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# Spatial Distribution of Elementary Schools in Chitradurga District, Karnataka: A GIS Approach

Lakshmidēvi. B<sup>1</sup>, Dr. Nagaraj. H<sup>2</sup>

<sup>1</sup>Research Scholar, <sup>2</sup>Professor, Department of Studies in Geography, University of Mysore, Mysore-570006, India

**Abstract--** The spatial distribution of schools is a fundamental aspect of educational planning. Understanding the spatial distribution of elementary schools is essential for several reasons as it provides valuable insights into the distribution, accessibility, and effectiveness of educational institutions within a specific region. Thus, this study aims to undertake a comprehensive mapping of elementary schools located within the Chitradurga district, Karnataka, using a Geographic Information System (GIS) approach. The objective of the study is to assess the information about elementary schools and identify their spatial distribution within the district. The study utilizes school data obtained from the Department of Education, Karnataka, and location data from other relevant sources. The research findings highlight the spatial patterns and distribution of elementary schools in the study area.

**Keywords--** spatial distribution, elementary schools, Geographic Information System (GIS)

## I. INTRODUCTION

Education is indispensable for individual growth and societal progression, as it provides individuals with the skills and knowledge needed to succeed (Sharma, 2011; Gupta, 2015; Patel, 2018). It is crucial to the well-being of any society, and in a developing nation like India, it plays a fundamental task in advance the welfare of its citizens. Since independence, India has made prominent evolution in the field of education. The country's vast socio-cultural diversity, encompassing a variety of religions and languages, is reflected in its education system. This diversity is considered when providing educational opportunities, ensuring access for all, regardless of caste, class, gender, or location.

As per the Constitution with Article 21A, Education is a fundamental right which mandating free and compulsory education for children aged 6 to 14 years. This guarantees the equitable access to education despite of socio-economic background (Mehta, 2020).

Primary education is the foundational learning stage which providing young learners with essential skills and knowledge (Jayalakshmi, et. al). Without going through the Elementary level of education, individuals cannot proceed to the secondary and higher levels of education (Subba and Yodida).

The aim of elementary education is to make every learner of 6 - 14 year old to obtain base skills such as the ability to read and write with fluency, numeracy, comprehension, analysis, reasoning and social skills such as teamwork.

India has a long history of implementing policies and reforms aimed at improving elementary education. Some of these policies have had a considerable impact on shaping the country's educational landscape. Sarva Shiksha Abhiyan (SSA) focused on universalizing elementary education by providing free and compulsory education to all children aged 6 to 14 years. The Right to Education (RTE) Act of 2009 further reinforced this by making education a fundamental right for children in this age group. The RTE Act ensures free and compulsory education, prohibits discrimination, and sets standards for infrastructure, teacher-student ratios, and curriculum.

More recently, the National Education Policy (NEP) 2020 aims to transform the education system by emphasizing holistic development, a flexible curriculum, and digital learning. The NEP 2020 focuses on foundational literacy and numeracy, vocational education, and teacher training. These policies reflect India's commitment to improving both the quality and accessibility of elementary education, with a focus on inclusivity and equity.

