ORIGIN AND GROWTH OF GANDHINAGAR CITY

Avinash Kumar Singh

Ph.D. Scholar, MD University, Rohtak

Email ID: avinash.rs.geo@mdurohtak.ac.in

ORCID: 0000-0002-1780-8183

Abstract

The goal of Gandhinagar's Development Plan for 2011 was to change it from a centre of administration into a dynamic and prosperous community that could meet the demands of a rapidly urbanizing economy. This plan advocated a land readjustment mechanism for urban expansion. The present research aims to examine Gandhinagar's origin and growth. According to the 1971 Indian Census, only 24,055 people were living there; by 2011, that number had increased ten times over two lakhs. To estimate the city's future expansion, data for this work were gathered from secondary sources in the historical dements and statistical techniques, including ratio, arithmetic mean, and exponential growth. With a decadal growth rate of 160 per cent, the city's population increased three-fold in 1981. In 2011, the decade that witnessed the most significant fall in growth rate, the city's population increased by just 3.47 per cent over a decade. The spatial growth of Gandhinagar city has extended from 56.75 km^2 in 1971 to 182.30 km^2 in 2011.

Keywords: Origin, Growth, Urban Expansion, Population growth.

Introduction

"Gujarat was formed as a new state on May 01, 1960, with the division of the old Mumbai State into two independent states, Gujarat and Maharashtra. Ahmedabad, Gujarat's economic centre, was chosen as the state capital, and it was recommended that a new capital be built in the style of other state capitals, notably Chandigarh. The foundation stone of Gandhinagar city, named after Mahatma Gandhi, was set in 1965, and the capital was moved from Ahmedabad to Gandhinagar in 1970. The development of Gandhinagar, like its older cousins Chandigarh and Bhubaneswar, was in part an educational experiment and social

welfare project, as well as a venture in professional city planning and architecture (Kalia, 2004)".

Gandhinagar became a Municipal Corporation on March 16, 2010. It includes four municipalities: Pethapur, Mansa, Kalol, and Dahegam. It had an area of 182.30 km^2 and more than two lakh population. Before, it was the only notified area capital of any state in the country which did not have an elected body to govern. It has been developed as a planned city (GMC, 2018). According to Lamarche (1976), planning can only be considered "genuine" if it meshes with the objectives of real estate investors. Castells (1975) noted the recent rise in an obsession with minimally improving squatter communities and establishing the legitimacy of urban growth.

Etymology

"The capital of Gujarat, Gandhinagar, is named after Mohandas Karamchand Gandhi, the native son of Gujarat revered worldwide as Mahatma (Great Soul) Gandhi".

 Gujarat, the melting pot of India and treasure trove of architectural styles, derives its name from *Gujjara-ratta*, the form it takes in Prakrit, the ancient Indic dialect. Its Sanskrit name, *Gurjjara-rastra*, literally means the "country of the *Gurjjaras.*" The Gurjjaras were a Central Asian tribe believed to have entered India along with the Huns in the mid-fifth century when the imperial control of the Guptas was in decline . The region the Gurjjaras settled in was called Gujarat by the tenth century, when Mulraj Solanki, the founder of the Hindu Chalukyan dynasty, established his capital at Anhilwara Patan. Anhilwara, in time, came to be replaced by Ahmedabad, which Muzaffar Khan selected as his sultanate's capital in 1412 . In time, the city came to rival Manchester, UK, in textiles. However, Bombay (present-day Mumbai) became the region's capital when the British placed Gujarat under their Bombay presidency. It was not until 1960, after the unilingual (Gujarati) State of Gujarat was from bilingual Bombay, that Gandhinagar, about 15 miles (24 km) north of Ahmedabad on the right bank of the Sabarmati River, was selected as the site of the capital city for the new State .

Study Area

Geographical Setting

Location, Site and Situation

"Gandhinagar is located approximately 23 km north of Ahmedabad, on the west-central point of the Industrial corridor between Delhi, the national capital, and Mumbai, popularly known as the country's financial capital. It is some 900 km southwest of Delhi and 464 km away from Mumbai".

