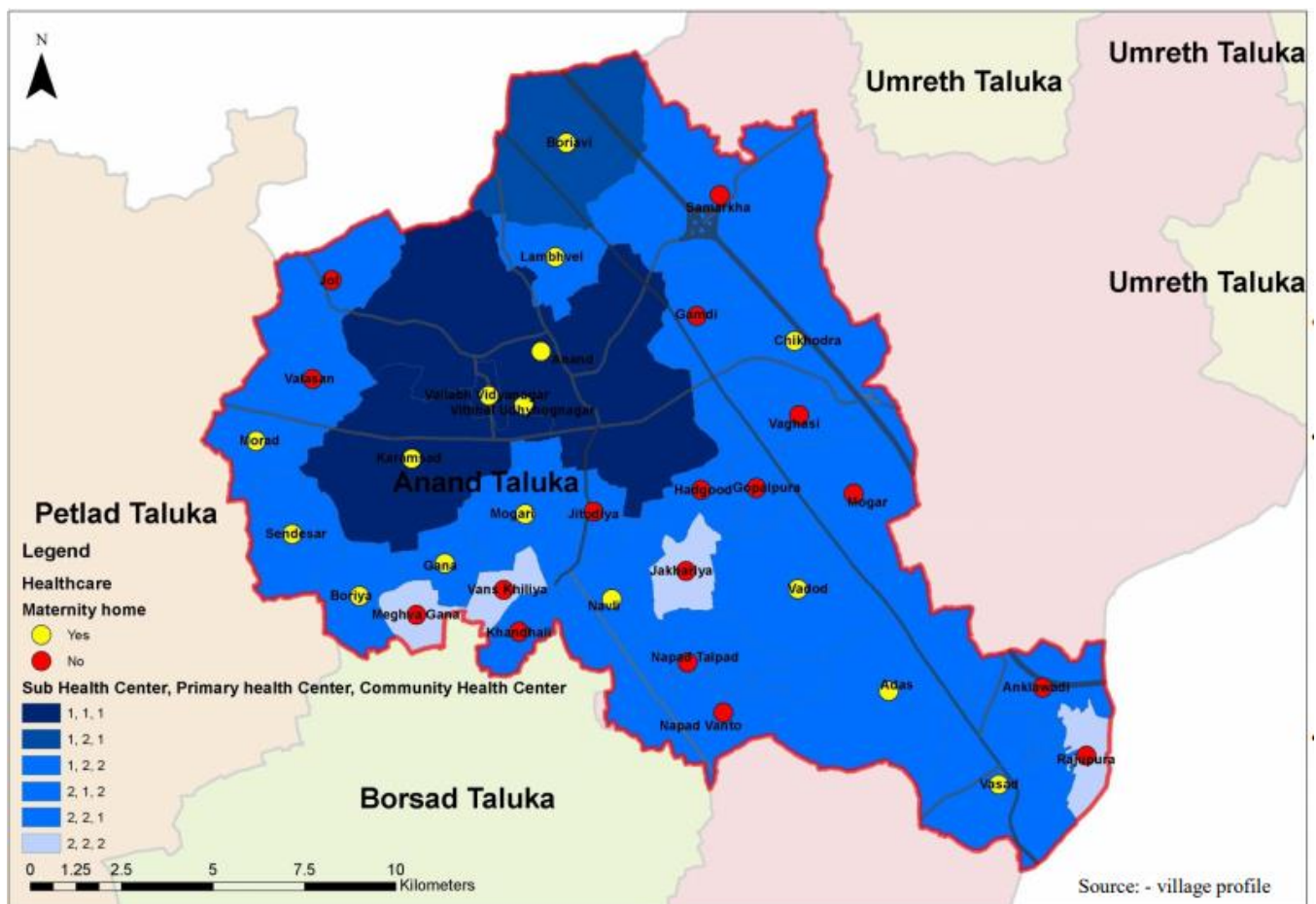
As per the guidelines there is provision of one female health worker for every 2000 population. There is provision of one urban health officer for every 50 ,000 population.

3.4 Urban Land Use & Urban Sprawl

3.4.1 Elevation
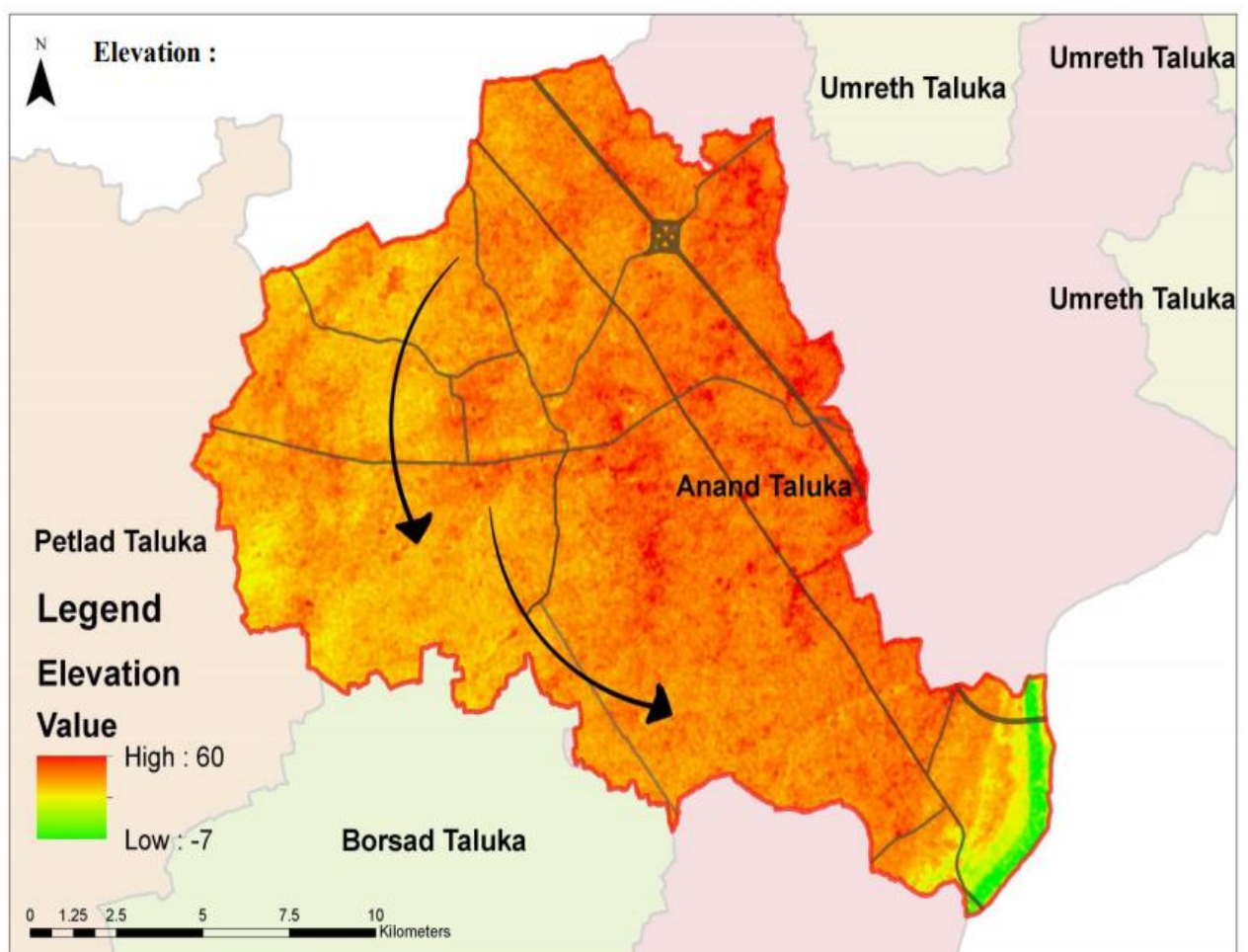
FIGURE 3.17 ELEVATION

Anand District lies between 22 ° 33' and 72 ° 58' having Mean Sea Level of 39 .65 mts. The District of Anand lies just beyond the Aravalli ranges and has sandy soil conditions prevailing in this part.

33

The ravines of Mahi River lie in southern part of AVKUDA, where most of the reclaimed ravines are located in Anklavadi and Rajupura village.

Natural drainage area of the AVKUDA region is in north south direction and major drainage network in the urban region drains into the Mahi Canal. The regions south of Urban Area including Hadgood, Adas, Vasad etc drains into river Mahi.
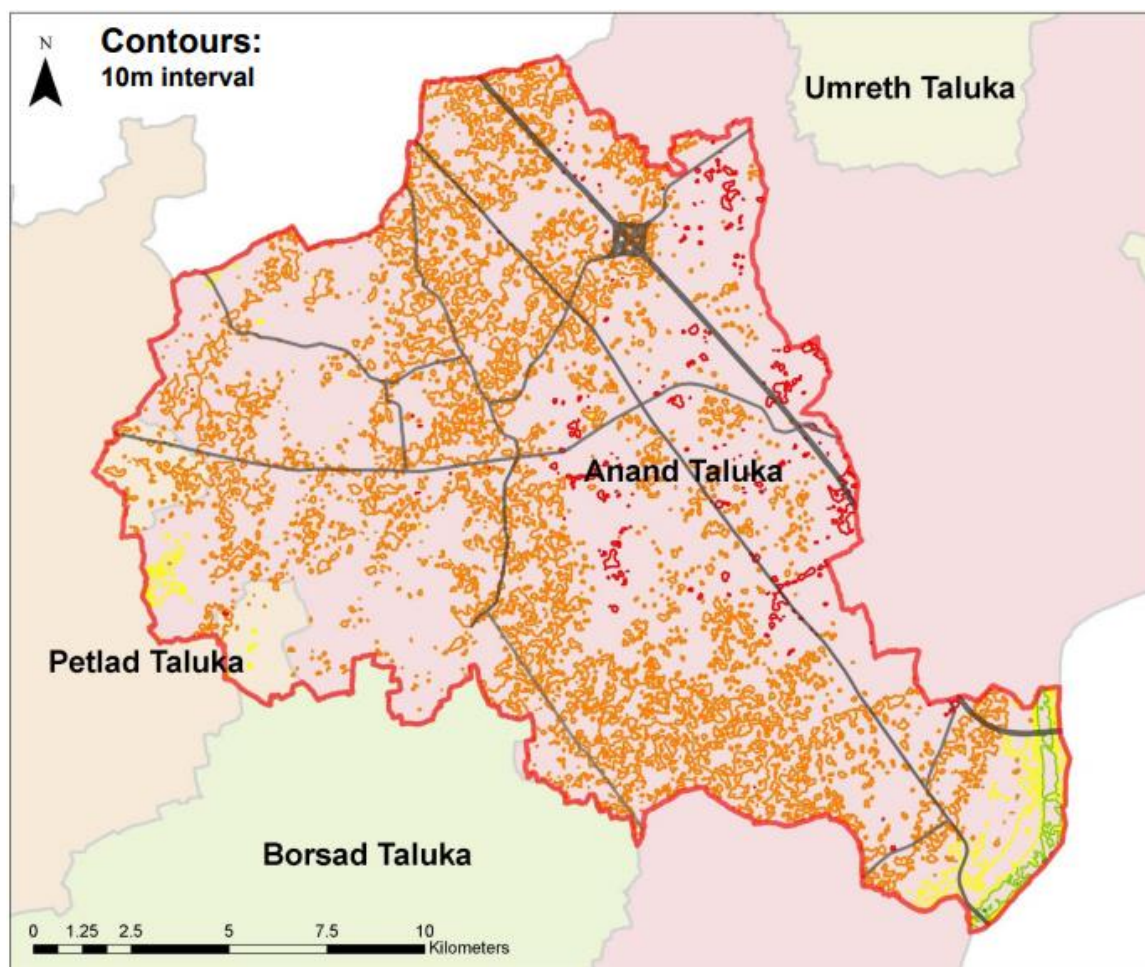
FIGURE 3.18 CONTOURS

3.4.2 Soil Type

The soils of the district can be classified into two main types: the Goradu (Gravelly) and black. The Goradu type is mainly found in the Charotar tract comprising Anand, Borsad, Petlad and parts of Khambhat talukas. The black type of the Bhal tract is found in Khambhat taluka.

