CHAPTER VII

SUMMARY

OF

CONCLUSIONS
The study area comprising about 5450 sq km in Sri Potti Sriramulu (SPS) Nellore district (generally called as Nellore district) in Andhra Pradesh is essentially in between the north latitudes 13°57' and 14°30' and the east longitudes 79°18' and 80°12' in the Survey of India topographic maps 57 N, 57 O and 66 B on a scale of 1:250,000 and 57 N/6-8, 10-12 & 14-16, 57 O/5 & 9 and 66 B/2-4 on a scale of 1:50,000. It borders the Bay of Bengal in the east, steeply-rising Velikonda hill ranges in the west, Pennar River in the north and Swamamukhi River in the south. The Kandaleru river basin occupies around 65% of the study area with the balance area occupied by a portion of the Pennar river basin in the north and a portion of the Swamamukhi river basin in the south. The area includes the upland western mandals of Kaluvoya, Chejarla, Rapur, Dakkili, Balayapalli and Venkatagiri, the central mandals of Podalakur, Sydapura and Gudur, and the coastal eastern mandals of Nellore, Indukurpet, Thotapalligudur, Venkatachalam, Muthukur, Manabolu, Chillakur, Ojili and Kota. Although the mica belt lies mostly in the central mandals, the bordering mandals are also included for the sake of comparison. Further, there is relevance in the study of the coastal mandals in view of the possibility of chemically-resistant economic minerals in the mica belt such as mica, quartz, garnet, beryl, magnetite, ilmenite, rutile, zircon, kyanite and coltan to get concentrated in the fluvial fluvial sediments, dune sands and beach sands along the coast.

The Nellore mica belt became famous since 1887 as the largest producer and exporter of high-value block mica and mica splittings next only to Bihar through hundreds of underground mica mines in the private sector. Incidental to mining of high-value mica, large quantities of other minerals such as waste mica, quartz, potash
and soda feldspar, biotite and vermiculite, and rarer minerals such as garnet, beryl, apatite and coltan extracted were simply dumped around the mines as waste. The importance gained by the Nellore mica belt can be appreciated from the fact that the Mica Mines Labour Welfare Fund (MMLWF) Act, 1946 was the first Act to be enacted in India for the welfare of mine workers in the private sector, while similar Acts to benefit mine workers of other minerals could be enacted only after a lapse of over 25 years. Both Indian Bureau of Mines (IBM) and Directorate General of Mines Safety (DGMS) have established sub-regional offices at Nellore, while the State Government established the office of the Assistant Director of Mines and Geology at Nellore and Government Mining Institute and Government Institute of Ceramic Technology at Gudur. With the near exhaustion of mica deposits in Bihar and the carving of the mineral-rich areas of Bihar into a separate state of Jharkhand, Andhra Pradesh soon became the number one state in terms of reserves, production and export of mica from India. The difficulties faced in the economic mining of sheet mica at greater depths and the necessity felt to mine not only sheet mica but also other minerals such as scrap mica, feldspar, quartz and vermiculite to make mining viable have resulted in a gradual replacement of the underground method of mining to opencast method of mining in many mines in recent years. The present work is aimed at studying the voluminous work carried out by the previous workers and make new studies through extensive field work, remote sensing studies using recent and historic satellite images available in the Google Earth public domain, geophysical and geochemical surveys, and chemical analysis of major constituents through spectrums generated by Carl Zeiss Scanning Electron Microscope (SEM)
with Oxford Energy Dispersive X-Ray Spectroscopy (EDS). After a study of the problems faced by the mining industry in the Nellore mica belt, suggestions are made as to how the Nellore mica belt could retain its supremacy in the harnessing of mica, its value-added products and associated minerals in the coming years without at the same time causing any mining-related environmental degradation. The conclusions arrived at and recommendations made are summarised below.

1. Because of a breach that took place in 2005-floods to the high-level bridge across Kolleru River on the Sydapuram-Gudur road – the main artery connecting the mica belt to outside world, vehicular traffic gets halted continuously for a few days every time the river gets flooded. There is urgent need for the restoration of this high-level bridge.