The coordinates of Gandhinagar, India, are

(https://dateandtime.info/citycoordinates.php?id=1269515):

Geographic coordinates

Latitude: 23°13′00″ N

Longitude: 72°40′59″ E

Elevation above sea level: 54 m = 177 ft

Coordinates in decimal degrees

Latitude: 23.2166700°

Longitude: 72.6833300°

Coordinates in degrees and decimal minutes
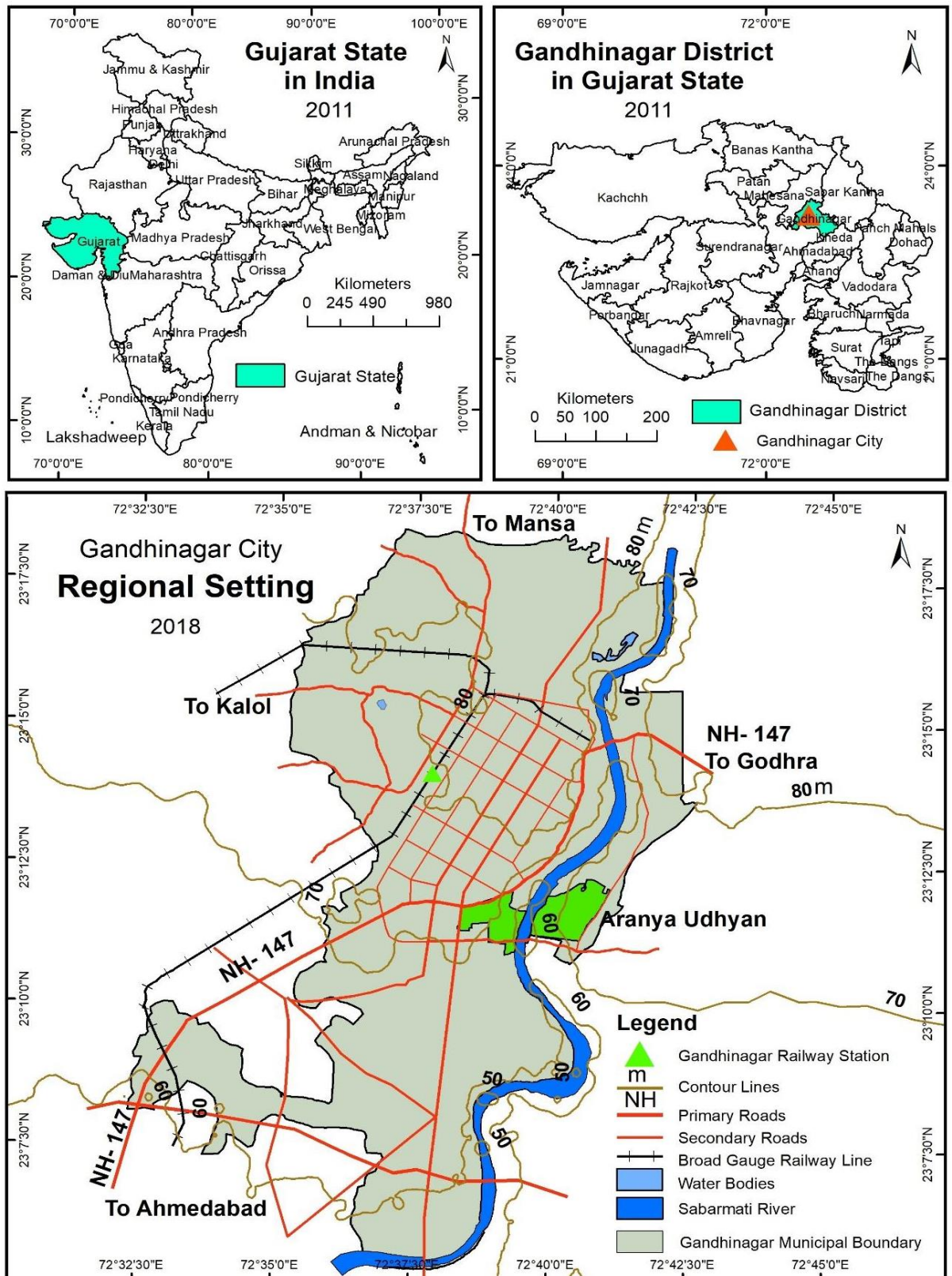
Latitude: 23°13.0002′ N