The soil in Anand District in general is neutral PH. Electricity conductivity, too, is low. Organic carbon is low and Phosphorus content of the soil is medium. Potash is high. So, overall, the soil fertility indices are good from agriculture point of view.
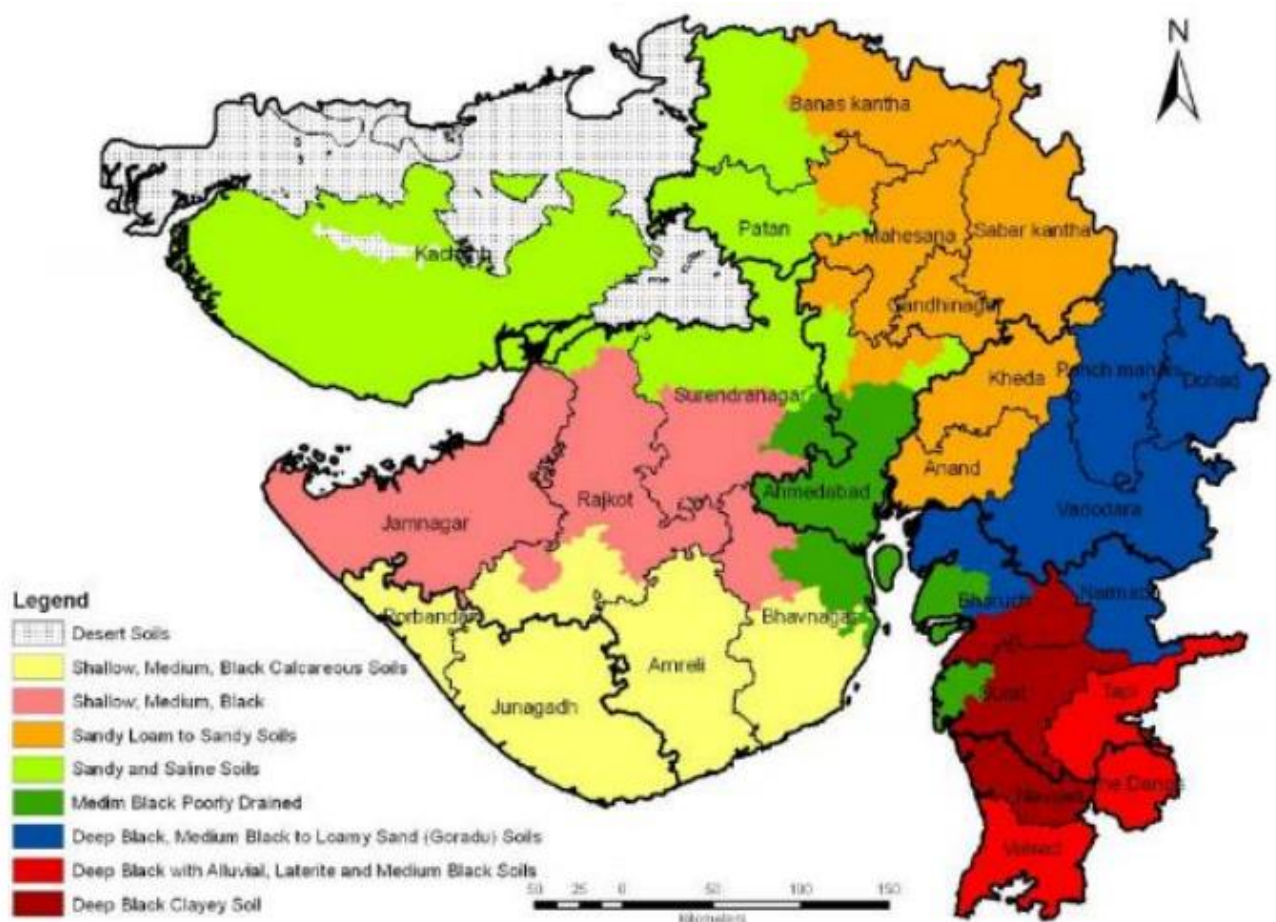
FIGURE 3.19 SOIL TYPE

3.4.3 Rivers and Water Bodies

The region has perineal River Mahi located in the southernmost tip; which so far has been utilized for the water requirement of the urban area. There are large number of water bodies including ponds and natural drains. Anand city has four major water bodies which are not used for any domestic purposes. Most of the water bodies are currently used for discharge of waste water and storage of additional rainwater during the monsoon. Other

settlements in AVKUDA area are also having their village ponds. Artificial water bodies are also created in some of the villages within AVKUDA area.

The network of drainage systems at present is used for carrying domestic waste from urban areas. The domestic and industrial waste mainly from the city is being disposed mostly without proper treatment. The ponds are also source of recharging groundwater within the region, some of water bodies are regularly cleaned and maintained to increase its storage capacity.
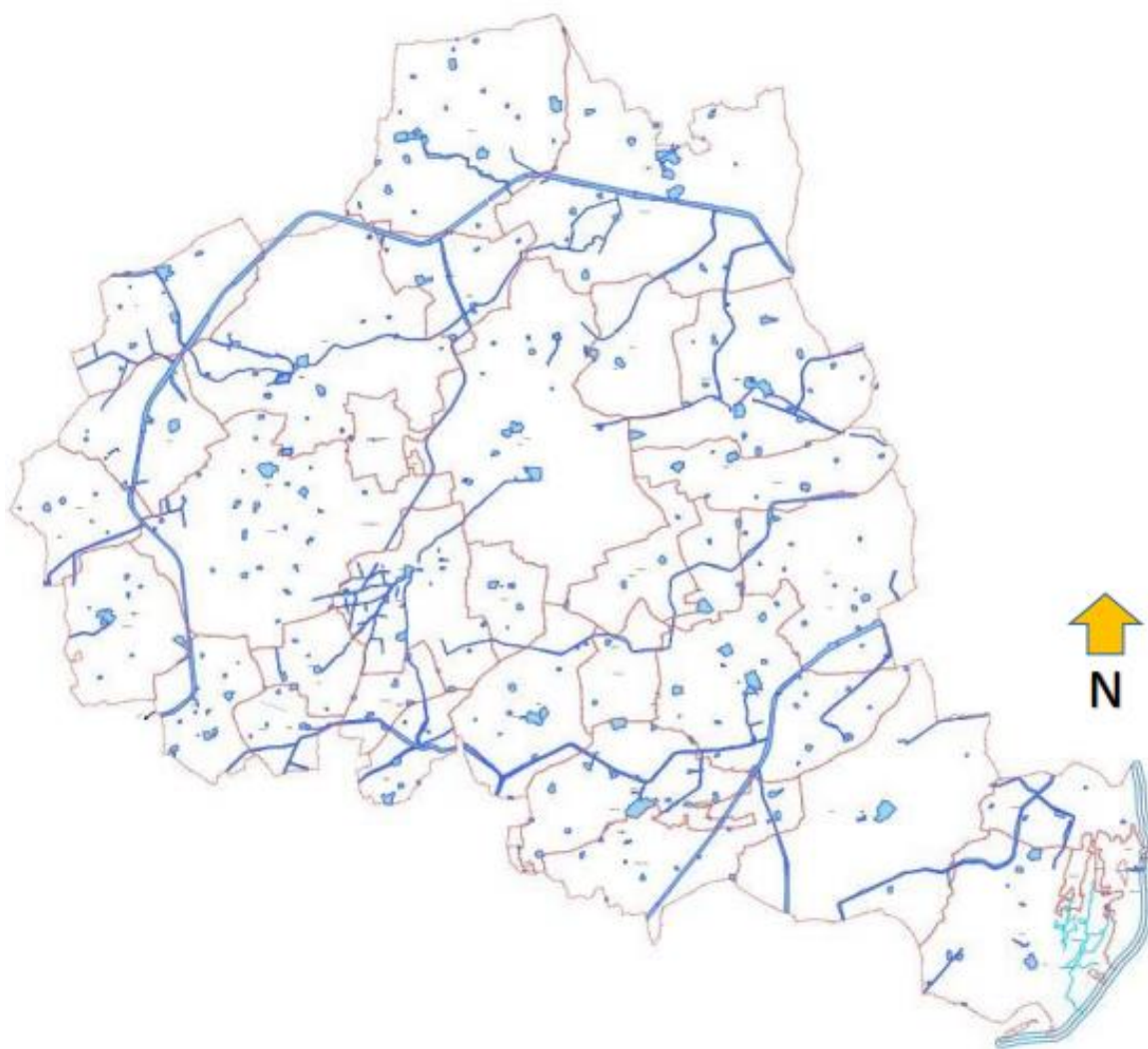
3.4.4 Natural Drains

In the Western zone, natural drain namely Samarkha-Lambhel flow in North of town and meet K.B.drain which flows in West Southern direction parallel to Petlad branch canal & meeting in downstream to Bay of Cambay. In the Southern part of the town Mogari natural drain flows in the South West parallel to Borsad branch canal meeting Bay of Cambay.

The existing drains are being maintained by drainage (Kans), Irrigation Department. On an overall it can be said that the Anand & Kheda district are prone area for disposal of any excess water in way of storm water or effluent from treatment units of either domestic or industrial nature.

The Anand-Mogari drain is about 42 km in length with its catchment area around 2720 sq.km. ultimately meets Mahi kotar having 19 structures and 40 inlets on alignment. At 10 to 15 mm run off, the minimum and maximum discharge ranges from 29.40 to 75.75 cumecs.

The drain is having bed gradient varying from 1800-1 to 1000-1 and about 1658 ha. area under submergence. Similarly, the K.B. drain is also about 48 km in length with its catchment's area around 654 sq.km. ultimately meets Alang drain having 27 structures and 7 inlets on alignment. At 10 to 15 mm run off, the minimum and maximum discharge ranges from 3.75 to 54.84 cumecs. The drain is having bed gradient varying from 3400-1 to 2500-1 and about 1905 ha. area under submergence.

FIGURE 3.20 NATURAL DRAINS IN AVKUDA

Name of Drain	Meeting to	Catchment area in sq.km	Discharge in cumecs	Length	Section in m
Samarkha Lambhvel	K.B.Drain	23.04	5.15	2040	5.5x1.2
Anand-Mogari	Mahi kotar	246	29.84	5850	13.2x2.0

TABLE 3.8 EXISTING NATURAL DRAINS

Source: - AVKUDA Report, 2015

3.4.5 Climate

AVKUDA region has hot and dry summer, except during south west monsoon. The region has four seasons namely winter season mid of December to February, summer season March to May, while the south west monsoon is between June to September and retreating west monsoon is from October to November.Anand has large variations of temperature ranging from maximum temperature of 40° to 43°C during summer and minimum temperature of 8° to 10°C. The average rainfall of the city in last 13 years has been recorded as 723 mm which has been found to be lower than the state average of 851 mm.

large variations in rainfall have been observed during this period ranging from highest of 1330 mm in the year 1997 and lowest of 305 mm in the year 2000. Except two years i.e., 1996 and 1997, city has recorded lower rainfall than the state. Only during four years, the city recorded higher rainfall than the average whereas for the remaining ten years, the rainfall was below this average. This indicates that city is deficit in terms of rainfall for majority of time.

3.4.6 Spatial Growth of the Anand City

Anand city's present profile of growth can be understood by studying its growth at certain stages. The Anand Municipality covers an area of about 39.69 sq. kms, having more than 61% of developed urban area by 2013. The next important class to consider would be its proximity with Nadiad municipality; in terms of its urban development.

The surrounding 34 villages and 4 urban areas of an urban agglomeration in 2001 census represented a pattern of development where large vacant or agricultural land separated the Anand urban development with surrounding urban centers of Karamsad, Vallabh Vidyanagar, & Boriyavi.

| STAGES	YEARS	CAUSES OF GROWTH	RESULT
FIRST	1900-1925	Better infrastructure availability in the form of hospitals and railway station and Polson dairy development.	Concentric form of core
SECOND	1925-1950	Congestion of the City Core	Growth cross the limit of city core and emergence of the station area as a new economic center.
		Establishment of Amul dairy and Gujarat agriculture university 8 km away from the gamtal.	Establishment of satellite urban areas and sub-urban, economic centers.
THIRD	1950 – 1975	Industrialization	A tremendous growth rate of the town has led to a sprawl in southern and northern direction.
FOURTH	1975-2001	Establishment of Anand area development authority. AADA.	Planned urban development through TP scheme development, city has developed in all direction.

