

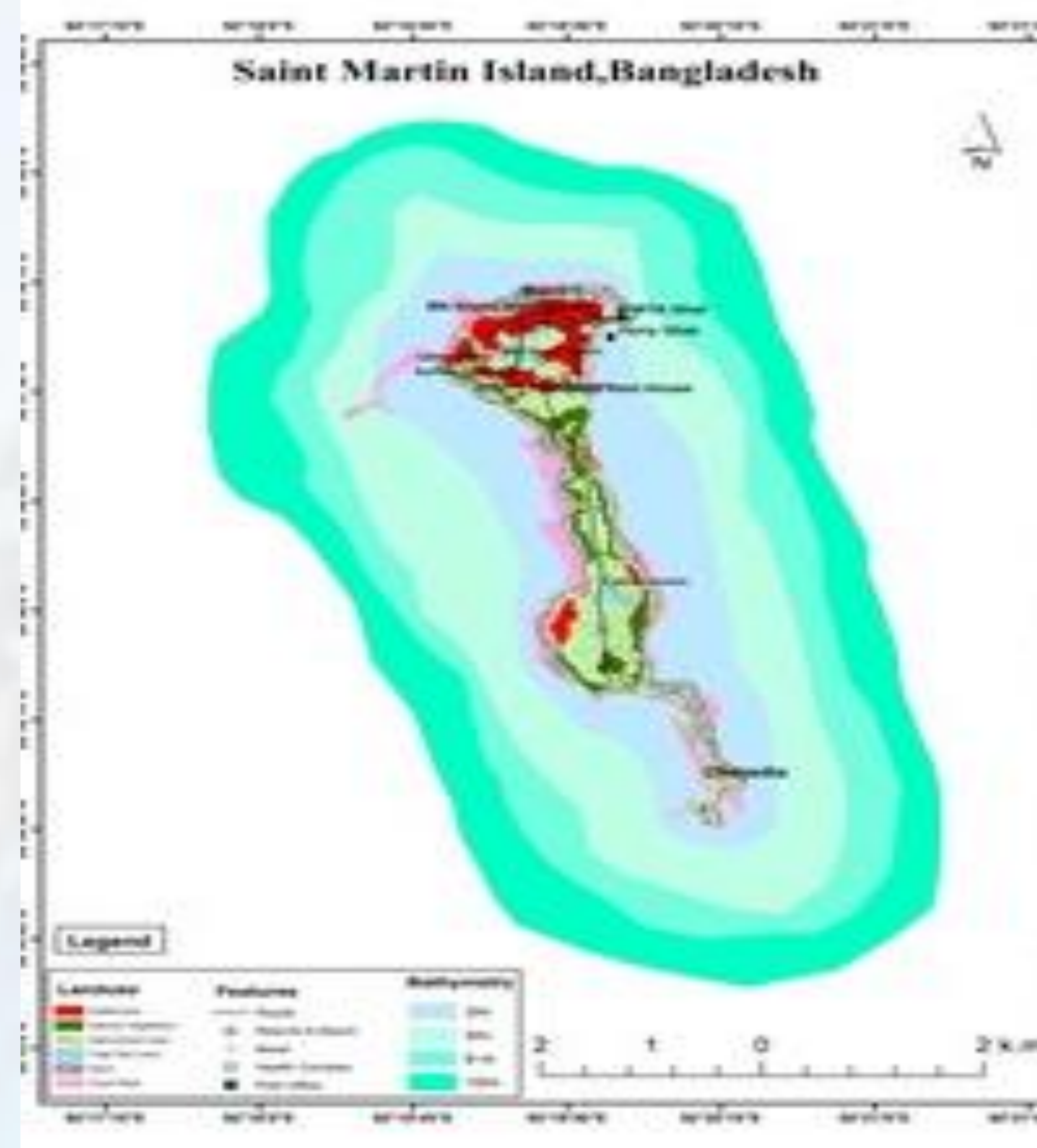
Land Surface Temperature Change Detection in Saint Martin's Island, Bangladesh: Analyzing satellite image from 1990 to 2024

Presented by,
Ummul Khayer Salma Keya
Jakia Jannat Fabiha
Md. Rubaet Bin Abedin
Institute of Remote Sensing and GIS
Jahangirnagar University
Savar, Dhaka-1342

