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A GEOGRAPHICAL STUDY OF TEMPORAL DYNAMICS OF IRRIGATED AREA UNDER DIFFERENT IRRIGATION PROJECTS IN SOLAPUR DISTRICT – A GEOGRAPHICAL PERSPECTIVE

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ABSTRACT

The semi-arid Solapur district of Maharashtra faces persistent water scarcity and erratic rainfall, making irrigation projects indispensable for agricultural development. This study examines spatial and temporal variations in irrigated area across minor, medium, and major irrigation projects during 2013–14, 2017–18, and 2023–24. Using secondary data from official reports, census abstracts, and district-level statistics, supplemented by field observations, the analysis covers taluka-wise trends through absolute and percentage growth rates, cartographic techniques, and thematic representations. Findings reveal that the total irrigated area in Solapur district nearly tripled (+190.91%) over the decade, with major projects contributing the highest expansion (+358.14%). Minor projects also grew significantly (+177.62%), while medium projects remained stagnant (+5.34%), leading to sharp regional disparities. High-growth tahsils such as Mohol (+1262.48%), Mangalwedha (+885.15%), and Pandharpur (+765.18%) benefited from large-scale canal and reservoir development, whereas Barshi (-5.24%), Malshiras (-37.40%), and Akkalkot (-32.38%) registered stagnation or decline due to contraction in medium irrigation sources.

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INTRODUCTION

Irrigation plays a vital role in the agricultural development of Solapur district, where rainfall is low, irregular, and uncertain due to its semi-arid climate. In such conditions, irrigation ensures stable crop production, enhances agricultural productivity, and secures the livelihood of farming communities. It not only supports food security but also strengthens the rural economy by enabling farmers to cultivate water-intensive and commercial crops. Thus, irrigation is the backbone of sustainable agriculture in the region.

The significance of different types of irrigation projects—minor, medium, and major—is crucial in understanding Solapur's irrigation dynamics. **Minor projects** cater to localized needs, providing water to small villages and scattered farmlands. **Medium projects** extend irrigation to larger areas, balancing local and regional demands. **Major projects** serve as the most dominant source, covering vast command areas and ensuring large-scale agricultural development. Together, these three categories form a comprehensive irrigation system that supports varied crops, reduces regional disparities, and stabilizes agricultural growth.

This geographical study examines the **temporal dynamics of irrigated area** in Solapur district during 2013–14, 2017–18, and 2023–24. In 2013–14, the district reported **28,624 ha under minor projects, 46,255 ha under medium projects, and 53,607 ha under major projects**. The trend continued in 2023–24 with further expansion to **79,464.95 ha (minor), 48,724 ha (medium), and 2,45,593 ha (major projects)**. These figures clearly highlight the growing importance of irrigation projects, particularly major projects, in transforming Solapur's agricultural landscape and strengthening its role in regional economic development.

NEED OF THE STUDY

1. Semi-arid climate and rainfall uncertainty – Solapur district faces low and irregular rainfall, making irrigation the most reliable source for sustaining agriculture and ensuring food security.
2. Dependence on irrigation projects – Farmers in the district rely heavily on minor, medium, and major irrigation projects, and understanding their role is essential for analyzing agricultural development.
3. Temporal changes in irrigated area – The irrigated area has shown remarkable changes between 2013–14, 2017–18, and 2023–24, highlighting the importance of studying spatial and temporal variations.
4. Dominance of major projects – Data shows a significant rise in irrigated area under major projects (53,607 ha in 2013–14 to 2,45,593 ha in 2023–24), indicating their increasing importance in the regional irrigation system.
5. Regional disparities in irrigation – Taluka-wise distribution reveals uneven benefits, with some talukas like Mohol, Pandharpur, and Mangalwedha showing high dependence, while others have

relatively limited irrigation coverage.

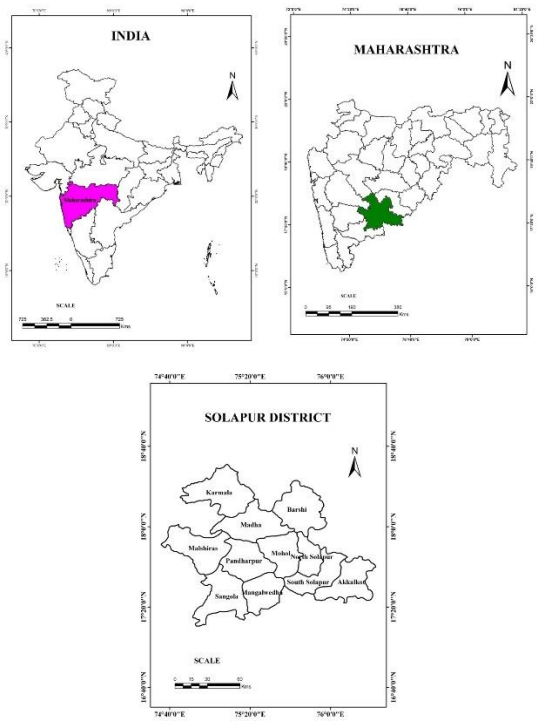
6. Impact on agricultural productivity – Irrigation expansion directly influences crop choices, crop intensity, and productivity levels, making it vital to study its geographical implications.

