



“Urbanization And Its Climatic Impacts: A Case Study Of Raipur, Chhattisgarh”

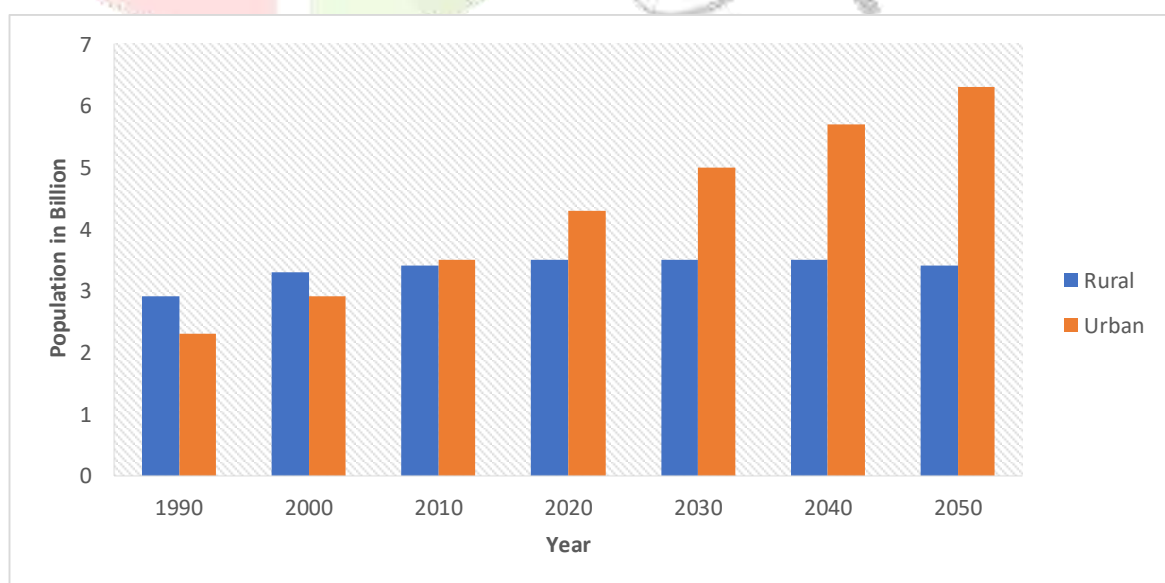
Shikha Shinde¹ Aradhana Dewangan²

¹Assistant Professor (Physics), Govt. Kavyopadhyay Hiralal Collage , Abhanpur, Raipur

² Assistant Professor (Chemistry) Dau Ram Chandra Sahu , Govt. Collage Ranitarai , Durg

ABSTRACT-Climate change is an emerging threat to global public health. One of the main causes of the global climate and environmental change is the unchecked expansion of towns and cities into the rural and natural areas around them, which in turn increases demand for additional natural resources. This study examined Raipur's loss of agricultural and natural land over the past 25 years, a time when urban areas have grown significantly and its impact on climate. The report highlights the detrimental effects of Raipur's previous disorganized urban and regional planning, which frequently included flexible ex-post solutions that favoured real estate market profits rather than avoiding ex-ante the unsustainable concerns. The aim is to demonstrate that the only way to more effectively promote sustainable land use practices is to reevaluate planning priorities and include policies that support ecological protection.

INTRODUCTION-Urbanization means not only mass migration of population from rural to urban but also city becoming denser and the pressure of population will be more towards the outskirts of city as well as rural people abandoning their old ancient way and follow the city life in other word, they transform the way they live, travel, work and build network.



Source-UN World Urbanization Prospects 2018

Figure 1. Urban and rural populations of the world, 1950-2050

Urban growth is going to happen all across the board. Interestingly it's mainly cities across Asia and Africa and only three nations—China, Nigeria, and India—are predicted to account for more than one-third of the anticipated urban expansion between now and 2050. India is expected to have 416 million urban resider by 2050, followed by China with 255 million and Nigeria with 189 million.

In context to Raipur, it developed rapidly after it became the capital of Chhattisgarh in 2000. The development strike was triggered so fast that the planning to build the capital came to naught and the undesirable outcome is visible in the form of Climate Change. This paper is deep study about the change in climate due to urbanization of Raipur after 25 years becoming the capital.

Well-planned urbanization can enhance employment prospects and quality of life. Inadequate urbanization management result in traffic, high population density, pollution, and depletion of natural resources like water, pure air, soil etc. This is the matter of concern the world's unplanned urban population is growing dramatically.

Methadology-1. A comprehensive secondary data and review was carried out to collect any information that might be accessible about Raipur.

