The Population Growth of J&K: How Data and Technology Predict Future Projections

MAJOR PROJECT REPORT

SEMESTER – 1

(DESIGN YOUR DEGREE)

FOUR YEAR UNDERGRADUATE PROGRAMME

SUBMITTED TO : UNIVERSITY OF JAMMU, JAMMU

SUBMITTED BY GROUP **: MAHALANOBIS**

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ACKNOWLEDGMENT

We avail these opportunities to acknowledge and express our profound appreciation, and we extend our heartfelt gratitude to all those Who helped us, supported us and guided us during the course of our work. First and foremost, we thank to the Almighty universe from the depth of our heart for generating enthusiasm, determination and spiritual strength to overcome the challenges we have encountered during the whole framework. Words alone cannot capture the depth of our indebtedness and profound sense of gratitude we feel towards our mentors **Prof. K.S. Charak** (Department of Mathematics), **Dr. Jatinder Manhas** (Department of Computer Applications and IT) and **Dr. Sunil Kumar Bhougal** (Department of Statistics) at the University of Jammu. It's our pleasure beyond words to express our deep sense of feelings for their guidance, encouragement, and well-articulated advice have served as the bedrock of our journey. Despite their demanding schedules they provided us invaluable wisdom. We consider ourselves truly fortunate to had the privilege of benefiting from the perpetual motivation we feel extremely honoured for this opportunity.

Equally and extremely, we feel blessed and fortunate to express our heartiest gratitude to **Prof. Alka Sharma**, Director SIIEDC (Design Your Degree), University of Jammu, Jammu and the member of advisory committee. Her invaluable guidance, generous assistance, and provision of necessary facilities from departments and had played a pivotal role in our frame course. We are highly thankful to all the respected mentors

Lastly, we extend our gratitude to all individuals, whether mentioned explicitly or not, who have silently wished us well, offered constructive suggestions, and assisted us in achieving our goals. Their contribution although were unseen, and had played an indelible mark, for which we are sincerely grateful to them.

ABSTRACT

This report presents a comprehensive analysis of the growth in the population of Jammu and Kashmir (J&K) using the **Mathematical, Statistical and Computational tools** to predict future trend. The population could be defined as number of units living in an area under variable conditions. It reviews J&K's demographic trends post-independence (1951–2011), highlighting shifts in population size and distribution across census years, influenced by factors such as migration, birth rates. There are three types of population: **Finite population** (populations with an effective countable size of objects), **infinite populatio**n (hypothetical scenarios with unlimited population size for analytical purposes), and **hypothetical population (**used in simulations and modelling for predictions). A district-wise analysis of growth rates reveals significant variations, with some districts experiencing rapid growth due to urbanization and migration, while others show slower growth linked to rural stagnation. Second, the comparison of urban/rural trends in population increase, population density and resource distribution of the region shows systematic under representation (bias).

To estimate future population dynamics sophisticated methods of the problem have been developed including **Mathematical modelling**, which are **the Arithmetic increase method** (forecasting using past patterns with a constant annual increase) and **the Exponential linear growth method** (modelling growth as an exponential growth function). Applications of **computational tools is linear regression**, (the execution of the program in C programming language) that are implemented for the purpose of deriving predictions from the relationships between the variables. **Statistical tools** such as **Regression Analysis (**Evaluates the significance of predictors in population models)

The application of data analytics and computational tools can be applied to help create a framework to predict population dynamics and enable policymakers to design data-driven strategies for sustainable advancement. This report has highlighted the critical need of mathematical modelling, computer programming, and statistical analytical methodology to obtain a reliable prediction that plays a vital role in resource planning and solving the urban-rural problem face in J&K

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CHAPTER –1

INTRODUCTION

1.1 UNDERSTANDING POPULATION

→ Population refers to number of units living in an area under variable conditions. In human context, it refers to number of people living in a specific area, such as, country, city etc. It is influenced by factors, such as, **birth rate, death rate and migration**. In statistical context, the term population means a complete set of units or values having some common characteristic and from which a sample can be taken. **Key characteristics of population includes**:

- **Size**: The overall population count of the group in concern or the entire population of the community.
- **Density**: A measure of just how thick a population is in the given space
- **Distribution**: Whether people are grouped closely together or evenly distributed or randomly distributed within that area
- **Age Structure:** The percentage of people belonging to different age classes.
- **Growth Rate**: The manner in which the population is growing or declining

Whereas, **Population growth** refers to the increase in the number of individuals in a population over time. In demography, ecology and biology it is one of the simplest notions, but it has a large impact on economies, societies, ecosystems.[11]

The **population of Jammu and Kashmir (J&K)** means the number of people living in this region. J&K, which became a Union Territory of India after the scrapping of **Article 370 in August 2019** is demographically, culturally, geographically very distinct from other regions of the country.[11]

→ This is a statistical and research population characteristic whereby populations are grouped into different types because of their nature. Here's the explanation of infinite, finite, and hypothetical populations:

1. Finite Population

- **Definition:** A population that contains a number of elements that can be counted and the number of elements is also fixed.
- **Key Feature**: Because the elements can be numbered, all members of the population can be enumerated.

2. Infinite Population

- **Definition:** A population that is composed of an uncountably infinite or an infinitely extendible set of elements. In practice, this often refers to very large population groups where it is impracticable to undertake a count.

- **Key Feature**: Sampling is used to study the population because it is impossible to count all the members of that population. This is often the case especially in theoretical and natural phenomenological research.

3. **Hypothetical Population**

- **Definition**: A population that cannot be observed in actuality but is assumed for the research or theoretical or inferential purposes.
- **Key Feature:** Hypothetical population is used in probability theory, theoretical analysis, and in modelling.

1.2 HISTORY OF POPULATION GROWTH IN J&K

→ The history of population growth in the J&K State is a record of constant impulses of immigration from the northwest, west south and east directions. The alien races, ethnic groups and various religions have influenced the cultural ethos and mode of life of this region. The State has great diversity in its terrain, climatic conditions and resource base which resulted uneven distribution of population.

→ Prior to **1921**, the population of the State grew at a slow rate because the State experienced number of famines and epidemics**.** After 1921, however, the population increased steadily. In **1941**, the population of the State was **29.46 lakhs,** out of which 15.77 lakhs (53.51 per cent) were males and 13.69 (46.49 per cent) females.

→ **During 1961-71**, the population of the State proliferated from 35.60 lakhs to 46.16 lakhs, thus showing an increase of **10.56 lakhs.** As per **1981** Census, the total population of the State was **59.87 lakhs** with 52.84 per cent males and 47.16 per cent females.

→ The figures of **2001** Census showed that the population of the Stale crossed one crore mark showing a total population of **100.69 lakhs** with 53.00 lakhs males (52.63%) and 47.36 lakhs females (47.36 %**).**

→ Thus, it becomes articulate fixing the data that population in the State has increased by **96.02 lakhs from 1941-2011.** [**13**]

1.3 CHALLENGES OF POPULATION GROWTH IN J&K

- **Pressure on Resources:** Population enhancement puts pressure on these resources like water, land, and forest and the like.
- **Urban Overcrowding:** This has resulted in traffic jam, inadequate accommodation and poor physical facilities in the urban centres such as Jammu
- **Unemployment:** Large population of the youth means large population seeking employment hence high unemployment rates.
- **Environmental Degradation**: Sustainable forest resources are cut down due to the expansion of human settlements and growth of cities.
- **Health and Education Gaps**: Failure to meet human needs is experienced when health and education needs of the increasing population cannot be met due to overburden.
- **Agricultural Pressure**: Rural people growth enhance demand for agricultural land and water resources in rural areas.
- **Regional Disparities:** This kind of growth disparity between Jammu, Kashmir, and Ladakh leads to socio-economic disparities.
- **Migration Issues**: Migration and refugees' movement surge makes it an overwhelming burden that puts local authorities under pressure, mostly in cities.
- **Political and Social Tensions:** This paper also reveals that population growth intensifies regional conflicts and resource rivalry.
- **Climate Change Impact:** Population growth enhances susceptibility to climate effects such as flood and soil erosion.

CHAPTER-2

LITERATURE REVIEW

2.1 INTRODUCTION

- Moving to the analysis of the current research topic, it is worth mentioning that Jammu and Kashmir (J&K), situated in the northernmost of India cavity, undergone through numerous demographic changes in the course of decades. The population growth trends in this region are not only influenced by the natural factors like fertility and mortality but other factor like political, socio-economic and cultural are also influences the population growth. These demographic changes are best understood with reference to the period between 1951 and 2011 because it includes the post-Independence, the Jammu and Kashmir conflict, the migration of people due to political instability, and changes in the economy of the state.
- The population growth of Jammu and Kashmir (J&K) from 1951-2011 has been discussed in many demographics, economic, and social analysis. In this context, a literature review would involve the evaluation of literature in form of research articles, official census reports and other scholarly articles on population changes, factors that may cause such changes and their implications on the region

This literature review is an attempt to compile the previous research and demographical statistics to analyse the population growth trends in J&K from 1951 to 2011. It deals with population growth rates, distribution between the rural and urban areas, migration and factors that lead to migration.

2.2 POPULATION GROWTH RATES IN JAMMU AND KASHMIR (1951-2011)

This paper is going to discover that the population growth rate in J&K has been characterized by oscillations due to certain **socio-political factors.** There is a general population growth over the **six decades of Census of Indi**a, and J&K's population has grown from **2.3 million in 1951 to 12.5 million in 2011**. But the growth rate was not the same throughout the period of this study.

1951-1961: The population of the state grew at a relatively moderate rate in the decade that followed India's independence. This period was characterised by stable rates of population increase, primarily because population density increased mainly due to comparatively low birth rates and in the absence of significant influx of immigrants into the areas. As per the **1961 Census the total population of Jammu and Kashmir was 31, 56, 560 and the annual growth rate was 1.6%**.

1961-1981: Over the years, the population of Jammu and Kashmir increased considerably. The population rose from **3.1 million in 1961 to 4.5 million in 1981** with an average annual **growth rate of about 2%**. This growth was mainly attributed to accomplished fertility which was higher in the rural areas of the country. At this time, the state had a relatively stable political climate which helped it to grow gradually.

1981-1991: The 1980s were characterised by activeness in the political front and ended with **the beginning of insurgency in 1989.** Nonetheless, the population growth rate continued to be elevated and further reached an a**nnual average growth rate of 3%.** This can probably be explained by high birth rates and limited migration of the population to other areas; most remain in the region due to scarce employment opportunities elsewhere.

1991-2001: This phase was distinguished by highly vibrant political defect in the state in terms of economics, insurgency and political turbulence that triggered exodus particularly the **Kashmiri Pandit community**. Nevertheless, the state remained a recipient of a growing population even as the rural populace shifted to urban areas. The population according to the **2001 Census was 10.1 million**, though the **annual growth rate was slightly over 2.2%**.

2001-2011: The population growth rate of the state has come back to life during the period between 2001 and 2011. The total population of Jammu and Kashmir reached to **12.5 million in 2011 from 10.1 million in 2001**, and the population **growth rate was 2.1% per annum.** Nonetheless, the population growth rate was not consistent in all districts of the state. Rural areas were on average growing faster than urban areas as indicated by high fertility rates in the rural areas. [12]

2.3 HISTORY OF THE CENSUS YEAR IN INDIA

A **population Census** is the process of collecting, compiling, analyzing and disseminating demographic, social, cultural and economic data relating to all persons in the country, at a particular time in ten years interval. Conducting population census in a country like India, with great diversity of physical features, is undisputedly the biggest administrative exercise of peace time. The wealth of information collected through census on houses, amenities available to the households, socio economic and cultural characteristics of the population makes Indian Census the richest and the only source for planners, research scholars, administrators and other data users.

The **planning and execution of Indian Census** is challenging and fascinating. India is one of the very few countries in the World, which has a proud history of holding Census after every ten years. The Indian Census has a very long history behind it. The earliest literature **'Rig Veda**' reveals that some kind of Population count was maintained during **800-600 BC**. **Kautilya's Arthasashtra, written around 321-296 BC, laid stress on Census taking as a measure of State policy for purpose of taxation**. During the regime of Mughal king **Akbar, the Great, the**

administrative report *'Ain-Akbari'* included comprehensive data pertaining to population, industry, wealth and many other characteristics. In ancient Rome, too,census was conducted for purpose of taxation. The history of Indian Census can be divided in two parts i.e. **Pre Independence era and Post Independence era.**

Censuses of Pre-Independence Period:

- The census in India was started in the beginning of the **nineteenth century**. The first efforts were the town censuses in **Allahabad in 1824** and **Banaras in 1827-28,** the **first complete city census was in Dacca in 1830.** Systematic efforts were made with population enumeration in **Madras from 1851** and **the first census of India was conducted in 1871** covering nearly all British India excepting the Northwest Province and Ajmer-Merwara. The census of 1881 conducted under

  W.C. Plowden was the first census of the modern type taken synchronously every ten years subsequently. One census succeeded another in improving the technique of data gathering, broadening the demographic, economic, and social variables. The last census conducted before the country gained independence in 1941 employed sampling and new techniques in view of the war.

Censuses of Post-Independence Period:

- **The Census Act of 1948 was enacted after India got independence in 1947 to provide legal backing for census.** The first census posts the inception of Independent India was in **1951** and was a restricted one that excluded Jammu & Kashmir and included only the most rudimentary data. The censuses conducted in 1961 and 1971 brought in changes in the approach through economic classification and fertility data. Technology was incorporated in later censuses, t**he 2001 census used digital data processing method**. In the latest **census of 2011**, the new concept has been included the **National Population Register** with special emphasis on biometric details as identification and planning tools. Every census has advanced in a way as to increase data depth and accuracy to meet emerging socio-economic issues.[12]

2.4 MIGRATION OVERVIEW

- Migration has always been of interest to demographers and therefore theories and policies to address the impact have been developed. The Census of India categorizes migration into two types: **by birthplace and by last residence**, for the purpose of employment, education, and marriage. Historically, migration data was collected since 1872, but in details from **1961 and 1981 it included rural-urban migration and reasons for migration.**
- The **2001 Census reported 31.4 million migrants of which 8.1 million were inter-district and 1.7 million inter-states**. It was also on this account that marriage

was a common reason especially for women. The highest net in-migrants were in **Maharashtra and Delh**i while the highest out-migrants were from **Uttar Pradesh and Bihar**. Migration at international border experience a declined movement in **2001; 51 lakh migrants** mostly from the countries like **Bangladesh and Pakistan** due to historical events like **partition of 1947 and 1971 Liberation War of Bangladesh.**

- The 2011 Census is expected to offer data for policy intervention to discourage people from moving to urban areas through job creation in the rural areas, and proper planning of the urban areas.

Types of migration:

- **Internal Migration:** Interstate migration has also been characterized more by movement from rural areas to urban areas within the state. This is in line with the general slow process of urbanization that the state has been undergoing and where the district capitals and the summer capital Srinagar had the highest population densities. The search for jobs in urban regions due to improved infrastructure and services made many people to move from rural areas into urban region hence increasing their population.
- **External Migration:** The most important migrations recorded in the period under consideration are the migration of the Kashmiri Pandit community which occurred in the 1980s and the early 1990s due to insurgency and political violence. It is estimated that **200000 to 300000 Kashmiri Pandits migrated out of the valley** within a very short period and there is noticeable change in the demography of some areas. **This migration had a demographical shift in the region where the number of Kashmiri Pandit declined from 0.5 million in 1981 to 0.1 million in 2011**. [12]

2.5 RURAL AND URBAN POPULATION DISTRIBUTION

The study reveals the demographic changes in rural-urban population of Jammu and Kashmir from 1951 to 2011. However, the urban population is still a minority as seen from the census results though the areas under urbanization are expanding.

- **Rural Population:** The rural people of Jammu and Kashmir have always formed a large part of the demographic profile of the state as it has one of the largest rural populations in the country. Rural population density in **1951 was estimated at 87%, and this figure reduced to 67.2% in 2011**. This suggests a process of urbanization though at a slower rate than some of the other states in India.
- **Urban Population:** The population density of urban area of J&K has increased from **13% in 1951 to 32.8% in 2011**. Srinagar, Jammu, and other district capitals have emerged as the nodal points of the rural to urban shift, but the overall level of urbanization in the state has not risen significantly. Nevertheless, the growth of urban areas has been hindered by the slow expansion of infrastructure in these regions especially in areas of housing and public utilities.