2. The present tendency of mining industry is to market economic minerals mined to Chennai with little or no value addition besides using Chennai Port for exports. In the light of the recently created world-class private port at Krishnapatnam at a distance of 22 km from Gudur connected with Chennai-Kolkata railway line and Chennai-Kolkata National Highway, it will be cost-effective for the Nellore mining industry to make use of this port for exporting value-added products of minerals mined.

3. Comparative studies of the topography and relief of land forms using Survey of India maps and Google-GeoEye satellite images have revealed glaring discrepancies. These discrepancies are attributed to Google Earth giving geodetic latitudes, longitudes and altitudes based on the globally-used WGS-84 Datum last revised in 2004, while Survey of India gives those values
based on Indian Geodetic Datum based on Everest Spheroid of 1880 last revised in 1956. Some agencies such as the Forest Department prefer to use the local India-Bangladesh (IB) Datum coordinates rather than the WGS-84 Datum coordinates. In the interest of maintaining uniformity and avoid needless discrepancies, it is suggested that all concerned agencies in India come to an understanding to make use of the globally-used WGS-84 Datum coordinates.

4. There has been widespread environmental degradation and desertification due to natural abiotic factors particularly in and around Chejarla mandal towards northwest where there is widespread occurrence of rocky areas devoid of any soil or vegetation and alkaline soils barren of vegetation along several streams due to the occurrence of clayey soils of poor drainage at shallow depth. There is need to address these problems.

5. Present studies have indicated that several man-made activities such as large-scale brick making such as the one located at Degapudu in Podalakur mandal, construction of minor irrigation reservoirs (tanks) transforming their catchments into alkaline lands and command areas turning moderately alkaline to give reduced crop yields, and construction of the Kandaleru balancing reservoir transforming large tracts of downstream forestland and agricultural lands into deserts of alkaline lands devoid of any greenery. There is need to address these problems.

6. Because of creating large-scale irrigation infrastructure such as the Kandaleru balancing reservoir and canal networks, many valuable mineral deposits got
buried under them and could never be mined at any time. There is need to address this issue at least when such works are taken up in future and thereby prevent permanent concealment of valuable mineral deposits.

7. On the basis of Forest Canopy Density (FCD), forestland is classified as Very Dense Forest (VDF) with FCD of 100 to 70%, Moderately Dense Forest (MDF) with FCD of 70 to 40%, Open Forest (OF) with FCD of 40 to 10%, Scrub Forest (SF) of 10 to 0% and Barren Forest (BF) and Water Body (WB) with FCD of 0%. Of the recorded forest area of around 1309 sq km in the study area, 0% is VDF, 8% is MDF, 41% is OF, 31% is SF and 20% is BF and WB. With a mean FCD of 13%, the condition of the forestland in the study area is real pathetic. While contribution of mining for this condition is negligibly small, this pathetic condition is because of the abiotic factors and manmade activities mentioned above besides legal and illegal felling of trees and resources crunch for taking up large-scale reforestation and scientific land reclamation on an intensive scale.

8. Studies by the Forest Department between 2006 and 2010 revealed negative changes in the forest cover from Open Forest to Barren Forest, Open Forest to Scrub Forest, and Scrub Forest to Barren Forest in an area of 1665 ha and positive changes of forest cover from Barren Forest to Open Forest, Barren Forest to Scrub Forest and Scrub Forest to Open Forest in an area of 113 ha. This is further confirmed in the present study through a comparative study of recent and historic satellite images. It is suggested that this problem could be
tackled effectively by the scientific use of large mine wastes generated during mining to improve soil fertility and enhance plant growth.