TABLE 3.9 STAGES OF GROWTH, ANAND CITY

Source: - Centenary celebration book, Anand Municipality
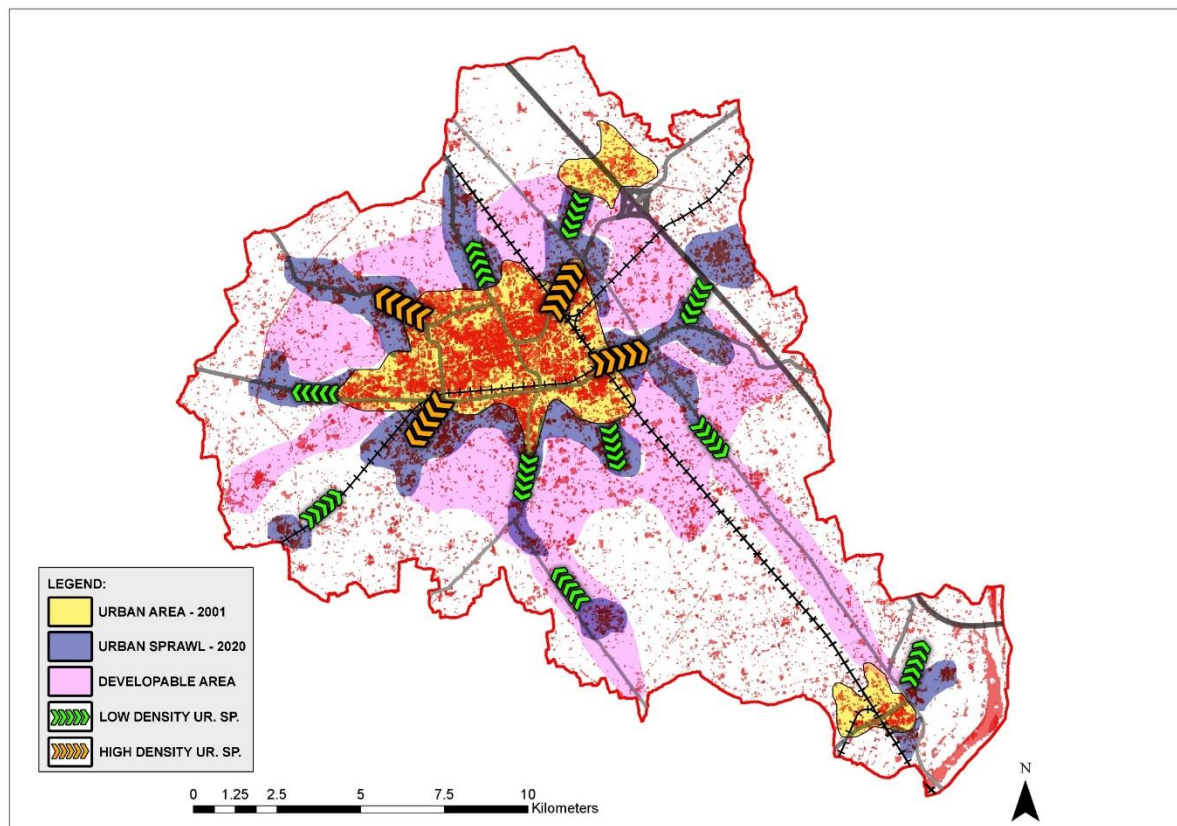
FIGURE 3.21 URBAN SPRAWL

3.4.7 Evolution of City

1991

2001
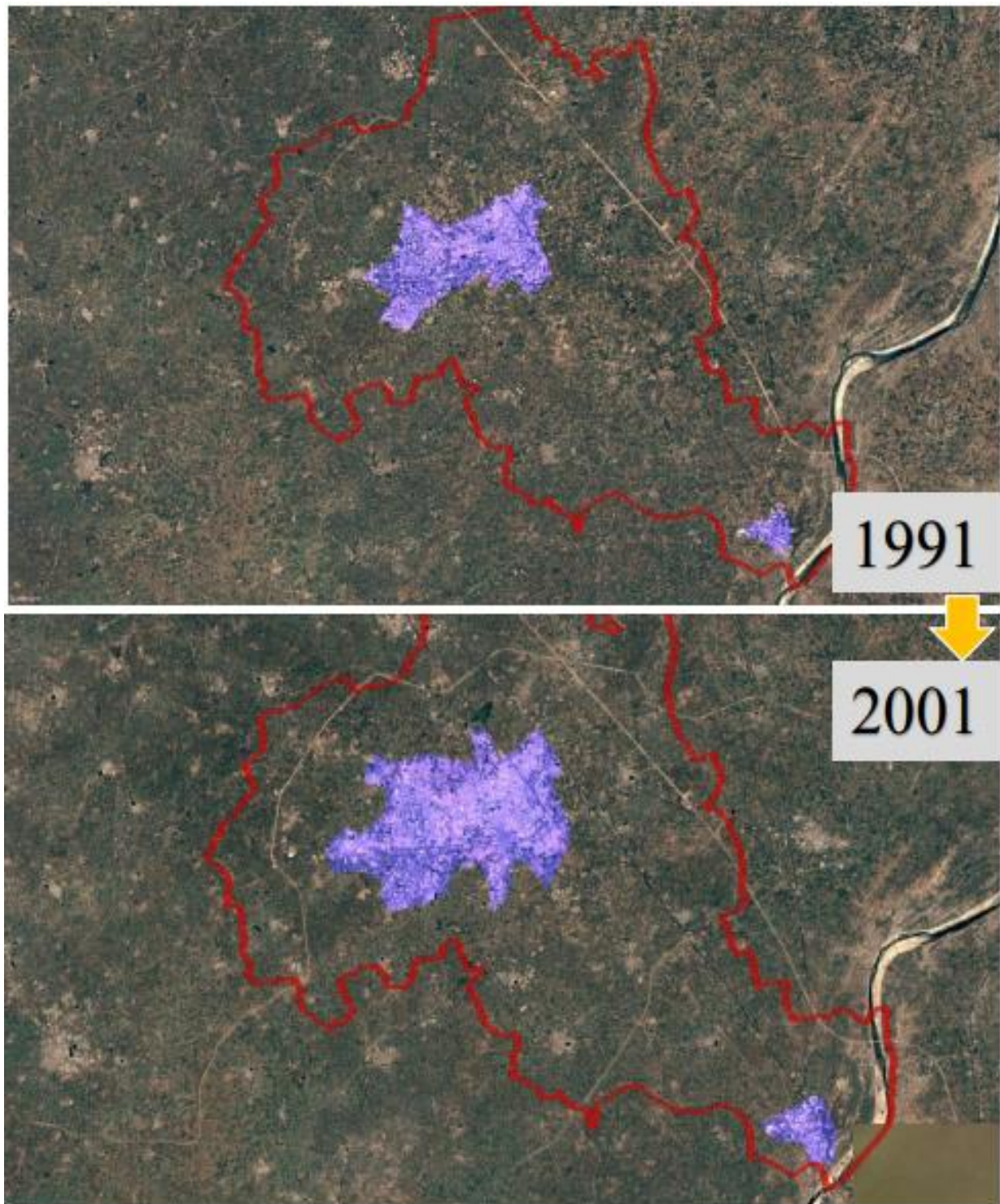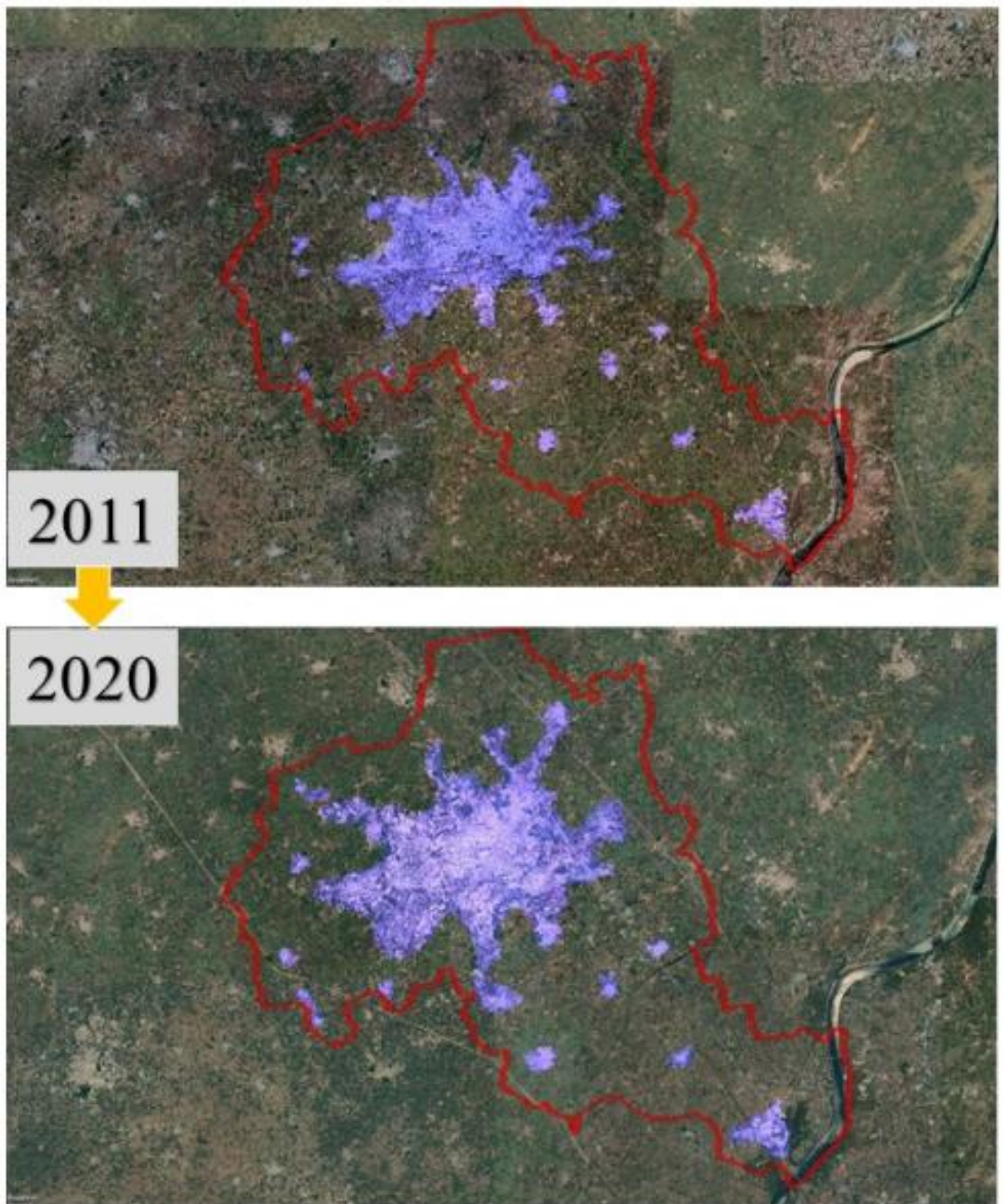
FIGURE 3.22 EVOLUTION OF CITY