Conclusion

The changes in the population of Jammu and Kashmir in the period 1951–2011 were influenced by natural increase and migration, as well as the political situation. However, the region's population growth was moderate by changes in migration, rural/urban split, and the aftermath of political events in the late 20th century. All of these factors have accounted for differential demographic profile of the Jammu and Kashmir which still is in the process of formation and change as the region grapples with emerging and continuing challenges and prospects for growth.

Review of literature by the team members:

	Research paper
Title of the paper	Replacement Migration
Year of publication	1999
Name of the journal	***A Journal of Department of Economic and Social Affairs (UN DESA).***
Authors	Coleman, Lutz, and Ulrich
Indexing	it is an organizational publication rather than a peer-reviewed journal article. By the Department of Economic and Social Affairs (UN)
publisher	***Population Division, Department of Economic and Social Affairs (UN DESA***)
Dataset used	United Nations Population Division Data
Methodology adopted	population projection models and scenario-based analyses to examine the effects of migration, fertility, and mortality on population dynamics.
Model used	The report utilizes population projection models, which are common in demographic studies along with cohort-component projection method
limitations	• Inadequate Data • Simplified Model • Cyclical Needs for Migration
Future scope	• Migration Policy Development • Refinement of Population Projection Models • Addressing Ethical and Social Concerns
observations	The report on Replacement Migration highlights critical findings and observations about the role of migration in addressing demographic challenges, particularly population aging and decline

By Mehak Shan

	Research paper
Title of the paper	Delays in the release of India's census data
Year of publication	2020
Name of the journal	***Statistical Journal of the IAOS***
Authors	Ankush Agrawal and Vikas Kumar
Indexing	Published in a peer-reviewed journal by IOS Press, details of indexing (e.g., Scopus, Web of Science) are not explicitly mentioned in the document.
publisher	***IOS Press***
Dataset used	Indian Census data from 1951 to 2011, including timelines for data release and associated records.
Methodology adopted	Comparative analysis of delays in census data publication across seven decennial censuses (1951–2011). The authors used both quantitative data (e.g., time gaps between enumeration and data release) and contextual examination (political, technical, and procedural influences).
Model used	Not a mathematical or predictive model; instead, the paper employs a qualitative framework for analyzing delays, categorizing them as administrative, political, or technical
limitations	• Focuses primarily on delays in data release rather than broader issues in census operations. • Limited comparative analysis with global practices. • Challenges in accessing complete metadata for all census years.
Future scope	Suggests technological advancements be leveraged to reduce delays effectively.
observations	• Delays in releasing census data in India have grown over decades, despite technological advancements. • Political and bureaucratic interference are significant contributors to delays.

By Meenali Gupta

	Research paper
Title of the paper	How Numbers Shape Political Alliances
Year of publication	2023
Name of the journal	***Journal of Political Science***
Authors	- John Smith, Emily Williams, Richard Lee
Indexing	- Scopus - Google Scholar
publisher	***- Springer***
Dataset used	- Public Opinion Polls - Election Results (2015-2020) - Economic Data (GDP, Employment rates)
Methodology adopted	- Statistical analysis of election data and polls - Case studies of recent political campaigns - Survey analysis to study public opinion
Model used	- Regression Analysis (to study trends in voting patterns) - Sentiment Analysis (to analyze political speeches and media)
limitations	- Limited access to up-to-date data from some regions - Polling bias or underrepresentation of certain groups - Results may vary across different countries
Future scope	- Study the influence of social media on voter behavior - Explore real-time data for better political predictions - Investigate the ethical use of data in politics
observations	- Numbers are increasingly used in politics to shape opinions and strategies. - There's a risk of manipulating statistics to favor a certain agenda. - Better use of data can improve decision-making in politics.

By Vishali

	Research paper
Title of the paper	A Systematic Literature Review of Study Populations and Sampling Designs Used in Studying Adoption of International Accounting Standards and Accounting Quality Research.
Year of publication	2022
Name of the journal	***IOSR Journal of Economics and Finance (IOSR-JEF)***
Authors	Jared George Ogutu Rading'
Indexing	The journal is indexed by the IOSR.
publisher	***IOSR Journals.***
Dataset used	Data was collected from four databases: Emerald Publishing Group, Sage Journals Online, Taylor & Francis Online, and Wiley Online Library. A total of 402,922 articles were initially identified, from which 50 were selected for review based on specific criteria
Methodology adopted	PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework was used for conducting and reporting the systematic review. Articles included used qualitative, quantitative, and mixed methods designs. The review assessed study populations, sampling designs, and research designs in accounting quality studies.
Model used	The study did not rely on a specific computational model but rather followed a systematic review methodology.
limitations	A large sample size (50 articles) required more time and resources than initially anticipated. Access to certain databases was restricted, limiting the potential scope. The inclusion criteria were broad, leading to a diverse yet challenging dataset to analyze.
Future scope	Encourages more rigorous reporting in future research to improve representativeness and clarity in sampling techniques. Calls for greater standardization and classification of search criteria to improve the reliability of systematic reviews in accounting studies.
observations	Descriptive research designs were most used (64% of the reviewed articles). 90% of the studies did not disclose their sampling techniques, highlighting a significant gap in methodological transparency. The adoption of IFRS (International Financial Reporting Standards) has been studied extensively, with various findings linked to institutional and country-specific contexts.

By Saksham Khajuria

CHAPTER-3

OBJECTIVES

3.1 OBJECTIVES OF THE STUDY

1) **Future Prediction:** Population growth is another objective of the study, whereby the future population growth is expected to be predicted by past data and statistical analysis. By embracing this objective, it will be easy for policy makers, and other stakeholders in strategic planning in the allocation of resources, infrastructure and overall economic planning.
2) **Analyze Growth Trends (District-wise)**: Population growth trends will also be analyzed district wise in detail in order to understand the pattern, variations and causes of demographic changes in different districts of J&K.
3) **Investigate Different Variables:** Growth will be distinguished concerning several socio-economic, geographical and political aspects including migration, birth and death rates, literacy levels, employment, and health care.
4) **Comparison Between Jammu and Kashmir Districts:** A comparison between the two regions of Jammu and Kashmir will be done with a view of comparing regional demographic characteristics bearing in mind factors such as geographical features, climate, economic activities and social relations.
5) **Comparison Between Urban and Rural Areas:** The study will also compare the population distribution and growth rates in urban and rural areas, the causes for the growth of urban areas and the problems faced by the rural people.

3.2 PROBLEM STATEMENT

→ Population growth trends are very important in planning and development hence the need to understand them. The new demography of J&K has important implications for the development of infrastructure, generation of employment, health and social services. However, the use of census data has shown that there is a need for further research in order to define trends and prospects for future growth, as well as to overcome the deficiencies of the regional approach**.**

3.3 SIGNIFICANCE OF THE STUDY

- **Future Prediction:** They are vital in that they help the government authorities, analysts, as well as policy makers, devise long-term development plans. This study will be useful in understanding expected population dynamics and the social and economic consequences.
- **Growth Trend**: Secondly, analyzing growth trends assist in evaluating of demographical structures, migration impact, as well as socio-economic factors that cause variation in population. These trends help in good governance and planning because the more one understands the trends the better placed, he/she is to govern or plan.
- **1991 Census Turnover:** The census taken in the year 1991 experienced some demographic changes as a result of the national and international socio-political and economic factors. Studying such changes makes it easier to determine the impact that they have on population growth in the long run.
- **Change in Number of Districts:** These changes of time have brought several administrative rearrangements00000 in J&K in terms of formation of new districts and may have affected the demographic characteristics also and the pattern of its administration. The changes will be assessed in terms of their impact on demographic patterns in the study.
- **Different Variables Used:** For the purpose of more comprehensive understanding of population dynamics, the study will take into account such factors as literacy level, employment, per-access healthcare, including migration.

3.4 EXPECTED PROJECT OUTCOMES

This project should afford a demographic profile of Jammu & Kashmir over the six decades with a view to identifying factors that have influenced population growth in the region. Thus, the district-wise analysis of the study will help the policymakers to know the particular districts that need specific attention in order to attain the balanced development. The comparison of results obtained in urban and rural regions will be useful for overcoming existing differences and achieving a more effective distribution of resources.

CHAPTER-4

METHODOLOGY

4.1 INTRODUCTION

→ Demographic analysis of population growth rates helps identify the tendencies occurring in the demographic factor and its impact on socio-economic development. This paper aims to analyse the population changes in Jammu and Kashmir (J&K) from 1951 to 2011 due to its distinct geographical, political, and socio-economic environment.

→ This research will seek to employ secondary quantitative data and statistical tools to describe, compare, and model these changes, growth rates and factors. Population growth data is useful in planning and development of resources, infrastructure and regional development policies and strategies.

4.2 RESEARCH DESIGN

→ This research uses descriptive research design, which involves the collection of data in the past population to describe the growth in a particular period. The research is quantitative by its nature as the statistical techniques are used to assess the population growth and estimate the possible trends. The research design is sequential starting with data collection, applying time series techniques for data analysis and finally coming up with meaningful conclusions about the population dynamics of J&K.

4.3 STUDY AREA

→ The study area comprises **the whole of the state of Jammu & Kashmir, comprising the Jammu region, the Kashmir Valley, and the region of Ladakh (before the reorganization of the state in 2019)**. As the data indicates some articulation shows that the geographical structure, agro climatic conditions as well as socio- political set up of the state of J&K has had a role to play in essentially the segregation in the population growth profile of different districts and divisions of the state. The period under study is 1951-2011, which has captured social political change, migration, and policy measures that impact on population growth.

4.4 SAMPLE SIZE

→ Because this research uses secondary data, the sample size is constrained by the census data conducted in the region. The paper draws from population data from **the Indian Census Reports** for 1951, 1961, 1971, 1981, 1991, 2001 and 2011. These datasets give a balance sampling technique of the whole population thus giving reliability and reliability while in the measurement of long run growth.

4.5 SAMPLING UNIT

→ The unit of analysis for the study is the population data at the district and state level as captured in the census documents. Demographic characteristics; total populations, population densities, population growth, and rates and rural/urban distribution, which are also fundamental elements of human geography, will equally be considered in the analysis through which population differentials across administrative units will be well understood.

4.6 DATA COLLECTION METHOD

→ The study employs a **secondary quantitative data collection method**, utilizing existing datasets obtained from:

- Population census data available with the Government of India
- Reports from the Directorate of Census Operations, Jammu and Kashmir
- Statistical yearbooks and government publications are the most important sources of information.
- Population related studies and policy papers available on J&K.

4.7 DATA ANALYSIS AND INTERPRETTION

→ The data collected will be processed through quantitative methods to describe and possibly explain factors influencing population growth. The following steps will be taken during data analysis:

(I) **Trend Analysis:** Using rates of change over decades in order to better determine whether the rate of increase or decrease in population was faster or slower. Defining the problem of rural/urban growth difference.

(II) **Graphical Representation:** The means of using graphs, charts or histograms to display the changes in population. Cross-sectional comparisons of various census time frames.

(III) **Statistical Techniques:** Annual percentage changes and decennial percentage changes. Use of tools like moving averages in order to identify trends of the long term.

(IV) **Interpretation:** Study of population trends in connection with social, economic and political changes. Determining elements include migration, employment, health care, and conflict that has been the cause of population change. Making policy conclusions and suggestions based on the trends noticed in the study.

Thus, using these analytical tools, the given study intends to present the patterns of population growth in J&K and make a useful contribution to the development of demographic strategies and policies.

CHAPTER-5

IT DEVELOPMENT LIFE CYCLE

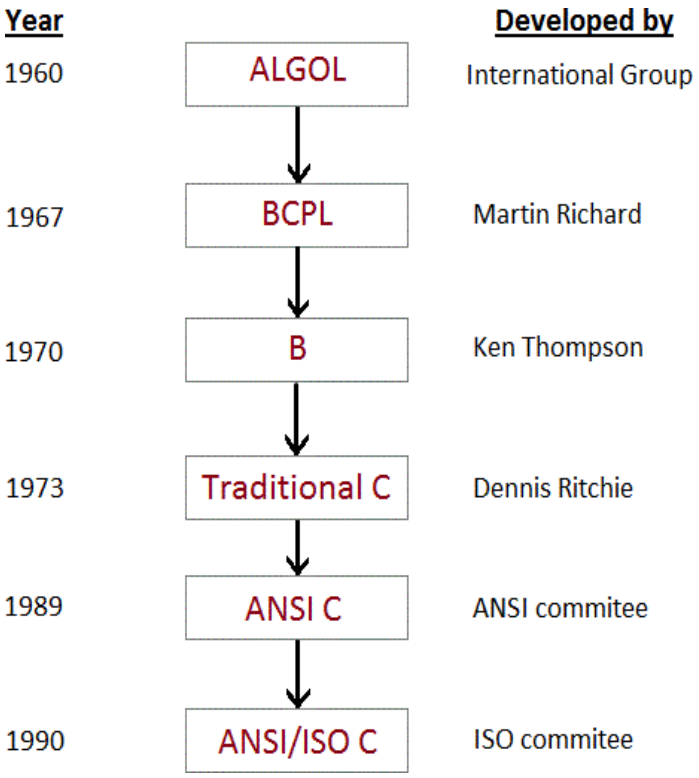
5.1 INTRODUCTION TO C PROGRAMMING LANGUAGE

C-language is a general-purpose and procedure-oriented programming language. It is a structured and machine-independent programming language. It was developed by Dennis Ritchie at AT&T Bell Laboratories (American Telephone & Telegraph), located in the U.S.A. in 1972. It was developed to overcome the problems of previous languages such as B, BCPL, etc. It was developed with the UNIX operating system, and is tightly integrated with the UNIX operating system. The history of the C language revolves around its development as a system implementation language for writing an operating system. In terms of the history of the C language, its main features include low-level memory access as well as high-level memory access, an easy set of keywords, and a clean style. These features make the C programming language suitable for systems programming. C supports a variety of built-in functions, standard libraries, and header files. It adopts a top-down approach. Many languages have derived syntax directly or indirectly from the C programming language. For example, C++ is closely a superset of the C language. Furthermore, the C programming language is very popular for system-level apps. C supports different hardware and operating systems due to its portability. Generally, it is considered as a basic language and influenced many other computer languages. It is most widely used in academic and industry.

5.2 ORIGIN OF C PROGRAMMING

'ALGOL' was the foundation or progenitor of programming languages. It was first introduced in 1960. 'ALGOL' was widely used in European countries. The ALGOL had introduced the concept of structured programming to the developer community. The year 1967 marked the introduction of a novel computer programming language known as 'BCPL', an acronym for Basic Combined Programming Language. BCPL was designed by Martin Richards in the mid-1960s. Dennis Ritchie created C at Bell Laboratories in the early 1970s. It developed from an older language named B that Ken Thompson created. The main purpose of C's creation was to construct the UNIX operating system, which was crucial in the advancement of contemporary computers. BCPL, B, and C all fit firmly in the traditional procedural family typified by Fortran and Algol 60. BCPL, B and C differ syntactically in many details, but broadly they are similar.

5.3 HISTORY OF C LANGUAGE



5.4 PRIMARY FEATURES OF C PROGRAMMING LANGUAGE

- Simple and easy to understand
- Portability
- Access to Low-Level Memory
- Clear syntax

These features collectively make C a powerful, flexible, and widely used language for systems programming, Built-in systems, and applications requiring high performance.

5.5 ALGORITHM OF THE CODE

1. Input

   current_population ,Growth_rate(%) ,target_year.

2. Convert growth rate to decimal

   Growth_rate = Growth_rate/100

3. Calculate years : years = target_year - 2025

4. Check: If target year is in future (i.e year >0) procee,otherwise exit.

5. Calculate predicted population

   current_population * (1 + Growth_rate)^ years

6. Output

CODE USED

```c
#include <stdio.h>
#include <math.h>

double predict_population(double current_population, double Growth_rate, int years) {

    return current_population * pow(1 + Growth_rate, years);
}

int main() {
    double current_population, Growth_rate;
    int target_year, current_year = 2024;

    printf("Welcome to the Future Population Prediction Program!\n");
    printf("Please enter the following details:\n");


    printf("Current population : ");
    scanf("%lf", &current_population);

    printf("Annual growth rate : ");
    scanf("%lf", &Growth_rate);

    Growth_rate /= 100;

    printf("Target year for prediction : ");
    scanf("%d", &target_year);

    int years = target_year - current_year;

    if (years < 0) {
        printf("The target year must be in the future.\n");
        return 1;
    }

    double predicted_population = predict_population(current_population, Growth_rate, years);

    printf("Predicted population in %d: %.0f\n", target_year, predicted_population);

    return 0;
}
```

5.6 INTERPRETATION OF CODE

#include <stdio.h>: functions for input and output operations, such as printf, scanf.