Introduction

Land surface temperature refers to the temperature of the Earth's surface. Estimation of Land Surface Temperature (LST) and the study of its changes over time is an important topic of research because, these days, global climate is changing fast. Therefore, retrieval of LST with new technologies has become an interesting field to explore in order to better understand the environment all over the world. St. Martin's Island, one of the most visited tourist destinations of Bangladesh, is greatly famous for its diverse coral ecosystem. The island has undergone significant LST changes in recent decades due to both anthropogenic and natural factors. The expansion of tourism-related activities and development projects has been a major driver of LST change on the island. Climate change, including sea-level rise and tidal fluctuation, has also played a role in shaping the LST changes on the island. The National Conservation Society of Bangladesh has declared Saint Martin's Island an ecologically and environmentally critical zone, highlighting the need for conservation and management efforts. Monitoring programs and the use of remote sensing and GIS technologies are valuable tools for calculating and detecting LST changes on the island. Conversion of land cover changes act as the prime reason for changing LST as different land covers have different individual characters in terms of energy radiation and absorption proper ties . For example, the temperature found in the urbanized areas with impervious surfaces (paved land cover) is normally higher than that of any other areas such as rural area or forest.

Saint Martin's Island, Bangladesh



Result

Over our thirty-four years of observation, we can see that,

- In the years 1990 and 1995 the LST was high.
- After that, the temperature decreased to 2000 due to a massive flood. And again increased day by day.
