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PRESIDENT'S COLUMN

After nearly seven years of steady growth, slowdown in global economy had impact on mineral sector in India during 2008-09. After a short duration, the mineral sector in 2009-10 revived with upward trend. Unfortunately during this period serious cases of irregularities in mining activities have been brought to lime light in almost all the mineral rich States. Because of adverse publicities, mining sector again suffered and it may also affect future growth. This damage could have been avoided had the Govt. agencies timely implemented the normal regulatory practices as per the prevailing laws. While the proposed New Mineral Policy and amendments to MMDR Act with the rules there in would surely help in growth of this sector, question arises whether these changes can be implemented by Govt. which have not been successful in the past. For example, in order to achieve transparency in awarding mineral concessions, the concept of auctioning and prior environment & forest clearances by Govt. for the areas to be auctioned may not be practicable. First of all strengthening of mineral administration at various levels of both the State & Central Govts. is essential today. Particularly the concerned departments of respective Govts. have to jointly control, monitor and enforce the statutory regulations while the public and industries have to co-operate. In this context the suggestions detailed by SGAT in "Vision Document for Mineral Development – 2020 for Orissa"(briefly indicated in last issue of the bulletin) need to be considered.

The Workshop on "Requirement of Power for Mining and Mineral Based industries in Orissa" organized by SGAT in August, 2009 has also highlighted the reasons of existing shortage in availability of power and has suggested for needful action for future. Here also the failure of Govt. system and implementation of plans are highlighted. Good governance with early implementation of Electricity Act 2003 and Rules there in have been recommended.

The proposed Seminar on "**Strategy for Management of Economic Slowdown in Mineral Industry**" in December, 2009 is likely to bring out some suggestions which would also deserve consideration by Govt. and industries as well for achieving growth of mineral sector in future.

Good governance along with effective C.S.R. and people friendly activities by the industries can only help in Sustainable Development of Mineral Sector.

Dr. R.C. Mohanty
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MINERAL RESOURCES AND INVESTMENT ENVIRONMENT FOR MINERAL SECTOR IN KYRGYZSTAN

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ABSTRACT

Kyrgyzstan, located in Central Asia occupying parts of Tien Shan and Parmir mountain ranges, has its economy based on agricultural produce that predominates over industrial sector. It has rather rich potential for mineral based industries, has a lot be exploited, so far. Besides gold, it has silver, mercury, antimony, rare earth, tin, tungsten, uranium, iron, titanium, vanadium, aluminium, copper, molybdenum, beryllium, tantalum and niobium. In the sources of energy sector this country is endowed with coal, gas and oil also. State Agency for Geology and Mineral Resources carries out geological surveys, issues licenses for geological exploration. The geological data base has been archived by the Agency which constitutes an important asset of the country. Exploration companies have not been subject to government interference and enjoy healthy relation with State Agency for Geology which manages all affairs related to exploration licenses while it tries to encourage investors. The principal problem with the law is that it gives too much discretionary powers to the State Agency for Geology which has a room for subjective applications. Taxation of mining enterprises is in the form of profit taxes, royalty, value added tax, road and emergency tax, customs duties and smaller land and excise taxes. Draft of a new more open and transparent, mining law aimed at boosting foreign investment have been prepared by the Kyrgyz government and are expected to be debated within coming months.

Key words: *Mineral exploration, Mining development, Gold, Silver, Coal, Uranium, Business environment, Mining Law, Profit tax.*

INTRODUCTION

Kyrgyzstan is located at the centre of the Eurasian landmass, at 41° North 75° East, and borders China on the east, Kazakhstan on the north and west, Uzbekistan on the west and south and Tajikistan on the south. The country is mountainous, with about 90% covered by Tien Shan and Parmir ranges. The valleys, however, are well watered and provide farm land for much of the population, which in July 2006 was estimated at 5.3 million: 70% ethnic Kyrgyz, 14% Uzbek, 10% Russian and other Europeans, and 6% other groups. The Russian and other European population have

declined since independence in 1991, as these peoples leave the country in search of better opportunities in Russia and elsewhere. Many ethnic Kyrgyz also work in neighboring countries (mainly Russia and Kazakhstan), due to low job opportunity in the country. Most Kyrgyz are Sunni Muslims and most Europeans are Orthodox Christians.