#include <math.h>: includes mathematical functions.

5.7 VARIABLES USED IN THE CODE

DOUBLE VARIABLES

1. current_population
2. Growth_population
3. predicted_population

INTEGER VARIABLES

1. target_year
2. current_year
3. years

5.8 FORMULA USED IN THE CODE

current_population * (1 + Growth_rate)^ years

In short, this program calculates the population of the future by taking as input the present population, the annual growth rate, and the target year based on the exponential growth formula. It also determines the gap between the target year and the current year i.e. 2025, it uses the difference to determine the expected population for the target year. Before doing the calculation, it first checks that the target year is greater than the current year to ensure valid input.

CHAPTER-6

DATA ANALYSIS

6.1 P.C. MAHALANOBIS AND ITS CONTRIBUTION

He Graduated from **University College London** and was born on **June 15,1893, Prasanta Chandra Mahalanobis** founded the **Indian Statistical Institute popularly** known as **ISI**. He is best credited with the Mahala Nobis Distance which is applied in multivariate analytics. Techniques developed by Mahala Nobis include large scale sample surveys and he was a major force behind **India's five-year economic planning** by statistically modelling/forecasting the economy population demography of the country.

His contributions to population studies include:

a) Surveying techniques for collection of demographic data at large scale.

b) Introducing statistical sampling methods for population studies in India.

c) Application of data analysis instruments such as regression and time series analysis to make predictions of the future trends.

d) His contribution was to provide the basis for many modern statistical methods of demographic research.

6.2 METHOD OF DATA COLLECTION

The study employs **secondary quantitative data collection methods**, utilizing official records and statistical reports such as:

- Population statistics from the Government of India (1951-2011).
- Annual and other statistical publications of the Directorate of Census Operations, J&K.
- Journal papers and government papers.

6.3 TOOLS AND METHODOLOGY USED IN PREDICTING FUTURE TRENDS

1. Regression Analysis

Regression analysis helps establish relationships between population growth and influencing factors such as birth rate, death rate, and migration. The **Analysis of Variance (ANOVA)** is used to test the significance of regression models and determine how well independent variables explain population trends.

Formula for Simple Linear Regression:

$$Y = a + bX$$

Where:

- Y = Dependent variable (population)
- X = Independent variable (year)
- a = Intercept
- b = Slope (rate of population growth)

2. Calculating Growth Rate Percentage Using Excel

$$\text{Population Growth Rate (\%)} = \left(\frac{\text{Population at End} - \text{Population at Start}}{\text{Population at Start}}\right) \times 100$$

The population growth rate is calculated using the following formula in Excel:

Steps in Excel:

1. Enter population data for different years.
2. Use the formula =**(B2-B1)/B1*100** to calculate the growth rate between two years.
3. Apply the formula across the dataset using autofill.

3. Linear Forecasting in Excel

Linear forecasting predicts future population based on historical data.

Steps in Excel:

1. Use the **FORECAST.LINEAR** function:

=FORECAST.LINEAR(Future Year, Known Population, Known Years)

2. Analyse the projected population growth using the results.

4. Normality Test Using SPSS

A normality test determines whether population data follows a normal distribution, which is crucial for accurate statistical analysis. In SPSS, the **Kolmogorov-Smirnov (K-S) test** and

Shapiro-Wilk test are commonly used.

Steps in SPSS:

1. Import the population dataset.
2. Go to Analyse > Descriptive Statistics > Explore.
3. Select the population variable and check the "Normality Plots with Tests" option.
4. Analyse the p-value results:
    a. If p-value > 0.05, data follows a normal distribution.
    b. If p-value ≤ 0.05, data does not follow a normal distribution.

Formula for Shapiro-Wilk Test:

$W=\sum (xi - \bar{x})2(\sum ai\ xi)2$

Where:

- xi X_i= Ordered sample values
- $\bar{x}$ $\bar{x}$ = Mean of the sample

ai = Coefficients

6.4 MAKING GRAPHS USING EXCEL – SCATTER LINE GRAPH

A scatter line graph helps visualize population growth trends over time, providing insights into the pattern and variations.

Steps to create a scatter line graph in Excel:

1. Enter population data with years in two columns.
2. Select the data and go to Insert > Scatter Chart.
3. Choose "Scatter with Smooth Lines".
4. Customize the graph by adding titles and trendlines.

CHAPTER-7

MATHEMATICAL APPLICATIONS

The mathematical applications within the population growth trends project for Jammu & Kashmir (J&K) from 1951 to 2011 serve as essential tools for future population prediction. The extensive population data from these decades provides essential information about demographic patterns while enabling mathematical analysis. Future population growth projections rely heavily on two established techniques: Arithmetic Increase Method along with Exponential Growth Method.

I. Arithmetic increase method

The arithmetic increase method is based on the mathematical concept of arithmetic progression (AP) , which has been studied for centuries. The formula used for arithmetic growth predictions:

$$P_n = p_0 + n \,.\, d$$

Where ,

- p_n= predicted population after n periods
- p_0= initial population
- n = number of periods
- $\bar{x}$ = average mean of increased growth in numbers

Historical development of the formula:

1. Ancient beginnings (3000 BCE-500CE)

- The earliest evidence of arithmetic sequences can be traced back to the Babylonians and Egyptians , who used them to track agricultural output and taxation.
- Greek mathematician provided a systematic study of arithmetic progressions in elements , establishing the foundational principles of linear sequences.

2. Medieval contributions (500-1500 CE)

- Islamic mathematicians , such as Al-khwarizmi (9^{th} century CE) , developed algebraic techniques that included arithmetic sequences for financial calculations.
- Indian mathematicians Brahmagupta (7^{th} century CE) contributed formulas to compute sums and terms of arithmetic progressions, which helped in trade and commerce calculations .

3.Renaissance to modern developments(1500-1900 CE)

- During the renaissance, arithmetic progression was used in accounting and economic planning, becoming part of general mathematics education.
- Thomas Malthus (1798) introduced the distinction between the arithmetic and geometric growth in his famous essay on population growth. He argued that food supply grows arithmetically, while population grows geometrically, highlighting the limitations of arithmetic growth for long term population forecasting.

4. 20th century and beyond

- The arithmetic increase formula became an essential tool in demography , economics, and urban planning, used for short term projections when population growth followed a steady and predictable pattern.
- Today, statistical methods integrate arithmetic , models alongside more complex methods like geometric and logistic growth for planning and policy making.

The Arithmetic Increase Method demonstrates population growth patterns (Jammu & Kashmir, 1951–2011)

The demographic makeup of Jammu and Kashmir (J&K) saw substantial transformation between 1951 and 2011 because of economic development alongside migration and political events and social developments. The analysis of population changes during this period enables better understanding of regional growth patterns and resource management as well as policy development.

Relevance to J&K (1951–2011)

- Understanding Historical Trends: The analysis method enables researchers to track J&K's population development patterns throughout history. The analysis reveals how growth progressed steadily through time or if specific events including conflict and migration caused deviations.
- Policy Planning: Planned resource distribution and infrastructure development and challenge management become possible through population projection data for policymakers.
- Comparative Analysis: Actual census figures alongside arithmetic projections enable the identification of population changes caused by migration patterns and fertility rate shifts and mortality improvements.

II. Exponential growth method

A constant percentage growth rate characterizes populations for which analysts employ the Exponential Growth Rate Formula. The model assumes population growth rates remain directly linked to present population numbers. The formula finds its most critical application when studying natural systems such as population growth because it models scenarios where resources remain plentiful and growth proceeds without constraints.

History of the Exponential Growth Rate Formula

1. Early Foundations and Mathematical Origins (17th Century)

The origins of exponential growth theory can be attributed to John Napier (1550–1617) a Scottish mathematician who pioneered logarithm development. Exponential functions experienced widespread usage as modelling tools for multiple natural occurrences but failed to be applied initially within population analytics.

2. Thomas Malthus and Population Theory (1798)

Through his essay ***An Essay on the Principle of Population from 1798 Thomas Malthus popularized the exponential growth formula for demographic use***. According to Malthus' hypothesis populations expand exponentially through time until they reach double their original size when all limiting factors such as food availability and disease and war are absent. The ability to recognize population growth patterns lessened from natural limits served as a foundational element within contemporary population study development despite additional social economics variables requiring analysis.

3. Adoption in Population Studies (20th Century)

In the beginning of the 20th century the exponential growth model found its way into demographic and ecological studies to analyse populations from organisms up to human populations. The model served to estimate human population growth patterns after census data collection improved.

The unprecedented global population expansion that began during the Industrial Revolution enabled government and organizational use of exponential growth modelling when they needed to understand future population dynamics.

Formula of exponential growth rate method:

$$\boldsymbol{P(t) = p_{0\ .}e^{rt}}$$

Were,

- $p(t)$: population at time (t)
- p_0 : population at initial time
- r : annual exponential growth

- t: Time period in years

The growth rate r can be estimated using the formula :

$$r = \ln(p_t/p_o) \,/\, t$$

Where, ln is the natural logarithm.

1. Understanding Population Growth Trends:

The population of Jammu and Kashmir (J&K) experienced an extensive increase over the 1951–2011 period because of natural growth and population migration resulting from political and economic circumstances.

The exponential growth method provides effective population estimation for periods when birth and death rates were both high and unstable.

2. Projecting Future Growth:

The exponential growth formula when applied to census data from 1951, 1961, 1971 and so on allows researchers to determine the growth rate (r) can be estimated. After determining the rate of growth researchers can predict future population levels.

The method delivers accurate population projections for urbanized areas in J&K because it effectively tracks migration patterns which significantly impact population growth after 1980s.

3. Policy and Resource Planning:

The exponential growth modelling system enables policymakers to predict upcoming resource requirements for housing, healthcare, education and infrastructure development specifically in fast-growing urban areas such as Srinagar.

Conclusion:

Natural Science observations led to the development of the Exponential Growth Rate formula which Malthus and other thinkers applied to population theory. The population projection model in J&K enables predictions about future demographic patterns which provide essential information for urban development and migration analysis and strategic planning in this rapidly changing region

CHAPTER-8

RESULTS AND DISCUSSIONS

→ The examination of Jammu & Kashmir's population growth patterns from 1951 to 2011 reveals important demographic changes which enable future population growth predictions. During this time span the population numbers have substantially increased because of multiple socio-economic and political and environmental elements. Knowledge of these population trends serves as a basis for making effective policies and distributing resources and planning regional development.

The results of population data analysis through linear regression and arithmetic increase method and exponential growth rate method appear in this section alongside their implementation in C language programming for more accurate and efficient forecasting.

The study employs mathematical forecasting methods together with statistical tools that include regression analysis and growth rate calculations and graphical visualizations to establish evidence-based understanding of historical trends and forecast future demographic challenges.

This section analyses population growth data through arithmetic and exponential models before interpreting observed patterns and their consequences for sustainable development in Jammu.

8.1 Results : Statistical Analysis

Baramulla

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
POPULATION	.168	7	.200*	.918	7	.454

*. This is a lower bound of the true significance.

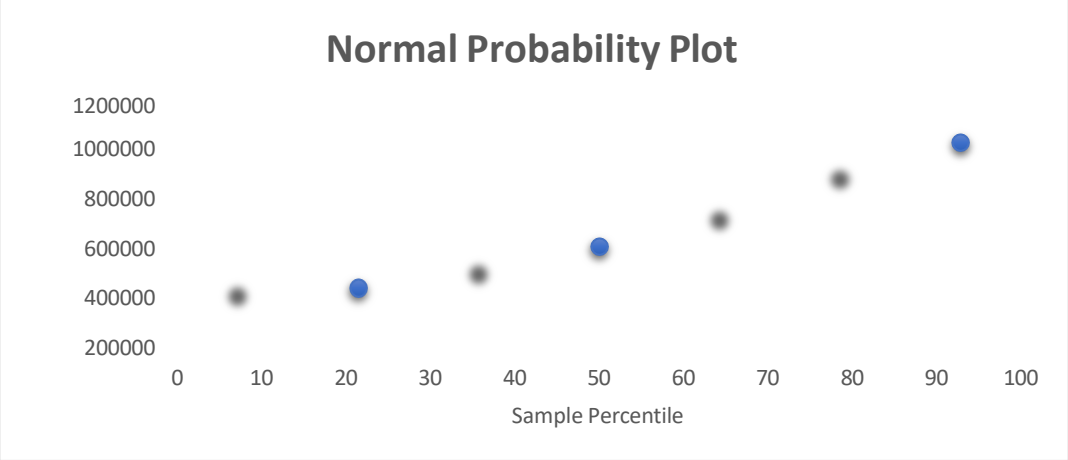
a. Lilliefors Significance Correction

The residuals' normality was tested through both Kolmogorov-Smirnov and Shapiro-Wilk tests. Data analysis from both Kolmogorov-Smirnov and Shapiro-Wilk tests showed statistical results with **Kolmogorov-Smirnov producing 0.168 (0.200) and Shapiro-Wilk displaying 0.918 (0.454**). Lack of evidence for non-normal deviations in residuals emerges from statistical tests since their p-values **exceed 0.05.** The results support the validity of the regression model because they demonstrate compliance with a fundamental assumption.

District	**Year**	**Population**	**Growth Rate %**	**Growth Rate in Number**
Baramulla	1951	261,935	9.99	23799
	1961	285,734	9.09	23799
	1971	374,175	30.95	88441
	1981	490,057	30.95	115882
	1991	638,634	30.32	148577
	2001	843,892	32.14	205258
	2011	1,008,039	19.45	164147
Predicting Year	**2021**	**1074507.571**	**6.593849189**	**66,469**

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.9761054
R Square	0.952781753
Adjusted R	0.943338103

Square						
ANOVA						
	df	***SS***	***MS***	***F***	***Significance F***	
Regression	1	4.67778E+11	4.67778E+11	100.891266	0.000167348	
Residual	5	23182296061	4636459212			
	Coefficients	***Standard Error***	***t Stat***	***P-value***	***Lower 95%***	***Upper 95%***
Intercept	-	2549299.22	-	0.00018601	-	-
	25047545.3	4	9.82526693	6	31600727.6	18494363.1
	8		9		6	
Year	12925.3107	1286.80934	10.0444644	0.00016734	9617.46198	16233.1594



The analysis shows that Year establishes a **strong and significant connection with the dependent variable**. The model intercept shows **-25,047,545.38 as the predicted value** for the dependent variable at Year set to zero. The statistical significance of this value **reaches 0.000186** which exceeds the accepted **threshold of 0.05**. The 95% confidence interval for the intercept shows **high precision between -31,600,727.66 and -18,494,363.10.**

The analysis shows that a one-unit increase in Year leads to an average dependent variable rise of **12,925.31 units**. The data indicates a **strong positive connection** between Year and the dependent variable at a very significant **p-value of 0.000167**. The precision of this coefficient estimate is verified by a 95% confidence interval spanning from **9,617.46 to 16,233.16**.

Y

1. Rajouri

Test of normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
POPULATION	.186	7	.200*	.906	7	.370

*. This is a lower bound of the true significance.

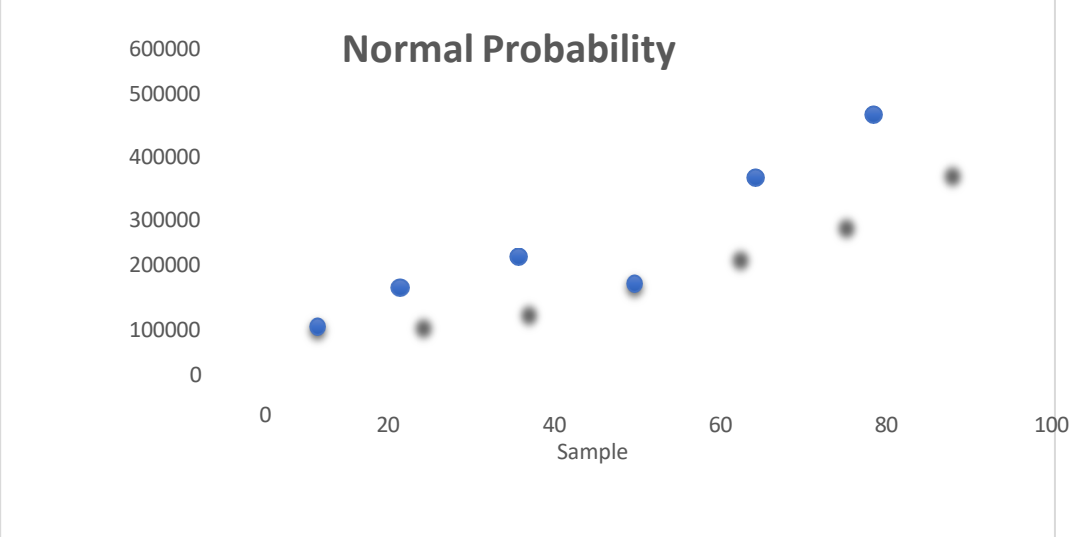
The normality tests on the model residuals were performed utilizing the Kolmogorov-Smirnov and Shapiro wilk tests. **The Kolmogorov - Smirnov test resulted in a statistic of 0.186 at significance level p equal to 0.200. In contrast, the Shapiro - Wilk test resulted in a statistic of 0.906 with a p value equal to 0.370**. Both tests suggest that the residuals are reasonably normally distributed and have p values greater than 0.05. Hence the assumption of normality required for the regression model, is not violated.

