Chapter 3

Description of Study Area

3.1 Overview

The study area's location, geology, soil, geomorphology, land use, climate condition, elevation, slope, forest type, tree species, river, drainage pattern, watershed, transportation and settlement, agriculture, livelihood, and population are included in this chapter.

3.2 Location of study area

The present study involves the Kiriburu and Meghahataburu iron ore mines, and its surrounding forest area, located in the Saranda forest, West Singhbhum district of the Indian state of Jharkhand (Figure.3.1). Saranda forest is known for Asia's biggest Sal forest. The geographical location of the study area is within 22º 00′ 45″ to 22º 1′ 36″ N latitude and longitude 85º 08′ 18.8″ to 85º 24.36′ 35″E with an elevation of 720 meters above the MSL. This area is characterized by hilly terrain and steeply sloping with dense homogeneous forest cover. The tropical dry and moist deciduous forest is situated in this region. Sal and Teak are mainly found in abundance trees in the Saranda forest (FSI). This area is mainly famous for the largest iron-ore mines, namely MIOM (Meghahataburu iron-ore mine) & KIOM (Kiriburu iron-ore mine), both governed by Steel Authority of India Limited (SAIL).

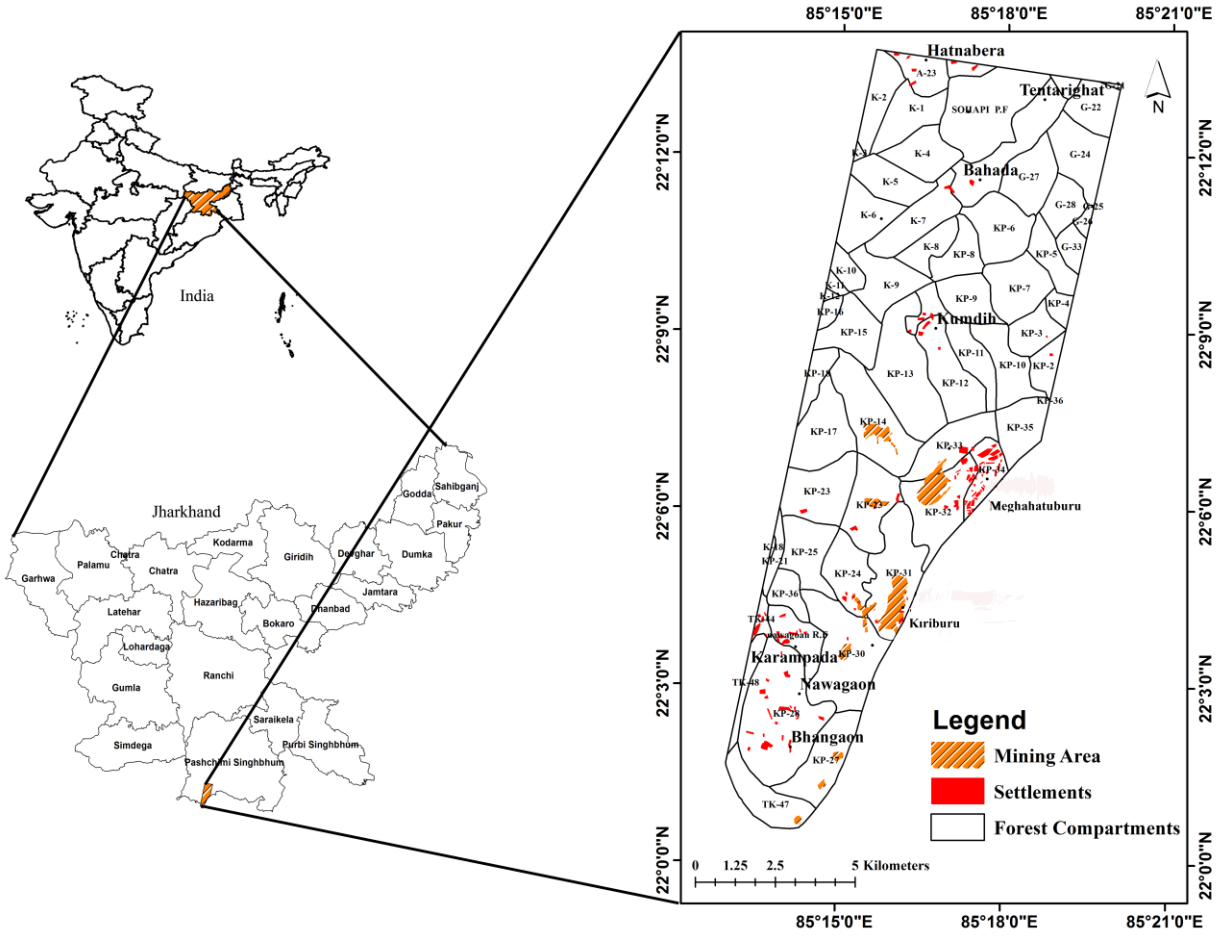

Figure 3. 1: Location map of the study area

3.3 Soil and geology

The soil of the study region was formed mainly from rocks and stones. Soil of this area can be classified into three groups: rocky, red, and black soil. Rocky soil is found mostly in the southern, the western and the north-western part of the study region . Red clay is spread throughout the study area, and it is sandy and loamy types. Black soil is mostly found in the lowlands of the study region, and its texture is loamy and clayey. Soil map is shown in Figure.3.2. The region is an integral part of the peninsular highland that is a part of Gondwanaland. 'Singhbhum thrust zone' is famed for the storehouse of several essential minerals. Study area has various types of minerals: hematite, granulites, schist, gneisses, granite, and quartzites etc. The lithology of the area comprises six categories: banded hematite, iron ore, lava, shale, metavolcanic, and phyllite. Lithological maps are shown in Figure.3.2.

