

# **TITLE: Healthcare Infrastructure and Gap Analysis at District Level, Chhattisgarh, India**

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## **Introduction**

Chhattisgarh is located in East-Central India with an area of 135,190 sq-km and consists of 5 divisions with 28 districts. Chhattisgarh was carved out of Madhya Pradesh on 01 November, 2000. Most part of Chhattisgarh is covered with hills in northern and southern parts, but the central part of Chhattisgarh is fertile plain. About 44% of the state is covered by moist and deciduous forests of the Eastern Highlands Forests.

## **Methodology**

Town's physical and nonphysical characteristics including regional setting/character of the land - landforms, density, land uses, hospitals, nursing homes, clinics, accessibility and roads have been mapped and analyzed using open-source software i.e., QGIS 3.16 . To measure the physical and nonphysical characteristics mentioned above, data was collected from various datasets such as NITI Aayog, Census 2011 for Population data, ISRO for district boundaries and Google Earth Pro. For instance density has been calculated by using different measurements, such as dwellings per kilometre, persons per kilometre, and the source of information was collected from census data.

To identify the hospitals, nursing home and clinics their locations were marked using longitudes and latitudes available from the dataset from Google Earth Pro so as they can be imported to QGIS (geographic positioning system), also care was taken to avoid taking into account of any other institutions (such as medical shops) which were present in hospital dataset. This allowed to easily identify, locate and check various medical institutions per district.

## **Specific Steps**

1. District boundaries data sets were obtained from ISRO
2. Datasets of hospitals was downloaded from Google Earth Pro and exported to (.KML) extension which could be then imported to QGIS.
3. Tiles which covered Chhattisgarh were downloaded from BHUVAN.
4. After associating correct tiles with the location, certain attributes were linked with layers(excel saved as .csv and then drag and drop in QGIS). Population data and density was added in the attribute table of wards.
5. Population density map was prepared and viewed as graduated by clicking on properties of ward layer.
6. Hospitals were marked using the (.KML) files exported earlier directly into QGIS.
7. Then the analysis was done to calculate the density of population per hospital and number of hospitals for given unit of population or area of land as well.

## **Complexities**

1. Multiple districts were newly created and obtaining data for these districts was very difficult.
2. The data set contains various noise(multiple non medical institutions added just because of name)

## **Application**

Land use for major new upcoming hospitals can be planned using the GIS-based map to locate a best suited place using proximity and availability of transport and population demand, for instance a location in a densely populated city with easy connectivity to roads can be used for construction of new hospital to benefit the people and the institutions as well. Through sustainability analysis, local authorities can find out which areas need improvement in terms of hospitals or medical institutions.