Longitude: 72°40.9998′ E
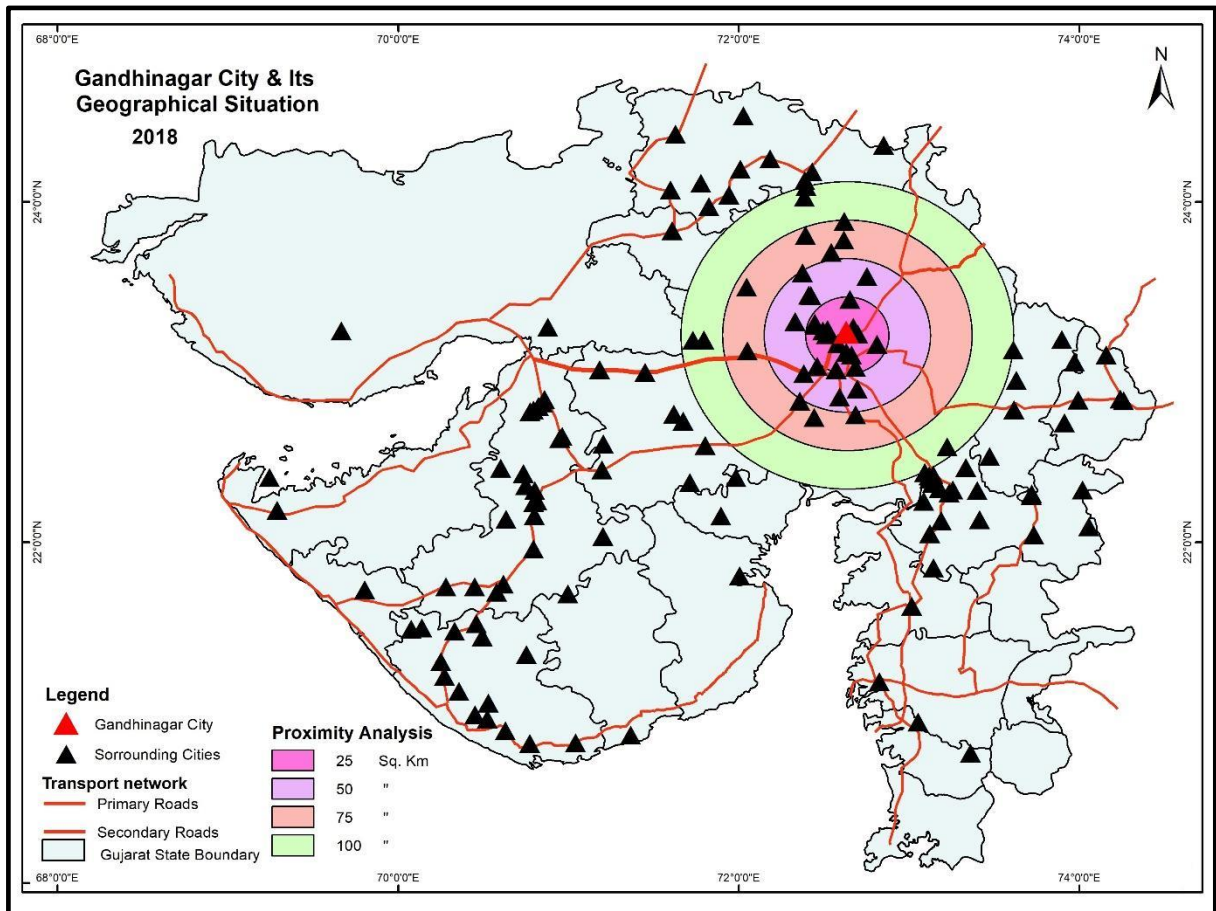
UTM coordinates

UTM Area: 43Q

Easting: 262919.91835393

Northing: 2569395.541575

Source: Census of India, 2011 & Google Earth Images, 2018.

Map 1: Location and Regional Aspects of Gandhinagar City

Source: Google Earth Pro, USGS, 2018.

Map. 2: Geographical Situation of Gandhinagar City

On the west bank of the Sabarmati River, near Pethapur hamlet in the erstwhile Kalol taluka, a permanent location for the state's new capital was chosen, and the town of Gandhinagar was built. The district comprised a single taluka formed from some villages of Ahmadabad and Mahesana in 1964. This city is approximately 16.5 kilometres long from north to south and 4.6 kilometres long from east to west. Mahesana district borders it on the north, Sabarkantha district on the north-east, Kheda district on the south, and Ahmadabad district on the south. It connects with Ahmedabad, Gandhinagar, Udaipur, New Delhi, and Chandigarh through National Highway 8C, Surat, Mumbai, and Navi Mumbai through National Highway 48. Maps 1 and 2 provide a view of Gandhinagar's location and geographical situation.

Physical Characteristics

The Sabarmati plain is run over by the river Sabarmati, which runs from north to south across this region, dividing the district into two parts.

With an average elevation of 54 metres above sea level, it is a flat alluvial plain with minimal undulations. This region's geological structure comprises alluvium, blown sand, and other materials. The Usterts-Ochrepts type of soil is found in this area.