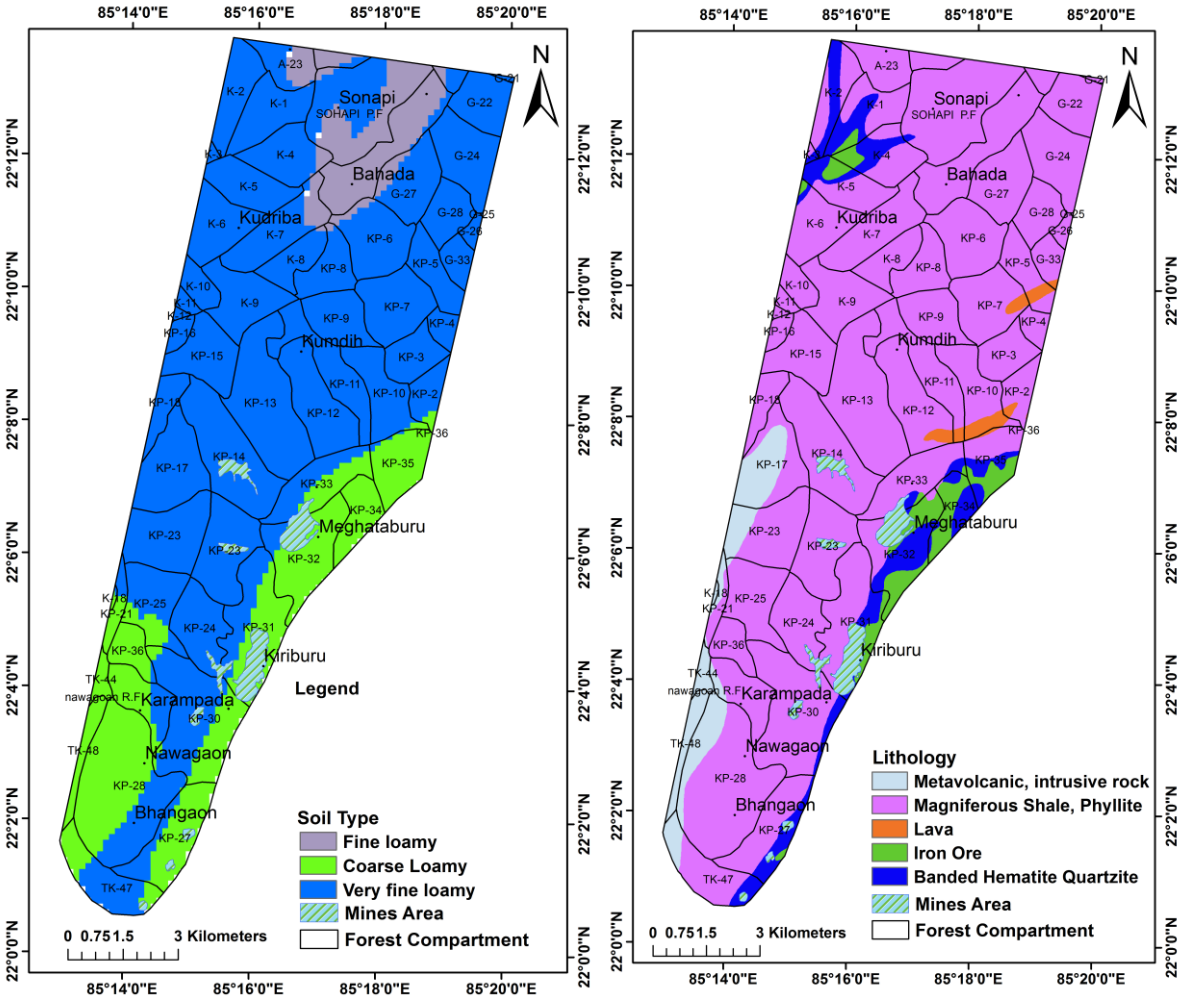

Figure 3. 2: Soil and Lithological maps of the study area

3.4 Geomorphology and LULC

Saranda forest is dominated by hilly ranges, valleys, and plateaus. Hilly terrain and steep geomorphology contributes in a dense forest cover with the altitudinal variation ranges from 300 to 850 meters. The geomorphological map can be classified into four types: structural origin moderately dissected hills valley, denudational origin-pediment-pedi-plane complex, anthropogenic origin terrain, and water-bodies. The LCLU map of the study area can be classified into seven main classes: dense forest, moderate forest, open forest, agricultural land, water-body, built-up land, and wasteland. The dense forest is situated in the hilly sides of Kiriburu and Meghataburu mines. The open forest is located basically near the mines surrounding area and upper as well as lower sites of the study region. The agricultural land is located in the Sonapri, Bahda, Kudriba, and Karampada forest compartments. Geomorphology and LULC maps are shown in Figure.3.3.