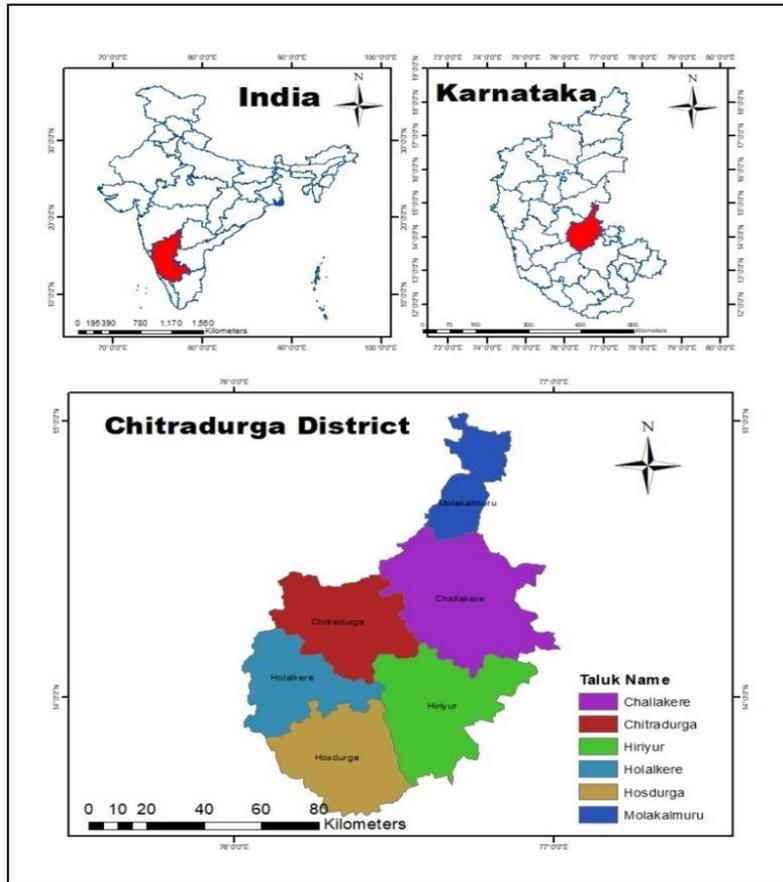
However, while significant progress has been made in elementary education, the universalization of elementary education (UEE) has yet to be fully achieved (Nath). Several challenges persist, including social, moral, and population-related issues, environmental concerns, high dropout rates, and problems of integration. Disparities in access to education and the quality of educational resources are particularly pronounced between urban and rural areas, posing severe consequences for rural development (Moulton, 2018).

## II. STUDY AREA

Chitradurga is a district located in the central region of Karnataka state, located at latitude of 14° 13' 48.00" North and a longitude of 76° 24' 1.37" East. Covering a total geographical area of 8,388 square kilometers, the district accounts for 4.40 percent of Karnataka's total land area.

The district shares its borders with Tumkur District to the southeast and south, Chikmagalur District to the southwest, Davanagere District to the west, Bellary District to the north, and Anantapur District of Andhra Pradesh to the east.

Administratively, Chitradurga is divided into six taluks: Chitradurga, Challakere, Hiriyyur, Holalkere, Hosadurga, and Molakalmuru.



**Fig.1**Map showing the location of Chitradurga district in Karnataka, India, and taluks in Chitradurga district.

**III. OBJECTIVE**

This study aims to conduct an in-depth study of the spatial distribution of elementary schools across Chitradurga district, Karnataka, by mapping and examining the geographic extend of schools within the districts of six taluks such as Chitradurga, Challakere, Hiriyyur, Holalkere, Hosadurga, and Molakalmurutaluk. Hence, the study seeks to analyze the spatial distribution of elementary schools in Chitradurga district.

**IV. METHODOLOGY**

The data was collected from the Deputy Director of Public Instraction (DDPI) office Chitradurga district to assess the existing schools. However the location information (Latitude and Longitude) of these schools are not available in the DDPI office, so schools latitude and longitude were identified from schoolgis.nic.in web portal using unique school code. Further, based on each schools collected latitude and longitude, the point location of schools was created using ArcGIS 10.5 software, and Taluk wise spatial istribution of elementary schools was identified and mapped.

V. DISTRIBUTION OF ELEMENTARY SCHOOLS IN CHITRADURGA DISTRICT

<b>List of Schools by Management - Chitradurga District</b>		
<b>Sl. No</b>	<b>Management</b>	<b>Number of Schools</b>
1	Department of Education	1765
2	Jawahar Navodaya Vidyalaya	1
3	Other State Govt. Managed Schools	6
4	Private Aided	312
5	Private Unaided	365
6	Tribal Welfare Department Schools	45
<b>Total</b>		<b>2494</b>
Source: Deputy Director of Public Instruction		

The distribution of elementary schools is a significant phase of educational planning, as it determines the accessibility and availability of education for children in different regions. The data on existing schools in Chitradurga District was obtained from the Deputy Director of Public Instruction (DDPI) Office, Chitradurga District. It was found that there are a total of 2,494 schools in the district.