3.4.8 LULC Map of AVKUDA
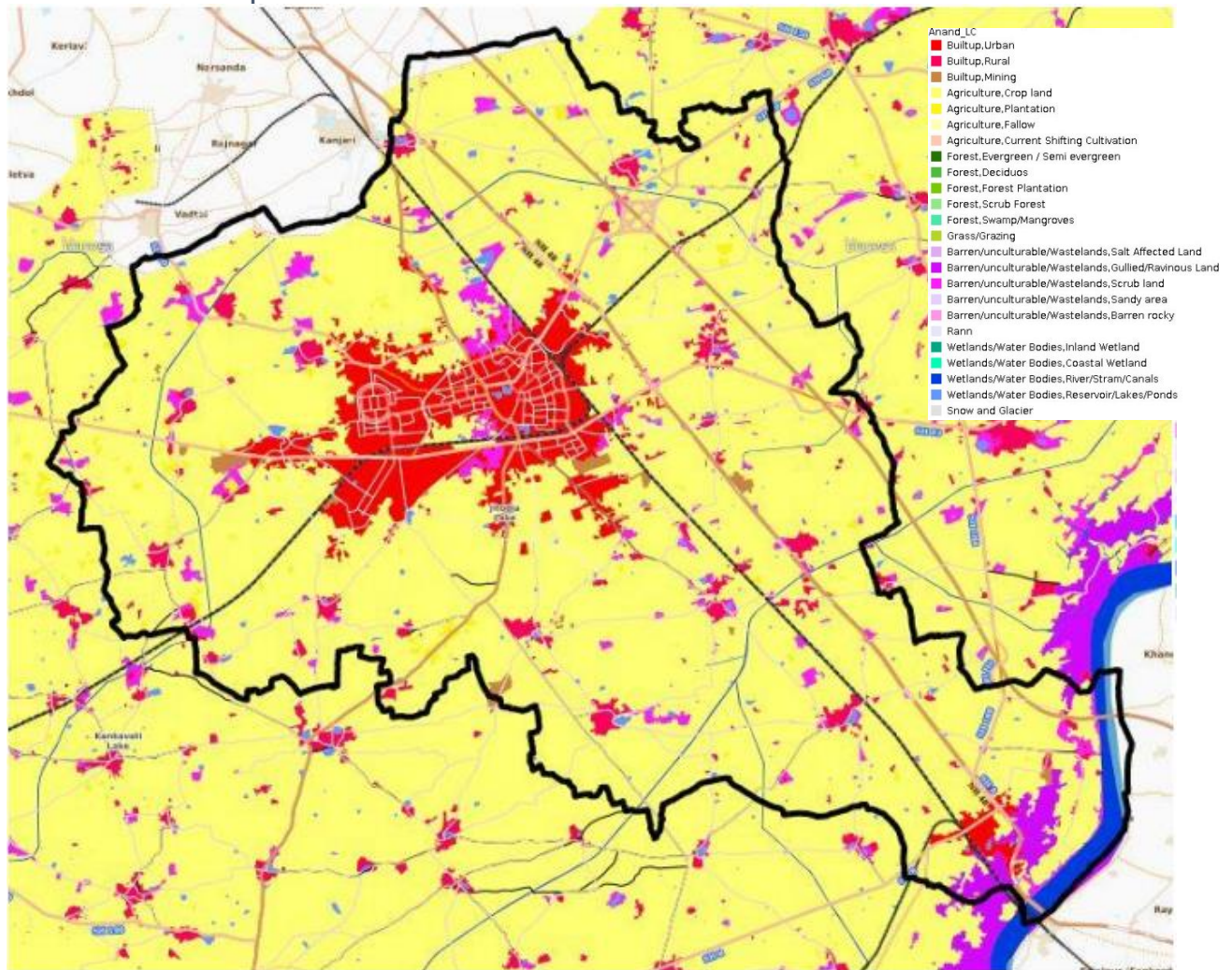
FIGURE 3.23 LULC MAP OF AVKUDA
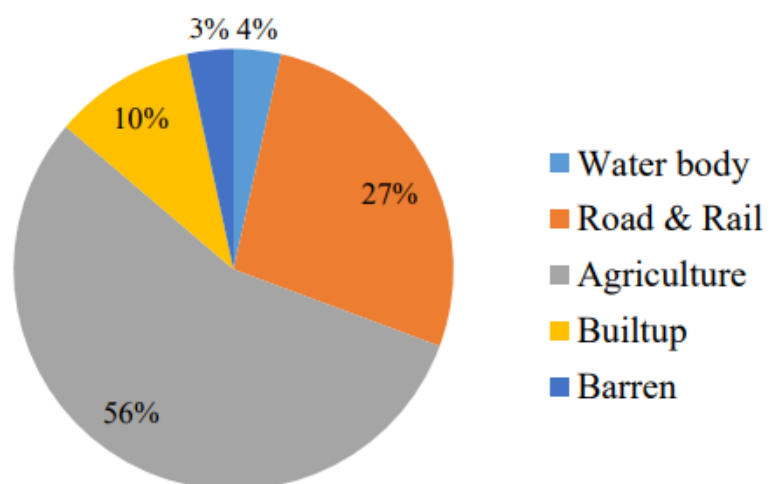
FIGURE 3.24 AREA OF LULC MAP OF AVKUDA

3.4.9 Environment / Natural Hazard Mapping
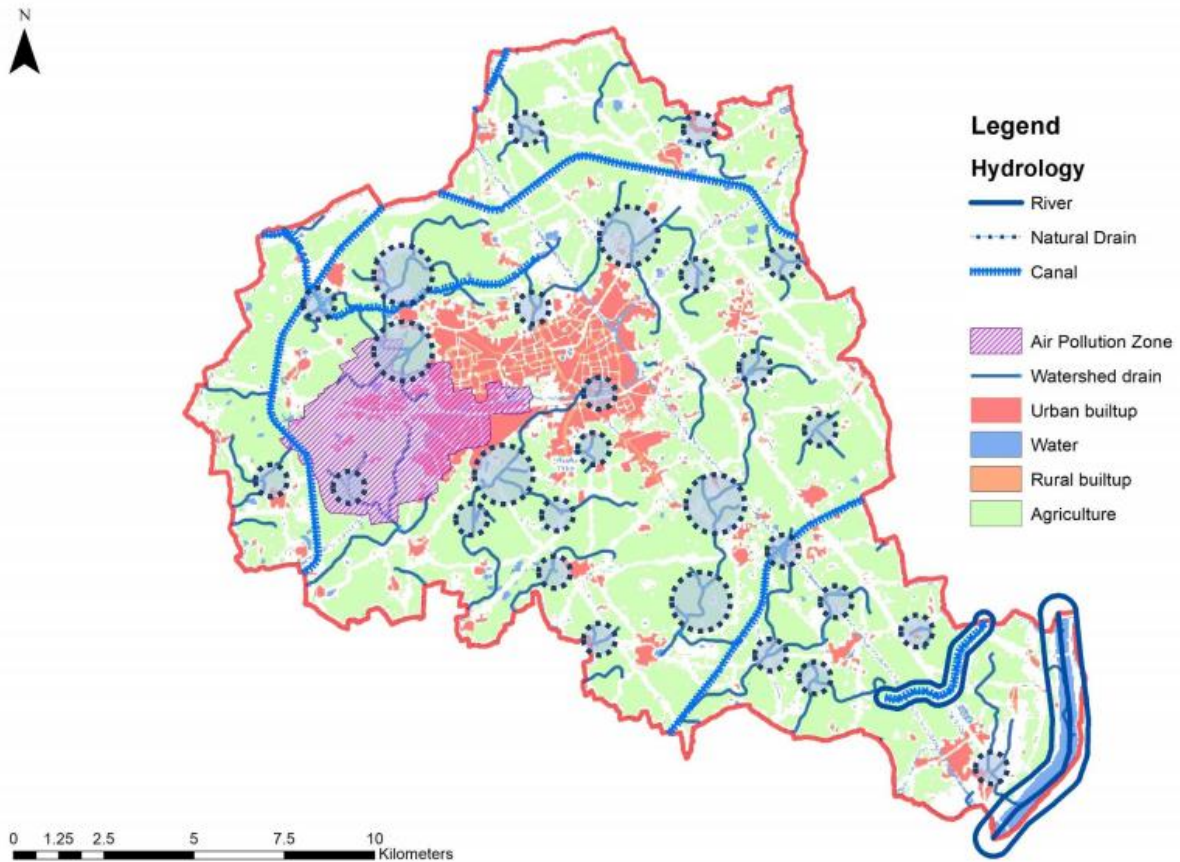
FIGURE 3.25 ENVIRONMENT / NATURAL HAZARD MAPPING

Due to the rapid growth of population and urbanization, the environment quality is fast degrading. As a result, it is leading to further deterioration of conditions and over extraction of resources.

3.5 Urban Environment Scenario

Anand city has witnessed a well-planned road network through the Town Planning Scheme in very early stage of development. The city is getting further developed towards Vallabh Vidyanagar having well planned roads in west and along the state highway in the region.

The traffic network is in terms of public transport run by a contract agency for the city and hinterland areas. The intrastate network of road transport

is supported by private bus operators. The city is more dependent on this mode of transport. The rail linkage is useful for commuters to specific connections and for the long-distance economical travel such as to Mumbai.

3.5.1 Regional Transport Linkages and Connectivity

The development area of AVKUDA is well connected with road and railway network to other regions of state. Proximity to upcoming DMIC; NH -48, NE - 1 & SH passing through AVKUDA area marks the strategic connectivity to regional context.

The road network is utilized by GSRTC, VITCOS and other private transport operators. The city is connected by railway to all important towns in Gujarat and the Metropolitan city of Mumbai, Delhi, Bangalore, Chennai, Lucknow, Jaipur, and Pune etc. It is also connected to the National Highway No .48 via Boriavi and Samarkha and the Express Highway No. l. The SH -83 connects Rajkot, Bhavnagar through Tarapur.
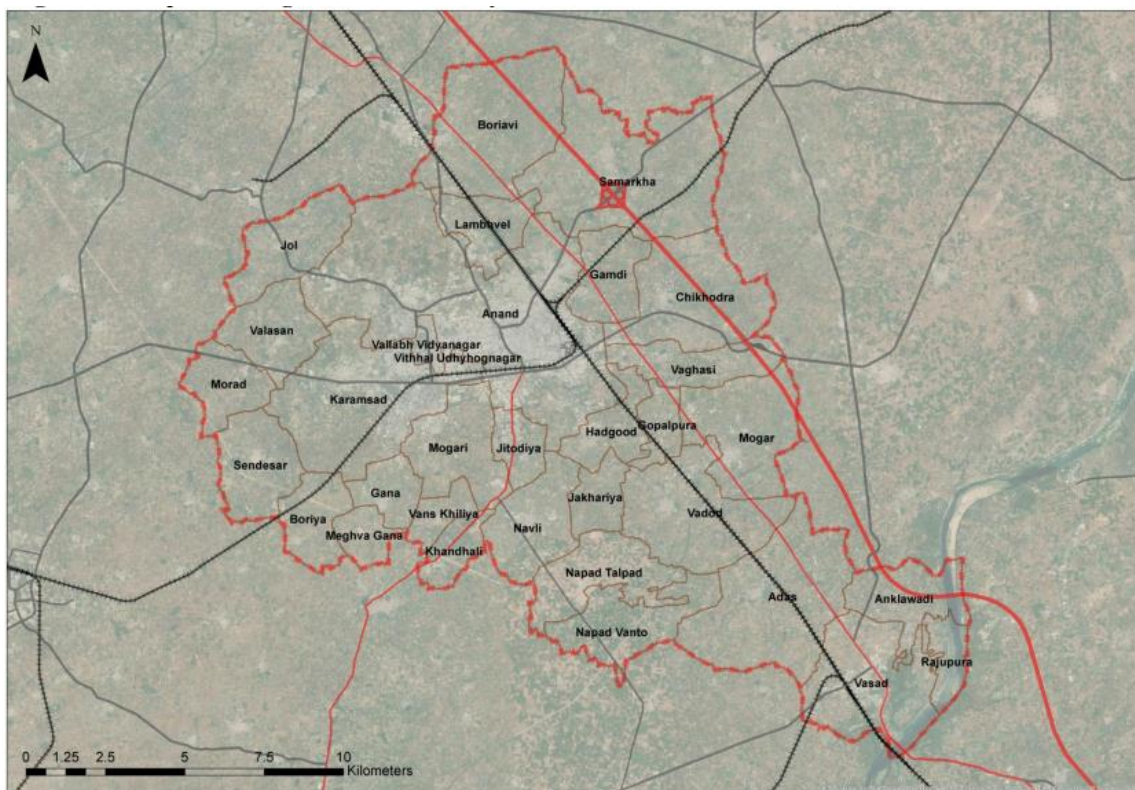
FIGURE 3.26 TRANSPORT LINKAGE

3.5.2 AVKUDA Transport Linkages and Connectivity

Expressway: - The expressway (Mahatma Gandhi Expressway No. 1) connecting to Ahmedabad and Vadodara. It`s length is around 16 km.