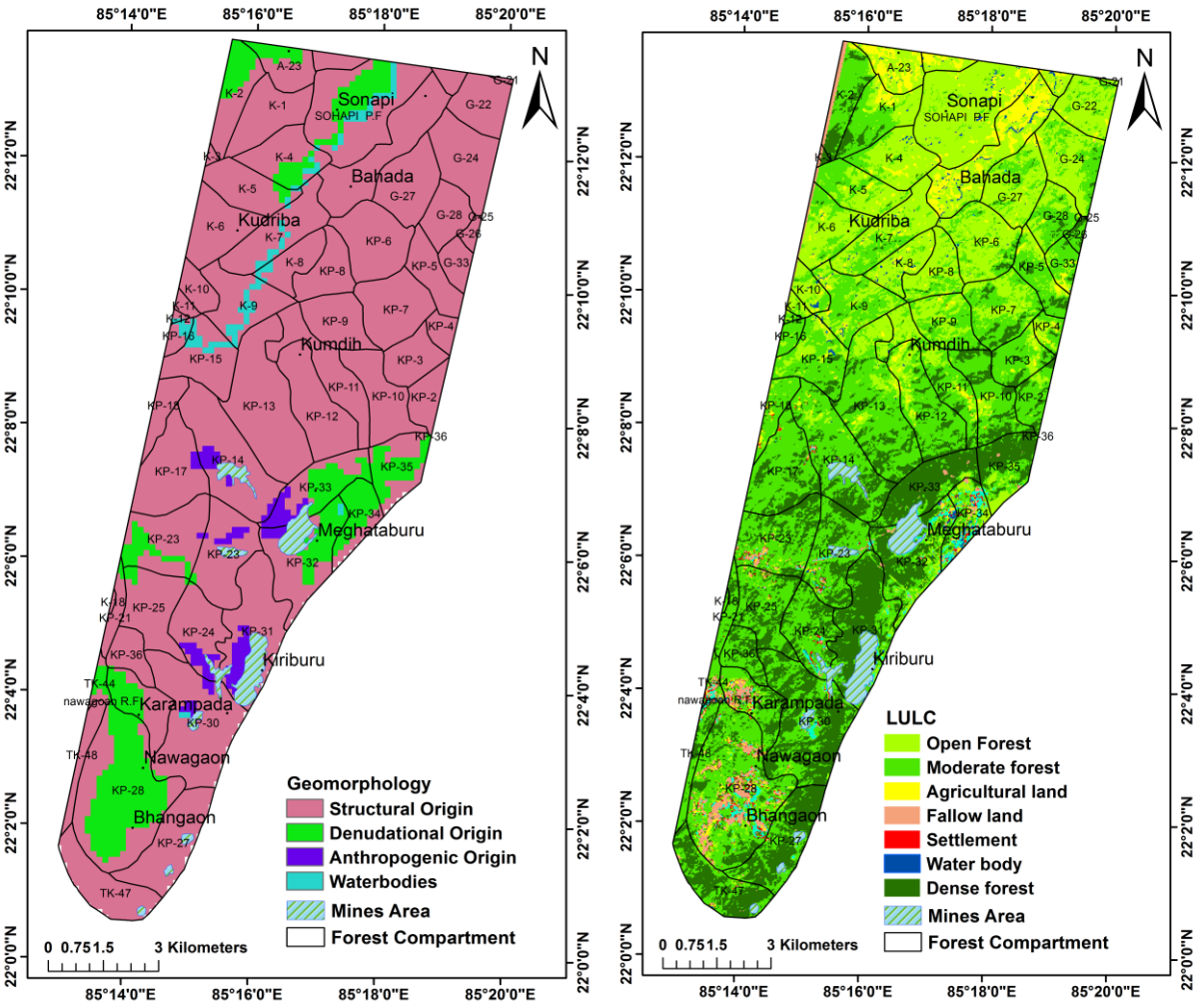

Figure 3. 3: Geomorphology and LULC maps of the study area

3.5 Climate condition

Saranda forest is characterized by three seasons: the winter from Nov to Feb, summer from Mar to May, and Rainy from June to October. In summer, the temperature range between 40-46 °C while the temperatures falls to as low as 4° C in winter. The temperature variation depends on altitude as well as geographical characteristics of the plateau region. This region receives maximum rainfall during the South-West monsoon (July to September), with a variation of 1400 to 1800 mm. The annual rainfall is 1422 mm during the study period, with an average monthly temperature of 26 °C. Between the years 1980 to 2014, climate data (max temperature, and rainfall) were acquired from NCEP website and monthly average temperature and annual average rainfall were calculated. The precipitation and maximum temperature maps of the study area were prepared from by IDW interpolation method using GIS software are shown in Figure. 3.4.