Among these, 1,765 schools are managed by the Department of Education, whereas one school is managed by Jawahar Navodaya Vidyalaya. In addition, six schools are managed by other state governments, 312 schools are managed by Private Aided institutions, 365 schools are Private Unaided, and 45 schools are under the jurisdiction of the Tribal Welfare Department Schools.

<b>List of Schools by Category – Chitradurga District</b>		
<b>Sl.No</b>	<b>School Category</b>	<b>Number of Schools</b>
1	Primary	862
2	Primary with Upper Primary	1042
3	Primary, Upper Primary and Secondary only	74
4	Upper Primary and Secondary	45
5	Secondary Only	327
6	Secondary with Higher Secondary	40
7	Upper Primary, Secondary and Higher Secondary	1
8	Higher Secondary Only	83
9	Upper Primary Only	16
10	Primary with Upper Primary Secondary and Higher Secondary	4
<b>Total</b>		<b>2494</b>



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There are a total of 2,496 schools, Classification of schools by categories or grades, it was found that 862 schools are primary schools, 1042 schools are Primary with Upper Primary, 74 schools are Primary, Upper Primary and Secondary , 45 schools are Upper Primary and Secondary, 327 schools are Secondary Only, 40 schools are Secondary with Higher Secondary, 1 school is Upper Primary, Secondary and Higher Secondary, 83 schools are Higher

Secondary Only, 16 schools are Upper Primary Only and 4 schools are Primary with Upper Primary, Secondary and Higher Secondary.

Since this study only focuses on elementary schools in Chitradurga district, Karnataka, this analysis considers only the data related to primary and upper primary schools. Thus, the elementary schools are extracted from the above table.

<b>Number of Elementary Schools by Management</b>		
<b>Sl.No</b>	<b>Management</b>	<b>No. of Schools</b>
1	Department of Education	1640
2	Private Unaided	197
3	Private Aided	75
4	Tribal Welfare Department Schools	6
5	Other State Govt. Managed Schools	2
<b>Total</b>		<b>1920</b>
Source: Source: Deputy Director of Public Instruction		

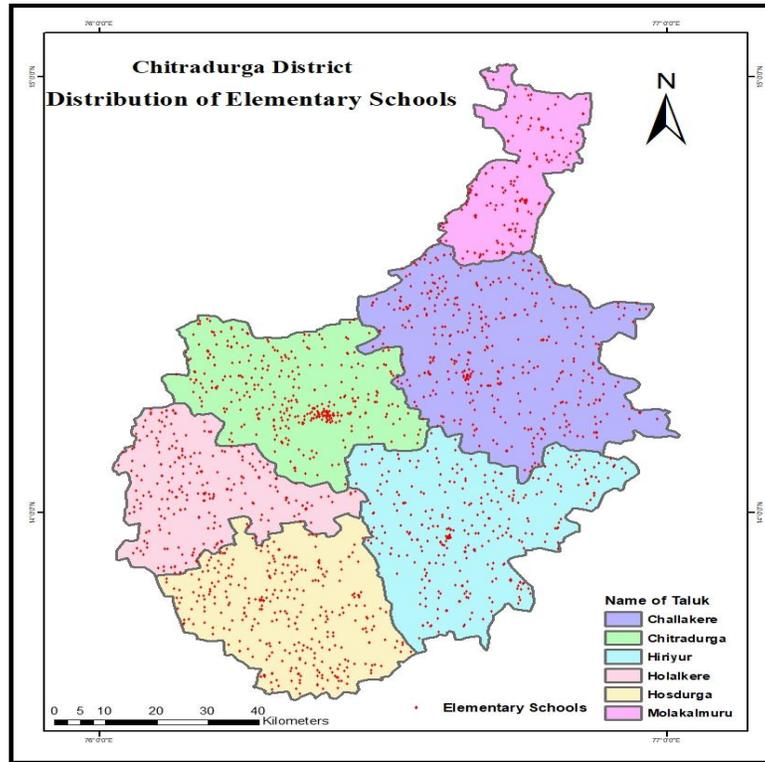
In Chitradurga District, there are a total of 1,920 elementary schools. Among these, 1,640 are managed by the Department of Education, 197 are private unaided, 75 are private aided, 6 are run by the Tribal Welfare Department,

and 2 are other state government schools. Since the study focuses only on government-managed elementary schools, a total of 1,723 schools are analyzed.