- But surprisingly temperature again decreased in the year 2020 due to COVID-19 as tourism activities were minimal at that time.
- It gives us a clear view that there is a close relationship between LST and tourism activities in our study area.
- Other factors also affect the LST. These can be natural disasters like cyclones, floods, storm surges etc.

Method

Multi-temporal and multi-sensor Landsat satellite e.g., Landsat 5 TM for 1990, 1995, 2000, 2005 & 2010 and Landsat 8 OLI/TIRS for 2015, 2020 & 2024 images were used to calculate the LST of the area, which are Landsat Collection 1 Level 1 data, produced by the Landsat Product Generation System (LPGS) and downloaded from USGS Earth Explorer website (<https://earthexplorer.usgs.gov>)

Conclusion

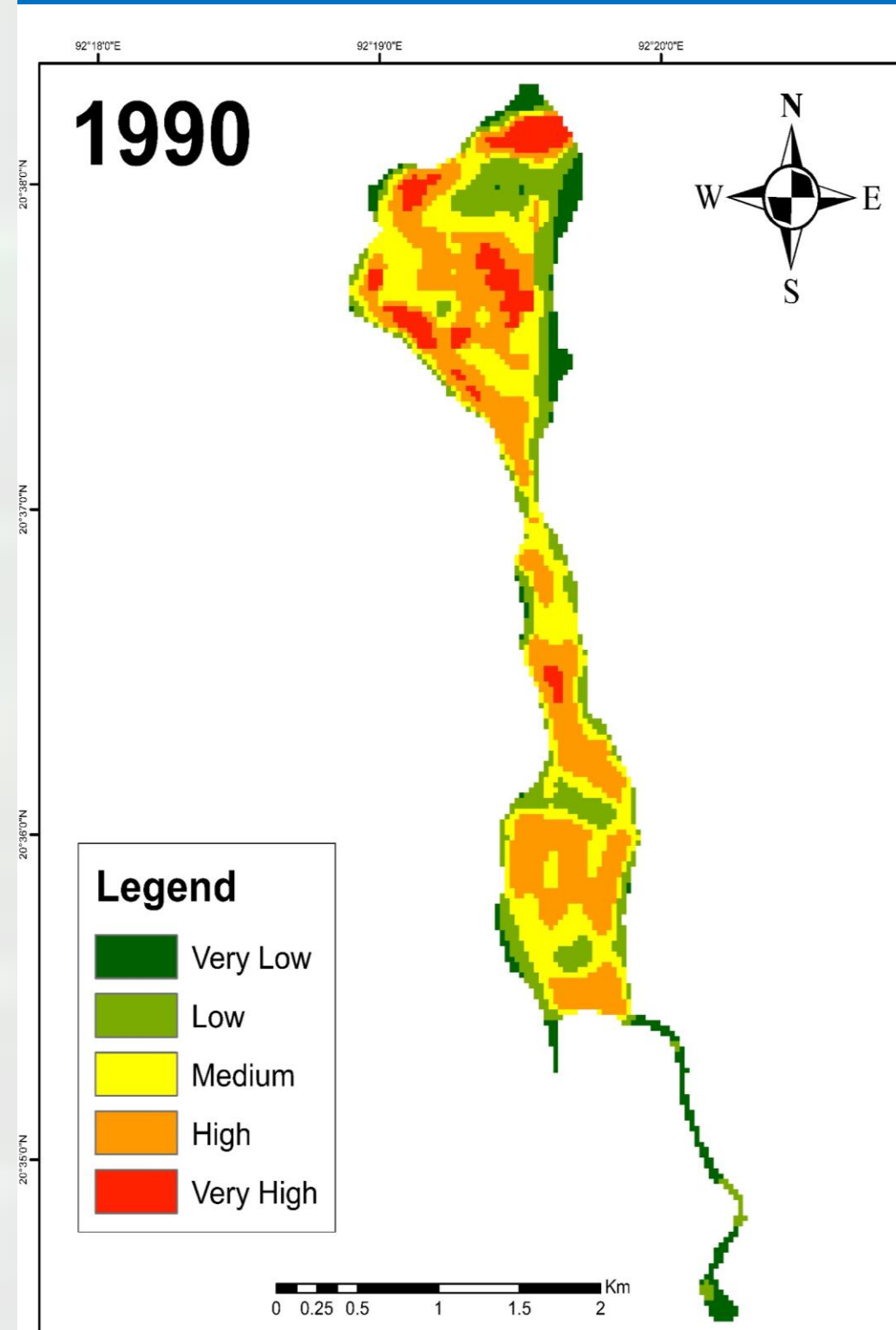
The significant increase in LST on Saint Martin's Island during the last three decades is a sign of the effects of climate change on a larger scale, which have been accelerated by localized human activities including land use changes, tourism, and deforestation. The island's fragile ecosystems, such as coral reefs, marine life, and endemic terrestrial species, are in danger due to this warming trend. Additionally, a rise in LST may accelerate the deterioration of natural resources, which would have an impact on nearby communities that rely on tourism and fishing. The island's microclimate may also be disturbed by high temperatures, which could change precipitation patterns and raise the risk of soil erosion and coastline damage. A sustainable strategy to development that prioritizes ecological preservation and climatic resilience is necessary to address these developments. To further reduce the impact, strategic measures like controlled tourism, reforestation, and conservation initiatives are crucial.