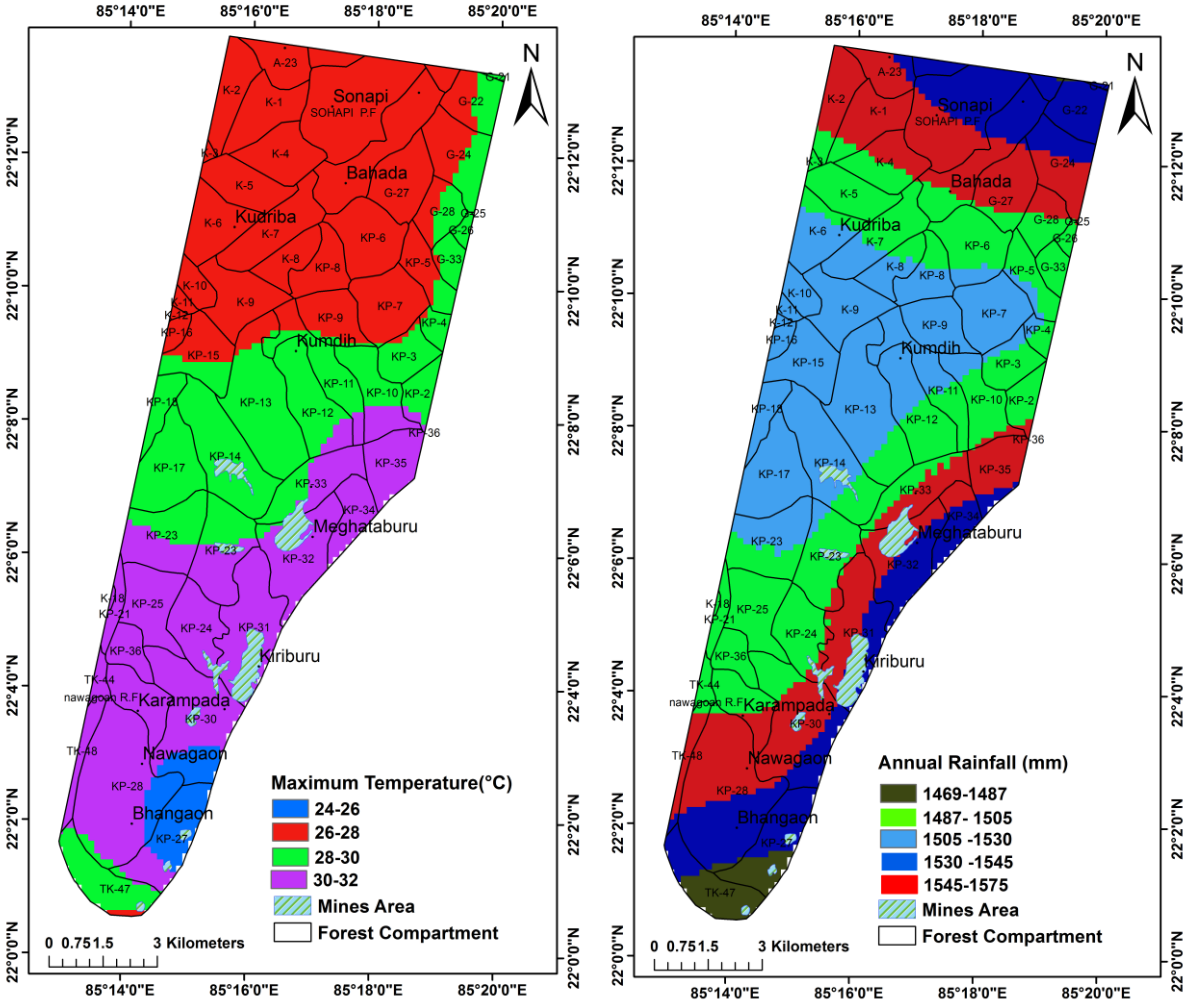

Figure 3. 4: Maximum temperature and annual rainfall maps of study area

3.6 Altitude and slope

Altitude and slope maps are necessary for terrain analysis and hydrological studies. From the altitude map, it can be observed that the altitudinal variation lies within 266 to 860 meters above MSL. From the slope map, it has been observed that the slope varies between 0-38˚. These maps are generated from the Cartosat -1 DEM image in GIS software. The altitude map classified the area into five different classes (0-410m, 410-484m, 484-559m, 559m-740m, and 740-860m). The slope angle map classified it into five classes (0-7.12°, 7.12-16.71°, 16.71-27.64°, 27.64-32.16°, and 32.16-38.52°). Very high altitude and slope are observed in forest compartment surrounding Kiriburu and Meghataburu mining areas. Medium elevation slope are situated on the east side where as low altitude slope are exhibited by Karampada, Sonali, Kumdih, and Bhangaon villages. The altitude and slope maps are shown in Figure. 3.5.