<b>Number of Elementary Schools by Taluks</b>		
<b>Sl.No</b>	<b>Taluk Name</b>	<b>Number of Schools</b>
1	Challakere	265
2	Chitradurga	209
3	Hiriyur	320
4	Holalkere	313
5	Hosadurga	299
6	Molakalmuru	317
<b>Total</b>		<b>1723</b>
Source: Source: Deputy Director of Public Instruction		

According to the table, Hiriyuru taluk has the highest number of elementary schools at 320, followed by Molakalmuru with 317, Holalkere with 313, Challakere with 265, Hosadurga with 299, and Chitradurga with 209. The total number of elementary schools in all these taluks combined is 1723.

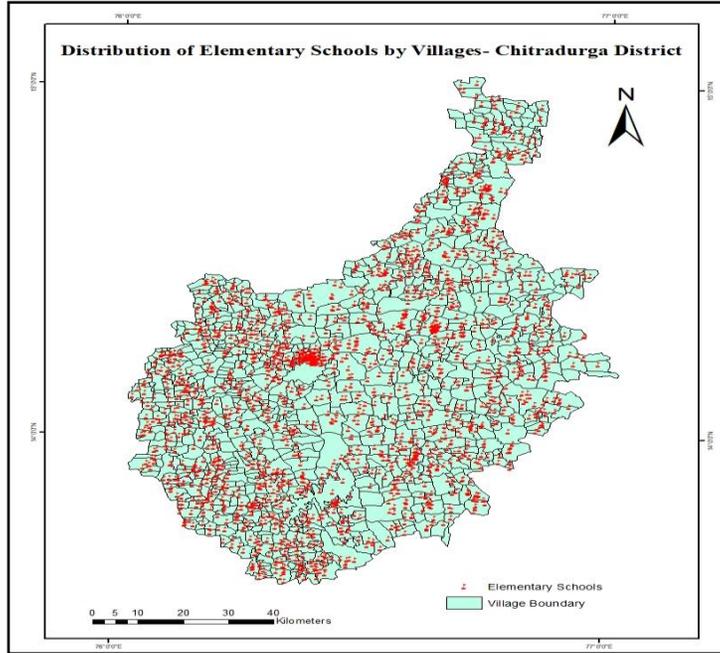
After confirming that the elementary schools provide education from 1st to 8th standard, this information was geographically mapped using ArcGIS. The maps below illustrate the distribution of these schools across the different taluks in the region.



**Fig.2 Taluk wise distribution of schools in Chitradurga district**

The Fig.2 illustrates the distribution of schools by taluk within Chitradurga district. This comprehensive representation provides valuable insights into the allocation of educational facilities across various regions.

It effectively highlights the dispersion of elementary schools, revealing how they are distributed throughout the district.