References

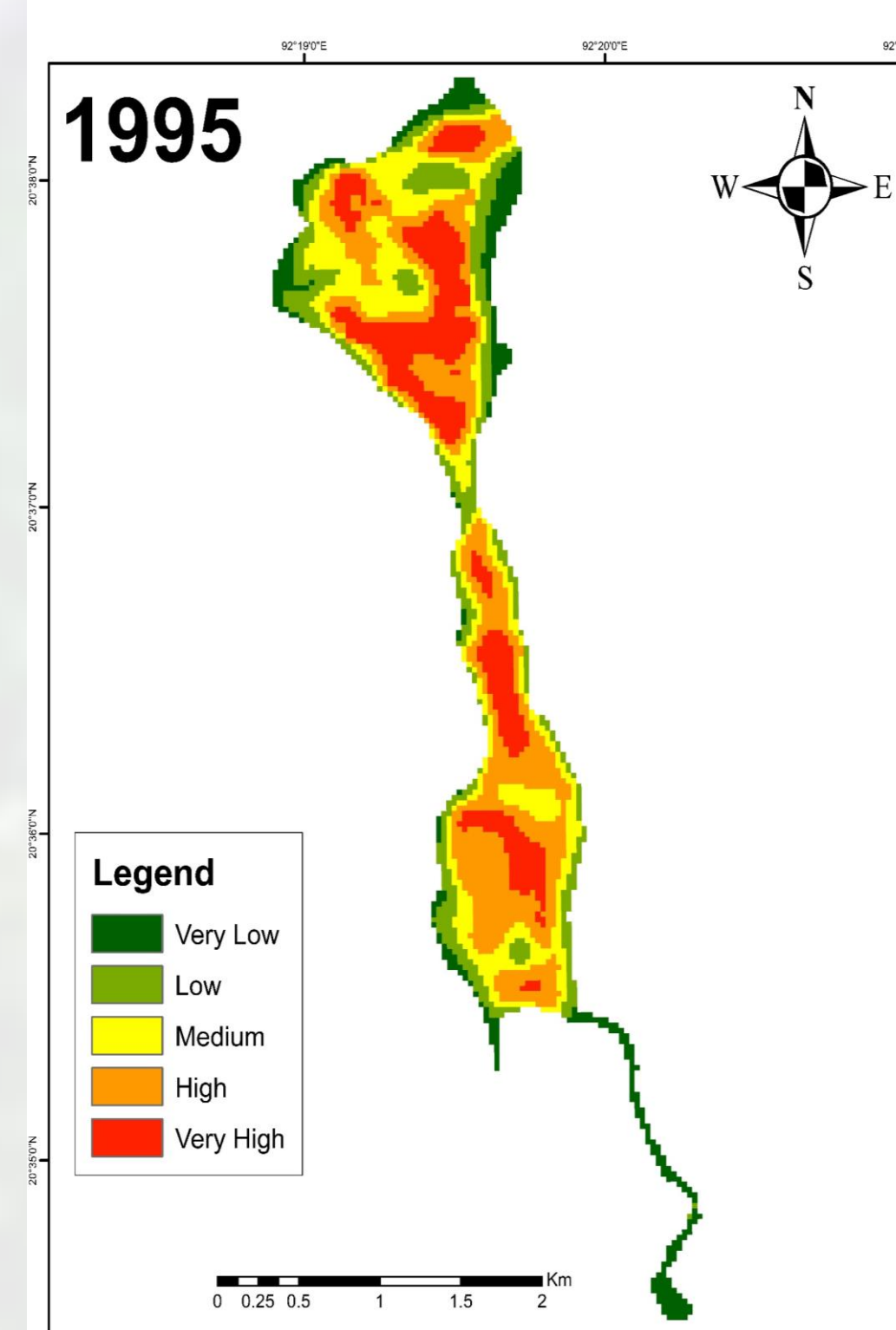
Ahmed, R., Mahmud, K. H., Hafsa, B., Tuya, J. H., Reza, E., & Coalee, U. M. (2023). Climate Change Impact on Land Use and Land Cover Change on Saint Martin's Island, Bangladesh. *Journal of Coastal Conservation*, 27(4), 26. <https://doi.org/10.1007/s11852-023-00954-y>