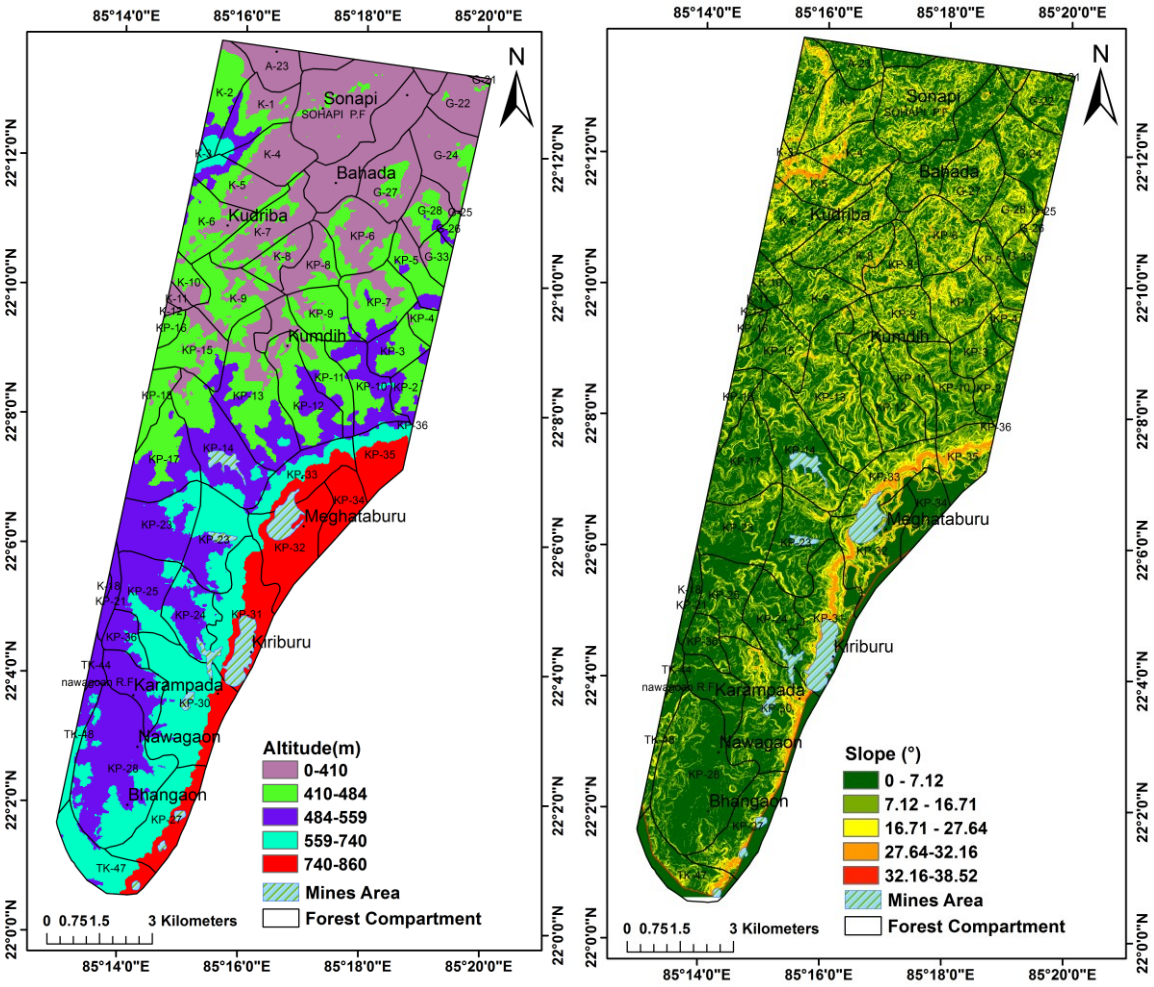

Figure 3. 5: Altitude and Slope maps of the study area

3.7 Forest type and Tree species

Saranda forest is famous for Asia's largest Sal forest and comprises of two main types of forest: tropical moist deciduous and tropical dry deciduous. Forest density map was collected from the State Forest Department (Chaibasa forest office, Jharkhand). Forest type map can be classified into four types: very dense forest, medium forest, open forest, and non-forest field. Sal and Teak trees are richly found in this region (FSI). Mostly, the forest is covered by deciduous trees, and the important species are Sal, Teak, Mangoes, Jamun, Piar, Akasmani, kusum, Mahua, Tilia, and Jackfruit. Tree species map was prepared from satellite imagery (Hyperion), and field tree spectra data using spectral discriminant analysis. We have identified six tree species (Sal, Teak, Akasmani, Mohwa, Palash, and Bot) in the study area. Forest type and tree species maps are shown in Figure. 3.6.