National Highway: - NH 48 & NH 64 passes through AVKUDA area. It`s length is around 25 km. and it`s covers around 9 % of highway.

State Highway No.: - SH 139, 60, 75 and 83 passes through the region with access from all the directions mainly connecting the taluka and urban centres in the district. It`s covers around more than 70 % of highway.

City Roads: - The Anand city has about 400 kms of the road network connecting major wards and location within city.
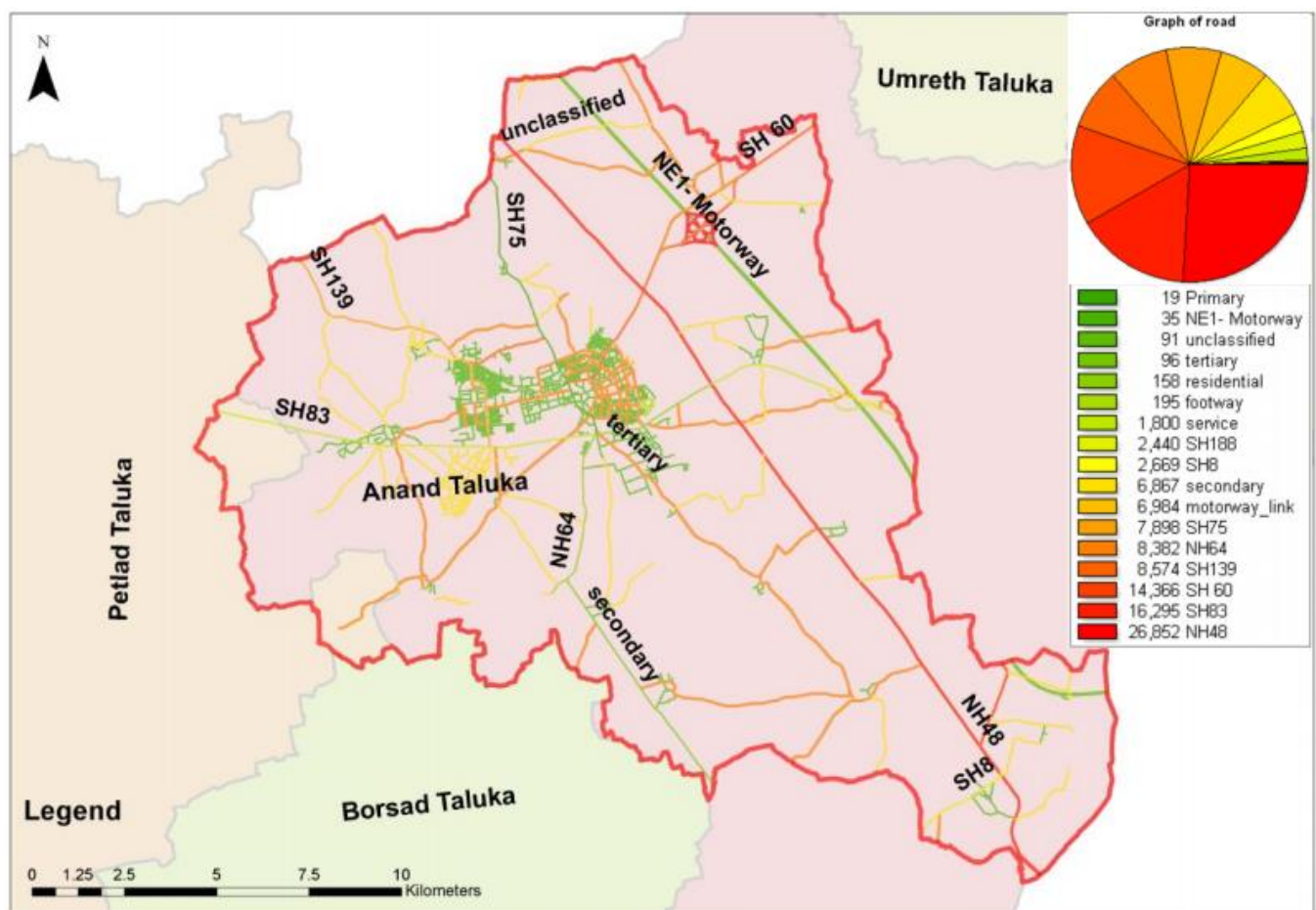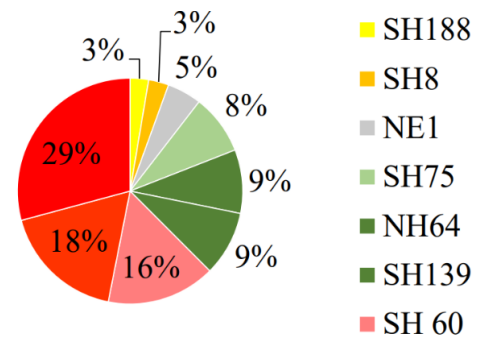

FIGURE 3.27 AVKUDA TRANSPORT CONNECTIVITY

45

3.5.4 Vehicular Growth

There is constant increase in the number of privately owned vehicles in the region. The trips by private vehicles & auto-rickshaws constitute a majority of trips leading to increased demand for parking and add to the noise and air pollution problems.

Major accident-prone junctions are chikhodara cross road, Amul dairy cross road, Station Road, samarkha cross road. The increasing number of vehicles and inadequate carrying capacity of road along the improper geometry of road network are major causes for traffic congestion.

Presence of informal activities along the road margins, illegal encroachment of pedestrian areas are the other causes for traffic congestion in the city.

TYPES OF VEHICLES	1997-98	1998-99	1999-2000	2000-2001	2001-2002	2002-03	2003-04	2004-05
Bus	60	35	21	16	9	18	14	21
Trax & jeep	256	212	189	171	310	386	410	452
LMV & Trucks	1540	1710	1782	2130	2865	3126	3648	4121
Auto Rickshaw	2489	2674	3265	2488	2364	1656	2314	2469
2 wheelers	1865	2245	2889	4123	4689	5265	6648	8962
4 wheelers	1560	1684	1746	1987	2641	3645	4124	5263
Others	1305	1395	1562	1648	2145	2659	3150	3658
Total Vehicles	**9075**	**9955**	**11454**	**12563**	**15023**	**16755**	**20308**	**24946**

TABLE 3.10 VEHICULAR GROWTH IN ANAND

Source: - AVKUDA Report, 2015

46

3.5.5 Urban Poor In AVKUDA

- It has been estimated that about 15 – 17 percent of total population of urban areas can be categorized as Urban Poor. The urban poor are residing in slums, chawls, delapilated buildings, public housing (EWS) and part of the village habitats. Most of the slums and EWS housing in authority area are located at the periphery of urban area in the fringes. This population would mainly comprise of service providers to the other higher income households residing within the core or suburbs of a city.

In case of AVKUDA development area the urban poor can be described as under:

a) **Vallabh Vidyanagar**: Hariomnagar slum & EWS housing must once be at the periphery of V.V.Nagar. But with growth and development of the town it has become part of the existing urban fabric.

b) **Anand**: In case of Anand also similar scenario is seen as in V.V. Nagar. These EWS settlements originally developed outside the Gamtal area. Across years with the growth and development of the suburbs and city these settlements became part of the urban fabric occupying prominent development land of the city. This scenario will not change until there is some kind of development pressure on these areas or government is planning slum rehabilitation.

c) **Urban Fringe**: In case of Gamdi, Mogri, Hadgood, Karamsad, Borsad & Bakrol these settlements are outside the Gamtal area of the village and consist of service providing community to the major centers like Anand, V.V. Nagar and Karamsad.

Characteristics of these settlements: unorganized access routes, concentration of community close to core areas (gamtal), railway stations, institutions, major routes, etc. These characteristics become catalyst in promoting such settlements.

The **distribution pattern** of these slums characteristically consists of small patches of poor mud huts roofed with anything from straw to mutilated kerosene, oil and biscuit tins. Slums mushroom in low ill-drained areas, pits, drainage-line, level-crossings, cross-roads, industrial areas, wasteland, scrub lands and nala or tunnels in contrast with the surrounding finer residences of the fairly wealthy people.

Urban Poverty Challenges

- Limited access to employment opportunities
- Inadequate and insecure housing and services
- Violent and unhealthy environments
- Little or no social protection mechanisms, &
- Limited access to adequate health and education opportunities

Urban Area	Total Population	Population in Slums	Percentage Share
Anand (M)	156050	13530	8.9
Boriyavi	19803	3800	19.2
Karamsad	28955	500	1.7
Vallabh Vidyanagar	29378	2254	7.7
Source: District Census Handbook (2001)			

TABLE 3.11 SLUMS IN ANAND

Source: - Anand District Hand book, 2011
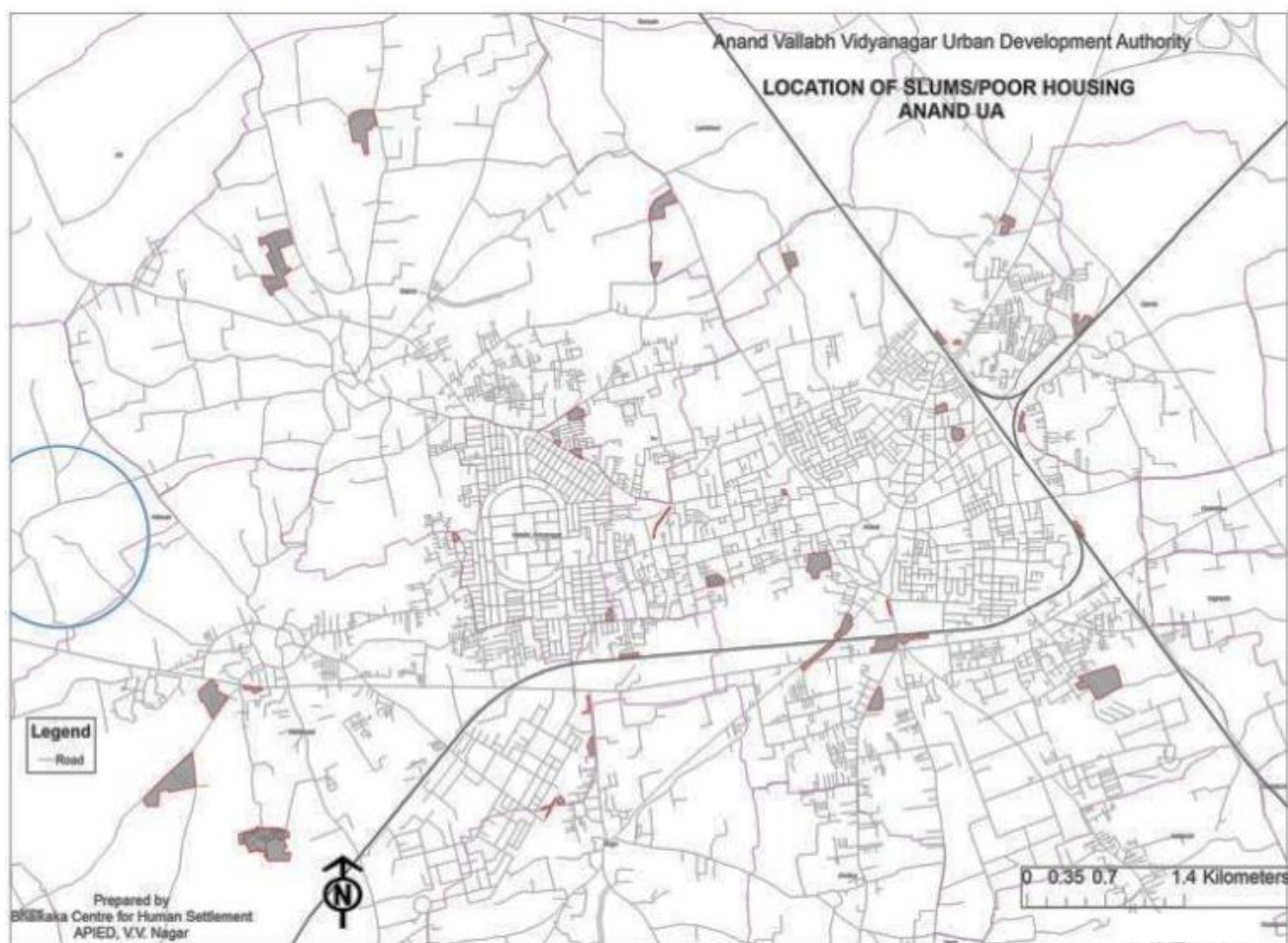
FIGURE 3.28 LOCATION OF SLUMS AND URBAN POOR IN AVKUDA

Source: - AVKUDA Report, 2015

3.5.6 Industrial Profile

Anand is famous internationally for its "Vithal Udhyog Nagar". There are thousands of small and medium scale industries in Anand District, principal industries are machine tools, electrical and mechanical equipment's and machinery. The district of Anand is home to over 3000 Small Scale Industrial units in sectors which includes engineering, glass & ceramics, and wood products etc. Anand is also an emerging hub for food processing industries and other agro based industries. The engineering industry is mainly thriving by leadership provided by diary industry and nonconventional energy sector.