7. Policy and planning significance – Findings will provide a knowledge base for future irrigation planning, resource allocation, and sustainable agricultural development in Solapur district.

STUDY AREA

The present study is confined to Solapur district of Maharashtra, located in the semi–arid region of Western Maharashtra, which forms part of the rain–shadow zone of the Deccan Plateau. The district lies between 17°10′ to 18°32′ North latitudes and 74°42′ to 76°15′ East longitudes, covering a total geographical area of about 14,895 sq. km. Administratively, it consists of 11 talukas—Karmala, Madha, Barshi, North Solapur, South Solapur, Mohol, Pandharpur, Malshiras, Sangola, Mangalwedha, and Akkalkot. The district is drained by the Bhima River and its tributaries, which provide the base for irrigation development. Soils are predominantly black cotton (regur) soils, which are fertile but highly dependent on irrigation due to low and erratic rainfall (annual average around 545 mm). Agriculture is the main occupation, and crops like sugarcane, jowar, bajra, wheat, and pulses dominate the landscape. Given these conditions, the district has developed an extensive network of minor, medium, and major irrigation projects. Studying the temporal dynamics of irrigated area under these projects (2013–14, 2017–18, and 2023–24) is crucial for understanding changes in water use, agricultural productivity, and regional disparities in irrigation development.

LOCATION MAP



OBJECTIVES OF THE STUDY

1) To examine the spatial and temporal changes in irrigated area under Minor, Medium, and Major irrigation projects in Solapur district during the period 2013–14 to 2023–24.

2) To analyze tahsil-wise growth patterns of irrigation development by classifying areas into high, moderate, and low/negative growth categories.

DATABASE AND METHODOLOGY

The present study, "A Geographical Study of Temporal Dynamics of Irrigated Area under Different Irrigation Projects in Solapur District – A Geographical Perspective", is based on both primary and secondary sources of information. Secondary data were collected from the Irrigation Department of Maharashtra, District Statistical Abstracts, Socio-Economic Abstracts, Census reports, and published research papers, while primary insights were obtained through field visits, informal farmer interactions, and consultations with irrigation officials. Taluka-wise data on irrigated area under Minor, Medium, and Major irrigation projects for 2013–14 and 2023–24 were compiled, tabulated, and analyzed to calculate absolute change and growth percentages. The percentage growth formula and ratio comparisons were applied to measure relative changes, and tahsils were classified into high, moderate, and low/negative growth categories. Cartographic and statistical techniques such as tables, graphs, and thematic maps were used to represent spatio-temporal variations, ensuring that both quantitative accuracy and geographical interpretation were achieved for a holistic understanding of irrigation dynamics in the district.

DATA ANALYSIS

Solapur district, located in the rain–shadow zone of Maharashtra, faces recurring droughts, erratic rainfall, and water scarcity. In this semi–arid setting, irrigation projects—minor, medium, and major—act as lifelines for agriculture and rural livelihoods. At the district level, the total irrigated area nearly tripled (+190.91%) between 2013–14 and 2023–24. The main driver was the Major projects (+358.14%), which contributed the largest share of new irrigated land. Minor projects (+177.62%) also expanded substantially, while Medium projects (+5.34%) remained almost stagnant. These temporal variations highlight both the transformative power of irrigation and the regional disparities in its benefits. Understanding such dynamics is crucial for assessing water sustainability, cropping patterns, and long-term agricultural development in Solapur district. The overall pattern shows that tahsils benefiting from Major-project command expansion surged ahead, while those suffering from Medium-project decline (Barshi tahsil, Akkalkot tahsil, Malshiras tahsil) either stagnated or declined.

Table NO. 1
SOLAPUR DISTRICT: AREA UNDER DIFFERENT IRRIGATION PROJECT (2013-14 AND 2023-24)