Except for the southwest monsoon months, this area has a hot summer, a cold winter, and a generally dry climate. There is a cold season from December to February, followed by a hot season from March to May. The southwest monsoon season lasts from June to September, followed by the transition or post-monsoon season from October to November. The temperature rises steadily from February until May, the warmest month of the year, with maximum temperatures of 41°C and lowest temperatures of 26°C.

Objective

The main object of the present research work is to explore the origin and growth of Gandhinagar City.

Database & Research Methodology

The present work is a systematic study in line with the study's aims, and the focus has been on examining the origin, growth, evolution, and development of Gandhinagar city. Data on the said aspects of the city has been gathered from Indian imperial gazetteers, extant literature, and other historical materials. In addition, the Census of India provided data on several population demographics of several capital cities. The A-2 table collected data on population decadal variation since 1901. In contrast, in 2011, the A-4 table was used to collect data on towns classed by population size class, with variations from 1901. Other essential data were gathered from town and country planning, the city's master plan, historical material, etc. Google Earth imagery has been brought in tiles, and each tile is geo-referenced and mosaic in ERDAS IMAGINE software using UTM projection and digitized in ArcGIS. Guide map of the city at 1:25,000 scales collected from Survey of India for assistance. Municipal corporation

boundary has been used to define city administrative boundary. Various population estimates and forecasting techniques were used in the study, including the ratio method, arithmetic growth method, and exponential growth method.

a. Ratio Method

i. Calculated the percentage share of the population of Gandhinagar City in the population of Gujarat in 2001 and 2011 (Table 1),

ii. For projecting the population of Gandhinagar City for the year 2021, computed the difference between the population share of Gandhinagar to the population of Gujarat in 2001 and 2011, as follows.

Share of Gandhinagar city's population in the population of Gujarat in 2001

$$(S_{2001}) = \quad 0.38$$

Share of Gandhinagar city's population in the population of Gujarat in 2011

$$(S_{2011}) = \quad 0.34$$

$$\text{Difference } (D) = S_{2001} - S_{2011}$$
$$= 0.38 - 0.34 = 0.04$$

This tendency, in degree and direction, was forward to project the population in 2021. The steps followed were as follows:

$$S_{2021} \quad = \quad (S_{2011} - D)$$
$$= \quad [0.34 - (0.04)]$$
$$= \quad [0.34 - 0.04] = 0.30$$

In other words, the City of Gandhinagar would have 0.30 per cent of the population of Gujarat in 2021.

iii. The combined population of Gujarat in 2021 was noted as 66,794, 000.

Hence projected population of Gandhinagar city in 2021 can be worked out as (66, 794, 000x 0.30) 100 = 1,99,921

Technically, this could be expressed as follows:

$$\text{Gandhinagar }_{2021} \quad = (T_{2021} \times S_{2021}) / 100$$
$$= (66,794, 000 \times 0.30) / 100$$
$$= 1,99,921$$

iv. The combined population of Gujarat in 2031 was noted as 73,437,000.

Hence projected population of Gandhinagar city in 2021 can be worked out as

(73,437,000x 0.26) 100 = 1,87,684 and so on

Gandhinagar $_{2021}$ = (T2031 x S2021) / 100

                                  = (73,437,000 x 026) / 100

                                  = 1,87,684.

Table 1: The percentage share of Gandhinagar's population in Gujarat's population:
2001–2101

Years	Gujarat	Gandhinagar	Percentage Share of Gandhinagar's Population in Gujarat
2001	50,670,000	195,985	0.39
2011	59,110,000	202,776	0.34
2021	66,794,000	199,921	0.30
2031	73,437,000	187,684	0.26
2041	78,935,000	167,210	0.21
2051	83,315,000	140,048	0.17
2061	86,770,000	107,904	0.12
2071	89,562,000	72,203	0.08
2081	91,673,000	33,808	0.04
2091	93,449,000	-6,410	-0.01
2101	95,020,000	-48,078	-0.05

Source: Census of India (2011). General Population Tables: A-Series, Office of the Registrar.

     General and Census Commissioner, India, New Delhi.

The Future Population of India, A Long-Range Demographic View,

Population Foundation of India and Population Reference Bureau, Delhi, August 2007.

b. **Arithmetic Growth Method**

This strategy is suitable for large, historic cities with tremendous expansion. In this approach, the average increase in population per decade is approximated using data from prior census reports. By adding this increase to the existing population, the population of the next decade may be determined. As a result, the population is thought to be steadily increasing.