2. Ground truthing, validation and profiling:

3. Database creation:

Urban Growth /Spread:

In 2000, three new states were designed in India. Chhattisgarh was formed from eastern Madhya Pradesh on 1st November 2000 and Uttaranchal, now known as Uttarakhand, was created on 9th November 2000. Jharkhand was carved out from the southern districts of Bihar on 15th November 2000.

Raipur was made the capital of Chhattisgarh. Raipur sits in the centre of the state of Chhattisgarh near Kharun River. Examine area stretches from latitudes 21° 14' 14"N to longitudes 81° 38' 5"E. The study area is 326 square kilometres in total. According to the 2011 census, there are 10.1 lakh people living in Raipur.

The current trends of urban growth have the most environmental impacts on the surrounding ecosystems, land resources, structure and pattern of the urban area and hence quality of life. The concept urban spread is one of the most important phenomena of a city with particular reference to undergoing rapidly growth of urbanization processes. Urban spread is noticeably concentrated on a city's outskirts and are growing quickly along highways. It is same with Raipur even it leaps over certain parts, hence the expansion of urban spread areas is patchy, dispersed with a tendency of discontinuity.

Following Table is Showing the Urban Spread Areas of Raipur City.

Years	1971-1981	1981-1991	1991-2001	2001-2011	2011-2021	2021-2025
Spread Areas (Sq.km)	25.17	55.03	64.29	70.47	76.84	84.3 (approx.)

Sources: - LANDSAT Satellite Data

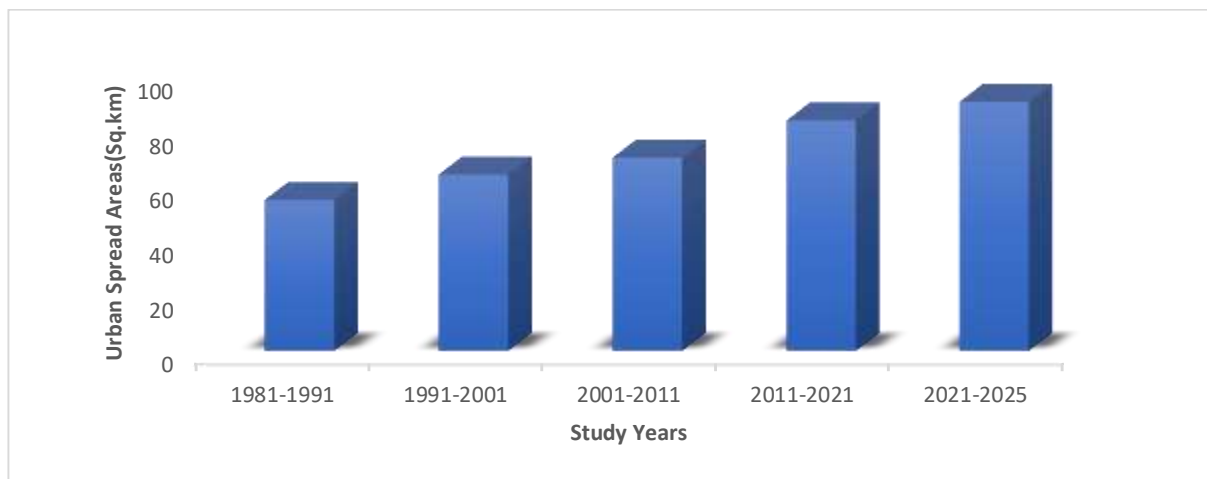


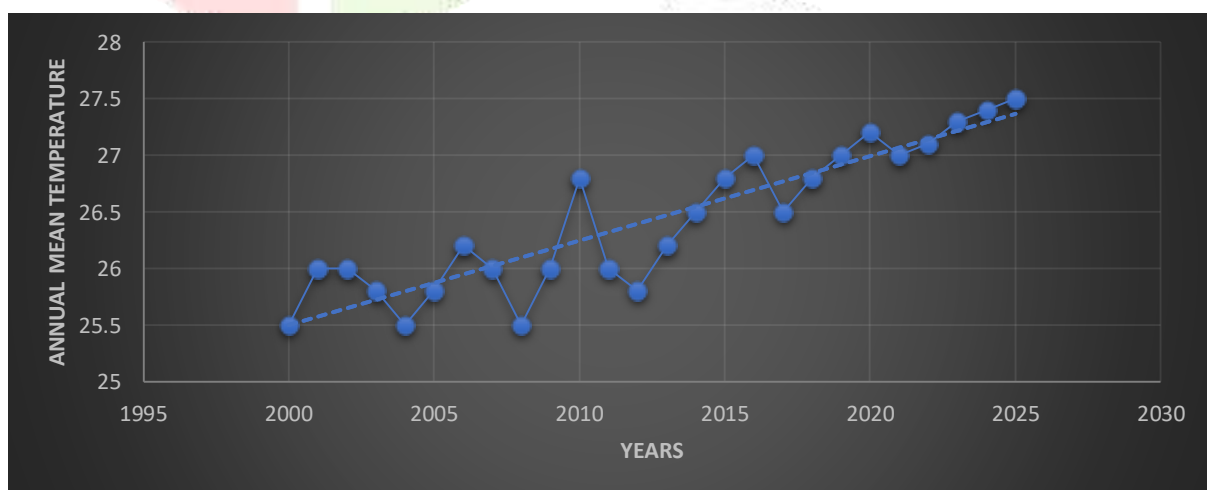
Figure no.2: Simple Bar Diagram Showing the Urban Spread Areas in Raipur City