Ara, S., Alif, M. A. U. J., & Islam, K. M. A. (2021). Impact of Tourism on LULC and LST in a Coastal Island of Bangladesh: A Geospatial Approach on St. Martin's Island of Bay of Bengal. *Journal of the Indian Society of Remote Sensing*, 49(10), 2329-2345. <https://doi.org/10.1007/s12524-021-01389-4>

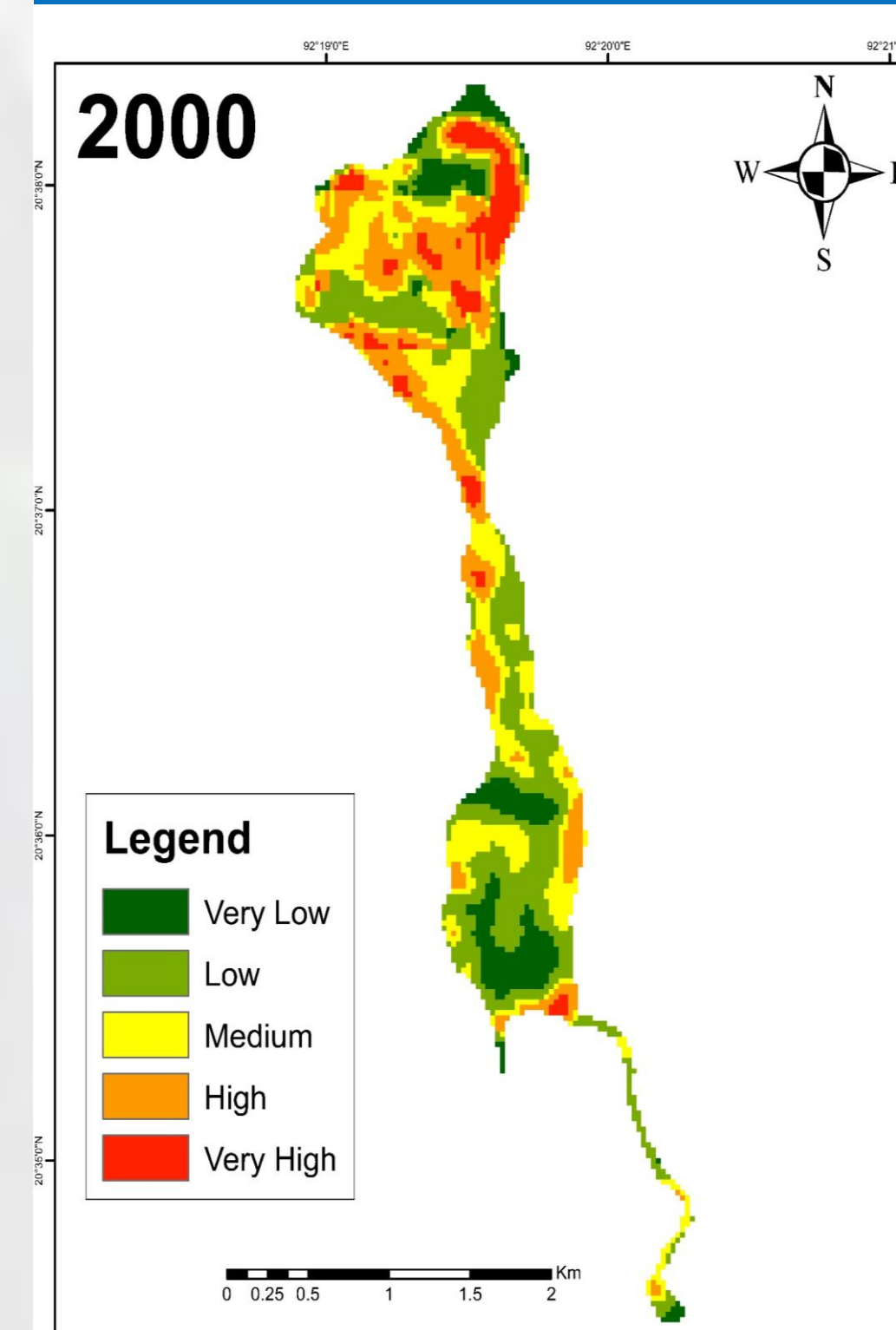
LST Map-1990



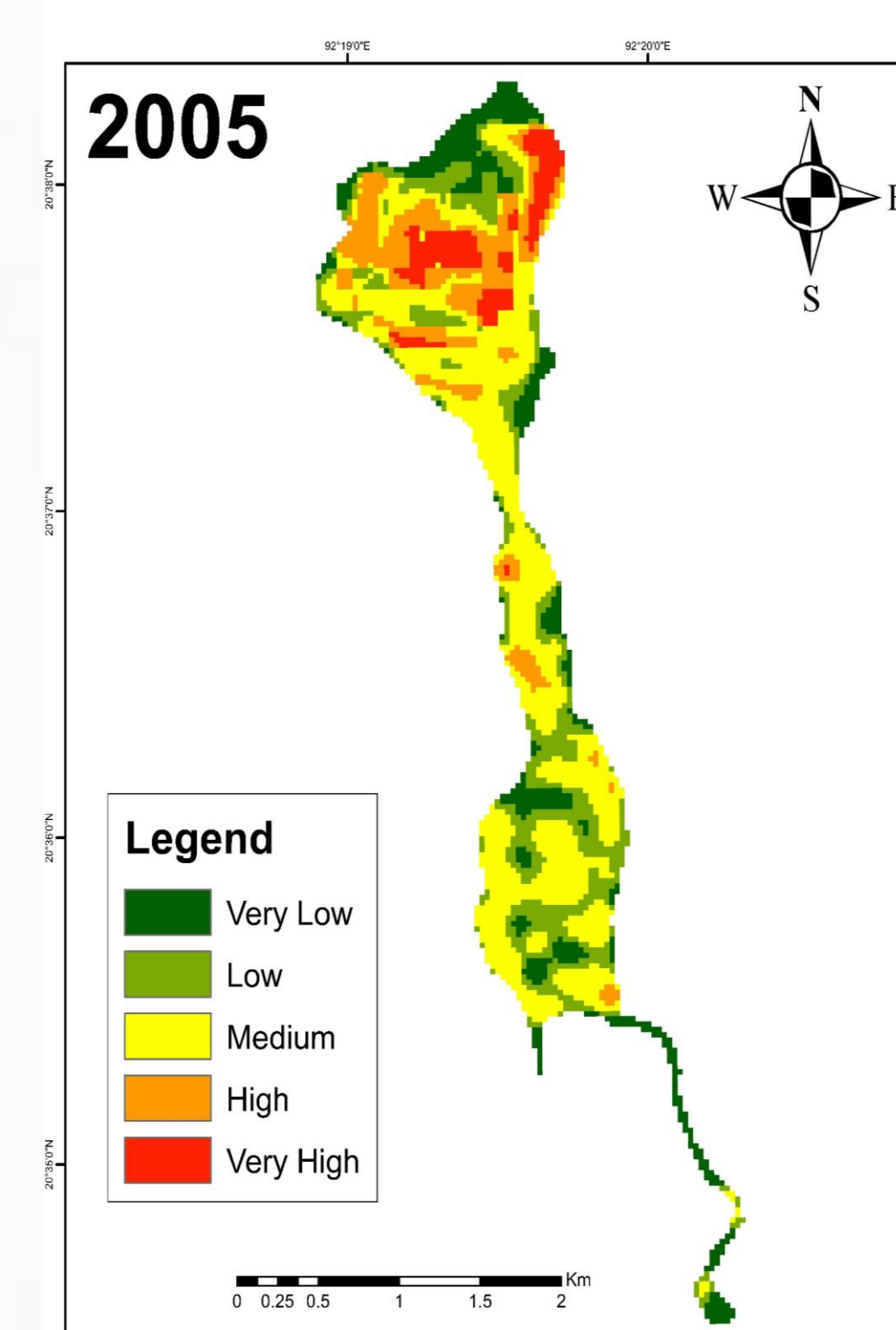
LST Map-1995



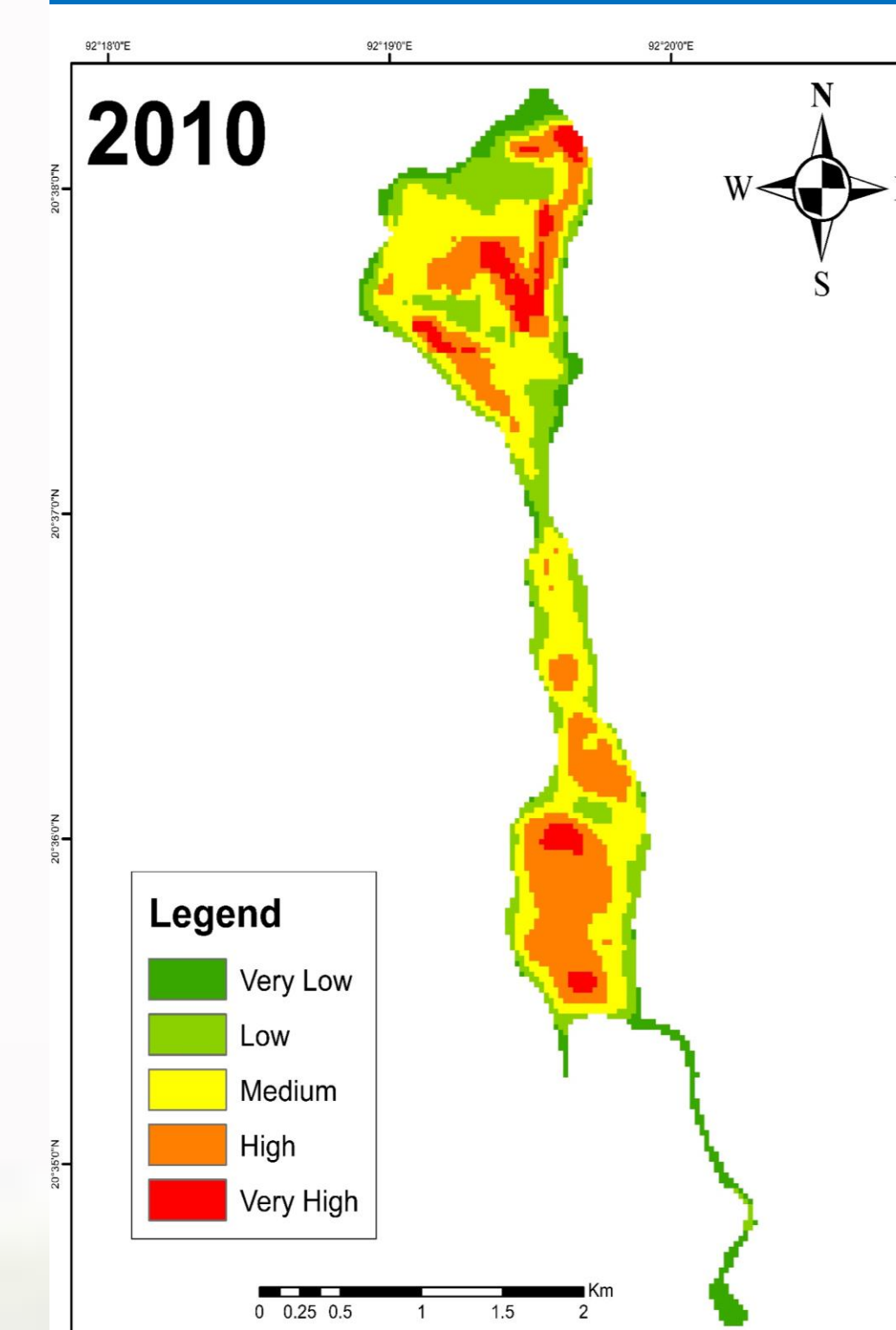
LST Map-2000