9. Allotment of land by the Government for various purposes such as (i) creation of irrigation infrastructure such as reservoirs, tanks, canal networks, (ii) culturable land for landless poor for cultivation, (iii) coastal land for salt manufacture and aquaculture, (iv) creation of infrastructure for transportation networks, (v) communications' infrastructure such as ports and roads and (vi) setting up of industries particularly under Special Economic Zones (SEZ) is a relatively easy task. But, when it comes to allotment of land for mining, the rules are made so difficult and stringent that the aspirants had to spend rather heavily and wait for a few years to obtain clearances from a number of Central and State Governments Departments for grant of mining leases. The percent land allocated to total geographical area comes to 9.5% in the case of landless poor, 1.05% for industries and infrastructure development, 0.81% for aquaculture and 0.75% for mining leases. This clearly indicates the low importance attached towards development of mining in an area known to be potentially mineral rich.

10. With the large scale Jalayagnam works taken up in the study area in recent years, there has been a big boost to the surface and ground water resources leading to water inundation of exploratory test pits and opencast mines round the year preventing study of the mineral occurrences in them and increased cost of dewatering for taking up mining.
11. It is noted that most mineral-rich areas are barren lands without vegetation, which are somehow included under the recorded forest area. The existing forest laws disallow conversion of those lands as non-forestland. A few decades ago, when forest laws were flexible, mining was allowed in forestland without hassles. As a result, there were once 181 mining leases spread over 3289 ha of forestland accounting for 2.5% of the recorded forestland. With changes in India's forest laws, it became extremely difficult to obtain new mining leases or renew mining leases that got expired. There are presently only five mining leases in 88 ha of forestland (i.e., 0.07% of the recorded forestland and 2.7% of forestland under mining earlier) as per the records of the Forest Department. But, as per the records in the office of the Assistant Director of Mines and Geology at Nellore, there are eight mining leases in 324 ha of forestland (i.e., 0.25% of the recorded forestland and 9.9% of forestland under mining earlier). Only by a radical change in forest laws, it becomes possible to realise the twin objects of development of both forest resources and mineral resources in a big way. There will be then no need for illegal mining of the mineral deposits in forestland and show as if they were mined in non-forestland. When mining is legalised, there will be no tax evasion and there will boost of revenues to the concerned Government Departments and a sizeable portion of it could be used for forest resource development.

12. Despite hiring the services of Registered Qualified Persons (RQPs) recognised by the IBM for the preparation of the Mine Plans, it is noted that
there are very large number of mining leases where there was no mining activity at all for want of availability of the mineral of requisite quality in economically extractable amounts. Such lapses can be avoided by discouraging RQPs from resorting to such practices. In some cases, some minerals are listed in the mine plan without establishing their economic occurrence just to avoid the trouble of including them in the event of finding them at a later date. Such lapses can be avoided by simplifying rules for according permission for inclusion of new minerals in existing mining leases through simple application.

13. The present approach of the mine owners is to excavate exploratory pits randomly and abandon them when no mineral could be located in them. A methodology has been suggested in the present study to replace ad hoc methods followed by scientific methods of mineral exploration.

14. It is known from the past experience that coltan and other rare minerals could be collected by intensive search of mine dumps around operating or abandoned mines. Now such a search is not possible because most such mine dumps were used by the mine owners to fill up the abandoned mines and unproductive prospecting pits as a way out to fulfil the rules promulgated by the Government of India in 2003 to implement “Mine Closure Plans” and “Progressive Mine Closure Plans”. Similar intensive search along the innumerable upland streams and geochemical drainage studies involving panned-concentrate drainage sampling along two stream networks have also not revealed the occurrence of any coltan, indicating that the intermediate
zone pegmatites which carry coltan are not exposed at all anywhere in the study area. The only way sizeable deposits of coltan could be extracted consists in replacing the hitherto practiced underground method of selective mining for mica by the opencast method of mining where the entire pegmatite is mined. By this, all useful minerals including coltan could be segregated and recovered.