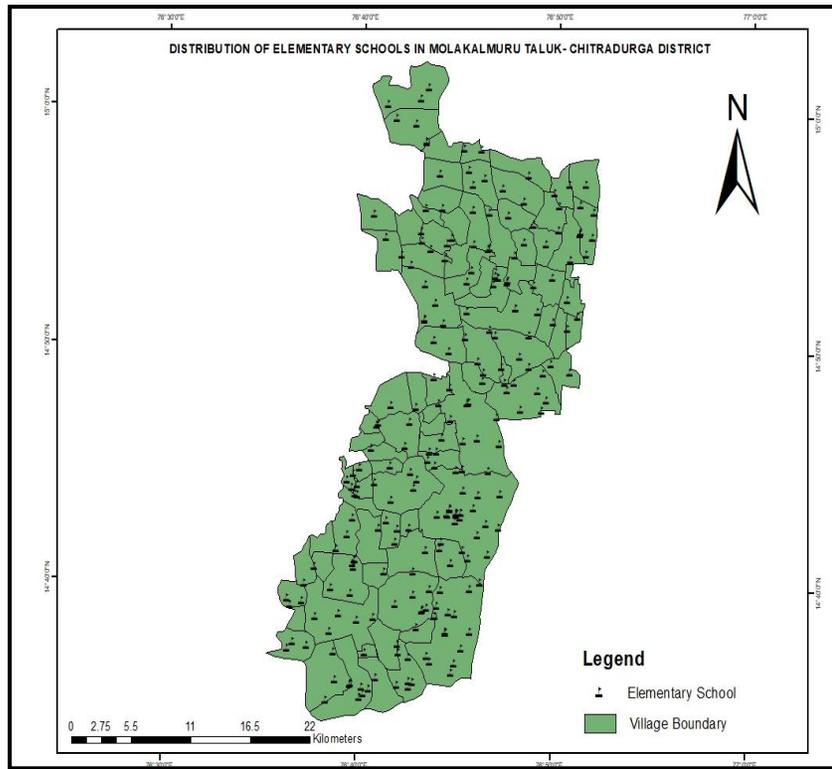
**Fig.3 village-wise distribution of schools within Chitradurga district**

The Fig.3 depicts the village-wise distribution of schools within Chitradurga district. This spatial representation provides valuable insights into the geographical spread of elementary schools across the different villages, highlighting patterns and disparities in educational accessibility throughout the region.

**MOLAKALMURUTALUK**

In Molakalmuru taluk of Chitradurga district, there are a total of 317 elementary schools.

Among that, 305 schools are under the management of the Department of Education, while 11 schools receive private aid, and 1 school is overseen by the Tribal Welfare Department. Of these schools, 159 provide primary education, 156 offer both primary and upper primary education, and 2 exclusively provide upper primary education. Fig.4 shows that the distribution of elementary schools in Molakalmuru taluk, Chitradurga district.



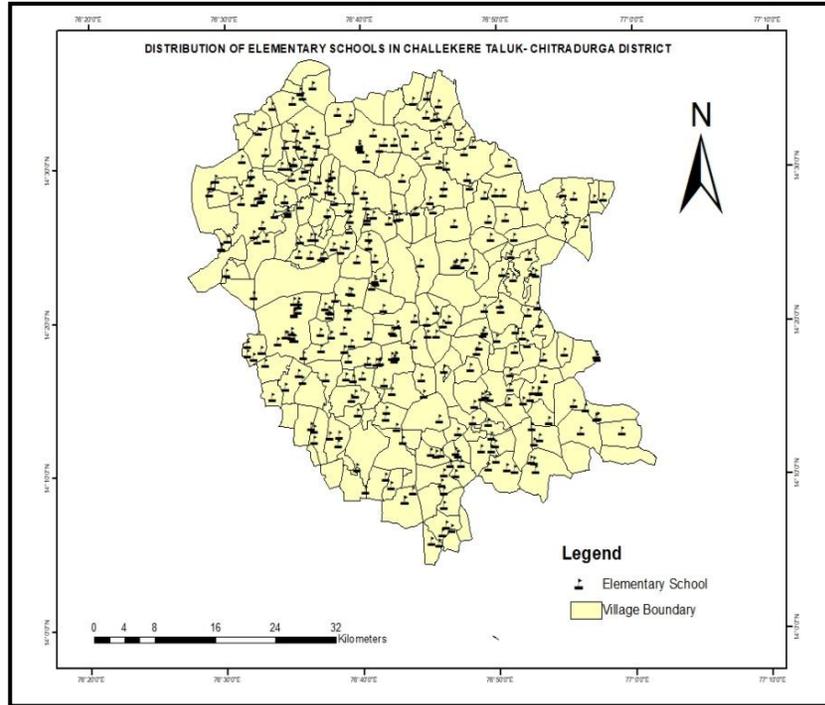
**Fig.4 Distribution of Elementary schools in Molakalmuru taluk**