Industries

Anand the Milk capital of India is a formerly known as Institutional city of India has a history of 1000 years back in the past. The main drivers of the economy are:

- **Dairy co-operatives.** Kheda Dudh Utpadak Sangh (Founder of Amul dairy) makes the revolutionary presence in the whole country through dairy & its allied products. Several Small-scale units related to dairy products have been activated in Anand & its surroundings. In monitory terms, Dairy and allied industries are the highest number in Anand city.

- **Agro based industries is the significant activity in the Anand region.** Anand is a heartland of "CHARUTAR" – key producer of tobacco & its allied products at state & national level. Spatial development of agricultural institutions setup in a form of Gujarat Agriculture University, National Dairy Science College and Institute of Rural Management (IRMA) helps the formation of agro based economic activities.

- **Several industrial units nearby Anand and Vittal Udyognagar.** Well structure industrial establishment around Anand as part of GIDC estates at Vitthal Udyognagar, adjacent to the southern part of Anand city. The local economic activities have been flourished in the form of wooden works, metal, chemical and automobile.

- **Proximity to Golden corridor.** The spatial pattern of Industrial development in Anand is influenced by the major transportation routes and links, leading to a concentration of settlements along the major corridor of Ahmedabad-Vadodara-Surat-Vapi-Bombay, the Golden corridor. Several leading industrial units have come up on Anand – Baroda National highway. Packaging industries have also flourished near the transportation corridor.

Industry Group	Anand Taluka	Total District	% Share
Edible Com.	37	76	48.68
Tobacco Ind.	28	116	24.14
Textile Ind.	0	10	0.00
Wooden Ind.	21	99	21.21
Paper Ind.	10	33	30.30
Leather Ind.	0	2	0.00
Rubber Ind.	5	5	100.00
Chemical Ind.	1	41	2.44
Electrical Gadgets	0	1	0.00
Means of Transportation	1	7	14.29
Other Ind.	176	441	39.91
Total	279	831	33.57

TABLE 3.12 DISTRIBUTION OF INDUSTRIES BY GROUP IN ANAND TALUKA

3.6 Analysis

3.6.1 Primary Survey

Number of persons in house

22% ▮ > 6
30% ▮ 1 - 4
48% ▮ 4 - 6

: Majority families consist 4-6 members

Source of Income

24% 33% 5% 18% 20%

▮ Business
▮ Farming
▮ Govt. Job
▮ Labour
▮ Private Job

: Income is based majorly on Business, Private jobs and Farming

Cooking energy used

- Cylinder
- Kerosene
- Pipe line
- Wood

3%
23%
1%
73%
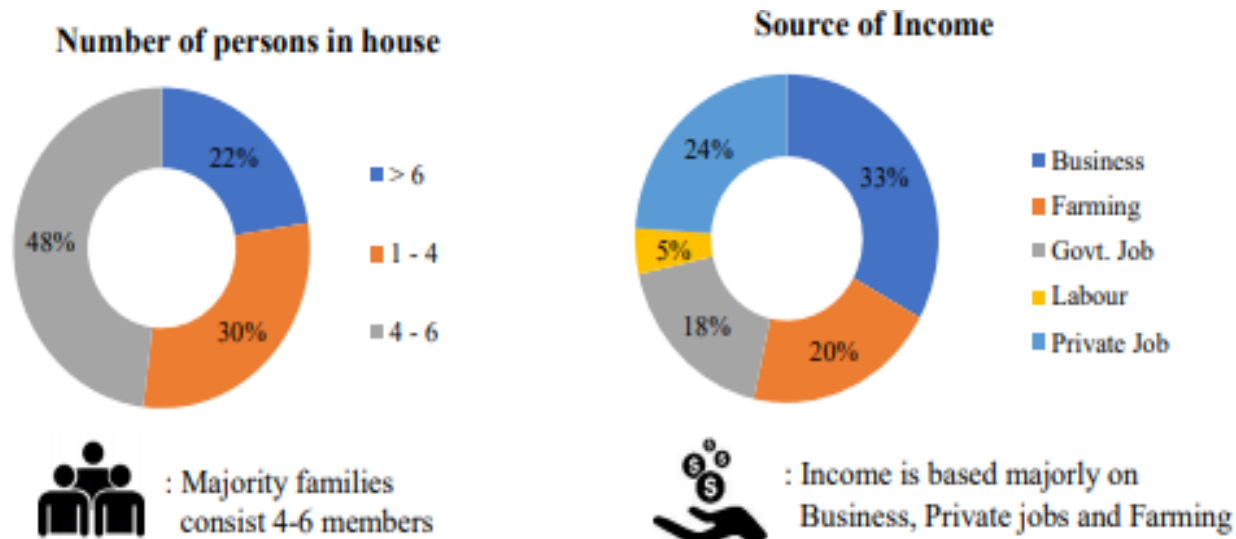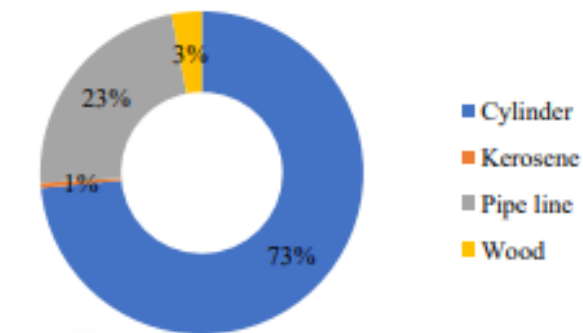
: 73 % Household were using Gas cylinders

Loans taken for the house

- No
- Yes

9%
91%
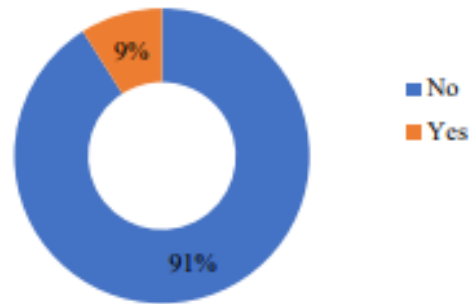
: 91 % People took loans For building their Houses

Water Quality

- Good
- Poor
- Satisfactory

12%
2%
86%
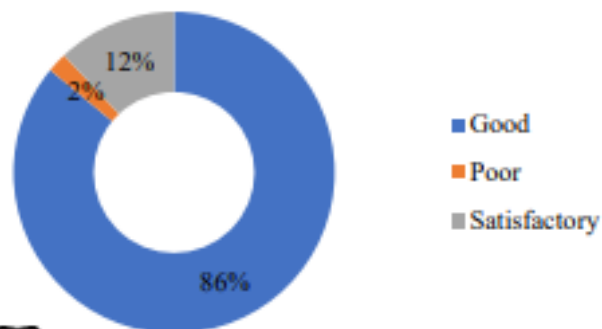
: 86 % Household were stating water quality as good.

Water purification

- Boiling
- No
- RO / UV

9%
30%
61%
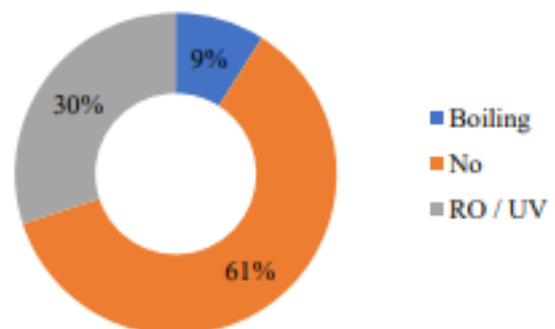
: 61 % Household were Drinking Direct Tap water

Count of Toilet connected

- Open Drain
- Septic tank
- Sewerage
- Soak Pit

4% 7%
24%
65%
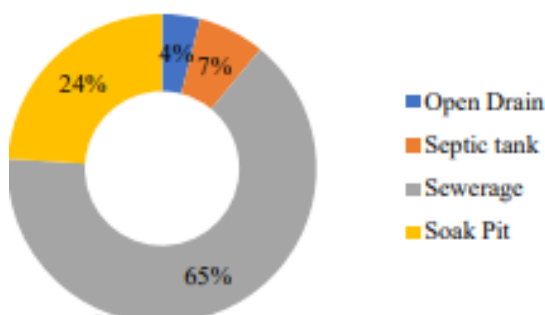
: 65 % Household were Having Drainage line

Count of Door to door waste collection

No
36%

Yes
64%

: 64 % Household were Having D to D waste Collection

Source of Water

- Bore well
- Gov. water
- Hand pump
- PublicTap
- Society bore well

2%
1%
2%
7%
88%
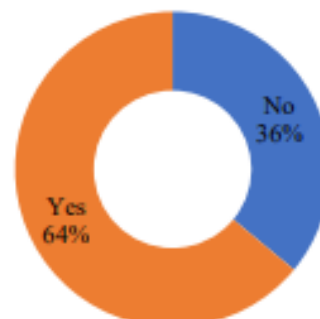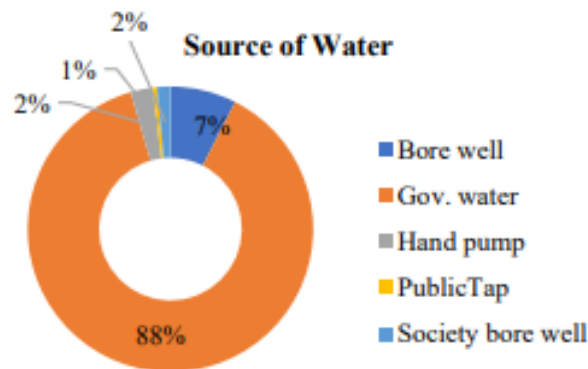
: 88 % Houses depend on government water as their primary source of Water

Recreational activity

- Farm
- Lake front
- Mall
- No
- Nowhere
- Parks / Garden
- Sports complex
- Temple

-1%
-1%
9%
1%
1%
21%
1%
67%
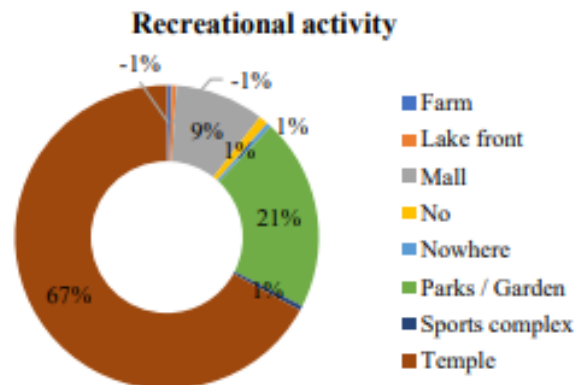
: 67 % Household were visiting Temple as Recreational Activity

Door-Door Waste Collection

- Yes
- No

29%
71%
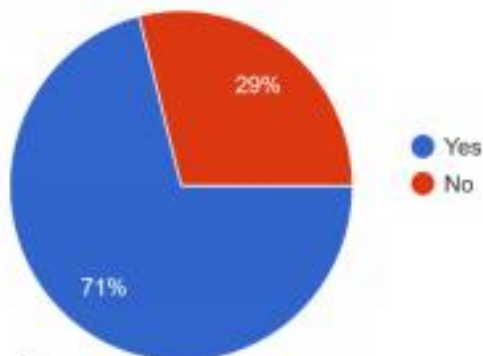
: 71 % Household were Having D to D waste Collection