As a result, dP/dt = C indicates constant population change rate. As a result, after the nth decade, the population will be P_n= P + n.*C. P_n represents the population after n decades, while P represents the current population.

c. **Exponential Growth Method**

Exponential growth is the process through which quantity rises over time. It happens when the instantaneous rate of change of an amount concerning time is proportionate to the amount itself. A portion undergoing exponential growth is an exponential function of time, which means that the variable denoting time is the exponent (in contrast to other types of growth, such as quadratic growth). If the proportionality constant is negative, the quantity declines with time and undergoes exponential decay. Because the function values form a geometric progression in the case of a discrete domain of definition with equal intervals, it is also known as geometric growth or geometric decay. The formula for the exponential growth of a variable x at the rate of growth r, while time t progresses at discrete intervals (that is, at integer times 0, 1, 2, 3), is whereas x_0 is the value of x at time 0.

$$\text{Exponential Growth } (X_t) = Xo(1 + r)^t$$

Result and Discussions

Population Growth and Future Projections

Gandhinagar city was developed to augment the capital of Ahmedabad in Gujarat state. It had a population of only 24,055 per the Census of India in 1971, growing ten times more than two lakhs in 2011. Table 1 gives an insight into the urban status, areal extent, gender configuration and population change.
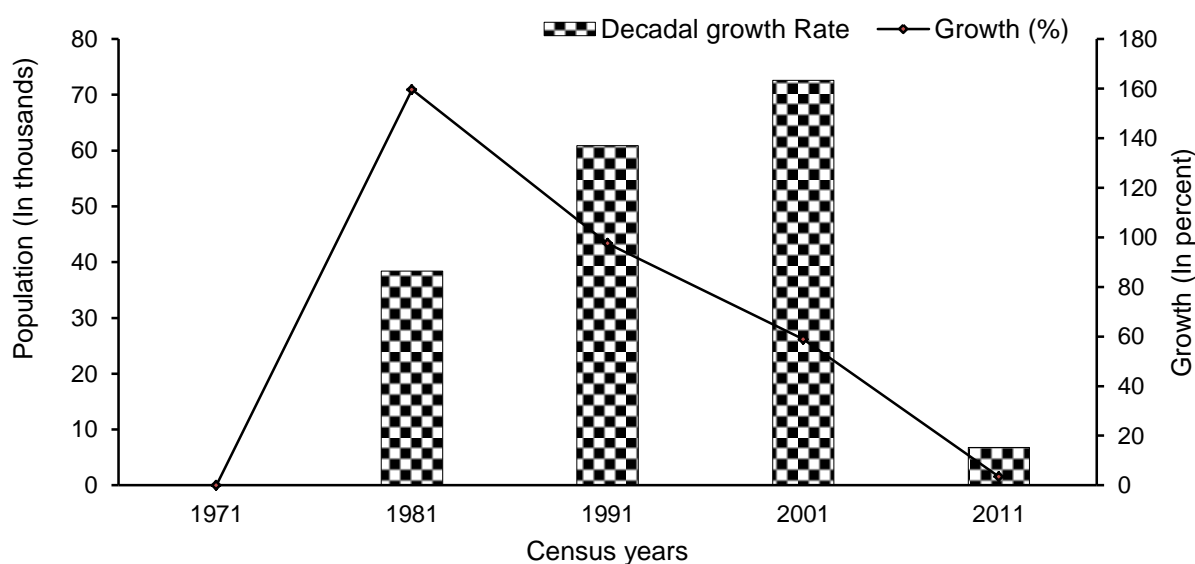
Table 2: Decennial Growth of Gandhinagar City: 1971-2011

| Census year | Urban Status | Area (square km) | Persons | Decadal Change | | Males | Females |
				Absolute	%		
1971	NA	56.75	24,055	-	-	12,945	11,110
1981	NA	56.75	62,443	38,388	159.58	33,619	28,824
1991	NA	56.75	123,359	60,916	97.55	65,320	58,039
2001	NAC	56.75	195,985	72,626	58.87	103,876	92,109
2011	**Municipal Corporation**	**182.30**	**292797**	**96,812**	**49.40**	**153443**	**139354**

Source: Census of India, 2011.
https://censusindia.gov.in/2011census/PCA/A4.html.

Gandhinagar City: Population Growth, 1971 -2011

Source: Census of India, 2011.