The table and figure no.2 showing, in Raipur city the urban spread areas is concentrated 25.17 sq.km in the study years 1971-1981, 55.03 sq.km in the study years 1981-1991, 64.29 sq.km in the study years 1991-2001, 70.47 sq.km in the study years 2001-2011, 76.84 sq.km in the study years 2011-2021 and approximately 84.3 sq.km in 2021-2025.

The urban spread boundary of Raipur city is rapidly increased towards Kharun river and along the railway lines, National Highways and major roads. In Raipur city the changing pattern of urban spread areas are mainly caused by different factors, such as – Positive impacts of Housing Preferences, Inner city problems, Transportation system and Regulatory frameworks of a city.

Climate Change: Industrialized area with their energy-intensive lifestyle was historically responsible for the problem of global warming of Raipur. Global warming will have severe impact on the climate of city, including increase Temperature, reducing water supply, decline in crop yield, and increase in vector borne diseases, such as malaria and dengue fever. Carbon dioxide (CO₂) comprises 77 percent of global greenhouse gas (GHG) emission, with fossil fuel consumption according for the bulk (nearly 60 percent) of this emission, while deforestation and land use conversion from natural to framed or built areas account for the rest of 40 percent.

Monthly mean of maximum temperatures



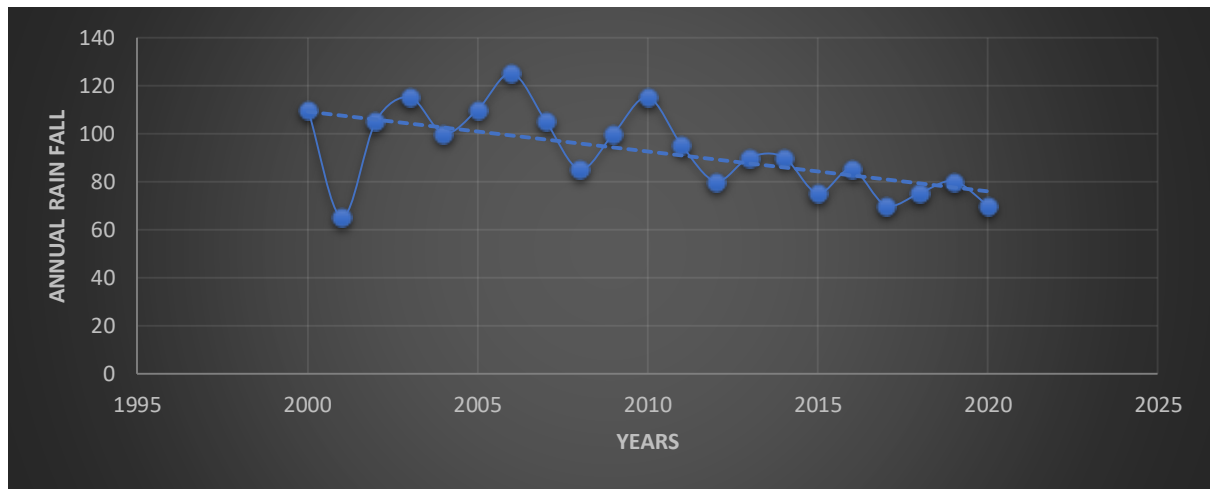
Source-[10.12944/CWE.10.1.38](https://doi.org/10.12944/CWE.10.1.38)

Figure no.3: Annual mean of monthly mean temperatures.

Figure number 3 shows monthly mean maximum temperature over different years. According to this the monthly mean of maximum temperatures has exhibited a statistically significant upward trend in past years. The monthly mean maximum temperature, which was 25.5°C earlier, has now become 27°C. Although it has

been less than 25.5°C in some years. Yet, monthly mean maximum temperatures have increased over the past years.