Sr. No.	Taluka	Minor Project Benefited Area (ha)		Growth in %	Medium Project Benefited Area (ha)		Growth in %	Major Project Benefited Area (ha)		Growth in %	Total		Growth in %
		2013-14	2023-24		2013-14	2023-24		2013-14	2023-24		2013-14	2023-24	
1	Karmala	5968	8746	46.55	3116	4048	29.91	5900	23368	296.07	14984	36162	141.34
2	Madha	748	5460.78	630.05	1400	13889	892.07	24657	42441	72.13	26805	61790.78	130.52
3	Barshi	5064	10911	115.46	13909	6944	-50.08	2086	2100	0.67	21059	19955	-5.24
4	North Solapur	447	2078	364.88	2610	2289	-12.30	2300	8984	290.61	5357	13351	149.23
5	Mohol	338	6214	1738.46	1720	1800	4.65	2942	60110	1943.17	5000	68124	1262.48
6	Pandharpur	2400	4880	103.33	1600	5300	231.25	3100	51248	1553.16	7100	61428	765.18
7	Malshiras	2200	886	-59.73	1800	1400	-22.22	2950	2065	-30.00	6950	4351	-37.40
8	Sangola	1700	1838	8.12	2500	2300	-8.00	3000	3200	6.67	7200	7338	1.92
9	Mangalwedha	1400	26014	1758.14	1800	2900	61.11	3400	36106	961.94	6600	65020	885.15
10	South Solapur	1181	2938.17	148.79	1940	4184	115.67	2260	14229	529.60	5381	21351.17	296.79
11	Akkalkot	7178	9499	32.33	13860	3670	-73.52	1012	1742	72.13	22050	14911	-32.38
Total	**District**	28624	79464.95	177.62	46255	48724	5.34	53607	245593	358.14	128486	373782	190.91

Source: District Socio-Economic Abstract, 2013-14 and 2023-24

In case of High-growth tahsils, Mohol tahsil (+1262.48%) recorded the highest growth in the district. The jump is mainly anchored in a massive +1943% rise in the Major project area (2,942 → 60,110 ha), supported by an extraordinary +1738% rise in Minor projects. Together, these expansions multiplied the total irrigated area more than twelve times. Mangalwedha tahsil (+885.15%) also witnessed explosive growth. The Major project area rose sharply by +962% (3,400 → 36,106 ha), while the Minor projects increased even more steeply (+1758%). This dual growth pushed the tahsil into the high-growth category. Pandharpur tahsil (+765.18%) combined strong gains across all three sectors. The Major project area surged +1553% (3,100 → 51,248 ha), the Medium projects expanded +231%, and the Minor projects grew +103%. This balanced growth ensured Pandharpur became one of the leading tahsils in irrigation expansion. South Solapur tahsil (+296.79%) achieved nearly three-fold growth. The Major project area expanded by +530% (2,260 → 14,229 ha), complemented by positive gains in Minor (+149%) and Medium (+116%) projects. The strong role of Major irrigation defines the tahsil's success (in Table no. 1and Fig.No.2.

In case of Moderate-growth tahsils, Karmala tahsil (+141.34%) showed a steady rise. The Major project area increased by +296% (5,900 → 23,368 ha), which served as the main driver. Both Minor and Medium categories added modest but positive contributions, ensuring the tahsil's

place in the moderate band. North Solapur tahsil (+149.23%) grew mainly due to the Major project area (+291%, 2,300 → 8,984 ha). While the Medium projects declined slightly (-12%), and Minor increased strongly (+365%), the overall effect was a significant positive change. Madha tahsil (+130.52%) is unique because the Minor projects (+630%) and Medium projects (+892%) rose sharply from very small bases. The Major project area also grew (+72%), adding weight in absolute terms (24,657 → 42,441 ha). The combined effect placed Madha tahsil firmly in the moderate-growth category (in Table no. 1and Fig.No.2.