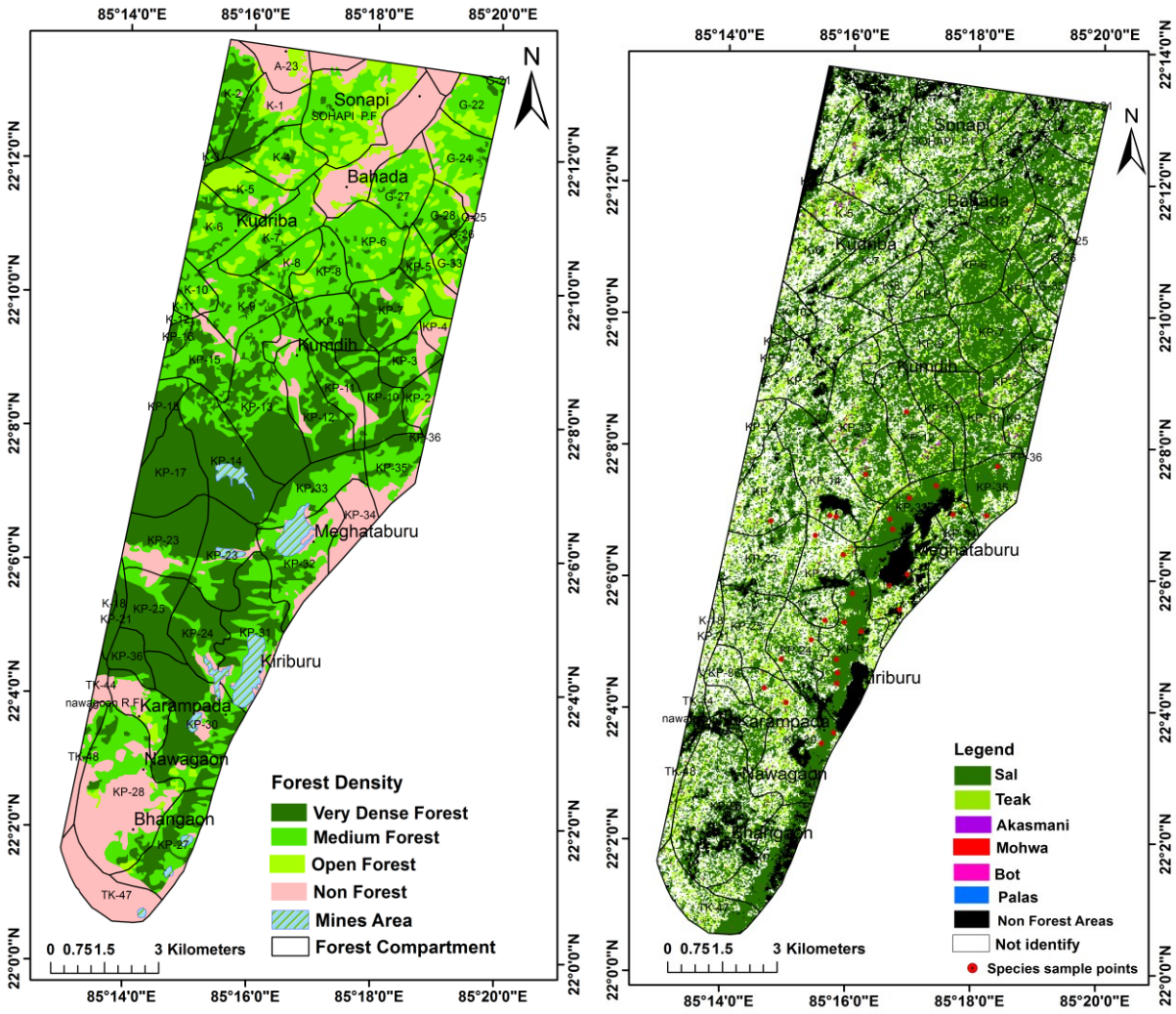

Figure 3. 6: Forest density and tree species maps of the study area

3.8 River, drainage pattern and watershed

River, drainage pattern, and watershed are significant for hydrological analysis in the study area. North Karo is the main river of the Saranda forest and it is famous for high scrap falls (17 meter). The volume of Karo River is much less during summer. Its tributaries has catchment area covering the industrial and iron ore mines (Kiriburu and Meghahatuburu), as a result, river water get polluted. This river merges with south Koel River near Serengda village. This river is located in the upper (north) side of the study area. The drainage pattern of the Karo river basin is sub-angular. The drainage pattern was digitized from Toposheet using GIS software. The highest stream order of the river basin is five. Micro-watersheds of the Karo river basin has been delineated from the

drainage map. A total of twenty-seven micro watershed is shown in the study area. River, drainage pattern, and watershed maps are shown in Figure. 3.7.

