



ISSN : 0973-7057

## GIS-Based Abiotic Factors Assessment of Gir Sanctuary, Gujarat, India

Pratikkumar Chavada, P. J. Bhatt, Bhagyashri V. Dangar, Kunjan Balai, Rajesh Raviya\*

Department of Life Sciences, Bhakta Kavi Narsinh Mehta University, Jungadh, Gujarat, India

Received : 3<sup>rd</sup> July, 2023 ; Revised : 3<sup>rd</sup> August, 2023

DOI:-<https://doi.org/10.5281/zenodo.12341402>

**Abstract-** This research deals with quantitatively studying abiotic factors - rainfall and temperature of the protected area, Gir Sanctuary by the means of GIS technology. ArcGIS Desktop version 10.7.1 was used for creating rainfall and temperature maps of the study area over the period of ten years (from 2011 to 2020). The results indicate higher rainfall and temperature in the Eastern Gir region as compared with Western Gir region. This also positively correlates rainfall and temperature. This research is the first study of Gir Sanctuary with respect to studying abiotic factors with the help of GIS technology and can be replicated in other protected areas of Gujarat.

**Key words:** Gir Sanctuary, ArcGIS, Abiotic Factors, Temperature, Rainfall

### INTRODUCTION

GIS – Global Information Systems are based on computers, which are capable of manipulating, storing and visualizing geographical data.<sup>1</sup> It provides a very good framework for the analysis of maps.<sup>2</sup> There are computer-based software, that use GIS technology, one of the most popular and powerful computer software is ESRI's ArcGIS.<sup>3</sup> Abiotic factors, also known as climatic factors, consists mainly of rainfall and temperature.<sup>4</sup> ArcGIS can be used to create rainfall and temperature map of the study area.<sup>5,6</sup> Gir Sanctuary provides varied environments for the flora and fauna because it is mostly dry deciduous.<sup>7</sup> It is constating a total of 1412 km<sup>2</sup> area.<sup>8</sup> Most often the Gir Sanctuary is divided in eastern and western region by the forest department of Gujarat. Both of these regions are having different biotic and abiotic conditions. Western

region is mostly dominated by *Tectona grandis*.<sup>9</sup> Eastern region is higher in slope and therefore shows difference in vegetation. Looking at the previous studies, it can be seen that it was related to phytosociology, ethnobotany, and conservation of Asiatic Lion.<sup>8,10,11</sup> No one has ever attempted to study Gir Sanctuary's abiotic conditions with respect to GIS technology. This research was started with aim of quantitatively studying the abiotic factors – rainfall and temperature by the means of ArcGIS.

### MATERIALS & METHODS

ArcGIS Desktop version 10.7.1 was used for this study.<sup>12</sup> First shapefile of the study area was created. Require data of rainfall and precipitation was downloaded from Climatic Research Unit.<sup>13</sup> A total of two maps, consisting ten years of rainfall and temperature (From 2011 to 2020) was created for the study area (Figure 1).

\*Corresponding author :

Phone : 97129 76699

E-mail : [rdraviya@gmail.com](mailto:rdraviya@gmail.com)

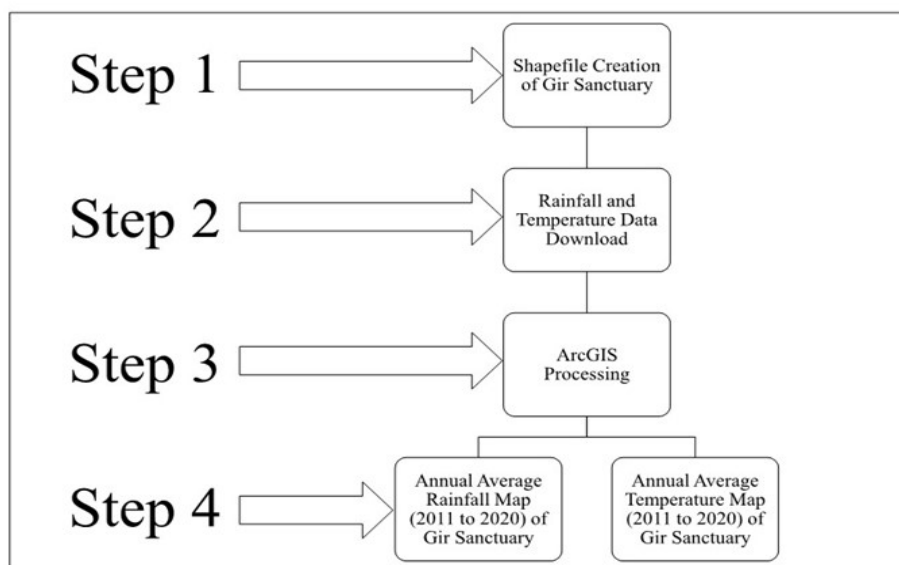


Figure 1. Gir Sanctuary - Rainfall and Temperature Maps creation process in ArcGIS