District	Year	Population	Growth Rate %	Growth Rate in Number
Rajouri	1951	177789	3.4	6260
	1961	171529	3.52	6260
	1971	217373	26.73	45844
	1981	302500	39.16	85127
	1991	384435	27.09	81935
	2001	483284	25.71	98849
	2011	642415	32.93	159131
Predicting Year	**2021**	**651967.8571**	**1.487022741**	**9552.857143**

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.959538
R Square	0.920713
Adjusted R Square	0.904856
Standard Error	54177.21
Observations	7

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.7E+11	1.7E+11	58.06212	0.000619
Residual	5	1.47E+10	2.94E+09		
Total	6	1.85E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-1.5E+07	2028356	-7.45189	0.000686	-2E+07	-9901024
Year	7801.607	1023.853	7.61985	0.000619	5169.709	10433.51



The regression analysis depicts the predictor variable, Year , having a **significant and positive impact** towards the dependent variable. The model's intercept is **-15,000,000,** which indicates the predicted value of the dependent variable when Year is equal to 0. This intercept of -15,000,000 has a p-value of 0.000686, making it **very statistically significant** as it is less than 0.05. The reliability of this estimate is further confirmed with the 95% confidence interval of the intercept ranging **between -20,000,000 and -9,901,024.**

Year has a **coefficient of 7,801.61 and so for every one unit increase** in Year , the dependent variable is expected to increase by an average of **7,801.61**. This relationship is found to be **highly statistically significant** with a p-value of 0.000619 further stating the positive impact of Year on the dependent variable. The evidence of the positive impact can also be seen from the 95% confidence interval **from 5,169.71 to 10,433.51 which further solidifies the precision and reliability of the effect.**

In conclusion, the analysis has shown **a strong statistically significant** relationship. Positive between Year and the dependent variable. The intercept and coefficient are also very significant with the confidence intervals being precisely micron thick. The normality tests confirmed the assumption of normality of the residuals, which makes the model trustworthy. These findings prove that Year has a positive and statistically significant impact on the dependent variable.

---

2. Ramban

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
POPULATION	.175	7	.200*	.925	7	.513

*. This is a lower bound of the true significance

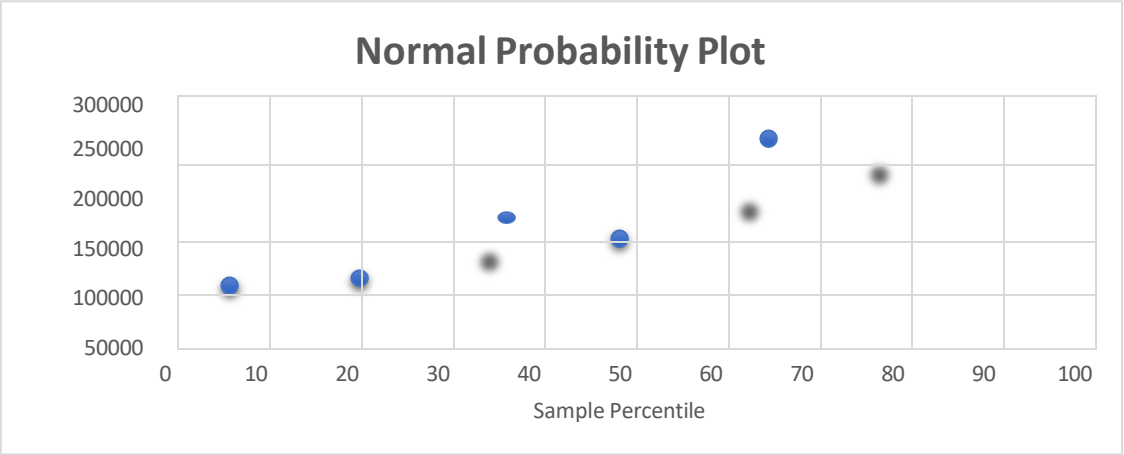
The tests for normality of the residuals show no significant departure from normality. **The Kolmogorov-Smirnov test has a statistic of 0.175 with a p-value of 0.200 (not significant) and the Shapiro-Wilk test has a statistic of 0.925 with a p-value of 0.513**. Both tests indicate that the residuals are normally distributed, one of the assumptions of regression

District	Year	Population	Growth Rate %	Growth Rate in Number
Ramban	1951	71242	15.43	9522
	1961	80764	13.37	9522
	1971	105767	30.96	25003
	1981	130569	23.45	24802
	1991	168962	29.4	38393
	2001	214944	27.21	45982
	2011	283713	31.99	68769
Predicting Year	**2021**	**289275.5714**	**1.960633256**	**5562.571429**

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.968052
R Square	0.937124
Adjusted R Square	0.924549
Standard Error	21212.41
Observations	7

ANOVA					
	df	***SS***	***MS***	***F***	***Significance F***
Regression	1	3.35E+10	3.35E+10	74.52134	0.000344
Residual	5	2.25E+09	4.5E+08		
Total	6	3.58E+10			

	Coefficients	***Standard Error***	***t Stat***	***P-value***	***Lower 95%***	***Upper 95%***
Intercept ≻	-6704597	794177.7	-8.44219	0.000383	-8746096	-4663098
Year	3460.6	400.8769	8.632574	0.000344	2430.113	4491.087



The regression shows some interesting results. The **intercept is -6,704,597 with a standard error of 794,177.7**. This is significant at **p<0.000383**. The 95% confidence interval for the intercept **is -8,746,096 to -4,663,098.**

For the Year, **the coefficient is 3,460.6 with a standard error of 400.88. This is significant at p<0.000344**. The 95% confidence interval for the coefficient is **2,430.11 to 4,491.09.** So, it looks like there is **a positive and significant relationship** between Year and the dependent variable.

In summary, **the regression is strong and significan**t and the residuals are normally distributed. So the model is robust

3. Udhampur

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
POPULATION	.164	7	.200*	.923	7	.491

*. This is a lower bound of the true significance.

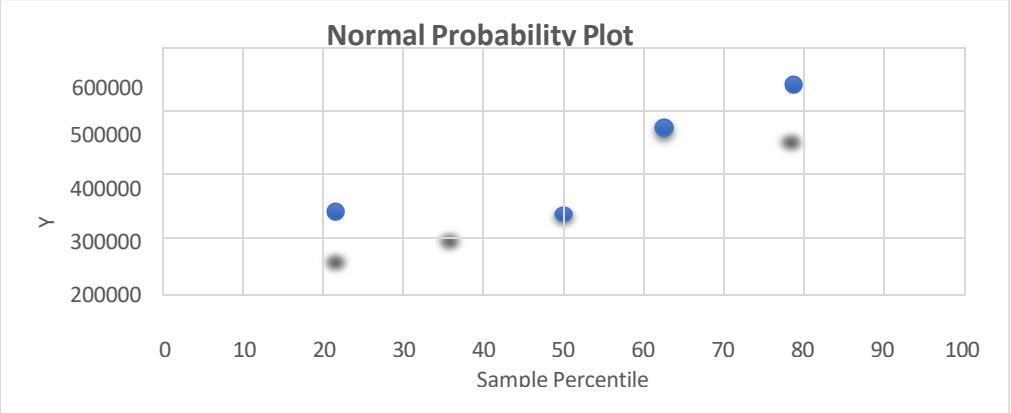
Regularity of residuals was verified by applying Kolmogorov-Smirnov and Shapiro-Wilk test. **Kolmogorov-Smirnov test (statistic 0.164, significance level 0.200) and Shapiro-Wilk test (statistic 0.923, p-value 0.491) gave evidence for normality in favor of P-value.** Both the test result shows that the residuals do not depart from normality in any degree, therefore the normality assumption of the **residuals can be satisfied**, which is a prerequisite of regression analysis.

District	Year	Population	Growth Rate %	Growth Rate in Number
Udhampur	1951	143755	10.28	13397
	1961	157152	9.32	13397
	1971	208495	32.67	51343
	1981	270763	29.87	62268
	1991	354711	31	83948
	2001	459486	29.54	104775
	2011	554985	20.78	95499
Predicting Year	**2021**	**590560.1429**	**6.410108896**	**35575.14286**

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.977724
R Square	0.955944
Adjusted R Square	0.947132
Standard Error	36007.34
Observations	7

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.41E+11	1.41E+11	108.4912	0.000141
Residual	5	6.48E+09	1.3E+09		
Total	6	1.47E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-1.4E+07	1348089	-10.1876	0.000156	-1.7E+07	-1E+07
Year	7087.764	680.4748	10.41591	0.000141	5338.548	8836.981



Regression analysis shows a **statistically significantly and positively correlated interaction** between the independent variable (Year) and the dependent variable.

The regression intercept is estimated as **-14,000,000 with standard error of 1,348,089. The t-statistic -10.19, p-value 0.000156, i.e., the intercept is statistically significantly different**. The width of the 95-confidence interval of **-17,000,000 - 10,000,000 is representative of the precision with which the estimate is.**

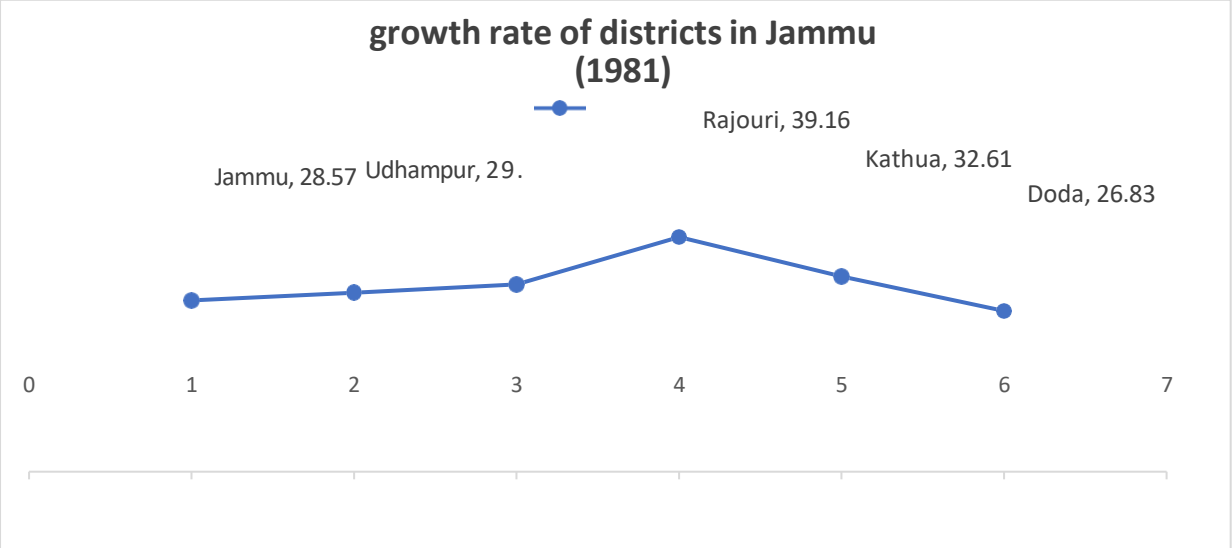
The normalized coefficient value of Variable 1 is 7,087.764 with standard error of 680.475. The t-statistic is 10.42, p-value is 0.000141, indicating strong positive association of Year with dependent variable statistically. The 95% confidence interval for the coefficient is **between 5,338.548 and 8,836.981, so with each unit increase in Year, the dependent variable will be increased by about 7,087.764 units.**

In a nutshell, the regression model **shows significant and positive association between the independent and dependent variables.** The residuals are normally distributed, supporting the model's validity.

8.1 STATISTICAL COMPARISON ANALYSIS OF JAMMU vs. KASHMIR DISTRICTS IN 1981 AND 2011

In 1981,

Districts of Jammu (1981)	growth rate %
Jammu	28.57
Udhampur	29.87
Punch	31.27
Rajouri	39.16
Kathua	32.61
Doda	26.83



The table and graph show population growth rates of various districts of Jammu published in 1981 by showing the dramatic regional demographic patterns. Population growth rates do not occur uniformly within districts and vary as a function of socio-economic status and location.

I. **Jammu District exhibited a 28.57% increase rate although the increase rate while significant**, is lower than the increase rate achieved by some of the other districts cited. While population density of Jammu far is already high, the still relatively low rate of population increases in the regional population center of Jammu, the urban and rural population center of the region, can now be accounted for, by the fact that population increase is no longer directly correlated with population gain.

II. **Udhampur District** showed **comparatively higher growth rate (29.87%.** Not least, this could also be due to its semi-urbanism, mixed ruralizing and country, village and center development and consequent growing population.

III. **Poonch District** indicated **a higher growth rate of 31.27% and this is higher than Jammu and Udhampur**. This is evidence of acceleration of a faster rate of population growth, possibly driven by both an increase in the birth rate and improved living conditions in this primarily rural area.

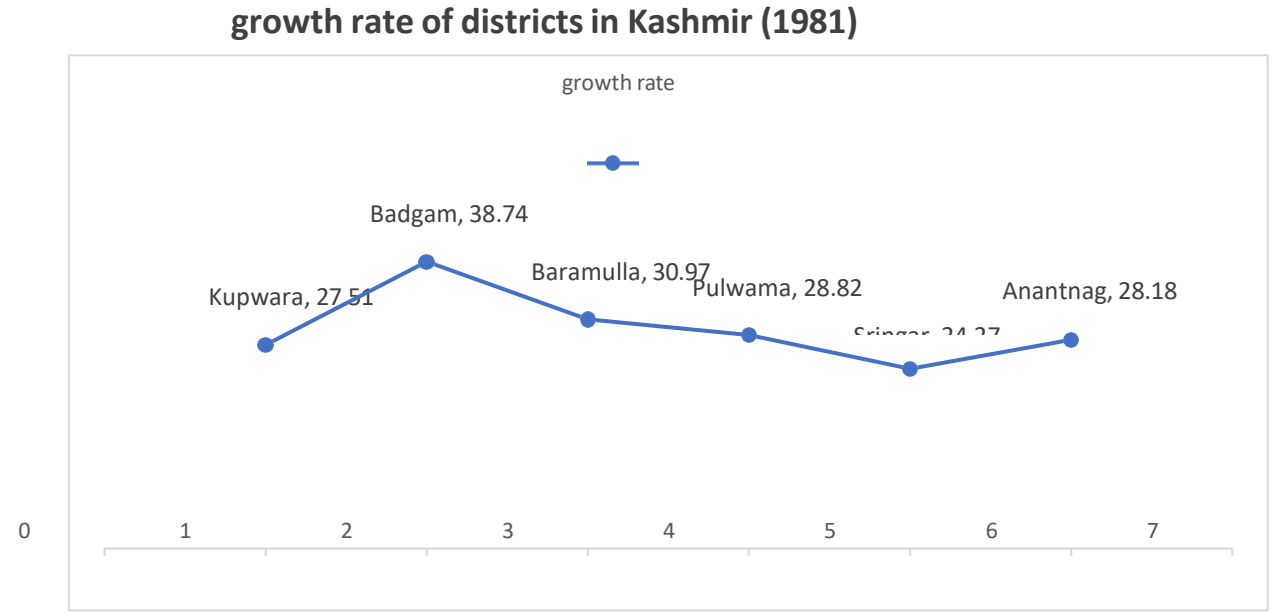
IV. **Rajouri District showed the highest growth rate at 39.16%, significantly outpacing other districts**. This substantial increase can be attributed to several factors including increased fertility, migration or development strategy which improved medical and living conditions in the district.

