Analysis of Cellular Network Coverage in Diverse Terrains of Sri Lanka

Project Description

This project aims to use Geographic Information Systems (GIS) to analyze how different terrains impact the cellular network coverage in Sri Lanka. The main goal is to assess how geographic and demographic features influence signal propagation and distribution by integrating cellular tower data with elevation models. This analysis will help identify coverage gaps and propose optimal locations for new cellular towers based on population density and signal propagation, thereby improving network service across different regions of the country.

Objectives

1. To use GIS tools to map the locations of existing cellular towers and analyze their coverage areas.
2. To integrate Digital Elevation Models (DEMs) to study how the terrain affects signal strength and coverage.
3. To combine the tower coverage data with terrain information to locate areas with inadequate cellular coverage.
4. Suggest strategic locations for installing new towers to enhance coverage based on population density and signal propagation.
5. Analyze cellular coverage based on different technologies (like LTE, GSM, UMTS) by province in Sri Lanka.

Data Utilization

- **Cellular Tower Data:** The locations and technology types of each tower are compiled from the OpenCelliD database.
- **Terrain Data:** Elevation data from Digital Elevation Models (DEMs) to check against physical barriers that could block the cellular signal.
- **Population Density Data:** Include population density information to portray cellular improvements according to population requirements.

Sources

1. Cellular Tower Data

- **OpenCelliD**: This is a global open database of cell tower locations and their technology types. It includes information about the technology bands used at each tower location.

2. Terrain Data

- **USGS EarthExplorer**: Provides access to a variety of global DEMs, including the Shuttle Radar Topography Mission (SRTM) data.
- **NASA Earthdata Search**: Offers multiple sources of elevation data.

3. Population Density Data

- **Sri Lanka - Population density (2015)**
- **WorldPop**: Provides detailed, open-access population distribution maps, which are essential for understanding where people live relative to cellular coverage areas. Sri Lanka-specific datasets are available.
- **NASA Socioeconomic Data and Applications Center (SEDAC)**: Offers population density datasets that are useful for correlating cellular network needs with population centers.