## RESULTS & DISCUSSION

Results indicate that over the period of ten years the annual average rainfall in Gir Sanctuary has varied from 775 mm/year to 912 mm/year (Figure 2). Western region gets lower rain compared to eastern region. Therefore, vegetation in both these regions are different.<sup>9</sup> The reason eastern region gets more rainfall is also because of increase in temperature. As the temperature gets higher, rainfall also increases.<sup>14</sup> This can be seen as well, ten years of annual average temperature in Gir Sanctuary also indicate

variation from 26.29°C to 26.7°C (Figure 3). Western region experiences lower temperature compared to eastern region. Previous studies show similarity with our study. Rainfall map of Al Mahwit over the period of ten years shows eastern region having high rainfall compared with western region.<sup>15</sup> Temperature maps of Dudpukuria-Dhopachari Wildlife Sanctuary over the period of thirty years show eastern region having high temperature compared with western region.<sup>16</sup>

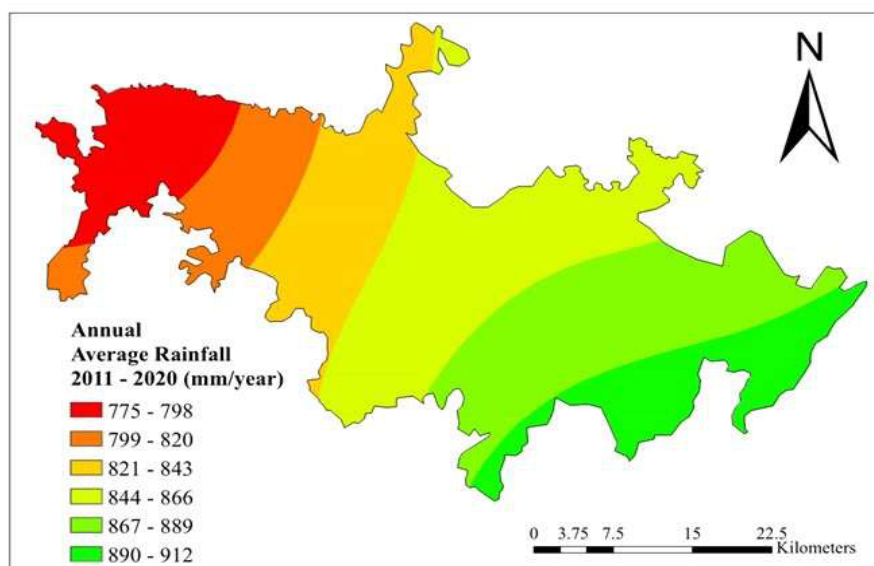
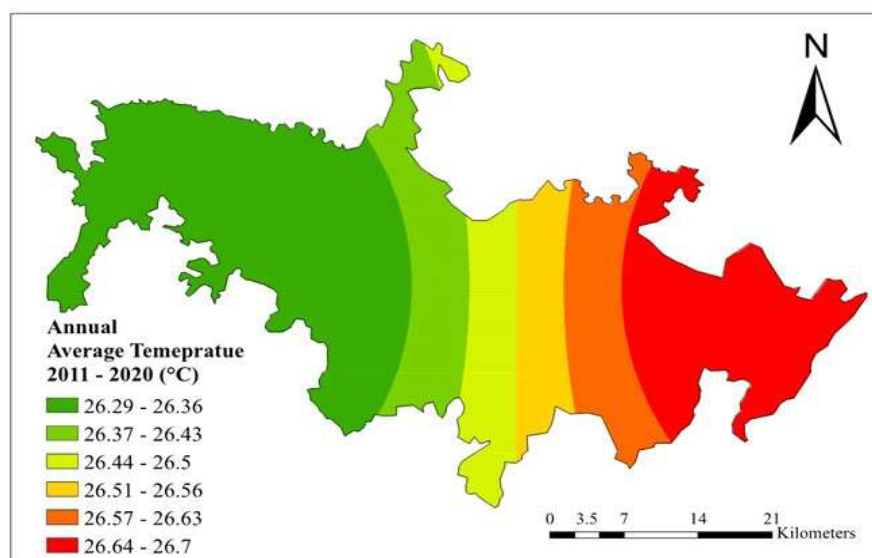