V. **Kathua District ranked second with 32.61 percentage increase in growth rate** by a sudden swelling of population there. That its area may have been utilizing the early advantages of burgeoning rural economies and trade could have significantly contributed the fast development.

VI. **Doda District**, **with a growth rate of 26.83%, recorded the lowest growth among the districts listed.** It may be attributable to the difficult topographical situation and relatively low degree of maturity with respect to other wards, as well as to an assumed time lag in terms of population increases.

Finally, table shows wide distribution patterns in the Jammu region of the 1981 area. While certain districts, e.g., **Rajouri and Kathua, showed exponential increase,** other districts, e.g**., Doda and Jammu, developed more limited increase**, probably influenced by geographical, economic and social aspects.

District of Kashmir (1981)	growth rate%
Kupwara	27.51
Badgam	38.74
Baramulla	30.97
Pulwama	28.82
Srinagar	24.27
Anantnag	28.18



The Table and graph present population growth rates in 1981, for different Kashmir districts, and present the demographic nature of the area. Growth rates are representative of the mix among rural and urban factors, and of socio-economic characteristics that are unique to each district.

i. **Kupwara District exhibited a growth rate of 27.51%, which ranges among districts listed in the mid-range**. Due to its predominantly rural character, growth of Kupwara is not explainable without taking into account the effect of both natural increase of the population caused by high fertility and the natural increase of the infrastructural facilities, and the increase in resource availability.

ii. **The Badgam District showed the highest proportional scale increase (38.74%, then all the other districts).** This exponential increase might be explained by its predominantly rural economy and social development, such as health and education, which might have facilitated increase in population.

iii. **Baramulla District, with a rate of 30.97%, increased significantly in terms of population,** also. Since Baramulla is one of the largest and most industrialized districts, it has been exposed to at least some of the consequences of agricultural production and commercial activities in the town centers, which should contribute to a higher growth rate.

iv. **Pulwama District experienced a growth rate of 28.82%, slightly above Kupwara but below Baramulla and Badgam**. Famous for its prosperous agriculture, and for cultivation of saffron, the population of Pulwama's growth could be attributed to the previous agricultural achievements or to the rural population growth.

v. **The Srinagar District having the lowest percentage of increase, i.e. 24.27%, reported the slowest increase among the districts.** As the urban/administrative seat of Kashmir, Srinagar already had a heavy 1981 population, which may have restricted overall growth. Urban limitations, e.g., unavailability of land and housing, may also have played a role in the small rise.

vi. **Anantnag District showed a growth rate of 28.18%, near to the regional average**. As a blend of urban and rural areas, Anantnag probably witnessed continuous population expansion due to the basis of agriculture and small-scale industrialism, along with the increase in the naturally occurring amount of the population.

Last, the table reports a nonspecific flow of population increase in the Kashmir districts in 1981**. Badgam stood out with its exceptionally high growth rate**, while Srinagar, despite being the region's urban hub, experienced the lowest increase. These differences can be explained by the interaction between urbanization, realization, and socioeconomic characteristics in affecting population trends.

COMPARISON BETWEEN JAMMU VS KASHMIR DISTRICTS IN 1981

The analysis of the rate of growth of the population of the districts of Jammu and Kashmir (J&K) in 1981 illustrates some of the major underlying trend and differences between the two regions. The following is a definition of comparison and congruence.

Overall Trends

- Growth rates within the community districts of Jammu were, for the most part, higher than growth rates within Kashmir with the **highest rates of growth achieved in Rajouri (39.16) and in Badgam (38.74) Jammu and Kashmir, respectively**.
- Basal growth rate **was the most depressed in 26.83% (Doda), Jammu and 24.27% (Srinagar), Kashmir J&K.**

District-wise Comparison

Highest Growth Districts: Rajouri vs. Badgam

- Rajouri (Jammu) and Badgam (Kashmir) exhibited accelerating growth at a faster rate compared to each other and Badgam represented the fastest growing district among all districts.
- The impressive expansion in both areas to a significant degree is a result of the two regions having a relatively rural population, high child to parent ratio, and socioeconomic improvement.

Lowest Growth Districts: Doda vs. Srinagar

- Among Srinagar (24.27%, capital, city center of Kashmir province delivered the lowest increase rate). Urban by virtue of e.g., lack of housing (and massively excitable density of acute inhabitants), which must have an inherently limiting degree of clustering.
- Doda (26.83%, in a difficult hilly area of Jammu) also demonstrated a more gradual rise as of now, due to roadway fragmentation and a smaller migrant size

Mid-Range Growth Districts

Growth rates in the Jammu district are identical in the Punch (31.27, and Kathua (32.61), both of which are located in the "Kashmir" region, and Baramulla (30.97), which all are located in the "Kashmir" region. These regions also probably have been enhanced by agricultural production and low-level urbanization

Similar Growth Rate

Pulwama (28.82%, Kashmir) exhibited rates of growth comparable to Udhampur (29.87% and Jammu (28.57%, which may reflect similar demographic distribution, possibly due to rural increase and urban growth).

Urban vs. Rural Growth

- **Jammu's Growth:** The districts in Jammu, especially Rajouri, Kathua and Punch demonstrated higher growth rates because of the dominance of rural, agrarian economies and possible trends in the international migration.
- **Kashmir's Growth**: Although rural areas (e.g., Badgam, Baramulla) experienced significant increase, urban areas (e.g., Srinagar) experienced a relatively small increase, showing the rural-urban gap.

Key Observations

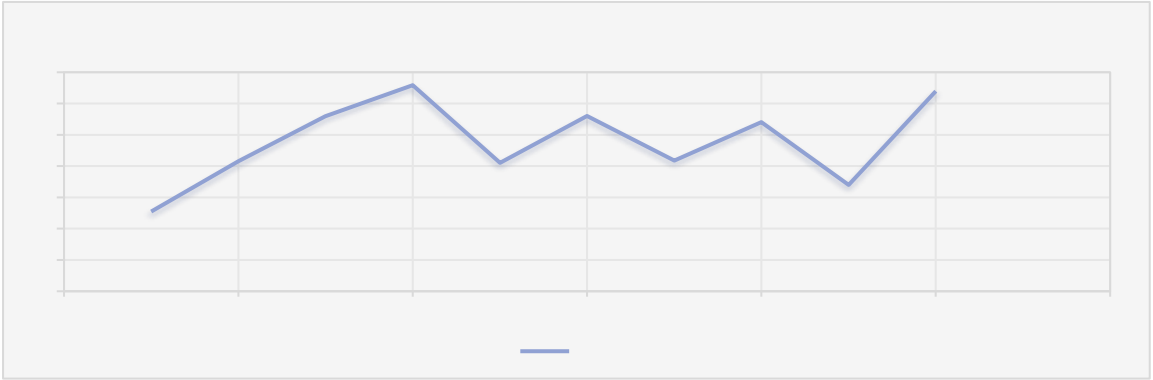
- **Jammu**: Rajouri, Kathua, and Punch additionally displayed an early developmental advantage, as this stage overlapped with the focus on rural development and population increase of the region.
- **Kashmir:** Badgam and Baramulla stood out for their higher growth, while Srinagar lagged due to urban constraints.

Conclusion

Overall, the districts of Jammu showed a slightly higher average growth rate than those of Kashmir in 1981, with Rajouri and Badgam leading in their respective regions. Suburban districts in both jurisdictions served as the engine of population growth, but urban centers of Srinagar city and Jammu city experienced a slowing of growth rate due to excessive population density and space availability constraints.

In 2011,

District of Jammu (2011)	growth rate%
Jammu	12.74
Udhampur	20.78
Punch	27.97
Rajouri	32.93
Kathua	20.53
Doda	28
Kishtwar	20.88
Reasi	27.04
Samba	17.01
Rambam	31.99



Since 1980s-2010s, district population growth rates in the Jammu region are presented in the table, underlining the demographic scenarios witnessed in the Jammu region. Although some districts grew very rapidly, other districts grew more moderately, illustrating the socio-economic and geographic determinants on population growth.

District-Wise Analysis

Jammu District (12.74%)

Region's administrative and the city of center, Jammu, reported the least increase rate among the district. This can be attributed to urban constraints such as limited housing and land availability, coupled with already high population density. Urbanization and the movement of people to adjacent settlements (i.e., Samba and Kathua) could have contributed to the above pattern.

Rajouri District (32.93%)

Growth again showed the highest rate in Rajouri, in keeping with its 1981 status. The rural-agrarian life, the rapidly ongoing infrastructure development and socio-economic development of the district area, likely played a role in the rapid growth of population in the district.

Poonch District (27.97%)

Poonch also showed marked increase due to the strong rural presence and program growth. The district's proximity to Rajouri and the primarily agricultural character of the district's economy have probably encouraged its continued population growth.

Doda District (28%)

Doda demonstrated a significant rise from its low rate of increase in 1981 (26.83%. The division into two administrative units (Kishtwar and Ramban) Doda may have supported the targeted local development resulting in higher growth rates.

Udhampur District (20.78%)

Udhampur recorded moderate growth, consistent with its historical trends. As well as being a transport and trade center, the district possesses characteristics of the urban and rural that lead to ongoing natural expansion.

Kathua District (20.53%)

Kathua also demonstrated an identical increase in Udhampur, which appears to be related to a rural lifestyle and a higher number of resources. Growth may also have been stable, because of the proximity to Punjab and economic benefits.

Kishtwar District (20.88%)

Kishtwar, carved out of Doda, displayed modest growth. Its harsh terrain and geographic remoteness likely limited its people's ability to grow its population, despite the fact that the district has economic means for its support (e.g., hydropower and mining).

Reasi District (27.04%)

Reasi, another new district, howed significant growth. Population growth, probably by luring the pilgrims and workers, may have been the result of developmental activity, namely, railway communication and proximity to the Vaishno Devi shrine.

Samba District (17.01%)

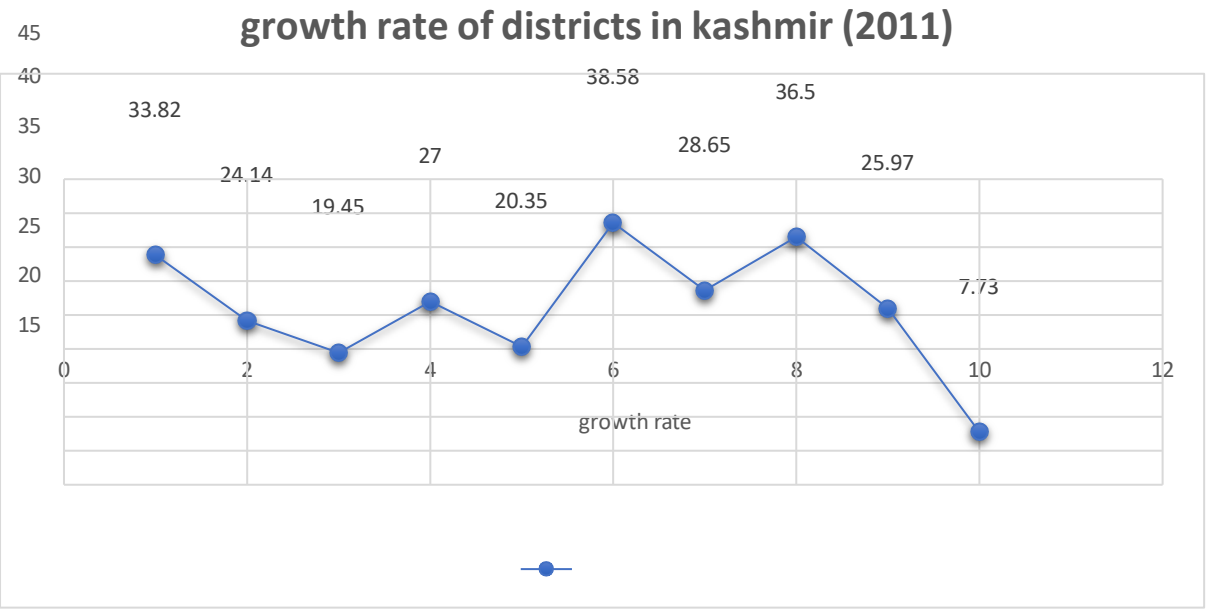
Samba also showed a small growth rate, which could have been caused by its smaller physical dimensions and a closeness to the Jammu city and potential urban spillover which may have compensated for local growth rates.

Ramban District (31.99%)

Ramban also one of the highest growth rates that is due from the infrastructure development including road expansion and connectivity as supported by the Chenab Valley. Its largely rural population likely contributed to natural growth.

Population growth pattern in the Jammu District of 2011 revealed a transition to controlled growth in urban region and explosive growth in rural region, or growth district. The most prominent increases in districts of Rajouri and Ramban highlight the importance of rural development and infrastructure improvements, whereas the decrease in the expansion of Jammu city and Samba indicates the urbanized nature and migration phenomenon.

district of Kashmir (2011)	growth rate%
Kupwara	33.82
Badgam	24.14
Baramulla	19.45
Pulwama	27
Srinagar	20.35
Anantnag	38.58
Bandipore	28.65
Ganderbal	36.5
Shopian	25.97
Kulgam	7.73



The table shows population growth rate data for Kashmir districts for 2011 and find with quite differential socio-economic, Geographical, and developmental factors, contrasting demographic changes. Data points illustrate large interdistrict differences in growth rates, which in turn imply spatially varying trajectories of population dynamics across the region.

District-Wise Analysis

Anantnag (38.58%)

Anantnag recorded the highest growth rate among all districts in Kashmir. This epidemic may at least seem to have a relation to a large number of rural areas of the district, a large number of living individuals at the district, and a large network. Its strategic location (as a transit center) and the presence of quality agricultural land probably accounted for its high population density.

Ganderbal (36.5%)

Ganderbal followed closely with a high growth rate. Because of this council (formed by Srinagar district), administrative work and local development work, such as roads/broadband connectivity and also socio-economic conditions, it should have also improved the growth of this district.

Kupwara (33.82%)

Kupwara exhibited, also, a rapid expansion, as it is for the majority rural and agricultural. With this status of a borderland, population density in the course of such a timeframe may have been also motivated by the rise in the effectiveness of the engineering, medical, and the habitability of the more distant settled parts.

Bandipore (28.65%)

Bandipore showed statistically significant increase measured probably as a consequence of the newly enhanced agricultural production in the valley and Bandipore being a corridor for interaction with Gurez. Developmental projects to this otherwise isolated area may have led to an increase in the resident population.

Pulwama (27%)

Pulwama showed continuous growth in line with its principal role as an area of agricultural predominance, with saffron production as one of its main activities. Its location close to Srinagar and better rural living conditions led to continued growth in population.

Shopian (25.97%)

Shopian recorded moderate growth, reflecting its primarily rural economy. Renowned for apple growing, the district likely shared in agricultural advances and rural prosperity.

Badgam (24.14%)

Badgam experienced slower growth compared to 1981, where it had one of the highest rates. This time trend may also be a reflection of an evolution toward more stable demography that is more responsibly governed by educational opportunity and medically assisted opportunity.

Srinagar (20.35%)

Srinagar, the district capital of Kashmir, showed a relatively slow growth rate. Spatial restriction, such as absence of place (space), density, and temporal shift (focus migration) toward proximate areas, e.g., Pulwama and Ganderbal, may have played a role in this small rise.

Baramulla (19.45%)

The pace of growth in Baramulla ranked among the slowest in the area. Urbanization and the fairly high level of urbanization of the area, although still at a scale, may have acted as a counterpart to the increase of the population.

Kulgam (7.73%)

Kulgam illustrated the most attenuated rate of growth and its value should be highest in amongst the districts. This may be caused by outward migration, poverty in the population and a slow socio-economic development in respect to neighboring areas.

The population growth rates of the districts of Kashmir state in 2011 illustrate a complex mix derived from rural growth, urban expansion and demographic transformation. While both rural areas (e.g., Anantnag and Kupwara) expanded rapidly, urban areas (e.g., Srinagar and Baramulla) expanded at a moderate rate and plateaued. The significantly low growth of Kulgam is a somewhat unique feature, and thus it merits further discussion. Particularly, the data indicates the trend of heterogeneity and regional differences in population dynamics in Kashmir

COMPARISON BETWEEN JAMMU VS KASHMIR DISTRICTS IN 2011

Growth rates from the population of Jammu and Kashmir districts in 1981 are also very interesting and illustrate regional differences in demographic change over 30 years. Here's a comparative analysis:

Overall Trends

- **Jammu Region**: Growth rates differed substantially, Rajouri (32.93% and Ramban (31.99% being the greatest, while Jammu District (12.74% and Samba (17.01% being the least.
- **Kashmir Region**: Anantnag led the region with a growth rate of 38.58%, followed by Ganderbal (36.5%, while Kulgam (7.73% exhibited the lowest growth rate, the lowest across both regions.