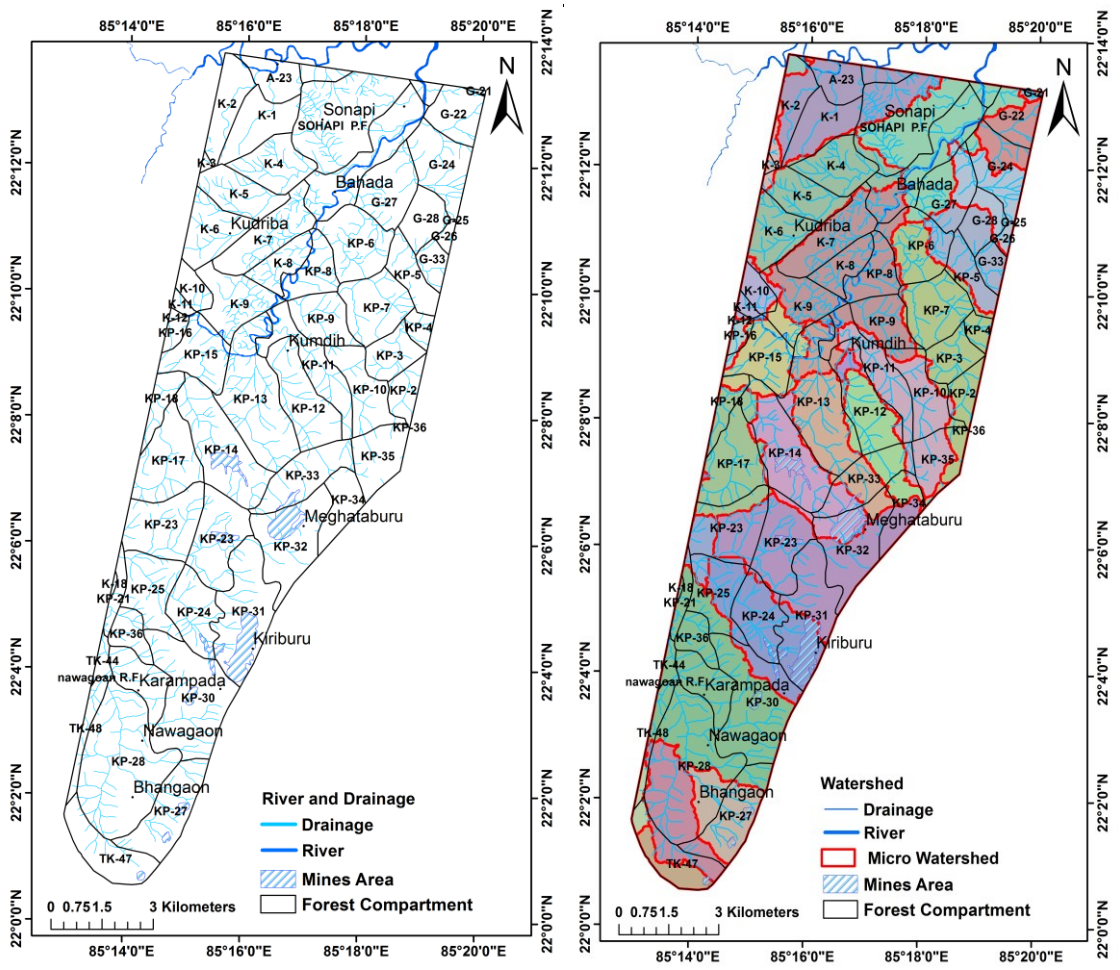

Figure 3. 7: River, drainage pattern and watershed maps of the study area

3.9 Transportation and settlement

Saranda forest has a poor connectivity with road, railway or any other transportation. However, the West Shingbhum district is connected by four highways (including national and state highways), six zila paraishad roads, and some local forest road. Chakradharpur is the railway division of the district. There are few railway lines laid in this area which are used for industrial purposes such as transportation of mineral. Tribal people mainly inhabit this area, and more than 20 tribes reside in this area. Transportation and settlement maps are shown in Figure. 3.8.

