1.) **Title of the project:** A GIS-Based Multi-Criteria Decision Analysis for Urban Heat Island (UHI) Mitigation Site Suitability in Bengaluru

2.) **Group members with roll numbers:**

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3.) **Background of the problem:** Bengaluru's rapid, unplanned urbanization has transformed it from the "Garden City" to the "Silicon Valley" of India. This has resulted in a 1055% increase in built-up areas and an 88% loss of vegetation since 1973. This drastic change in land use has created a significant Urban Heat Island (UHI) effect, leading to rising Land Surface Temperatures (LST), posing a direct threat to public health and environmental sustainability.

4.) **Problem statement:** The central challenge is the lack of a systematic, data-driven methodology to identify and prioritize neighborhoods for effective UHI mitigation interventions (e.g., new "pocket parks," green roofs). This project will address this gap by developing a GIS-based solution, inspired by the systematic methodology of our previous "Renewable Energy Site Selection" project , to guide urban planners in deploying resources equitably and efficiently.

5.) **Objective(s):**

- To identify and rank optimal, high-priority sites for UHI mitigation interventions within the Bengaluru Urban district.
- To analyze the spatial relationship between key environmental criteria (LST, NDVI) and social criteria (Population Density, Socio-Economic Vulnerability).
- To implement the Analytical Hierarchy Process (AHP) to calculate objective weights for each criterion.
- To produce a final, high-resolution suitability map to support evidence-based urban planning.

6.) **Research questions:**

- What are the key environmental and social factors that define high-priority UHI zones in Bengaluru, and what is their relative importance?
- How can a GIS-based AHP model effectively synthesize multi-source geospatial data (remote sensing, demographic, and infrastructure) to create a reliable site suitability map for UHI mitigation?

7.) **Possible datasets to be used:**

- Remote Sensing Data: Landsat 8/9 imagery (for LST and NDVI) processed via Google Earth Engine.
- Land Use Data: ESA WorldCover 10m dataset (as a constraint layer).
- Population Data: WorldPop gridded population density (100m).
- Socio-Economic Data: Bengaluru ward-level Census 2011 data (for vulnerability).
- Infrastructure Data: OpenStreetMap (OSM) for existing parks and water bodies (as constraints).
- Boundary Data: Bengaluru Urban administrative boundary shapefile.

8.) **Possible methods to be adopted:**

- Data Engineering: Cloud-based processing on Google Earth Engine (GEE) to calculate LST and NDVI composites.
- GIS Processing: Python (geopandas, rasterio) for data normalization, reclassification, and Boolean overlays to create constraint masks.
- Core Methodology: Multi-Criteria Decision Making (MCDM) using the Analytical Hierarchy Process (AHP) to derive criteria weights, ensuring a consistency ratio < 0.1.
- Final Analysis: A Weighted Overlay analysis to combine all criteria layers based on the AHP-derived weights to produce the final suitability map.

9.) **Expected results:** The primary output will be a final GeoTIFF raster file (a suitability map) that categorizes the land within Bengaluru Urban into five classes: "Highly Suitable," "Suitable," "Moderately Suitable," "Less Suitable," and "Unsuitable" for UHI mitigation interventions. This map will serve as a decision-support tool for urban planners.

10.)**keywords:** Urban Heat Island (UHI), Site Suitability, GIS, Remote Sensing, AHP, Multi-Criteria Decision Making (MCDM), Bengaluru, Google Earth Engine (GEE)

Referred Research Paper(s):

(On LST in Bengaluru): Keerthi Naidu, B. N., & Chundeli, F. A. (2023). Assessing lulc changes and lst through ndvi and ndbi spatial indicators: A case of bengaluru, india. Journal of Remote Sensing & GIS.

(On AHP & GIS for Suitability): Wang, Y., et al. (2022). A Study on the Suitability of Urban Park Site Selection Based on F-AHP and GIS. International Journal of Environmental Research and Public Health, MDPI.