Annual mean of total Rain fall



Source-10.12944/CWE.10.1.38

Figure no.4:

The graph illustrates the annual means of total rainfall with a general declining trend over time. A line of best fit has been applied to a series of data points, showing a strong negative correlation, meaning that as time progresses (moves along the x-axis), the amount of rainfall (on the y-axis) decreases. The annual mean total monthly rainfall showed a decreasing tendency, with a decline of 0.188 mm each year.

Discussion- The rapid growth of the urban population is a major factor driving the expansion of Raipur's urban areas. In addition to rising birth rates, migration from rural regions to the city significantly contributes to this population surge. This uncontrolled growth leads to overcrowding in the city centre specially Pachpedinaka, Jaistambh Chouk, Kalibadi Chouk, Pandri, Shankar Nagar etc pushing residents to settle in peripheral areas and ultimately causing urban sprawl.

Beyond spatial expansion, the consequences of this rapid urbanization are profound for the environment. The concentration of population and infrastructure has been linked to rising local temperatures due to the urban heat island effect, whereby built-up areas trap heat and reduce natural cooling and causes increasing AQI (Air Quality Index). Simultaneously excessive tree cutting for Road broadening at National highway 43 and NH6, the conversion of agricultural land of old Dhamtari road, Mana, Abhanpur, Bhatagaon into residential and commercial zones diminish natural water retention, contributing to a decline in rainfall patterns. The increasing number of four wheeler, Very large and disturbing number of Auto Rikshaw, surge in vehicular traffic, industrial activity, and construction dust further deteriorates air quality, exposing residents to harmful pollutants and respiratory risks. Moreover, the relentless demand for land, water, and energy resources results in the depletion of natural resources, threatening ecological balance and long-term sustainability of Raipur.

Conclusion

The development of urban spread in Raipur is primarily concentrated in the suburban zones, with the city expanding outward in multiple directions. Our analysis of Raipur city indicates, the Urban spread area expanded from 70.47 sq. km in 2001 to 84.30 sq. km in 2025. This uncontrolled urbanization has triggered significant environmental consequences as rising local temperatures approximately 0.010 °C per year, declining rainfall patterns with rate 0.188 mm each year results in reduced water availability and loss of green cover and natural land surfaces and poor Air quality.

Collectively, these outcomes highlight the urgent need for sustainable urban planning, resource management, and environmental protection strategies to ensure balanced growth in Raipur city. Raipur's future depends on shifting from **uncontrolled expansion** to **planned, sustainable development** that safeguards both its people and its environment.

Reference

1. Khavse, R., Deshmukh, R., Manikandan, N., Chaudhary, J. L., & Kaushik, D. (2015). *Statistical analysis of temperature and rainfall trend in Raipur district of Chhattisgarh*. *Current World Environment*, 10(1), 305–312. <https://www.cwejournal.org/vol10no1/statistical-analysis-of-temperature-and-rainfall-trend-in-raipur-district-of-chhattisgarh>
2. Nava Raipur Atal Nagar Vikas Pradhikaran. (n.d.). *Nava Raipur Atal Nagar official website*. <https://www.navaraipuratalnagar.com>
3. Jana, R., & Sinha, A. K. (2021). *Urban sprawl and its impact on urbanization in Raipur City (Chhattisgarh State), India*. *International Research Journal of Multidisciplinary Scope*, 2(1), 1–8. <https://doi.org/10.47857/irjms.2021.v02i01.045>
4. Ghosh, I. (2019, September 16). *The dramatic global rise of urbanization (1950–2020)*. World Economic Forum. <https://www.weforum.org/agenda/2019/09/mapped-the-dramatic-global-rise-of-urbanization-1950-2020/>
5. Martellozzo, F., Amato, F., Murgante, B., & Clarke, K. C. (2018). *Modelling the impact of urban growth on agriculture and natural land in Italy to 2030*. *Applied Geography*, 91, 156–167. <https://doi.org/10.1016/j.apgeog.2017.12.004>
6. Campbell-Lendrum, D., & Corvalán, C. (2007). *Climate change and developing-country cities: Implications for environmental health and equity*. *Journal of Urban Health*, 84(Suppl. 1), 109–117. <https://doi.org/10.1007/s11524-007-9170-x>
7. Barik, S. K., & Sethi, B. (2024). *Urban growth and climate change: A study in the context of Bhubaneswar City of Odisha*. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, 23(4), 49–55. <https://www.iosrjournals.org/iosr-jhss/papers/Vol.%2023%20Issue4/Version-1/H2304014955.pdf>