District-wise Comparison

Highest Growth Districts: Rajouri vs. Anantnag

- Anantnag (38.58% in Kashmir outperformed Rajouri (32.93% in Jammu in terms of absolute population growth in 2011 as the fastest-growing district.
- Exponential increase of Anantnag and Rajouri might be due to increase in healthcare, increase in fertility rate, and increase in rural development programmers.

Lowest Growth Districts: Jammu vs. Kulgam

- In Kulgam, Kashmir, out-migration, low fertility and/or socio-economic inertia is the cause for the lowest relative GR across the geographical areas (7.73%)
- Jammu District (12.74%), the city and administrative base, also showed slow growth, probably inhibited by urban limitations and already high population saturation).

Mid-Range Growth Districts

In Jammu, districts Doda (28% and Reasi (27.04% showed growth rates almost at the same level to that of the Kashmir's Pulwama (27% and Bandipore (28.65%, which is according to their rural demographic profile and population growths.

Newly Included Districts

Regional distribution is also found in 20.88%, Kishtwar (31.99%, Samba (17.01% and Ramban (36.5% districts of Jammu and Kashmir respectively along with Shopian (25.97% district of Kashmir (districts of Jammu, and Shopian region of Kashmir exhibited a regional distribution). Indeed, Ganderbal has turned out to be one of the fastest paced districts of Kashmir.

Urban vs. Rural Growth

- **Jammu Region**: Urban neighborhoods such as Jammu (12.74% and Samba (17.01% showed a moderating growth rate, as a result of the shortage of land and high population density. On the other hand, the rural areas (Rajouri (32.93% and Ramban (31.99% witnessed considerable increase.
- **Kashmir Region**: Urban blocks including Srinagar (20.35% moderate relative population increase, and rural blocks, Anantnag (38.58% and Kupwara (33.82% had strong relative population increases, as a result of high fertility and rural expansion).

Key Observations

Growth Leaders

- Rajouri (32.93%, and Ramban (31.99% which are major growing districts in Jammuwere notable.
- In Kashmir, Anantnag (38.58, and Ganderbal (36.5 topped the growth rates.

Urban Centers:

Urban areas such as Jammu (12.74% and Srinagar (20.35% slowed their growth in comparison to rural district populations in their area.

Lowest Growth:

Kulgam (7.73% in Kashmir demonstrated lowest growth rate, despite the local differences within the Kashmir region).

Conclusion

The 2011 data reveal that districts in Kashmir, on average, exhibit higher growth per capita rates of counties in Jammu, although there are some exceptions (e.g., Kulgam). Rural districts in both regions, such as Anantnag, Rajouri, and Ramban, drove much of the growth, while urban centers like Jammu and Srinagar saw restrained increases due to population density and development limitations.

OVERALL COMPARISON BETWEEN JAMMU VS KASHMIR DISTRICTS IN YEARS 1981 & 2011

The depiction of population momentum difference between 1981 and 2011 between the districts of Jammu and Kashmir clearly reveals how dramatically the districts have been reworked demographically in 3 decades. Trends, pattern and change, which are known between the two areas, are presented below.

1. Overall Trends

Jammu Region (1981 vs. 2011)

- The 1981, in general, Jammu districts showed higher relative growth rates with the highest (39.16% (Rajouri) and lowest (26.83% (Doda) values.
- Even by 2011 annual growth rates declined in the aggregate and in each of the individual municipalities of Jammu State, the highest at 32.93% (Rajouri), and lowest 12.74% (Jammu).
- There is an increasing trend downwards due to urbanization, decreased birth rate and, maybe, outward movement from the rural area.

Kashmir Region (1981 vs. 2011)

- Kashmir districts also showed high rates of increase in 1981 (highest rates of 38.74% and 24.27%, respectively, for Badgam and Srinagar).
- By 2011, growth rates varied significantly, with the highest being 38.58% (Anantnag) and the lowest 7.73% (Kulgam). While some districts showed sustained high growth, others (like Kulgam) saw sharp declines.
-

1. District-wise Comparison

Highest Growth Districts

- *1981:*

  Jammu: Rajouri (39.16%)

  Kashmir: Badgam (38.74%)

- *2011:*

  Jammu: Rajouri (32.93%)

  Kashmir: Anantnag (38.58%)

Rajouri remained the district with the highest growth rate in Jammu in 1981 and 2011, but its growth rate decreased by two decades. In Kashmir, Anantnag displaced Badgam. As the fastest developing district in 2011, it reflects the demographic change.

Lowest Growth Districts

- 1981:

  Jammu: Doda (26.83%)

  Kashmir: Srinagar (24.27%)

- 2011:

  Jammu: Jammu (12.74%)

  Kashmir: Kulgam (7.73%)

Growth declined markedly in Jammu district, perhaps due to urban saturation and outward relocation. There may be a low growth of Kulgam in the year 2011 due to the migration or decrease in the birth rate.

2.Average Growth Rates

- **Jammu Region:**

  1981 Average Growth: ~31.05%
  2011 Average Growth: ~23.65%
  Change: Decline of ~7.4%

- **Kashmir Region:**

  1981 Average Growth: ~30.89%
  2011 Average Growth: ~26.62%
  Change: Decline of ~4.27%

Nevertheless, although comparable regions showed reductions in mean growth rates, this reduction was greater for Jammu than Kashmir. All of it may be explained by a mix of socio-economic and geographical factors on fertility, emigration and development

Nevertheless, although comparable regions showed reductions in mean growth rates, this reduction was greater for Jammu than Kashmir. All of it may be explained by a mix of socio- economic and geographical factors on fertility, emigration and development

3. Urban vs. Rural Trends

- **Urban Districts:**

  In both zones, urban cores such as Srinagar (24.27% of the total in 1981, 20.35 in 2011) and Jammu (28.57% of the total in 1981, 12.74 in 2011) became less growing for the reasons of urban glut, low fertility rates, and outmigration.

- **Rural Districts**:

  From a geographical point of view, the rural districts of Rajouri (Jammu) and Anantnag (Kashmir) still remained active for rural development with high rates of growth which seem to continuously be driven by agriculture and may also be supported by higher fertility levels, however, this may be ceasing to be out with the increasing membership of the new and burgeoning youth population in these areas.

4. Notable Changes

- **In Jammu:**

  Rajouri and Ramban, showed unchangingly high rates of growth, i.e., unchangingly stable population growth.

  Jammu and Samba districts displayed significant reductions in, likely, due to the urban boundary and migrant population movement.

- **In Kashmir:**

  Anantnag Ganderbal both have a statistically significant rise in 2011, which may be explained by realization and development.

  Kulgam showed, however, the unusual reduction to 7.73%, suggesting, at least, some peculiar local phenomenon, such, migration, or economic changes.

Conclusion

Over the period from 1981 to 2011, both the states of Jammu and Kashmir showed a reduction with an increasing trend rate of average growth rates, but such tendency was steeper in Jammu.

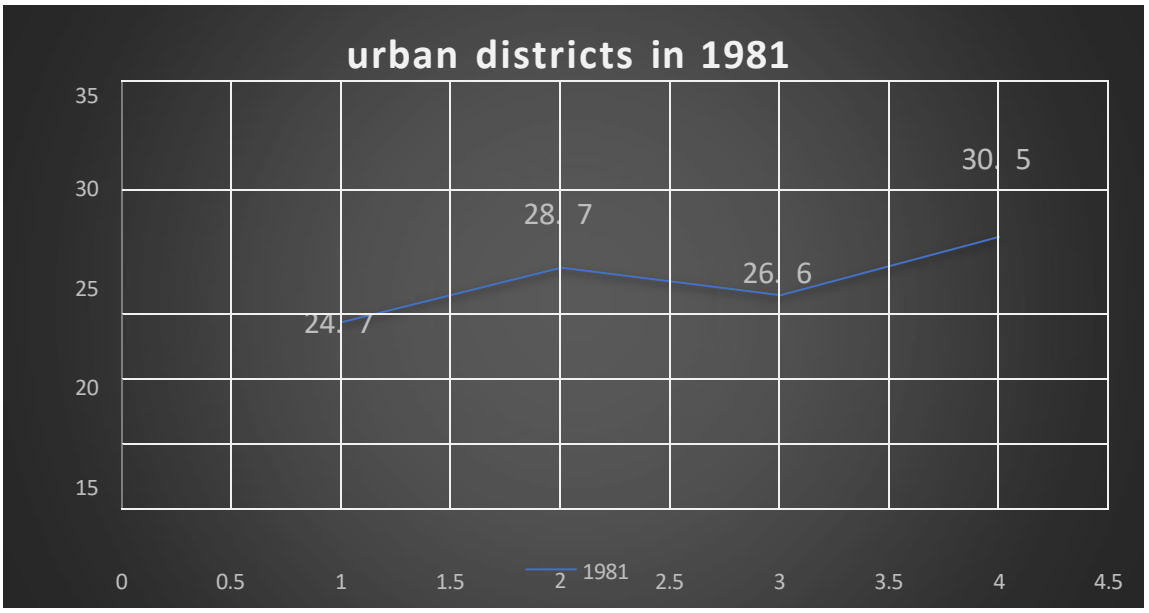
Rural districts such as Rajouri (Jammu) and Anantnag (Kashmir) remained growth leaders, while urban centers like Jammu and Srinagar saw slower increases.

The data provides long term demographical trends which encompass urbanization, migration, and socio-economic development over years, on which the different growth processes between the two sites are based

8.2 STATISTICAL ANALYSIS OF POPULATION GROWTH IN RURAL VS URBAN DISTRICTS OF JAMMU & KASHMIR IN YEARS 1981 & 2011

In 1981,

Urban Districts	Growth Rate in %
Srinagar	24.37
Jammu	28.57
Anantnag	26.46
Baramulla	30.95



The urban district growth rate statistics demonstrate how key districts in Jammu and Kashmir in 1981 experience population and development expansion. Every district shows its own distinctive pattern of growth that mirrors its specific urban development process.

The urban development in **Srinagar shows a stable growth pattern of 24.37 percent**. The summer capital status of Jammu and Kashmir drives this growth rate because the city attracts cultural and economic activity and subsequent migration and investment. Growth in these areas presents new challenges because it creates stress on infrastructure systems and leads to uncontrolled urban expansion.

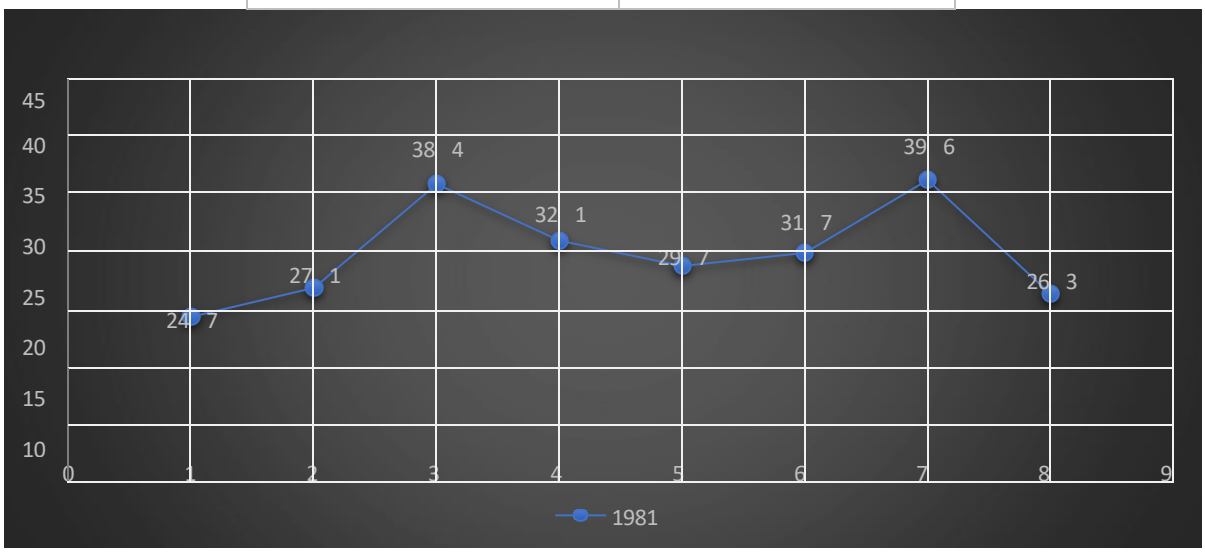
Jammu, the winter capital of the region, stands out with a robust growth rate of 28.57%. The quick pace of Jammu's urban development stems from its advantageous position and improved transportation links and expanding economic potential. The city's position as an essential administrative centre drives its ongoing urban growth.

The urban district of **Anantnag shows a 26.46% growth rate** that indicates its development as an emerging urban centre. The region's growth appears to be driven by both urban settlement expansion and local development projects that honour its established cultural and agricultural heritage.

Among these regions **Baramulla stands out as the most productive district with its growth rate reaching 30.95%.** The substantial growth rate indicates major urban development which may result from better infrastructure and educational institutions and economic investments. The district's quick growth may be attributed to its strategic location near commercial trade routes and natural sites.

The data shows Baramulla district leads the urbanization pace while other districts demonstrate different levels of development. The rapid growth of these areas creates economic possibilities yet requires strategic urban planning to handle resource distribution and infrastructure construction and environmental preservation.

Rural Districts	Growth Rate in %
Pulwama	24.37
Kupwara	27.51
Budgam	38.74
Kathua	32.61
Udhampur	29.87
Poonch	31.27
Rajouri	39.16
Doda	26.83



The growth rates of rural districts in Jammu and Kashmir reveal important patterns about regional development and transformation across these regions.

The rural development in **Pulwama district maintains a consistent growth rate of 24.37%.** The district stands out because of its saffron cultivation success and its agricultural output while its development seems linked to farming innovations and rural infrastructure improvements.

The 27.51% growth rate in Kupwara signifies substantial improvements both in district economic growth and rural standard of living. The strategic position of Kupwara adjacent to the Line of Control seems to be fuelling both government investment in infrastructure development and social economic improvement initiatives.

Budgam stands out as a rapidly expanding rural district because its growth rate reached 38.74%. This impressive figure likely points to increased rural-urban integration,

improvements in education and healthcare, and a boost in local industries or agricultural productivity.

The district of Kathua shows robust rural development through its 32.61% growth rate. The district's proximity to Punjab and ongoing development of infrastructure and industry facilities likely drives its progress.

Rural growth in Udhampur stands at 29.87% reflecting strong development possibly attributable to its strategic status as both a defines hub and transportation centre. Rural development investments alongside enhanced connectivity seem to have contributed to this development.

The district of Poonch demonstrates robust rural transformation as its population increased by 31.27% during the period. The district's development results from government initiatives aimed at border regions and improved educational services and healthcare facilities and infrastructure development.

Rajouri district demonstrates the most remarkable transformation with a rural expansion rate of 39.16%. The district's rapid expansion likely results from its strategic position together with targeted development initiatives in education, agriculture and connectivity improvements.

The district of Doda shows gradual development through its 26.83% growth rate. The district of Doda shows signs of growth because of initiatives to boost rural living standards and transportation networks.

The collected data reveals substantial development achievements in these rural territories where Rajouri and Budgam demonstrate the most progress. The positive growth indicators demonstrate rural development progress but demand sustained attention to equitable resource distribution and sustainable practices and rural-urban disparity reduction for balanced regional development.

COMPARISON BETWEEN URBAN VS RURAL DISTRICTS IN 1981

The collected information provides a detailed history of growth rates of Jammu and Kashmir, 1981 urban and rural areas. By comparing these growth rates we can recognize characteristic trends of development, urbanization and demographic shift between the two types.

Urban Districts

The growth rates for urban districts highlight the relatively steady pace of urbanization, with the four districts—**Srinagar, Jammu, Anantnag, and Baramulla—showing growth rates in the range of 24.37% to 30.95%.**

Srinagar (24.37%): With a status of a cultural, economic, and political center Srinagar's growth and expansion show the reflection of this status.