Count of Healthcare

- Govt.
- No
- Private

40%
59%
1%
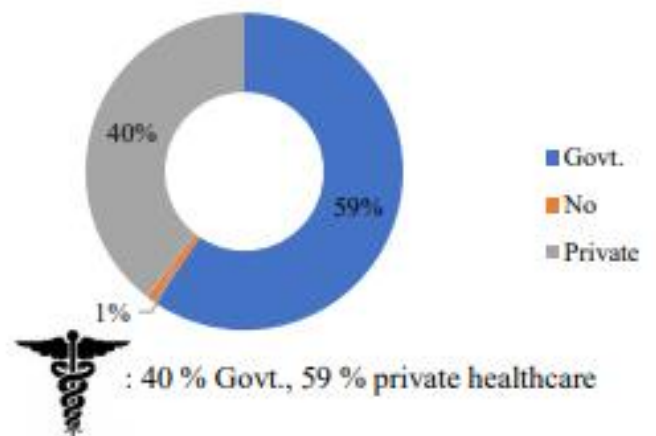
: 40 % Govt., 59 % private healthcare

Major Polluters

- Vehicles
- Industries
- Solid waste
- Sewage
- No
- Burning waste parts

52%
8.1%
26.4%
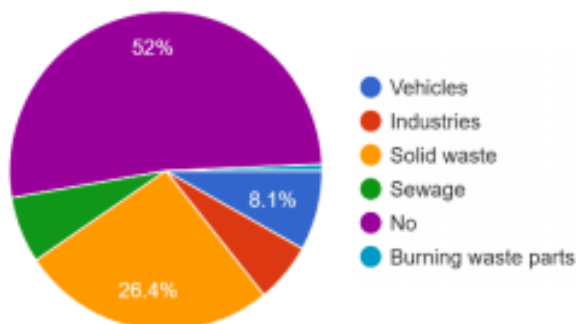
: Solid waste is Major Polluter

Health Problem / Diseases

Corona 14%
Breath (Bronchitis, Asthma) 10%
Blood pressure 10%
Heart problem 5%
Typhoid, Jaundice 3%
Malaria, Dengue 3%
Thairoid 2%
None 53%
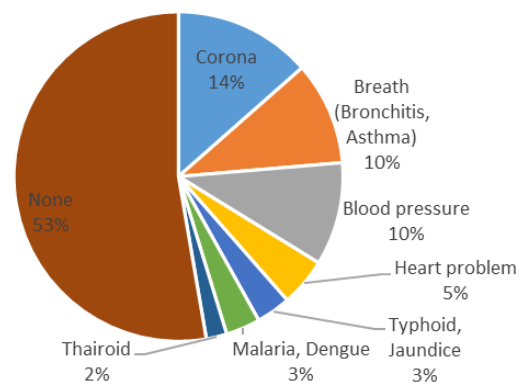
3.6.2 Secondary Data
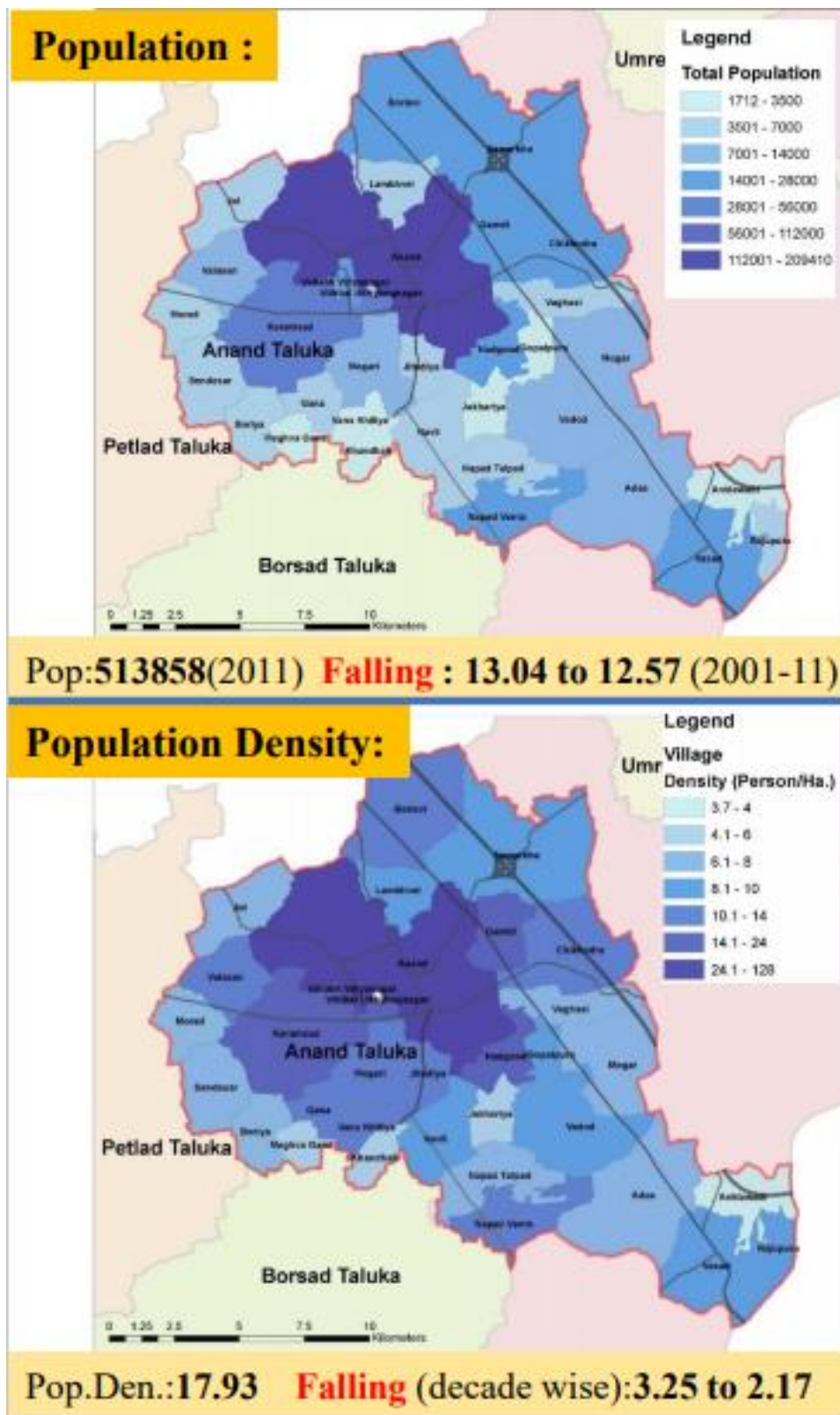
FIGURE 3.29 POPULATION & POPULATION DENSITY MAP
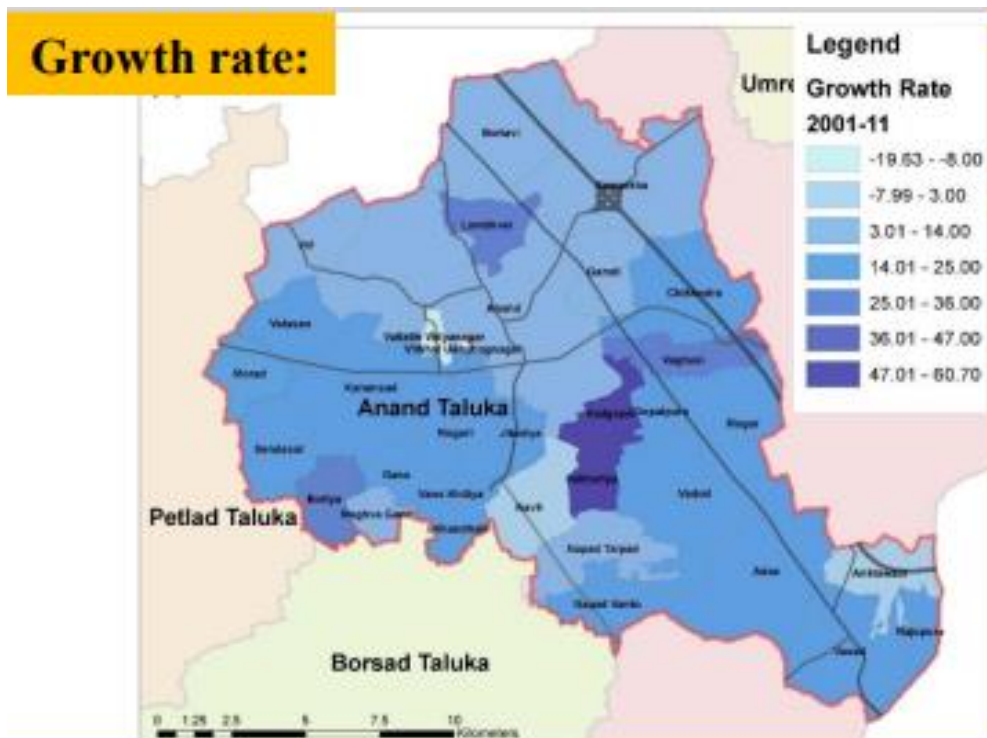
Growth rate:

Growth rate **falling** from **27.97%** to **13.28%** (2001-11)
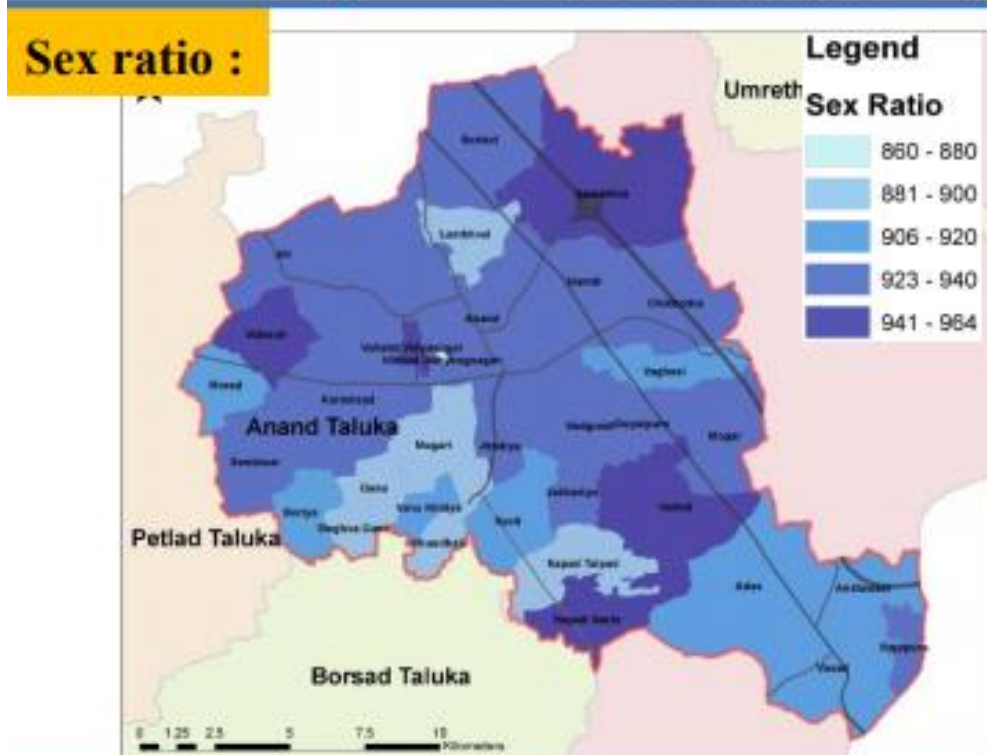
Sex ratio :

AVKUDA: **906**(2011) Gujarat: **919** Rising:**4** (2001-11)

FIGURE 3.30 GROWTH AND SEX RATIO MAP

Literacy rate:

Legend
Umreth TLiteracy Rate Total
79 - 82
82.1 - 85
85.1 - 88
88.1 - 91
91.1 - 94
94.1 - 97.4