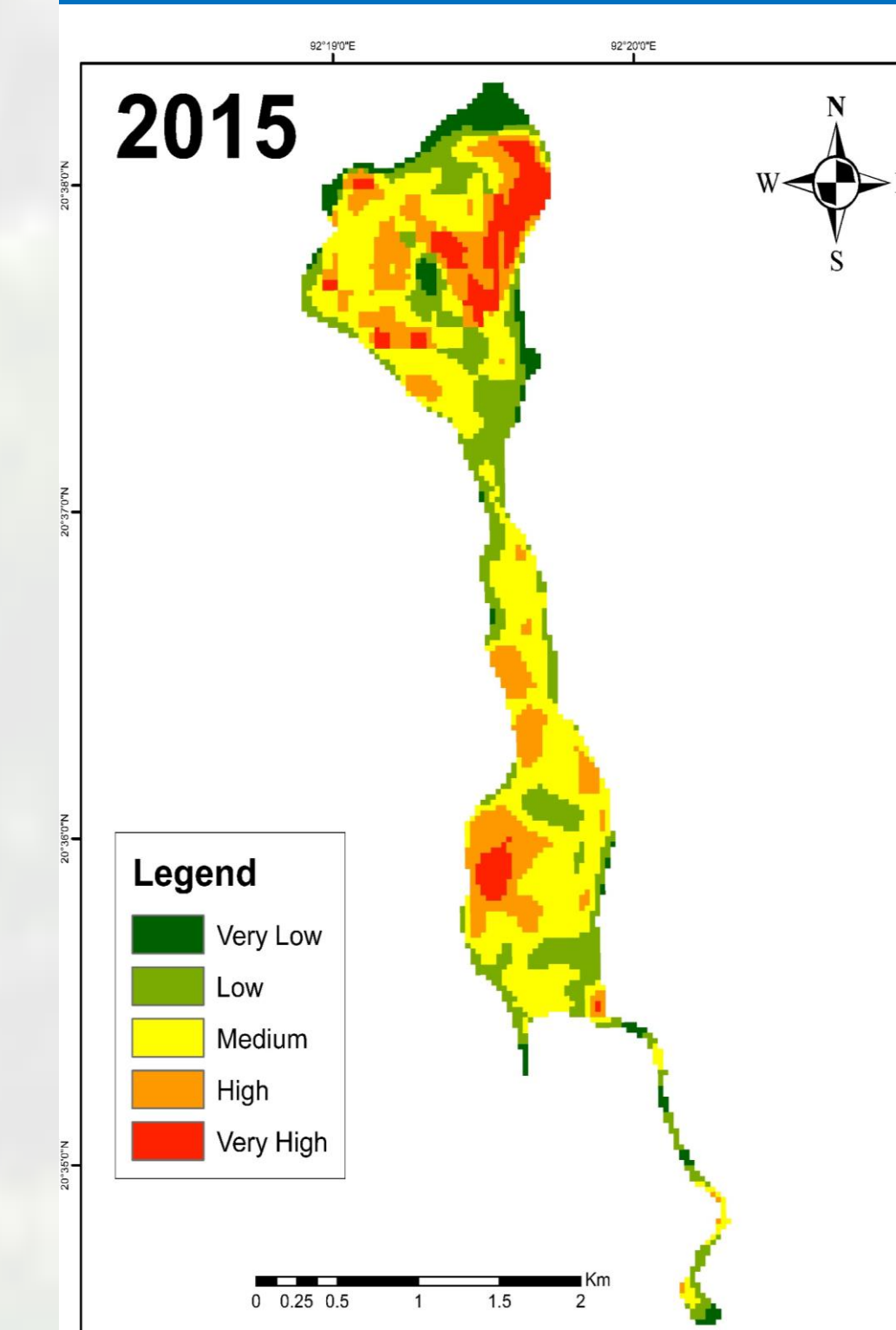
LST Map-2005



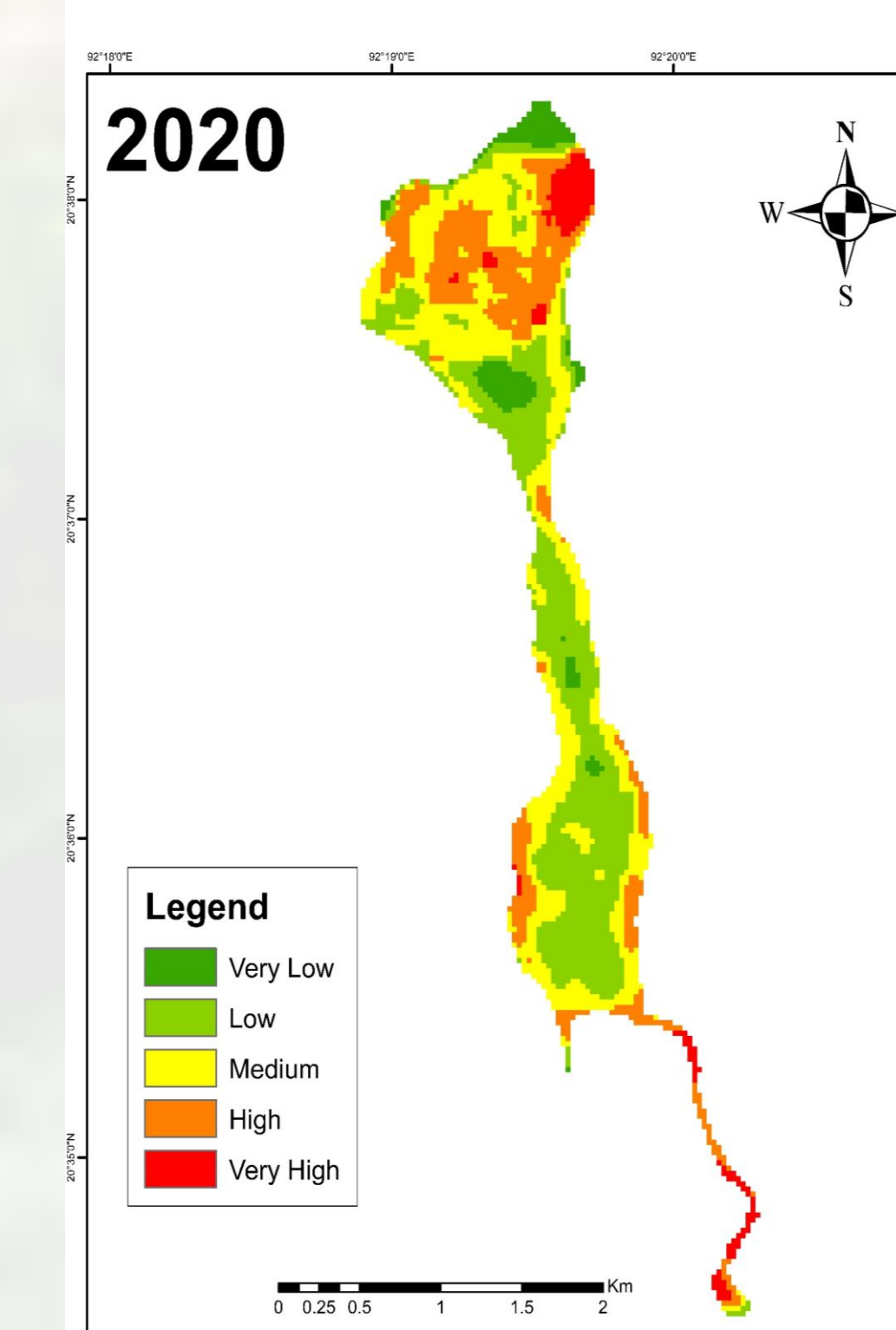
LST Map-2010



LST Map-2015



LST Map-2020



LST Map-2024