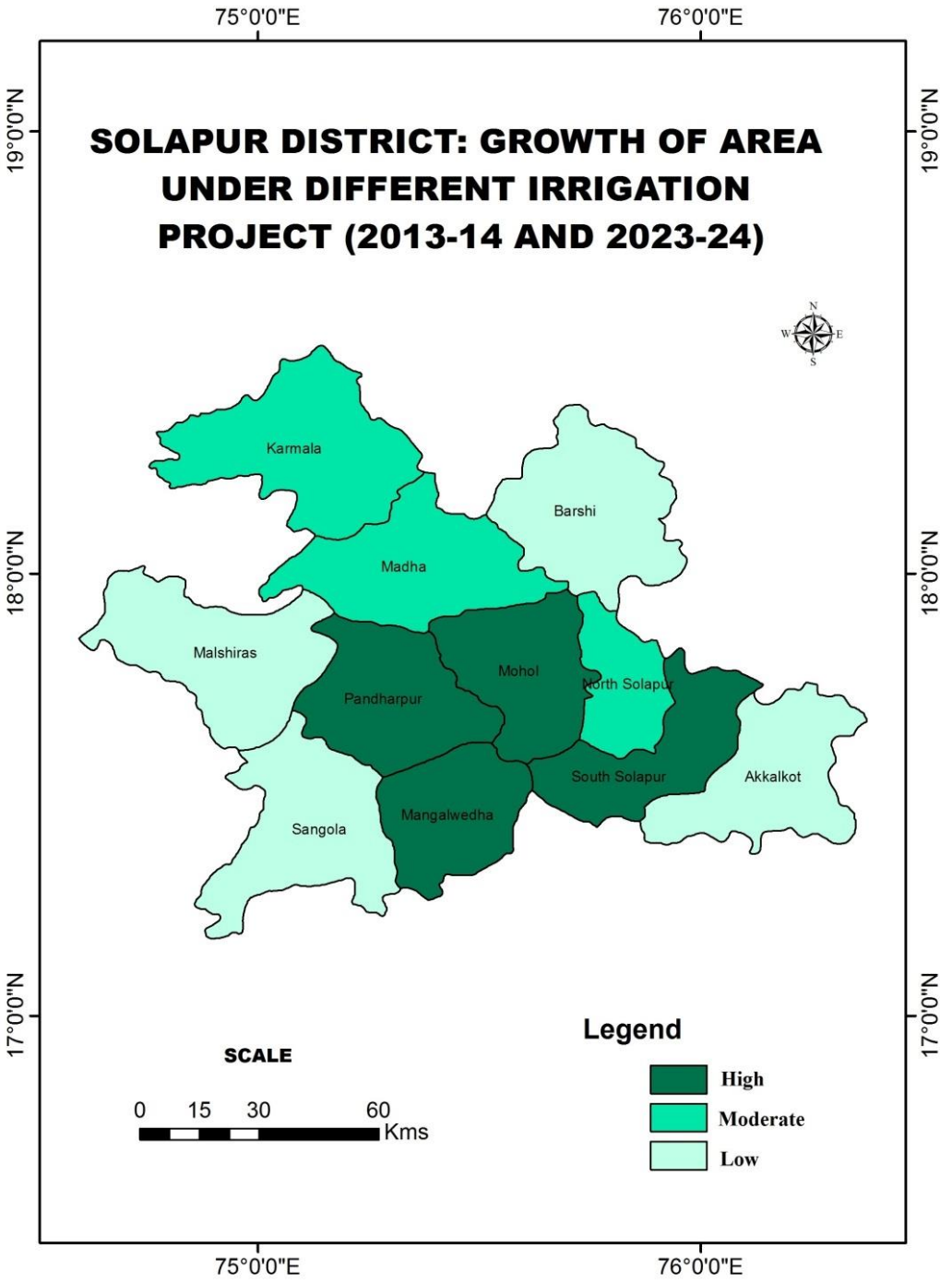


Fig.No.2

In case of Low or negative-growth tahsils, Sangola tahsil (+1.92%) remained stagnant overall. Minor (+8%) and Major (+6.7%) projects rose slightly, but a decline in Medium projects (-8%) neutralized the gains, leaving the tahsil nearly flat. Barshi tahsil (-5.24%) recorded negative growth. Although the Minor projects increased by +115%, the Medium projects halved (-50%, 13,909 → 6,944 ha), and Major projects remained almost constant (+0.67%). The heavy loss in Medium projects caused the overall decline. Malshiras tahsil (-37.40%) faced contraction in all categories. The Minor projects reduced by -60%, Medium projects by -22%, and Major projects by -30%. This combined downfall made Malshiras one of the weakest performers in the district. Akkalkot tahsil (-32.38%) also declined, mainly due to the Medium project area plummeting -73% (13,860 → 3,670 ha). Though Minor (+32%) and Major (+72%) projects showed growth, they were insufficient to balance the large Medium-sector loss (in Table no. 1and Fig.No.2.

CONCLUSION

The temporal dynamics of irrigated area under different irrigation projects in Solapur district clearly highlight the uneven yet transformative role of irrigation development in a semi-arid region. Between 2013–14 and 2023–24, the district's total irrigated area has almost tripled [128,486 ha → 373,782 ha; +190.91%], with Major irrigation projects emerging as the dominant force (+358.14%; 53,607 ha → 245,593 ha) behind this expansion, while Minor projects also contributed positively (+177.62%; 28,624 ha → 79,464 ha) from smaller bases. In contrast, Medium projects displayed stagnation or decline (+5.34%; 46,255 ha → 48,724 ha) in several tahsils, creating sharp spatial disparities. High-growth tahsils like Mohol (+1262.48%), Mangalwedha (+885.15%), Pandharpur (+765.18%), and South Solapur (+296.79%) demonstrate the benefits of large-scale canal and reservoir development, whereas Barshi (-5.24%), Akkalkot (-32.38%), and Malshiras (-37.40%) underline the vulnerability of irrigation when dependent on limited or shrinking sources. This spatially varied growth pattern reflects the close interlinkage between water resource availability, project implementation, and agricultural transformation. Thus, the study emphasizes that while irrigation has significantly altered the agricultural landscape of Solapur district, balanced and sustainable development across all tahsils requires integrated planning, efficient water management, and revival of Medium projects to bridge regional inequalities.

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