Figure 2. Gir Sanctuary – Annual Average Rainfall Map (From 2011 to 2020)



**Figure 3. Gir Sanctuary – Annual Average Temperature Map (From 2011 to 2020)**

## CONCLUSION

The present study deals with the abiotic factors – rainfall and temperature of protected area, Gir Sanctuary. To the best of our knowledge, this is the first GIS-based assessment of abiotic factors of the study area. It provides a ten-year map of rainfall and temperature Gir Sanctuary, showing the difference in the eastern and western region of the area. This study will be helpful for future ecology related study of Gir Sanctuary. It serves as a base for understanding the vegetation of the protected area. This work can be easily replicated in other protected areas of Gujarat.

## ACKNOWLEDGEMENT

The authors are grateful to the entire staff of Department of Life Sciences, Bhakta Kavi Narsinh Mehta University.

## REFERENCES

- Kadmon R. 2001.** Remote Sensing and Image Processing. In: Encyclopedia of Biodiversity. Vol. 5. Elsevier. p. 121–143.
- Mason P. J. 2005.** Remote Sensing | GIS. In: Encyclopedia of Geology. Elsevier. p. 420–431.
- Kuby M.J., Martinez A.S., Kelley S.B., Tal G. 2023.** Hydrogen station location analysis and optimization: Advanced models and behavioral evidence. In: Scipioni
- A, Manzardo A, Ren J, editors. Hydrogen Economy (Second Edition). Academic Press. p. 315–380.**
- Morand S., Lajaunie C. 2018.** Loss of Biological Diversity and Emergence of Infectious Diseases. In: Biodiversity and Health. Elsevier. p. 29–47.
- Deng Y., Wang S., Bai X., Tian Y., Wu L., Xiao J., Chen F., Qian Q. 2018.** Relationship among land surface temperature and LUCC, NDVI in typical karst area. *Sci Rep.* **8(1)**:641.
- Ali G., Sajjad M., Kanwal S., Xiao T., Khalid S., Shoaib F., Gul H.N. 2021.** Spatial-temporal characterization of rainfall in Pakistan during the past half-century (1961–2020). *Sci Rep.* **11(1)**:6935.
- Mukherjee A., Borad C.K. 2004.** Integrated approach towards conservation of Gir National Park: the last refuge of Asiatic Lions, India. *Biodiversity and Conservation.* **13(11)**:2165–2182.
- Khan J.A. 1995.** Conservation and management of Gir Lion Sanctuary and National Park, Gujarat, India. *Biological Conservation.* **73(3)**:183–188.
- Chaudhary R., Zehra N., Musavi A., Khan J.A. 2020.** Evaluating the effect of ecological and anthropogenic variables on site use by sympatric large

## Biospectra : Vol. 18(2), September, 2023

*An International Biannual Refereed Journal of Life Sciences*

- carnivores in Gir protected area, Gujarat, India. *Wildlife Biology*. **2020(4)**:1–7.
- 10. Pandit B.R., Raviya R.D. 2001.** Phytosociological Study of Eastern Gir Forest. *Flora and Fauna*. **7(1)**:35–36.
- 11. Pandit B.R., Kotiwar O.S., Oza R.A., R M.K. 1994.** Ethno-medicinal Plant Lore from Gir Forest, Gujarat. *Advances in Plant Sciences*. **9(1)**:81–84.
- 12. ArcGIS 10.7.1.** Available at <https://www.esri.com/en-us/arcgis/products/arcgis-pro/overview>
- 13. Climatic Research Unit. Online Database.** Accessible at [https://crudata.uea.ac.uk/cru/data/hrg/cru\\_ts\\_4.07/cruts.2304141047.v4.07/](https://crudata.uea.ac.uk/cru/data/hrg/cru_ts_4.07/cruts.2304141047.v4.07/)
- 14. Chairani S. 2022.** The Correlation between Rainfall, Temperature, Relative Humidity, and Rice Field Productivity in Aceh Besar. *IOP Conf Ser: Earth Environ Sci*. **1071(1)**:012030.
- 15. AL-Falahi A.H., Saddique N., Spank U., Gebrechorkos S.H., Bernhofer C. 2020.** Evaluation the Performance of Several Gridded Precipitation Products over the Highland Region of Yemen for Water Resources Management. *Remote Sensing*. 12(18).
- 16. Hasnat G.N.T. 2021.** A Time Series Analysis of Forest Cover and Land Surface Temperature Change Over Dudpukuria-Dhopachari Wildlife Sanctuary Using Landsat Imagery. *Front For Glob Change*. **4**:687988.

\*\*\*