

# S U M M A R Y

Singrauli coalfield spreading over an area of about 1800 sq km in Sidhi and Sonbhadra districts of M.P. and U.P. respectively, is witnessing environmental problems on account of large scale opencast mining and operation of super thermal power plants. These activities together with rapid urbanisation and industrialisation are also aggravating the environmental problems resulting into land degradation and pollution of air and water of the region. In order to mitigate the adverse impacts of coal mining and allied activities and conservation of environment, a judicious monitoring of the impact an efficient management plan is required. With the above background an integrated remote sensing study was carried out to evaluate resource potential of the area in terms of landuse/landcover, hydrogeomorphology, slope, drainage, soil, infrastructure facility and to assess the environmental impact in terms of temporal change in landuse/landcover and air and water pollution in the vicinity of coal mines and thermal power plants. Based on the resource potential and impacts studied an Environmental Management Plan was suggested for the area.

The study area located between 23°-55' to 24°-15' North latitude and 82°-30' to 83°-0' East longitude falls in Singrauli and Chitrangi tahsils of Sidhi district, Ramanujganj tahsil of Surguja district and Dudhi tahsil of Sonbhadra district located in M.P. and U.P., respectively. Rihand and Bijul tributaries of Son river are the main rivers of the area which falls in the Son catchment of lower Ganga basin.

Remote Sensing data as well as collateral data in the form of SOI toposheets, available maps and reports were used in the study. The various resource maps viz. landuse/landcover, hydrogeomorphology, soil, surface waterbody were prepared by visual interpretation of satellite data with limited ground truth verification, while drainage, slope and transport network maps were generated using SOI toposheets. Remote Sensing data was also used to assess the environmental impact of coal mining and thermal power plants on land, air and water in the study area. Impact on land was studied in terms of land transformation which occurred at different time spans. The problem of air and water pollution was studied using satellite data as well as laboratory methods.

The study revealed that landuse/landcover of the area has been drastically changed on account of coal mining and thermal power generation alongwith allied activities. Within a span of 22 years (1976-1998) the areas under built-up land, agricultural land, mining area, wasteland have increased while loss of area under forest was noticed.

Hydrogeomorphology of the area was described on the basis of geology, geomorphology and structure. Geologically, the area comprised of Archaean granite-gneisses, sandstone Gondwana, phyllite/schist, quartzite of Mahakoshal Super Group and recent alluvium. Geomorphologically, the area consisted of alluvial plains, valley fills, pediplain, buried pediplain, denudational hill, structural hills, residual hills, ridges, butte and inselberg. The alluvial plains and valley fills had excellent to very good ground water potential

zones. Buried pediplains developed over different geologic formations had good to moderate to poor potential for ground water exploration. Poor to nil groundwater prospect was observed in case of denudational hill, structural hill, riddges, butte and inselberg.

Soil in the area was mainly derived from sandstone, schist, granite-gneisses, quartzite and phyllite. The soil types encountered were mainly dark reddish brown, yellowish brown and dark brown. Texture-wise by and large clay loam, gravelly clay loam and gravelly loam soils were dominant. As per USDA Classification system, land capability classes found were II, III, IV and VII. The former three were cultivable while later was non-cultivable and suitable for pasture and forestry purpose only.

Topographically, the south-western part being plain to undulating was nearly very level to very gently sloping while north-western part characterised by hills and ridges had gently sloping to moderately sloping classes. Coal mining areas were confined to strongly sloping to moderately steep sloping area. Along the ridges steep sloping areas were noticed.

Drainage pattern observed was dendritic to sub-dendritic, sub-rectangular and sub-parallel and these occurred in north-eastern/south eastern part, north-western part and area between Kanchan and Mayar rivers of the study area respectively.

The basic amenities available were education, health, postal services, drinking water and electricity supply. These facilities were maximum in Singrauli tahsil followed by Chitrangi, Dudhi and minimum in Ramanujganj tahsil. Transport facility was available in the form of road network as well as railway line. However, roads served the major area, while railway in the northern part served coal mining and super thermal power projects.

Environmental degradation on account of coal mining and thermal power plants was reflected on landuse/landcover pattern, deterioration of air and water quality. Impact on land studied in terms of land transformation over the years, showed 0.89% increase of total area in built-up land between 1986 to 1998 was at the expense of agriculture, forest and wasteland. However, during the same period forest land was reduced by 4.51% of the total area and this was transformed into built-up, agricultural, mining and wastelands and the land lost to mining was 1.33% of the total area.

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The main cause of air pollution in the study area was dust emitted from coal mining and flyash from thermal power plants. Impact of dust deposition studied through satellite data revealed that deposition was more in 5 km radius than in 10 km radius. Also, the cumulative effect of dust generated from coal mines and thermal power plants was in the maximum area than the single effect of flyash deposition and coal mine dust.

The major factors affecting the surface water quality in the study area were suspended sediments and dissolved sediments coming from coal mines,

thermal power plants and urban areas and discharged into stream and reservoir. Accordingly three zones viz (i). river/stream polluted by mining waste water, (ii) reservoir tank affected by mining waste water/flyash pond overflows and (iii) clear water were identified with the help of satellite data based on district tonal variation of each zones.

The major socio-economic impact of mining and allied activities revealed that between 1981 to 1991 the number of villages were reduced, employment wise the number of agricultural workers decreased and other workers increased.

Based on natural set-up of the area and environmental impact on land, air and water studied, a environmental management plan was proposed for the area. For the reclamation of degraded land viz. mining OBs, degraded forest and wastelands biological method was proposed where plantation of suitable plant species can be grown compatible with local ecological condition of the area. Technical reclamation was suggested for mining areas which comprised levelling the OBS, backfilling of decoaled areas, trenching and contour bunding of recent OBS to check soil erosion during monsoons.

For control of dust pollution around mining and thermal power establishments, the best method suggested was raising of tree curtain or green belt around the periphery. Spraying of water along the haul road, service road, OB dumps, coal piles was also suggested to mitigate the problem of dust pollution in mining areas. Engineering methods like machanical collectors, electro-static

precipitators and wet scrubbing was proposed for control of stack emission from thermal power plant. Suitable control measures proposed for safeguarding the waterbodies were disposal of industrial/domestic effluents to natural water after proper treatment, circuit treatment plants, settling of suspended particles in sumps etc. Selection of suitable machinery and equipment for mining and their proper maintenance and green belt around colonies was proposed for abatement of noise pollution. For protection of foreshore of GBP reservoir and banks of nalas and streams from erosion plantation of suitable species was suggested along the banks of these water courses.

The study revealed utility of remote sensing technique in conjunction with conventional method for assessment of real time baseline data on natural resources and impact assessment of the area.