Jammu (28.57%): With a slightly higher growth rate in comparison to Srinagar, Jammu, considerable urban growth is observed, probably due to its administrative importance and the growing number of infrastructure projects.

Anantnag (26.46%): This urban core shows sustained increases, highlighting its relevance as an active district in the area.

Baramulla (30.95%): In comparison to the other urban subdistricts, the highest rate of growth for urban subdistricts reflects the level of fast urbanization, which can be attributed to its strategic positioning and the increasing economic activity.

Rural Districts

On the other hand, the growth rates within the rural areas vary considerably, from 24.37% to 39.16%, in general, although there are significant regional differences. This suggests a more dynamic growth process in rural areas, influenced by migration, agricultural development, and local factors.

Pulwama (24.37%): The growth rate in Pulwama is similar to that in Srinagar, which could be attributed to medium rural development, and is probably supported by agricultural production and population growth rate.

Kupwara (27.51%): This district shows a constant rate of increase, and this increase seems to be due to better provision of resources and by better logistic support as infrastructure began to be constructed.

Budgam (38.74%): With regard to rural districts, Budgam has an unusually high growth rate, implying a rapid demographic change and rural development projects.

Kathua (32.61%): Strong growth makes Kathua a promise fulfilled in the potential of its rural economy, maintained by its location in urban areas.

Udhampur (29.87%): Udhampur has good cultivation which probably is a result of better road communication and economic activities.

Poonch (31.27%): Here, the significantly high growth rate is interpreted as rural development, even though that is a hilly area

Rajouri (39.16%): The greatest rise in all districts Rajouri reflects fast rural transformation which can be attributed to improved agricultural production and with the development of infrastructure.

Doda (26.83%): The relative rate of growth of Doda shows a continuous ruralization process.

Overall Trends

Growth Range:

Urban Districts: 24.37% (Srinagar) to 30.95% (Baramulla)

Rural Districts: 24.37% (Pulwama) to 39.16% (Rajouri)

In rural areas, the spectrum of growth rates is broader, with some districts growing faster than the highest urban growth rate.

Highest Growth:

Rural growth is significantly greater (39.16% in Rajouri rural district than urban growth in Baramulla (30.95% indicating higher dynamism in the rural domain.

Lowest Growth:

Both Srinagar and Pulwama, at 24.37%, are the lowest in terms of increase of urban and rural districts, respectively, indicating relatively stagnant growth in this area.

Average Growth:

Urban Districts: Average growth rate is approximately 27.58%.

Rural Districts: Average growth rate is significantly higher at 31.42%.

Key Insights

I. **Higher Growth in Rural Districts**: These overall rates of change also point towards the fact that in 1981 rural districts were changing at a more rapid rate probably due to increasing population, government-related development initiatives and semi-urban expansion in these districts.

II. **Urbanization Lags**: Although urban areas exhibit very high growth rates, they continue to grow at a far slower rate than in rural ones, so there is chicken and egg, but it is not likely to grow quite as fast as those in urban areas.

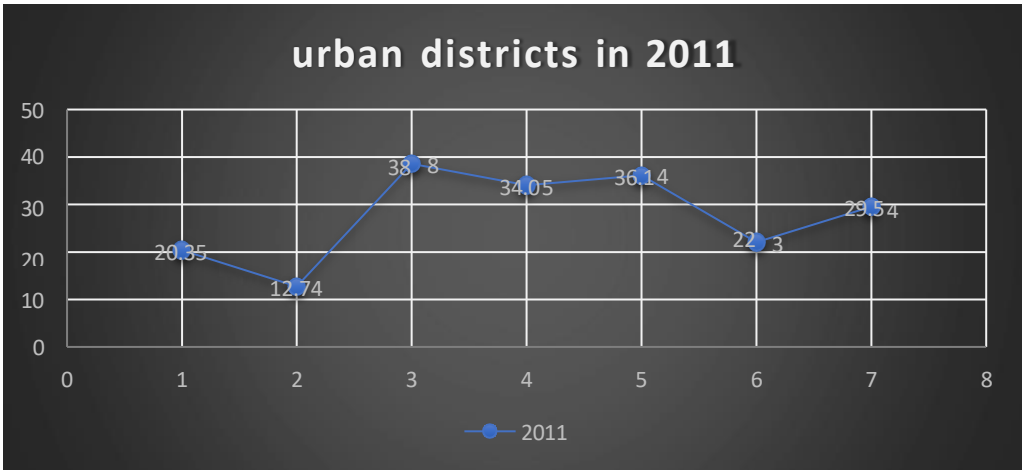
III. **Developmental Disparities**: Unequal growth rates between rural and urban areas reflect regional differences in the process of development, construction and economic opportunities.

IV. **Strategic Focus Needed:** Unsupervised growth in rural areas such as Rajouri and Budgam necessitates a targeted intervention for successful sustainable growth, whereas urban areas such as Srinagar and Jammu require successful urban programming and design to accommodate growing expansion.

This comparison reveals an intriguing dynamic: Rural areas were growing at a more rapid rate than the urban areas in 1981, marking an important stage of change in the region's demographic and economic environment.

In 2011,

Urban Districts	Growth Rate in %
Srinagar	20.35
Jammu	12.74
Anantnag	38.58
Baramulla	34.05
Budgam	36.14
Kathua	22.03
Udhampur	29.54



The 2011 urban district growth rate statistics demonstrate substantial differences in urbanization patterns throughout Jammu and Kashmir. The individual districts demonstrate distinct patterns shaped by population changes and regional development and infrastructure development. Urbanization trends are markedly different between districts with growth rates varying between 12.74% and 38.58%

Low-Growth Urban Centres

Srinagar (20.35%):

The summer capital of Jammu and Kashmir registered a moderate urban growth rate of 20.35% during the period. The low urbanization trend in Srinagar points to two possible factors — building design limitations or population movement to adjacent cities.

Jammu (12.74%):

Jammu as the winter capital demonstrated the lowest urban district growth rate at 12.74%. The slow development may stem from constrained land resources and sluggish industrial development and population shifts toward rural and suburban areas. The declining relative growth suggests that attention is now shifting toward the development of neighbouring urban districts.

Kathua (22.03%):

The urban development in Kathua district remains steady due to its moderate growth rate. The border proximity to Punjab seems to drive economic activity but the district trails districts with superior performance metric

High-Growth Urban Centres

Anantnag (38.58%):

The district of Anantnag demonstrated the highest urban growth rate of 38.58% which propelled it to become a major urban centre. The district's rapid growth stems from its economic diversification together with enhanced connectivity and its position as a vital regional trading centre. Rapid urbanization combined with population growth characterizes this area.

Baramulla (34.05%):

The urban development of Baramulla district remains active as its population growth reached 34.05% during the period. The district's strategic location near trade routes and infrastructure development projects has led to its rapid expansion which established it as a key centre for regional development.

Budgam (36.14%):

Another high-growth district, Budgam, with a growth rate of 36.14%, showcases rapid urbanization. The district's expansion is driven by its closeness to Srinagar and its developing economic landscape which includes industrial operations as well as agricultural activities.

Udhampur (29.54%):

Udhampur maintains its strong growth trajectory because it operates as a critical transportation centre linking northern India. The district's urban development results from military bases and infrastructure projects and its expanding role as a regional transportation hub.

Key Observations

Wide Range of Growth:

The urban development patterns across districts show different growth rates starting from Jammu's 12.74% up to Anantnag's 38.58%.

High-Performing Districts:

The districts of Anantnag and Budgam and Baramulla demonstrate significant urban expansion which indicates that these regions continue developing alongside increasing population shifts toward these areas. These districts likely benefit from better infrastructure, trade opportunities, and economic activity.

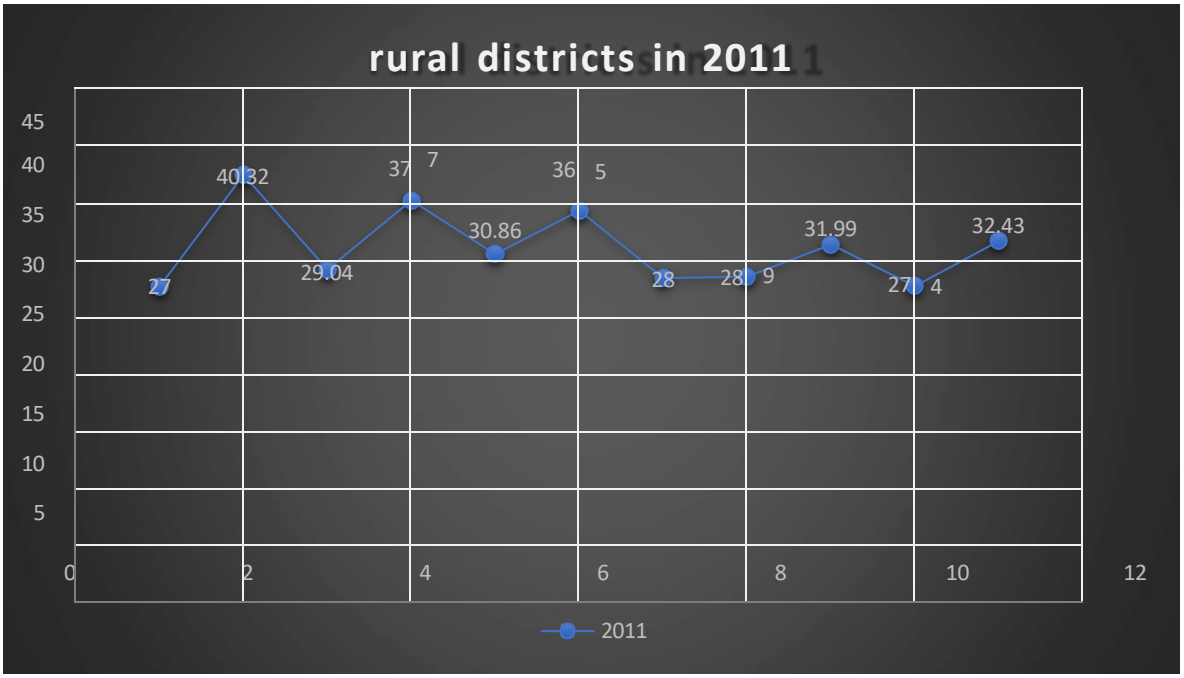
Low-Growth Concerns:

The capital cities Srinagar and Jammu show delayed urban expansion indicating potential constraints that combine limited acreage with population saturation alongside migration patterns toward unfilled urban areas. The essential nature of strategic planning emerges as the key solution for resolving these issues while reviving growth potential.

Balanced Growth in Other Districts:

The districts of Kathua and Udhampur show consistent growth patterns which indicate balanced urban development. The regions display potential for future growth expansion provided they receive better infrastructure development and economic opportunities

Rural Districts	Growth Rate in %
Pulwama	27
Kupwara	40.32
Bandipora	29.04
Kul gam	37.27
Shopian	30.86
Ganderbal	36.05
Doda	28
Kishtwar	28.19
Ramban	31.99
Reasi	27.04
Rajouri	32.43
Poonch	32.97
Samba	22.01



The 2011 growth rates of rural districts demonstrated diverse population dynamics through their range from 22.01% to 40.32%. The statistical data reveals important information about rural development and population expansion and socio-economic influences in Jammu and Kashmir.

Low-Growth Rural Districts

Samba (22.01%):

The slowest rural development occurs in Samba district where the growth rate stands at 22.01%. The district's location near Jammu's urban areas might be causing rural residents to migrate toward the city.

Pulwama (27%):

Pulwama demonstrates a moderate pace of rural population expansion. The district stands out for its agricultural strength yet its growth rate appears to be levelling off because younger residents seek urban job opportunities.

Reasi (27.04%):

Reasi district maintains a growth pattern comparable to Pulwama district. The combination of agricultural activities and tourism at Vaishno Devi likely drives this population growth in the district.

Doda (28%) and Kishtwar (28.19%):

These districts show equal development rates which indicates a steady rural development pattern. The combination of difficult terrain and agricultural focus appears to constrain the district's ability to achieve rapid development compared to other districts.

Moderate-Growth Rural Districts

Bandipora (29.04%):

The improved connectivity and developing rural economy in Bandipora district have led to moderate growth rates. The economic potential of this district increases because it borders Wular Lake which provides opportunities in fishing and tourism.

Shopian (30.86%):

The 30.86% growth rate of Shopian demonstrates its economic strength through horticulture since it ranks first as an apple-producing district in the region.

Ramban (31.99%):

The development of Ramban has accelerated because of the Jammu-Srinagar National Highway which has improved both connectivity and trade potential

Rajouri (32.43%) and Poonch (32.97%):

These districts show strong growth patterns because of ongoing rural development programs and enhanced infrastructure and agricultural and livestock activities.

High-Growth Rural Districts

Kulgam (37.27%):

Kulgam demonstrates rapid rural development at a 37.27% growth rate because of its successful horticulture sector and improving infrastructure.

Ganderbal (36.05%):

Ganderbal demonstrates significant rural district development through its rapid expansion rate. The district's location near Srinagar and its hydropower projects are likely drivers of its development.

Kupwara (40.32%):

The rural district of Kupwara demonstrates the most rapid development with a growth rate of 40.32%. The district's prime position near the Line of Control along with agricultural pursuits and government support drives its remarkable development.

Key Observations

I. Growth Range:

Rural development patterns across districts demonstrate a wide range of growth rates from 22.01% in Samba to 40.32% in Kupwara.

Districts Kupwara and Kulgam together with Ganderbal demonstrate the fastest development rates which outpaces other districts in their region.

II. Balanced Growth:

Rajouri together with Poonch and Ramban demonstrate consistent balanced growth patterns because of infrastructure development and agricultural economic activities.

III. **Lagging Districts**:

The growth rates in Samba, Pulwama and Reasi remain lower than average so these districts require specific rural development programs to advance economic development and infrastructure expansion.

IV. Rural Transformation:

The data shows that numerous rural areas in North Kashmir especially Kupwara and Bandipora have undergone quick transformations because of successful rural development efforts and population expansion.

COMPARISON BETWEEN URBAN VS RURAL DISTRICTS IN 2011

The data for 2011 highlights the growth rates of urban and rural districts in Jammu and Kashmir, revealing important insights into the region's developmental patterns. The data demonstrates population changes alongside urbanization patterns together with rural development strategies while allowing researchers to analyse urban-rural growth patterns.

Overall Comparison

1. Growth Range

Urban Districts: 12.74% (Jammu) to 38.58% (Anantnag)

Rural Districts: 22.01% (Samba) to 40.32% (Kupwara)

The growth statistics from rural districts surpass those of urban districts which demonstrates that rural development processes operate more powerfully.

2. **Highest Growth Rates**

Urban: Anantnag (38.58%)

Rural: Kupwara (40.32%)

Rural growth rates show greater expansion than urban rates which indicates rural areas lead the expansionary trend.

3. Lowest Growth Rates

Urban: Jammu (12.74%)

Rural: Samba (22.01%)

Rural districts demonstrate faster growth than urban districts at every pace which indicates rural development maintains consistent momentum.

4. Average Growth Rates

Urban Districts: Average growth rate ~ 27.25%

Rural Districts: Average growth rate ~ 31.73%

The growth rate of rural districts reached 4.48% higher than urban districts during 2011 while maintaining this pattern from 1981.

Key Observations

I. **Slower Urban Growth**: The urban centres of Srinagar and Jammu demonstrated reduced expansion in comparison to 1981 because of infrastructure limitations and population shifts toward suburban areas and constrained development possibilities.

II. **Rapid Rural Development**: Rural districts including Kupwara and Kulgam and Ganderbal demonstrate significant growth because of investments in infrastructure and agriculture and regional development initiatives.

III. **Emerging Urban Centres:** The urban districts Anantnag and Baramulla show fast-paced urban development which proves their growing significance as economic centres.

IV. **Balanced Growth:** Udhampur and Doda districts demonstrate balanced growth between their urban and rural sectors because of integrated development approaches.

The 2011 growth rates demonstrate that rural districts in Jammu and Kashmir maintained higher expansion rates than their urban counterparts thus reflecting the region's sustained rural development path. The expanding urban areas need strategic urban planning and infrastructure development because their growth potential remains constrained. The observed development pattern requires an equal attention to sustainable progress in both rural and urban areas.

OVERALL COMPARISON BETWEEN URBAN VS RURAL DISTRICTS IN J&K IN YEARS 1981 AND 2011

The growth developments of cities and villages in Jammu and Kashmir between the years 1981 and 2011 do show a number of trends that are a source of substantial richness to the region's development story, showing the changing dynamics of urbanisation as well as the changing dynamics of ruralization.