Fig. 1

The population in Gandhinagar city is estimated to triple based on Arithmetic mean projection, whereas according to exponential growth projection, the population would double in the period 2021-2101. On the other hand, the ratio method projects the population in the city to decline in the next century. The arithmetic mean projection findings reveal that the Gandhinagar population would add roughly 1 lakh per two decades. Eventually, the population in Gandhinagar would cross the half-million mark in 2081 and 2101, and the city would have more than six lakhs.
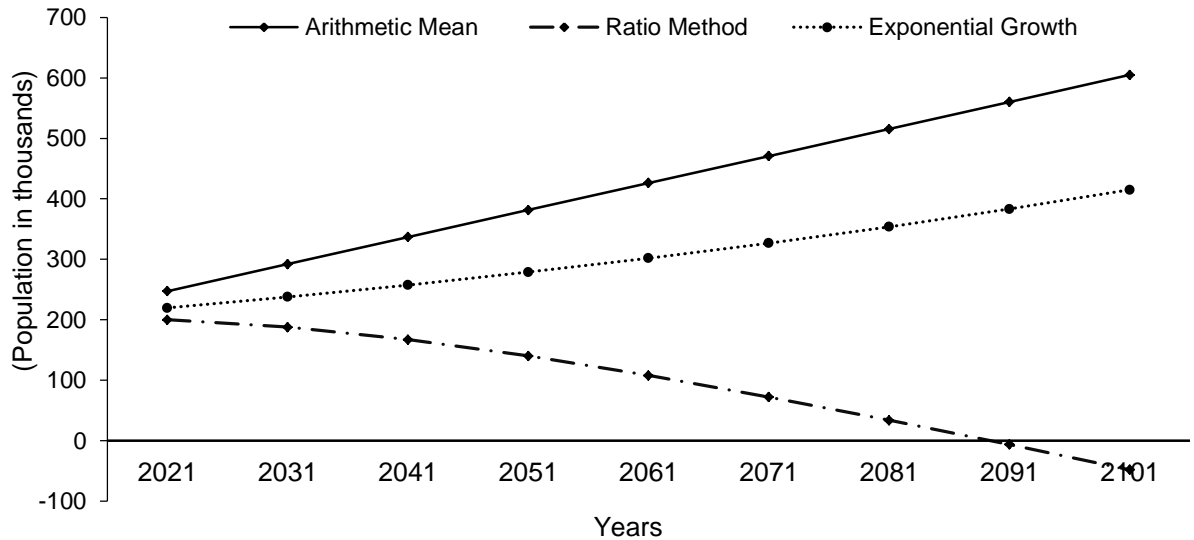
Table 3: Population Projection by Various Methods of Gandhinagar City: 2021-2101

Census year	Arithmetic Mean	Ratio Method	Exponential Growth
2021	247,456	199,921	219,566
2031	292,136	187,684	237,747
2041	336,816	167,210	257,433
2051	381,496	140,048	278,749
2061	426,176	107,904	301,830
2071	470,856	72,203	326,823
2081	515,536	33,808	353,885
2091	560,216	-6,410	383,187
2101	**604,896**	**-48,078**	**414,916**

Source: Calculated by Researcher.

In terms of exponential growth projections, the population in the city would add 1 lakh every four decades. In contrast, the ratio method projections reveal that the population in the city will continue to decline beginning in 2021 (Table 2).

Future trends of population growth in Gandhinagar City
2021-2101

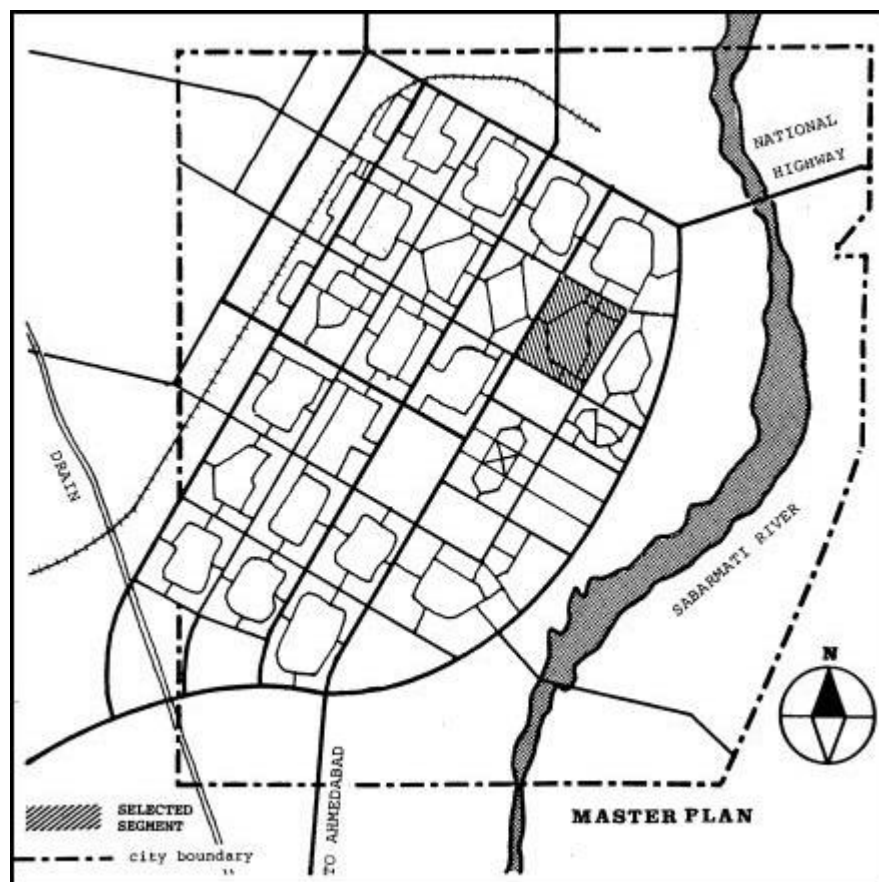Source: Calculated by Researcher.