AVKUDA:**87.83**(2011) Gujarat:78.03 **Rising** by **5.8**

Workforce participation rate:

AVKUDA:**38.10** Gujarat: **41** **Falling**(decade wise):**1.5**

Health :

Legend
Healthcare
Maternity home
Yes
No
Sub Health Center, Primary health Center, Community Health Center

Health Facility

- Avaiable 13% 16%
- Partially
- Not Available 71%

OBSERVATIONS:

Health facility is **good** in AVKUDA

TAKE-AWAYS:

- Need sub-health centers
- Need one District-Level Civil hospital

Education :

Legend
High. Secon. Higher Secondary, secondary, primary
Yes 1, 1, 1
No 2, 1, 1
2, 2, 1

Water Supply:

Legend
Tap Connections
450 - 700
701 - 1200
1201 - 1800
1801 - 2500
2501 - 4300
4301 - 7000
7001 - 41500

FIGURE 3.31 HEALTH FACILITY, LITERACY RATE, WORKFORCE PARTICIPATION RATE EDUCATION & WATER SUPPLY MAPS

Village Having Primary , Secondary & H. Secondary

- Primary
- Primary & Secondary
- Primary , Secondary & H. Secondary

30%
15%
55%
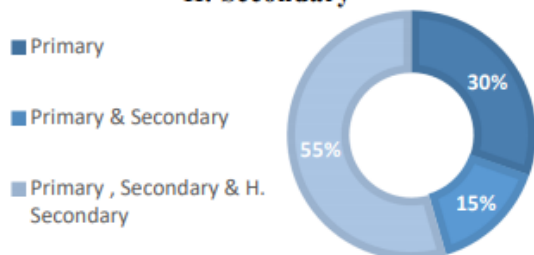
OBSERVATIONS:

Education facility is **good** in AVKUDA

TAKE-AWAYS:
- Need Secondary & Higher Secondary schools

Villages Having Main Source Of Drinking Water

- YES
- NO

2%
98%

OBSERVATIONS:

Water supply facility is **good** in AVKUDA

TAKE-AWAYS:
- Need betterment inn pressure , storage capacity and maintenance

Sewerage and Sanitation:
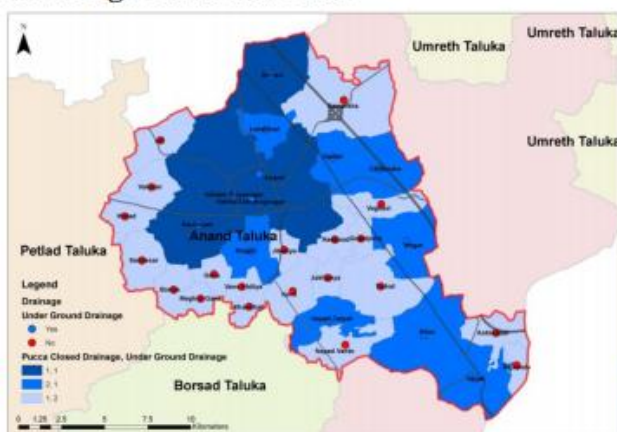
Solid Waste Management:

Villages Having Pucca Closed Drainge

- YES
- NO

21%
79%
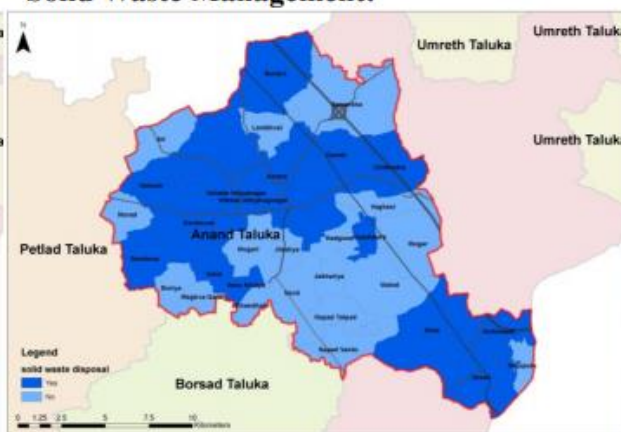
OBSERVATIONS:

Drainage facility is **average** in AVKUDA

TAKE-AWAYS:
- Need underground drainage system in rural areas
- Need allocated outlets to save natural ponds

Solid Waste Disposal

- YES
- NO

44%
56%

OBSERVATIONS:

Drainage facility is **poor** in AVKUDA

TAKE-AWAYS:
- Need dumping yards to save lakes , natural drains
- Need regular waste collection in rural areas

Figure 3.32 SEWERAGE AND SENITATION, AND SOLID WASTE MAPS

CHAPTER-4 INFERENCES & RECOMMENDATIONS

4.1 INFERENCES:

- Availability of good health care facilities across the area
- Poor urban waste management system
- Drainage lines non-functional resulting into water-logging
- Cultivated land and plantations are cleared up for construction purposes.
- The study of urban land use/land cover transformation and urban sprawl in Anand city revealed that there is large scale urban land use transformation in the study area and the share of built-up area in the city has increased.
- It also shows a marked reduction in the open spaces within the city within the city.
- Unhygienic situations in urban environment due to informal settlements
- Air pollution and water pollution is growing rapidly and need for the raw water is increasing with the increasing heavy industry
- Air pollution and noise pollution is also increasing, because of vehicular growth – proper public transport system with well connectivity needed
- Lack of public open/ green space

4.2 RECOMMENDATION:

- The issues of physical and social infrastructure degrading urban environment should be solved through by adding provision in development plan and town planning scheme.

- Industrial waste treatment plant which emphasis on recovery and waste to energy generation

- Automotive plant water treatment solutions - supply re-useable water, reducing raw water intake in industrial zone, which aim to achieve zero liquid discharge (zld) for better environment practice.

- Introducing pollution control committee (pcc) which will be regulated by avkuda, which will govern the industrial pollution and regulate it to its minimum.

4.3 Framework for Healthy Urban Environment:

WATER SUPPLY
- MINIMIZING WASTAGE
- RAIN WATER HARVESTING
- MAINTENANCE OF EXISTING AND AUGMENTATION OF NEW INFRASTRUCTURE
- METERING ALL INDUSTRIAL CONNECTION

OLD CITY AND NEW CITY POPULATION DYNAMICS

URBAN ENVIRONMENT
- CONSERVATION & REJUVENATION OF WATER BODIES
- REMOVQAL OF ENCROACHMENTS AND BUILDING BUFFER ZONES AROUND WATER BODIES
- RAIN WATER HARVESTING
- IMPLEMENTATION OF POLLUTER PAY POLICY
- AWARNESS DRIVES FOR CITIZENS

BEAUTIFYING INNER CITY ENVIRONMENT
- ROOF TOP GARDENING
- PLANTATION OF TREES ALONG ROADS AND HIGHWAYS
- PREVINTING LITTERING OF GARBAGE

TRANSPORT
- EXTENSION & MODIFICATION OF CITY BUS TRANSPORTATION SYSTEM & NETWORK
- DISCOURAGING PRIVATE VEHICLES AND PROMOTE COMMUNITY TRANSPORT SHARING

DRAINAGE
- REMOVING ENCROACHMENT & MAINTENANCE OF DRAINS
- ADDRESSING THE KEY WATER LOGGING POINTS

SOLID WASTE MANAGEMENT
- 100% WASTE COLLECTION
- NO OPEN DUMPING
- SEGREGATION OF WASTE AT SOURCE
- WASTE PROCESSING AND TREATMENT
- EXPANSION OF SWM INFRASTRUCTURE
- RECYCLE & REUSE AS MUCH POSSIBLE

Inner wheel: URBAN RESOURCE INFRASTRUCTURE, TOWN PLANNING SCHEME, DEVELOPMENT PLAN, HEALTHY URBAN ENVIRONMENT, SOCIAL ENVIRONMENT, POLICIES, PHYSICAL ENVIRONMENT, HEALTHY URBAN DEVELOPMENT

FIGURE 5.1 FRAMEWORK FOR HEALTHY URBAN ENVIRONMENT

Industrial waste treatment plant:
- Plant will be provided in industrial zone
- Especial emphasis on Recovery
- Waste to energy generation

Automotive Plant Water Treatment Solutions

- Supply re-useable water, reducing raw water intake
- Aim to achieve Zero Liquid Discharge (ZLD) for better environment practice
- Help manufacturers produce quality final products

### Removal of biodegradable organics:

- Biodegradable organic material of plant or animal origin is usually possible to treat using extended conventional sewage treatment processes such as activated sludge or trickling filter
- Activated sludge is a biochemical process for treating sewage and industrial wastewater that uses air (or oxygen) and microorganisms to biologically oxidize organic pollutants, producing a waste sludge (or floc) containing the oxidized material.

FIGURE 5.2 CYCLE OF RECOVERY

Removal of other organics:

Synthetic organic materials including solvents, paints, pharmaceuticals, pesticides. products from coke production and so forth can be very difficult
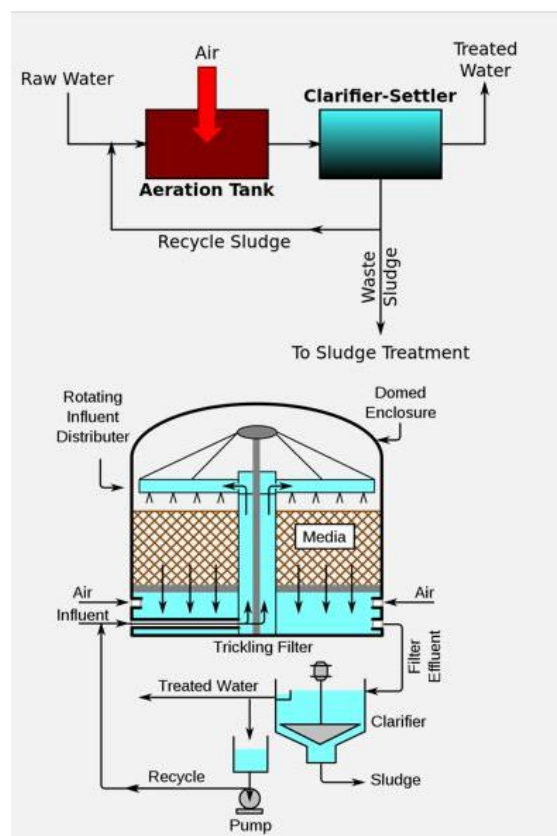
FIGURE 5.3 A TYPICAL COMPLETE TRICKLING FILTER SYSTEM

to treat. Treatment methods are often specific to the material being treated. Methods include advanced oxidation processing, distillation,

adsorption, ozonation vitrification, incineration, chemical immobilisation or landfill disposal.

Pollution control committee:

The PCC will be regulated by AVKUDA, which will govern the INDUSTRIAL pollution and regulate it to its minimum.

Air pollution:

Air Quality Monitoring is an important part of the air quality management. The National Air Monitoring Programme (NAMP) has been established with objectives to determine the present air quality status and trends and to control and regulate pollution from industries and other source to meet the air quality standards. It also provides background air quality data needed for industrial sitting and towns planning.

The National Ambient Air Quality (NAAQ) Standards in industrial areas (SPM - 360 ug /m3; RPM 120 ug / m3)

FIGURE 5.4 AIR & WATER POLLUTION

Water pollution:

Industrial wastewater treatment describes the processes used for treating wastewater that is produced by industries as an undesirable by-product. After treatment, the treated industrial wastewater (or effluent) may be reused or released to a sanitary sewer or to a surface water in the environment. The drain nearby disposal site takes the overflow of waste water which nins across the major parts of the city. The poor management and treatment at the site lead to accumulation of mosquitoes, larve and other vectors leading to infectious diseases in the areas.

Industrial Solid Waste rules: Hazardous waste is mainly generated by industrial activities. The amounts produced and their composition are

largely driven by production patterns. The manufacturing industry has been generating increasing amounts of waste.

Changes in production patterns and related technologies, and in waste management practices, have altered the composition of such waste.

Bio Medical Waste Management:

Plastic Waste:

Electronic Waste:

Hazardous Waste:

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