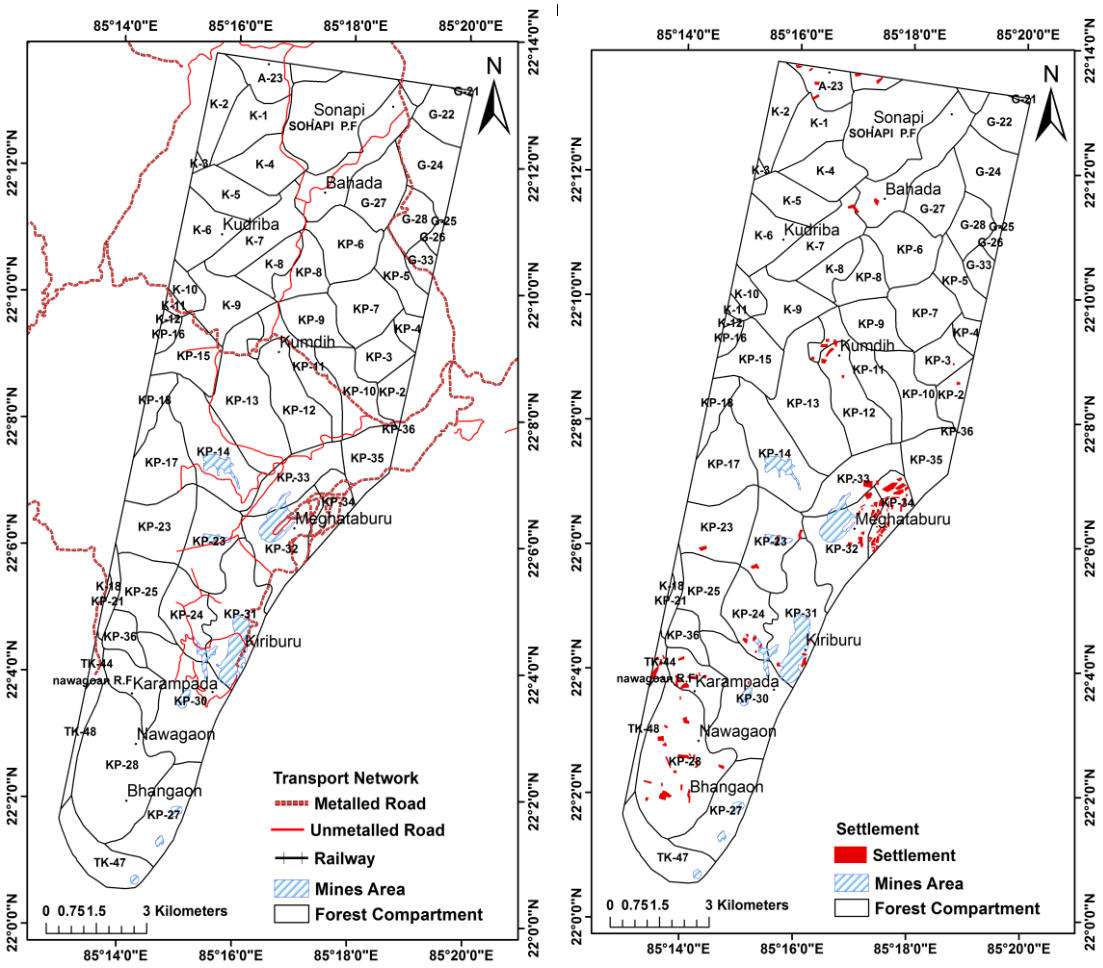

Figure 3. 8: Transport and Settlement maps of the study area

3.10 Population

The population of the West Singhbhum district is 12, 31,958, as per the 2001 census, of which 6, 18,073 were male and 6,13,885 were female with a sex ratio of 993 per 1000 males. The population density was 237. The overall literacy rate of the district was 38.54%. The scheduled tribe (ST) population constitutes 65.31%, scheduled caste (SC) 4.68% and others 29 % in the district with.

3.11 Natural resources

Saranda forest has a wide range of floral and faunal variation. This forest is inhabited by twenty two mammals, forty three birds, ten reptiles, four amphibians, and thirty three species of insects (FSI report). This forest has listed two hundred and eighty two plant species.

3.12 Agriculture and livelihood

Paddy is the main crop, and it relies on rainwater. Maize, wheat, pulses, and oilseeds are cultivated on a seasonal basis. The people of the Saranda forest are economically poor. They were dependent on the forest as well as forest products, agriculture land, and now they have started relying on the open cast mining activities for their livelihood.

3.13 Summary

This chapter outlines the details of the study area. Most of the area is covered with dense forest and consists of two mines (Kiriburu and Meghahatuburu). The infrastructure and communication systems in the study area are not good. Due to lack of proper infrastructure, communication facility, and adverse climatic conditions with hilly terrain, the population in the area is less and sparse. The essential parameter of the study area comprises soil, geology, geomorphology, forest density, slope, elevation, and tree species for forest health study.