Fig. 2

Origin and Evolution

"Gujarat came under the administration of the British East India Company in 1818. After the Indian Mutiny of 1857–58, the area became a province of the British crown. It was divided into Gujarat province, with an area of about 10,000 square miles (26,000 square km), and numerous native states (including Saurashtra and Kachchh). With Indian independence in 1947, the province of Gujarat was included in Bombay state; in 1956, the province was enlarged to include Kachchh and Saurashtra. Finally, on May 1, 1960, India's Bombay state was split into present-day Gujarat, and Maharashtra Ahmedabad city was the capital of Gujarat state (https://www.britannica.com/place/Gujarat/History)"

Planning of Gandhinagar city in Gujarat state came to existence in 1960 after the erstwhile Bombay state was divided into Gujarat and Maharashtra based on the linguistic characteristics of the people. Chief Architect H. K. Mewada and his aide Prakash M. Apte designed the new capital city. The Master Plan for the former GNA region was completed in 1965 and approved by the State Government in 1966 . It was envisaged to make a capital city in line with

Chandigarh with good infrastructure facilities where the Government offices would be placed. The land was acquired 23 km north of Ahmedabad from villages covering an area of 57 km^2. The location was chosen because the terrain was flat with a slight slope that provided adequate water drainage.

The proximity of the land to the Sabarmati River had assured ample water supply. The site had a good transportation connection to National Highway 8 and the Ahmedabad-Kalol State highway. The airport was near Ahmedabad Cantonment, which in turn was near the proposed Gandhinagar site.

The Gujarat New Capital (periphery) Control Act 1960 controlled the expansion surrounding the capital. This Act stifled expansion within 5 miles (8 kilometres) of GNA. The Gujarat Panchayats Statute 1961 and the New Capital (Periphery) Control Act 1960 were changed, and the resulting Act was known as the Gujarat Panchayats and the New Capital (Periphery) Control (Amendment) Act 1965.

Source: Gandhinagar Master Plan Report, 1966.

Map 3: Gandhinagar Master Plan, 1966

The acquired land was called Gandhinagar Notified Area (GNA)/ Gandhinagar Capital Project. It comprised eight wards, 20 villages, and 30 sectors. The main road layout was a grid, and the road system was designed to reduce urban congestion by segregating automobiles and pedestrians.

The territory obtained on the eastern side was given to the Border Security Force and a military cantonment. Given the primarily southwest to northeast wind direction, the land to the north of the city was designated for a thermal power plant, and the nearby regions were classified for industrial use. The common area is 200 m or 400 m for residential construction as per the Act, depending on the size of the community. The 30 sectors took up 28 km^2 of the 57 km^2 acquired, while the Cantonment, Natural Park and Forest, and Industrial Estates took up the remaining 29 km^2.

Each sector measured one kilometer by three-fourths of a kilometer. The city's core, in Sector 10, has government buildings with other sectors stretching around the Central Government Complex. The majority of the sectors are residential. Sectoral efforts were undertaken to develop housing that combined diverse economic groups/classes.

"Each sector has its shopping and community centre, primary school, health centre, government and private housing. Wide-open green parks, extensive planting, and a large recreational area along the river give the city a green garden-city appearance. Gandhinagar's roads are numbered and have crossroads named for Gujarati alphabets like K, KH, G, GH, CH, CHH, and J. All roads cross every kilometer (https://gandhinagarmunicipal.com/home/city-at-a-glance/)".