**CHALLAKERETALUK**

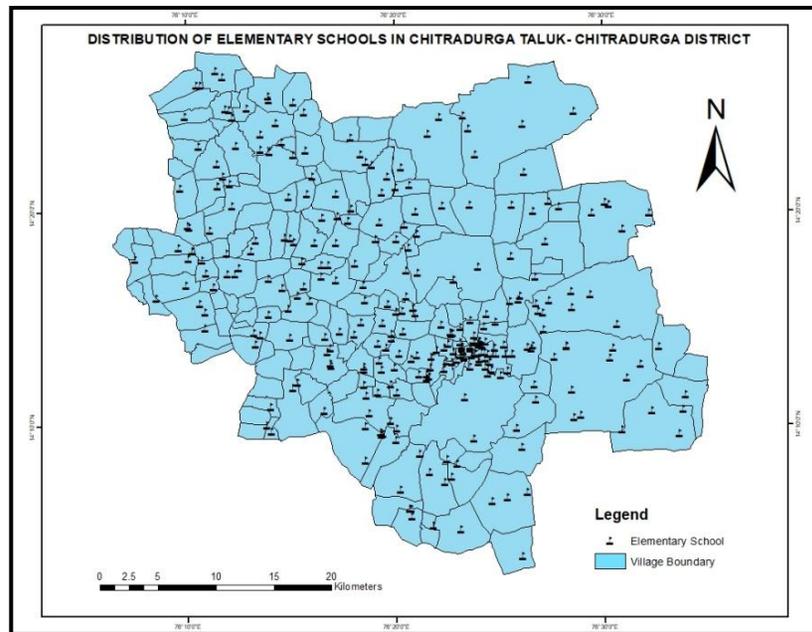
In Challakere taluk of Chitradurga district, there are a total of 265 elementary schools. Among that, 252 schools are under the management of the Department of Education, while 12 schools receive private aid, and 1 school is managed by other state government. Of these schools, 135 provide primary education, 126 offer both primary and upper primary education, and 4 exclusively provide upper primary education. Fig.5 shows that the distribution of elementary schools in Challakere taluk, Chitradurga district.

**CHITRADURGATALUK**

In Chitradurga taluk in Chitradurga District, There are total **209** elementary schools. 187 schools are managed by Department of Education, 21 schools are private aided and 1 school is managed by Tribal Welfare Department. 51 schools are providing only primary education, 156 schools are providing Primary with Upper Primary and 2 schools are Upper primary schools. Fig.6 shows that the distribution of elementary schools in Chitradurga taluk, Chitradurga district.



**Fig.5 Distribution of Elementary schools in Challakere taluk**

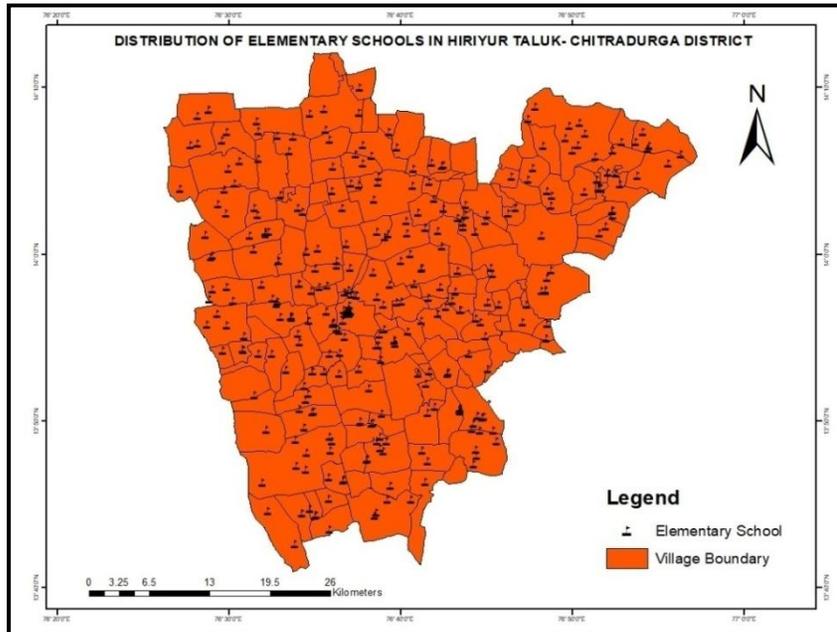


**Fig.6 Distribution of Elementary schools in Chitradurga taluk**

*HIRIYURTALUK*

In Hiriyuru taluk in Chitradurga District, there are **320** elementary schools 311 schools are managed by Department of Education, 8 schools are private aided and 1 school is managed by Tribal Welfare Department.

