The question of human-biosphere relation is most strongly felt in the context of a mining region where the development process is entirely dependent on the extraction of natural resources from the land. Coal mining in both open cast and underground collieries negatively affects the environmental quality of a region in various ways: loss of top soil, forest cover, agricultural land, changes in hydro-geomorphologic conditions, changes in topography, lowering of the groundwater table, creation of voids underground, land subsidence, mine fires, dereliction of land by overburden, sand and coal dumps, lowering of air and water quality, and the loss of flora and fauna.

Coal mining is one of those human activities, which completely alter and destroy the natural environment. The land and its resources, which had come into existence over millions of years of slow geological processes, are ravaged upon and obliterated with surprising rapidity. The changing natural landscape and environmental degradation in a mining region, therefore, have attracted the attention of experts all over the world.

The greatest impact of mining, however, occurs on the society and economy of the region, and the changes often have far-reaching results in spite of the transitory nature of land occupation in mining. In the competition to occupy land, agriculture loses wherever extractive resources occur, mainly because mining yields quicker returns. As a result, the land use pattern changes over the years, and a decline sets in the agricultural economy of the region as the collieries begin to occupy more leasehold land for not only coal extraction but also for setting up new transport routes, offices, workers' colonies and other buildings, overburden dumps, coal and sand dumping grounds, subsidence areas and the creation of fallow/barren/derelict land.

The Raniganj coalbelt is the oldest coal mining region of India and the second largest industrial and commercial region of West Bengal. The Eastern Coalfields Limited (ECL), the public sector company that administers mining activities in the Raniganj region, now encourages open cast operation due to the quicker returns and comparatively smaller capital investment. Open cast operation degrades about 0.24 sq. km of land for each million tones of coal production, though this figure depends on the thickness of the seam being extracted.
The study is concerned with the environmental impact of the environment of the Raniganj coal belt in different aspects namely, landuse, urbanization, dereliction of land, expansion of the built up area mouza level forest mapping and deforestation and afforestation with the help of satellite imagery. However it put special emphasis on coal fires and their impacts in this region. The study also includes the salient findings, which are including some recommendations for amelioration of the problems.

Opencast coal mining has created drastic disturbance of the overburden material and has changed the chemical and physical properties of environment. Dereliction of land has been one of the important effects of opencast coal mining. It has led to the creation of ‘dark spots’ on the surface of the earth, heterogeneity of soils, infertility of agricultural land, destruction of forest and other vegetation cover.

The study highlights the urban sprawl on the basis of visual interpretation of IRS IC images of November 1997, and census data of 1991.

The dereliction of land due to opencast mining in the Raniganj coal belt has been accurately measured from satellite data over time through visual interpretation of these data.

As forestry is a vital element from the points of view of biological or natural resources, renewable resources, pollution-free ecosystem, climate, and socio-economic development, accurate measurement of forest areas has been made in the study. Forests need to be given due importance in any kind of resource utilization plan especially in the micro-level developmental plans of a mining region. As mouzas are the lowest administrative units, mouza-level forestry mapping is the essential data input for the creation of plans for sustainable development at the micro-level. For this purpose we have prepared mouza level forest map of the Raniganj coalbelt using latest available remote sensing data.

Raniganj coal belt is one of the oldest coal mining regions of India and coal fires occur both on the surface and subsurface areas of this now densely populated and urbanized region. These fires are of various extent and depth, and result in significant environmental degradation due to population and dereliction of land, and lead to operational difficulties in coal mining activities. One of the problems was to locate the mine fires with the help of satellite data products and other cartographic data, their visual and digital interpretations
supported by field visits, and recommending suitable means of control of this environmental hazard. Therefore, the research has immense operational and applied usefulness.

It was found that both surface and subsurface mine fires of the Raniganj region are closely related to the nature of socio-economic development of the region. Besides spontaneous combustion, unauthorized mining and a long history of void-related subsidence have enhanced the fire problem. These fires endanger human security, make mining operations difficult and lead to environmental degradation. Their means of control at present are mainly technical - dousing with sealant and water, and use of overburden material to stuff out the path of oxygen reaching the coal seams. It was suggested that the degradation of local environment and loss of livelihoods among local populations in association with a decaying agriculture and disappearing commons are at the root of the problem of unauthorized coal mining in the region. These human-induced factors increase the spontaneous combustion of a highly inflammable material like coal. Therefore, along with technical measures, socio-economic planning will have to be taken by suitable implementing agencies. Such a holistic, region-specific approach to fire hazard will be able to control the problem in the Raniganj coalbelt.

The dissertation has been presented in eight chapters.

The first chapter provides answers for the fundamental questions that can arise in the theme of the coal mining, and its environmental problems, problem of coalfires, coal fire impact, detection by remote sensing – has been given this chapter. It also given an outline of mechanism of coal fires, its nature types of coal fire, main causes related to fire in the Raniganj coalbelt (RCB). Above all, the chapter gives some essential outlines of the research design – methodology, data base and data constraints, time span, working steps, usefullness and literature survey.

The second chapter includes the profile of the study region in respect of physical environment, historical evolution. It highlights the problem of area demarcation as well as physiographic characteristics of the region such as topography, drainage system, geology, coal characteristics and background of the population group.

The third chapter clarifies the relation between remote sensing and coal fire. At present it is very easy to detect coalfires and their areal extent, depth intensity with the help of
satellite data. Thermal remote sensing detects the fire prone zone in details. In the chapter fundamentals of remote sensing, thermal remote sensing, application of thermal radiation have been given.

The fourth chapter tries to put the general structure in the study region, general geological history, minerals and coal deposition according to geological time. It also describes economic geology in the Raniganj coalbelt. It tries to put a relation between geological formation and coalfires. I could not discuss details about the relation exact, due to some data limitation.

In the fifth chapter, we have discussed the environmental impact of mining on its physical and socio-cultural parameters in details. It includes the main causes of environmental degradation due to both opencast and underground mining. We have analyzed the major environmental impacts of mining – land subsidence, land degradation and dereliction, river morphology, lowering of water table and water quality, pollution, changes forest cover, loss of agricultural land due to mining, urban growth and other potential impacts.

In the sixth chapter, we have outlined the human security and mine fires from satellite data and census data both. The profile focuses on methodology, map generation to identify the fire prone areas, surface and subsurface fire in the village around the mines. The main causes and hazardous issues have been given in brief. It describes the impacts of coal fire on the environment. The social impacts of fire-endanger to human security in the fire areas have been given.

In the seventh chapter we have described different collieries as a case study. I have taken the most fire prone mine, distributed in the whole study area – Amritnagar, Jay Kay Nagar, Jambad, Shankarpur and Khaerbad (now under privatization) all are under ECL (Eastern Coalfield Limited) have given. In this chapter we have drawn the location, historical background, fire history, its effect neighbouring villages, fire fighting plan and management in brief.

The last chapter concludes our study. This chapter identifies common problems occurring in mining regions, and discusses the various findings problems and recommendation on the research aspect.