Residential plots were divided into eight groups, ranging from 80-90 sq. mt. to 1600 sq. mt. Sectoral efforts were undertaken to develop housing that combined diverse economic groups/classes. Simultaneously, it was assured that there was little distinction between these classes. Private housing had been supplied alongside government housing, removing the need for exclusive government colonies.

The new town was intended to have a population of 1,50,000, possibly increasing to 3,000,000 by the conclusion of the 50-year term. In addition, the proposal called for 10,000 new government jobs and 9000 new industrial positions. However, the city's future growth was envisioned to the northwest, like the river to the east and the industrial district to the north would not allow it. The updated master plan of 1991 reflected changes in land use in the late 1980s and 1990s due to the dynamics of Gandhinagar's growth and land demand. The Revised Master Plan of 1991 expanded the space for commercial use (from 0.66 per cent to 3.9 per cent) and public/semi-public usage (from 7.25 per cent to 9.15 per cent). In addition, attempts were made in the 1990s to bring in other offices. The land to the south of GNA was donated to Software Technology Parks of India (STPI), an independent organization under the Ministry of Communications and Information Technology of the Government of India. STPI's Gandhinagar centre, Infocity, was founded in 1996-97 to support, promote, and expand Indian software exports.

The Urban Development and Urban Housing Department (UD & UHD), Government of Gujarat, notified the Gandhinagar Urban Development Authority (GUDA) on March 12, 1996, with the primary goal of carrying out sustainable and planned development of the region falling outside the boundary of GNA. GUDA's jurisdictional area was 388 km^2, including 39 villages in Gandhinagar Taluka.

"The prime objective of the GUDA's formation was to carry out the sustained, planned development of the area falling outside the periphery of the Gandhinagar Notified Area. In addition, to ensure well-planned development of Gandhinagar capital city and 39 villages measuring an area of 388km^2 (https://guda.gujarat.gov.in/aboutus.htm)".

Conclusion

Gandhinagar, the new capital of Gujarat, became a separate city on May 1, 1960. In the former Kalol taluka, next to Pethapur village, on the banks of the Sabarmati River. In 1970, Gandhinagar replaced Ahmadabad as the state's capital. Indian planner Prakash M. Apte takes a thorough and fascinating look at

Gandhinagar's history of town planning, which was created with an egalitarian spirit but is now at risk of degenerating into just another suburb. The river to the east and the industrial area to the north would prevent the city's future growth. Thus, it was thought that it would occur in the northwest. There was a great need to open up the area to the south of Gandhinagar because of the city's dependence on Ahmedabad, its position, and the nature of the market.

The dynamics of Gandhinagar's expansion and land demand were represented in the modified master plan of 1991, which took into account changes in land usage in the late 1980s and 1990s. The decade before Gandhinagar's founding saw a dramatic increase in population. The city saw a three-fold increase in population in 1981, with a decadal growth rate of 160 per cent. The population increased by 98 per cent over the ensuing ten years, then it fell to 58.87 per cent in 2001. The city's population increased by just 3.47 per cent over a decade in 2011, the decade that saw the most significant decline in growth rate. In contrast to other cities, Gandhinagar's population increase has been prolonged.

References

Apte, P. M. (2012). *The building of Gandhinagar: new capital of Gujarat, India*, New Delhi: Power Publishers.

Castells, M. (1978). City, class and power. In *city, class and power* Palgrave, London, 167-173.

Dabu, N. N. (1983). *Evaluation of land utilization and circulation system in an urban layout: case study, town of Gandhinagar, India* (Doctoral dissertation, Massachusetts Institute of Technology.

Kalia, R. (2004). *Gandhinagar: Building national identity in postcolonial India*. Univ of South Carolina Press.

Lamarche, F. (1976). Property development and the economic foundations of the urban question. *Urban sociology: critical essays*, 85-118.

https://guda.gujarat.gov.in/

https://guda.gujarat.gov.in/aboutus.htm

https://gandhinagarmunicipal.com/home/city-at-a-glance/

https://dateandtime.info/citycoordinates.php?id=1269515.

https://censusindia.gov.in/2011census/PCA/A4.html.

https://earthexplorer.usgs.gov/

https://gandhinagarmunicipal.com/

https://gscdlgis.gandhinagarsmartcity.in/GandhinagarGIS/Map/GandhinagarGis
Map/all.

https://www.britannica.com/place/Gujarat/History.

http://www.censusindia.gov.in/2011census/PCA/A2_Data_Table.html.

https://www.townandcountryplanninginfo.com/2021/07/gandhinagar-master-
plan-case-study.html