159 schools are providing primary education and 161 schools are 156 schools are Primary with Upper Primary schools. Fig.7 shows that the distribution of elementary schools in Hiriyuru taluk, Chitradurga district.

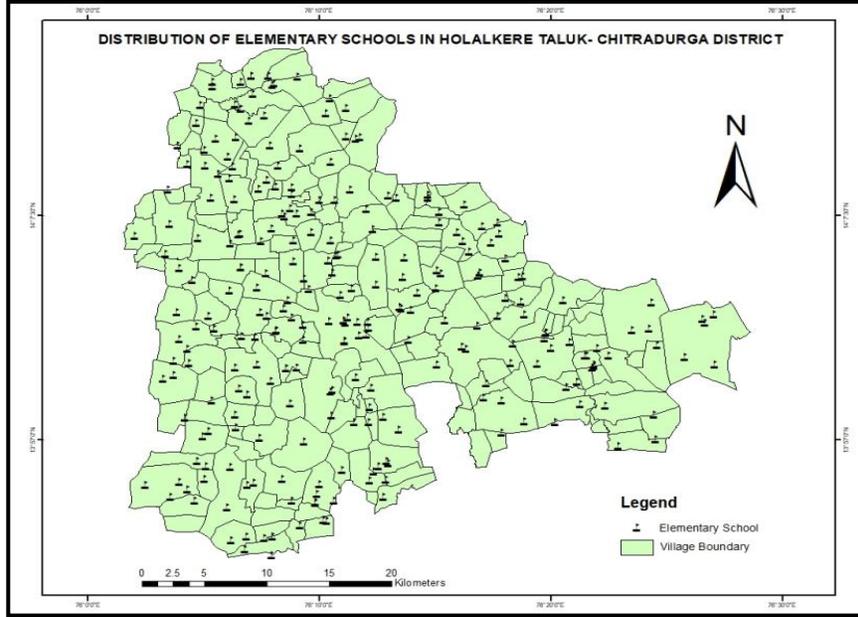


**Fig.7 Distribution of Elementary schools Hiriyuru taluk**

*HOLALKERE TALUK*

In Holalkere taluk in Chitradurga District, there are **313** elementary schools. Among 313, 302 schools are managed by Department of Education, 9 schools are private aided, 1 school is managed by Tribal Welfare Department and 1 school managed by other state government.

158 schools are providing only primary education, 154 schools are providing Primary with Upper Primary and 1 school is Upper primary school. Fig.8 shows that the distribution of elementary schools in Holalkere taluk, Chitradurga district.



**Fig.8 Distribution of Elementary schools Holalkere taluk**

*HOSADURGA TALUK*

In Hosadurga taluk in Chitradurga District, there are **299** elementary schools. 283 schools are run by the Department of Education, while 14 schools are classified as private aided institutions, and 2 schools are run by the Tribal Welfare Department.

Among these, 158 schools provide primary education, 139 schools offer primary education with upper primary levels, and 2 schools are designated as upper primary schools. Fig.9 shows that the distribution of elementary schools in Hosadurga taluk, Chitradurga district.