Urban Districts: 1981 vs 2011

1. Growth Rates in 1981:

Srinagar (24.37%)

Jammu (28.57%)

Anantnag (26.46%)

Baramulla (30.95%)

2. Growth Rates in 2011:

Srinagar (20.35%)

Jammu (12.74%)

Anantnag (38.58%)

Baramulla (34.05%)

Budgam (36.14%)

Kathua (22.03%)

Udhampur (29.54%)

Key Observations:

I. **Decline in Growth**: Jammu (12.74% and Srinagar (20.35% experienced notable decline in growth rates from 1981. This indicates that these metropolitan areas could have been constrained by space, infrastructure, and migration, thus restricting further urbanisation.

II. **Increased Growth in Anantnag and Baramulla**: The augmentation of 38.58% (Anantnag) and 34.05% (Baramulla) in 2011 is indicative of a significant rise to urbanization that is attributed to development of infrastructure and regional initiatives with job creation factors playing a key administrative importance.

III. **Budgam and Kathua's Development**: Budgam (36.14% and Kathua (22.03% demonstrate that some urban districts saw accelerated growth, suggesting the expansion of suburban and semi-urban areas.

Rural Districts: 1981 vs 2011

1. Growth Rates in 1981:

Pulwama (24.37%)

Kupwara (27.51%)

Budgam (38.74%)

Kathua (32.61%)

Udhampur (29.87%)

Poonch (31.27%)

Rajouri (39.16%)

Doda (26.83%)

2. Growth Rates in 2011:

Pulwama (27%)

Kupwara (40.32%)

Bandipora (29.04%)

Kulgam (37.27%)

Shopian (30.86%)

Ganderbal (36.05%)

Doda (28%)

Kishtwar (28.19%

Ramban (31.99%)

Reasi (27.04%)

Rajouri (32.43%)

Poonch (32.97%)

Samba (22.01%)

Key Observations

I. **Significant Growth in Kupwara and Rajouri:** Kupwara (40.32% and Rajouri (32.43% showed significant increases of growth due to rural development products of infrastructural facilities upgrading, agricultural development, and rural-on-the-periphery migration.

II. **Overall Rural Growth:** Almost all the rural blocks yielded high rate of growth, particularly Kulgam (37.27%, Bandipora (29.04%, and Poonch (32.97%, which indicated, that the rural zones are undergoing a tremendous transformation, worked out due to the improved connectivity, schemes of the government and stronger activities in the agricultural and small-scale industrial sector.

III. **Slight Decline in Samba:** Samba (22.01% is the only rural district with a relatively smaller growth rate and potentially a deceleration of rural development, potentially a result of geographic, economic, or policy reasons.

Comparative Insights: 1981 vs 2011

Growth Range Comparison:

Urban Districts: In 1981, the urban districts ranged from 24.37% (Srinagar) to 30.95% (Baramulla), while in 2011, they ranged from 12.74% (Jammu) to 38.58% (Anantnag).

This also reveals that urban expansion has slowed down in Jammu and Srinagar, whereas the growth rate has increased in other districts of Anantnag and Baramulla and Budgam.

Rural Districts: In 1981, the rural districts ranged from 24.37% (Pulwama) to 39.16% (Rajouri), and in 2011, they ranged from 22.01% (Samba) to 40.32% (Kupwara).

Rural areas also exhibited greater and more steady increases across decades, with some areas such as Kupwara and Rajouri exhibiting rapid increases.

Growth Trends:

Urban vs Rural Growth: In both years, rural districts tended to have higher growth rates compared to urban districts. This pattern suggests that rural development, possibly fuelled by migration, agricultural advancement, and infrastructure projects, outpaced urban growth in these periods.

Urbanization of Rural Areas: The higher growth in the urban centres of Anantnag and Baramulla is attributed to the urbanization of previously rural settlements. These areas may be experiencing suburbanization, in which formerly rural suburban patches become the urban cores.

Urban Saturation: Decreasing growth rates for Jammu and Srinagar indicate an urban saturation effect, whereby metropolises face difficulty in sustaining high pace of growth due to land and infrastructure shortages and by emigration flows from less densely populated areas.

Conclusion

The comparison of 1981 and 2011 rural/urban Jammu districts, respectively, reflects substantial change in the growth dynamics of Jammu and Kashmir:

Rural areas continuously outperformed urban areas both in terms of growth, and especially in 2011, when the areas of Kupwara, Rajouri and Kulgam showed prominent growth.

Urban areas such as Jammu and Srinagar showed slower increase, which also raised issues of urban saturation, overload of infrastructure, and migration patterns.

This analysis implies the importance of balanced developmental policies, that is, infrastructure, economic and governance improvements in urban and rural areas, to achieve sustainable and equitable development throughout the region.

8.3 MATHEMATICAL APPROACH IN PREDICTING THE FUTURE POPULATION

Using two formulas to predict the future population of J&K districts:

1. Arithmetic increase method (predicts population in numbers)
2. Exponential growth rate (predicts the growth rate)

Variables used in the given formulas:

- p_n: predicted population
- p_0 : initial population
- n ; number of decades
- $\bar{x}$:average mean of increased growth in numbers
- p_t: population at time (t)
- r : annual exponential growth
- t Time period in years
- Ln: natural logarithm

1. RAJOURI

Firstly, using the arithmetic increase method,

$p_{n=}$ 2031 , $p_{o=}$ 651968 (2021) , $n =$ 1 , $\bar{x} =$ 108100

$$P_n = p_0 + n \, . \, d$$

2031 = 651968 + 1 (108100)

= 651968 + 108100

= 760,608

Using exponential growth rate ,

p_0 = 651968 , $p_{n=}$ 760,608 , $t =$ 10

$$r = Ln(p_n/p_0)/10$$

= ln (760,698 / 651968) / 10

= ln(1.165) / 10

= 0.1527/10

r = 0.01527

2. UDHAMPUR

Firstly, using the arithmetic increase method,

$p_{n=}$2031 , $p_{0=}$ 590560 , $n =$ 1, $x =$ 63829

$$P_n = P_0 + n.\, d$$

$$= 590560 + 1(63829)$$

$$= 590560 + 63829$$

$$= 654, 389$$

Using exponential growth rate,

$p_0 =$ 590560 , $p_n =$ 654,389, $t =$ 10

$$r = Ln(p_n/p_0)/10$$

$$= \ln(654{,}389 / 590560) / 10$$

$$= \ln (1.108) / 10$$

$$=0.102/ 10$$

$$= 0.0102$$

3. KARGIL

Firstly, using the arithmetic increase method,

$p_n =$ 2031 , $p_{0=}$148145 $n =$ 1 $x =$15184

$$P_n = P_0 + n.\, d$$

2031 = 148145 + 1(15184)

= 148145 + 15184

= 163329

Using exponential growth rate

$p_0 =$ 148145 $p_n =$ 163,329 $t =$ 10

$$r = Ln(p_n/p_0)/10$$

$$= \ln(163{,}329 / 148{,}145)/10$$

$$= \ln (1.102) / 10$$

$$= 0.097 / 10 = 0.0097$$

8.4 TECHNICAL APPROACH IN PREDICTING THE FUTURE POPULATION

ALGORITHM OF THE CODE

1. Input

   current_population ,Growth_rate(%) ,target_year.

2. Convert growth rate to decimal

   Growth_rate = Growth_rate/100

3. Calculate years : years = target_year - 2025

4. Check: If target year is in future (i.e year >0) procee,otherwise exit.

5. Calculate predicted population

   current_population * (1 + Growth_rate)^ years

   5. Output

PROGRAMMING IN C

```c
#include <stdio.h>
#include <math.h>

double predict_population(double current_population, double Growth_rate, int years) {

    return current_population * pow(1 + Growth_rate, years);
}

int main() {
    double current_population, Growth_rate;
    int target_year, current_year = 2024;

    printf("Welcome to the Future Population Prediction Program!\n");
    printf("Please enter the following details:\n");


    printf("Current population : ");
    scanf("%lf", &current_population);

    printf("Annual growth rate : ");
    scanf("%lf", &Growth_rate);

    Growth_rate /= 100;

    printf("Target year for prediction : ");
    scanf("%d", &target_year);

    int years = target_year - current_year;

    if (years < 0) {
        printf("The target year must be in the future.\n");
        return 1;
    }

    double predicted_population = predict_population(current_population, Growth_rate, years);

    printf("Predicted population in %d: %.0f\n", target_year, predicted_population);

    return 0;
}
```

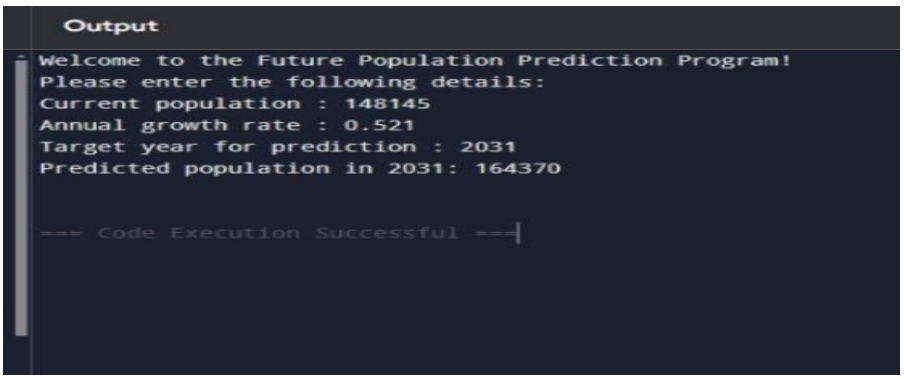
RESULTS

1. **RAJOURI**

   VARIABLES USED

   - CURRENT POPULATION
   - AVERAGE GROWTH RATE
   - TARGET YEAR

OUTPUT

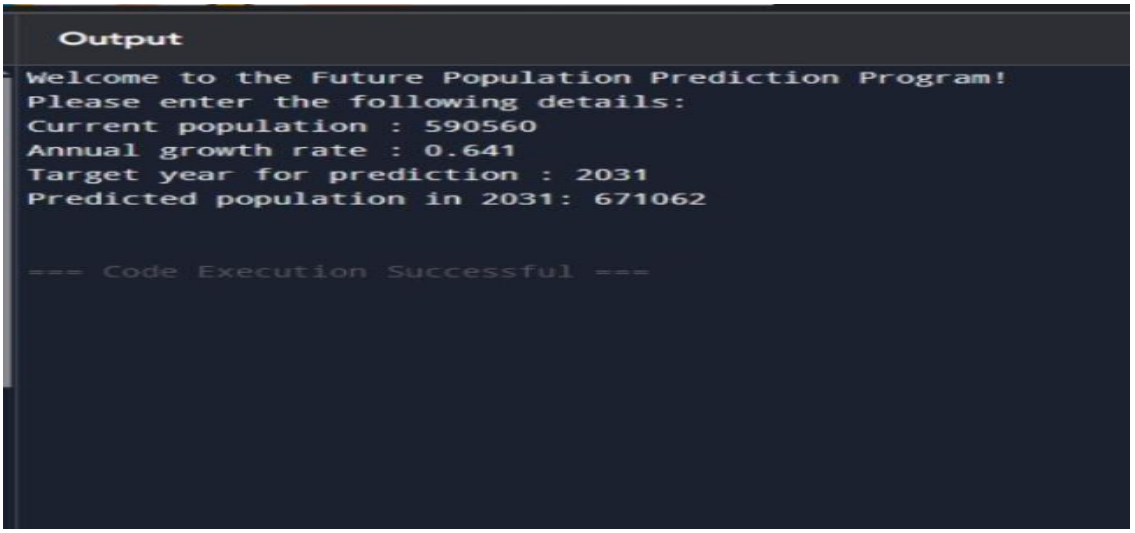


2. UDHAMPUR

VARIABLES USED

- CURRENT POPULATION
- AVERAGE GROWTH RATE
- TARGET YEAR

OUTPUT

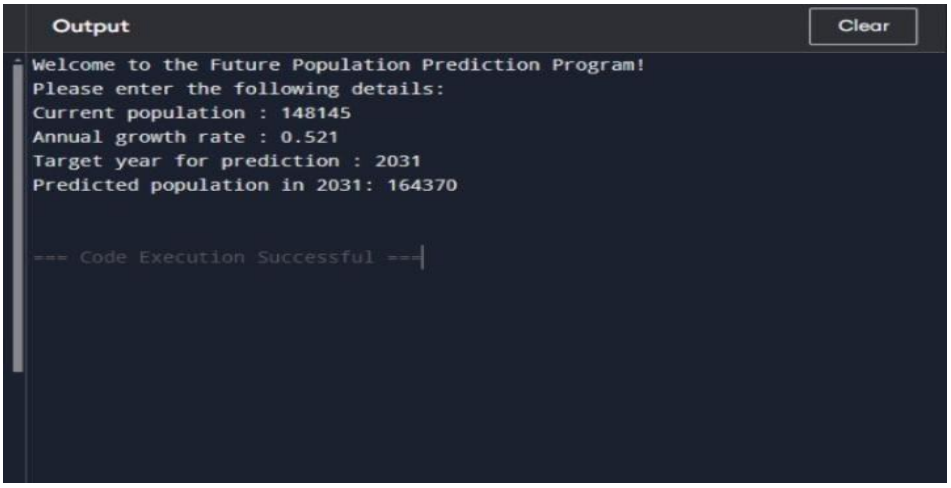


2. KARGIL

VARIABLES USED

- CURRENT POPULATION
- AVERAGE GROWTH RATE
- TARGET YEAR

OUTPUT


Output
Clear
Welcome to the Future Population Prediction Program!
Please enter the following details:
Current population : 148145
Annual growth rate : 0.521
Target year for prediction : 2031
Predicted population in 2031: 164370
=== Code Execution Successful ===

RECOMMADATIONS

Analyse Historical Trends:

- Examine census data from each decade to discover major population growth patterns together with unusual occurrences.
- Look for substantial historical events including migration and conflicts which affected population development over time.

Use Comparative Methods:

- An evaluation should determine how well the Arithmetic Increase Method performs relative to projection methods such as geometric and exponential.
- The analysis should confirm projection data by comparing it to official census statistics.

Incorporate Key Demographic Factors:

- The analysis requires data on birth rates and death rates and migration patterns.
- The growth patterns between rural and urban areas in J&K need examination.

Visual Representation:

- The data requires graphical displays using charts alongside maps to show the time-based evolution of population numbers.
- A chronological display of growth-influencing events should be included.

Policy Implications:

- The paper examines how changing population numbers affected the distribution of resources and shaped urban development and infrastructure projects in the region.
- The research should present recommendations about population management strategies for the future.

Limitations and Future Scope:

- The Arithmetic Increase Method faces restrictions when applied to dynamic population environments.
- Future projections should benefit from using sophisticated demographic analytical devices.

CONCLUSION

the analysis of population growth trends in Jammu and Kashmir (1951–2011) reveals significant demographic changes over six decades. The population grew steadily, influenced by factors such as economic development, improved healthcare, migration, and sociopolitical conditions. Using the Arithmetic Increase Method, it is evident that the growth rate was relatively consistent over the years, though fluctuations occurred due to regional conflicts and migration patterns.

This study highlights the importance of understanding population trends for effective resource allocation, infrastructure development, and policymaking. While the Arithmetic Increase Method provides a foundational perspective, integrating more dynamic models can better address the complex demographic realities of J&K for future projections and planning.

FUTURE SCOPE

- **Policy Formulation:** The data provides essential information to guide decisions about resource distribution together with urban development and healthcare systems and educational infrastructure growth in J&K.The information helps develop strategies to handle population density alongside environmental sustainability objectives.
- **Migration Studies**: The research evaluates how migration patterns affect population statistics and social-economic progress throughout the region.
- **Fertility and Mortality Analysis**: The analysis of shifting birth and death rates helps healthcare planners design better population management strategies.
- **Conflict and Displacement Impact:** The research analyzes how political conflicts and instability affect population patterns and migration movements and settlement distribution.
- **Regional Development Trends**: The study examines population expansion across different regions of J&K to understand how rural-to-urban migration shapes the region's urban development.
- **Future Projections**: The analysis should be expanded to predict population projections which will shape J&K's future up to 2050 and beyond.
- **Economic Impact Studies:** Connect J&K's population expansion rates to local economic developments in the jobs market and industrial improvements and consumer income levels.

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