15. The policy decision of the Government in including coltan and other non-radioactive materials such as beryl as Prescribed Substances for exclusive development by the AMD is responsible for the local mining industry in the study area showing little interest in their exploration and production. As coltan, beryl and rare earth elements minerals are not radioactive minerals, International Atomic Energy Agency (IAEA) does not impose any restrictions on their sale. The only way to boost up the exploration and exploitation of coltan, beryl and other rare earth elements minerals in the study area consists in removing them from the list of prescribed minerals under the exclusive control of the AMD and allow mine owners to mine and market them as per the market prices.

16. Although intensive efforts taken in the present study to locate coltan deposits have proved futile, the intensive methods used to locate coltan has helped in the location of ferrian ilmenite and titano magnetite deposits from scattered localities all over the study area. Anorthosites and basic igneous rocks (later metamorphosed to meta-anorthosites and orthoamphibolites) — the typical host rocks in which titanium deposits could occur are abundant in the study
area. Hard rock ilmenite and heavy mineral sands are the two major raw materials used to recover titania and titanium. Tellnes ilmenite mine, Sokndal, Southwestern Norway is the world's largest opencast mine of hard rock ilmenite with an average TiO₂ of 18% and estimated reserves of 380 million tonnes. The mine has been operating since 1960 with an average annual ore production of 8 million tonnes, of which ilmenite mined makes around one third. Large-scale exploratory drilling at potential sites where ilmenite occurs at surface could be taken up to locate many such hard rock ilmenite deposits from the study area. In a bid to encourage private sector participation in a big way, the Department of Atomic Energy (DAE) of Government of India has already removed titanium ores and concentrates, ilmenite, rutile, and leucoxene, zirconium and its alloys, compounds and minerals/concentrates including zircon from the list of prescribed substances with effect from 1 Jan 2007. Advantage should be taken by the private sector for throwing open titanium minerals for exploration and exploitation by the private sector and take up development of hard rock ilmenite deposits in a big way.

17. Although Andhra Pradesh dominates in mica production and exports, mica resources of Andhra Pradesh are known at a much lower degree of assurance while intensive work in Maharashtra and Rajasthan applying UNFC methodology evolved by the IBM helped to prove mica reserves in those states with greater degree of assurance (IBM, 2009a). It is worthwhile for the IBM to publish a monograph on the latest scientific methods of prospecting
of mica so that the private mining companies can use that methodology to estimate the mica reserves in the study area and develop them in a big way.

18. Widespread discrepancies are noted in the various types of statistics such as resources, reserves, production and exports of mica furnished by different Government agencies. There is need to resolve these discrepancies.

19. From the fact that the average daily employment in mica mines in India fell from 52,200 in 1951 to less that 600 now with underground mica mining getting replaced by opencast mines and permanent mine workers getting replaced by contract workers, there is no more need for the continuance of the Mica Mines Labour Welfare Fund Act of 1946 to provide relief to the mica mine workers. Collection of mica welfare cess at 3.5% over exports was mooted at a time the entire mica exported used to be raw mica without value addition. But, as most mica is now exported with some value addition without involving the use of mine workers, the cess collected is hurting the Indian mica exporters so much that they are losing business to other international mica exporters selling the same products at a lower price. As there are also no mine workers to get benefit from mica welfare cess, it is suggested for scrapping the Mica Mines Labour Welfare Fund Act of 1946.

20. Switching over from the underground method of mining practiced hitherto to produce mostly sheet mica to opencast mining to produce not only sheet mica, but also other minerals such as scrap mica, quartz, potash and soda feldspars and vermiculite and valuable minerals such as beryl, coltan and other rare and exotic minerals leads to the generation of enormous waste
rock. Mining laws should be made flexible for the mine owners to market minerals not included in the mining lease by simple application. Beneficiation of low-grade minerals has to be taken up and marketed. There is also need to find out new uses for mineral wastes of pegmaties and their host rocks for purposes such as laying roads and for soil reclamation so as to lead for to zero mine waste. If this could be achieved, there will be no environmental degradation at all because of mining with mine wastes actually improving the quality of environment by tackling the vexing problem of alkalinity of soils affecting crop growth in agricultural lands and plant growth in forestland in a big way.