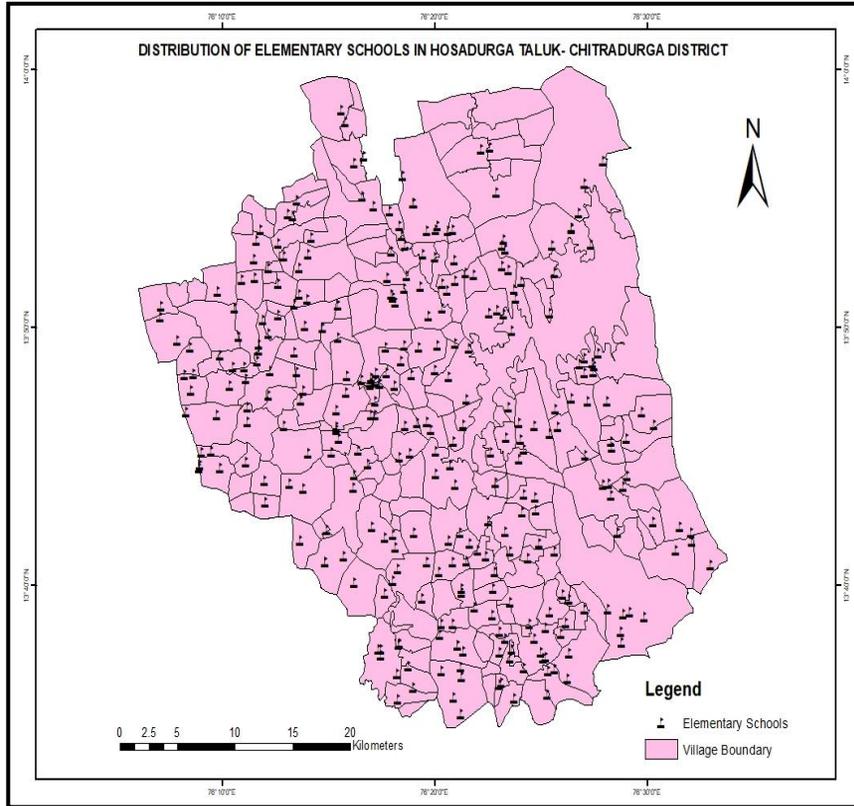


Fig.9 Distribution of Elementary schools Hosadurga taluk

## VI. DISCUSSION

This study aimed to explore the spatial distribution of elementary schools across Chitradurga District, Karnataka, using data from the Deputy Director of Public Instruction (DDPI) office and Geographic Information Systems (GIS) technology. Through GIS mapping, a clear understanding of the exact locations and distribution of schools across the district was achieved, providing insight into the accessibility of educational facilities.

The distribution of elementary schools in Chitradurga District discloses considerable disparities in access to education across different regions. The greater part of schools are managed by the Department of Education, highlighting the government's leading role in ensuring educational access, particularly in rural areas. However, the existence of private aided and unaided schools recommends a degree of privatization, introducing some level of competition and choice in the educational landscape.

The analysis also shows that the distribution of schools difference significantly across taluks. **Hiriyuru taluk** has the highest concentration of elementary schools, followed by **Molakalmuru, Holalkere, and Challakere**. Interestingly, **Chitradurga taluk**, although being the district headquarters, has a comparatively lower number of elementary schools, which may point to urban-rural educational planning dynamics or a concentration of substitute educational institutions like secondary or higher-secondary schools in the area.

In all taluks, the majority of elementary schools are managed by the Department of Education, supports the state's considerable presence in the education sector. Private aided schools and schools managed by the Tribal Welfare Department also contribute to the educational landscape, offering alternative approaches and educational choices, particularly in areas where public schools may not meet definite community needs.



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In addition, the majority elementary schools offer both primary and upper primary education, reflecting a focus on providing comprehensive and continuous education for children. The distribution of school types, however, varies across taluks. Some areas have a high proportion of primary-only schools, whereas others have a more balanced mix, which may influence educational accessibility and quality in those regions.

#### VII. CONCLUSION

The study, with the help of GIS, examined the distribution of elementary schools in Chitradurga District, Karnataka. The analysis provided understanding of the accessibility and availability of educational resources. The study reveals a strong government occurrence in the education sector, with the majority of schools managed by the Department of Education. This domination is predominantly prominent in rural areas, where government schools play a fundamental role in ensuring educational access.

Whereas government-managed schools predominate, the presence of private aided, unaided, and tribal welfare schools adds diversity to the educational setting. These institutions offer families alternative options and can foster competition, potentially improving educational quality.

However, the study also highlights disparities in school distribution among taluks. Some areas, such as Hiriyuru, have a high attention of schools, whereas others, like Chitradurga, have a comparatively lesser number. These disparities can influence accessibility and educational outcomes.

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