Kyrgyzstan is divided into seven provinces. The provinces are listed below, and their spatial relationship is shown in the figure below.

1. Bishkek 2. Batken 3. Chui 4. Jalal-Abad
5. Naryn 6. Osh 7. Talas 8. Issyk Kul

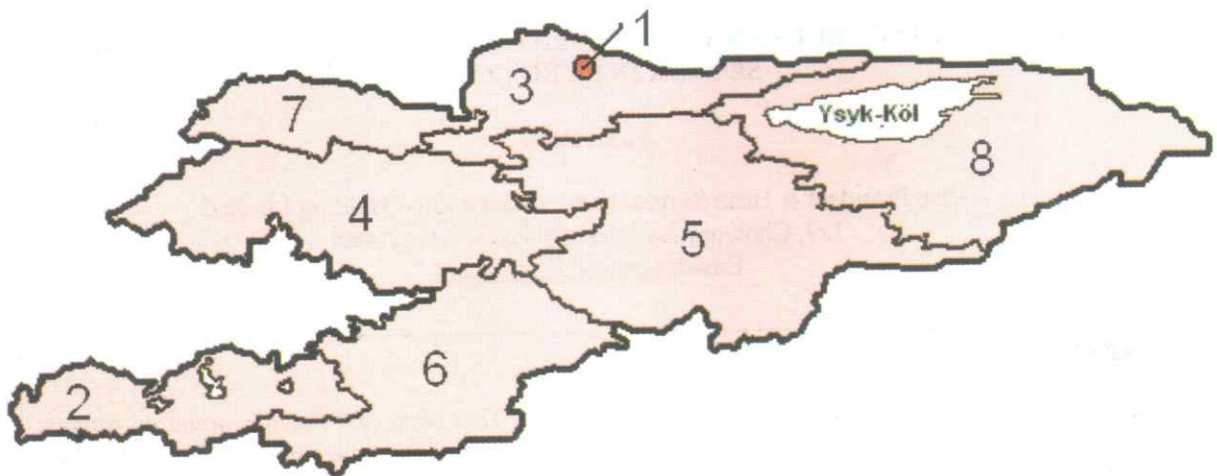


Fig-1: Administrative Divisions of Kyrgyzstan

Agriculture is the principal economic activity, accounting for 50% of the labour force and 32% of the GDP. Principal crops are cotton, tobacco, wool and meat. Tobacco and cotton are important export commodities. Grain, potatoes and sugar beets are widely grown, and the country is self-sufficient in food, although many prepared-food items are imported from Russia.

The industrial sector accounts for 20% of the GDP (PPP basis) and employs 15% of the work force. This sector is dominated by gold mining. Other enterprises in industry produce mercury, antimony and light machine shop equipment items. The balance of the economy is in the services sector, which includes trading between China and the Gulf States to Russia through the Kyrgyz gateway.

The country has a substantial current account trade deficit, which in the past has been covered by loans and grants from the World Bank, International Monetary Fund and bilateral donors, including the USA, the European Union and Japan. The external debt of the country is US\$3.0 billion (86% of official GDP), which creates some concern

among the donor organizations, although the country is reported to be making regular debt service payments.

Kyrgyzstan has mineral potentials which have been discovered during Soviet period. The country plans to prove the commercial exportability of these resources to develop its economy. An attempt is made here to offer information on some of these deposits and scope prevailing for their being developed.

MINERAL RESOURCES OF KYRGYZSTAN

Most part of Kyrgyzstan is occupied by the Tien Shan fold belt (Fig-1), which is known for its Gold occurrences. Gold mineralization occurs in two principal settings within the Tien Shan Mineral Belt, namely as i) *porphyry and epithermal* systems developed within magmatic arcs, and ii) *orogenic-type* gold deposits that are structurally controlled, and tempo-rally and spatially associated with late Palaeozoic, syntectonic to early post-collisional, highly evolved, I-type granodioritic to monzonitic intrusive in fore-and back-arc terranes (Cole and Seltmann, 2000; Yakubchuk et al., 2002; Mao et al., 2004).

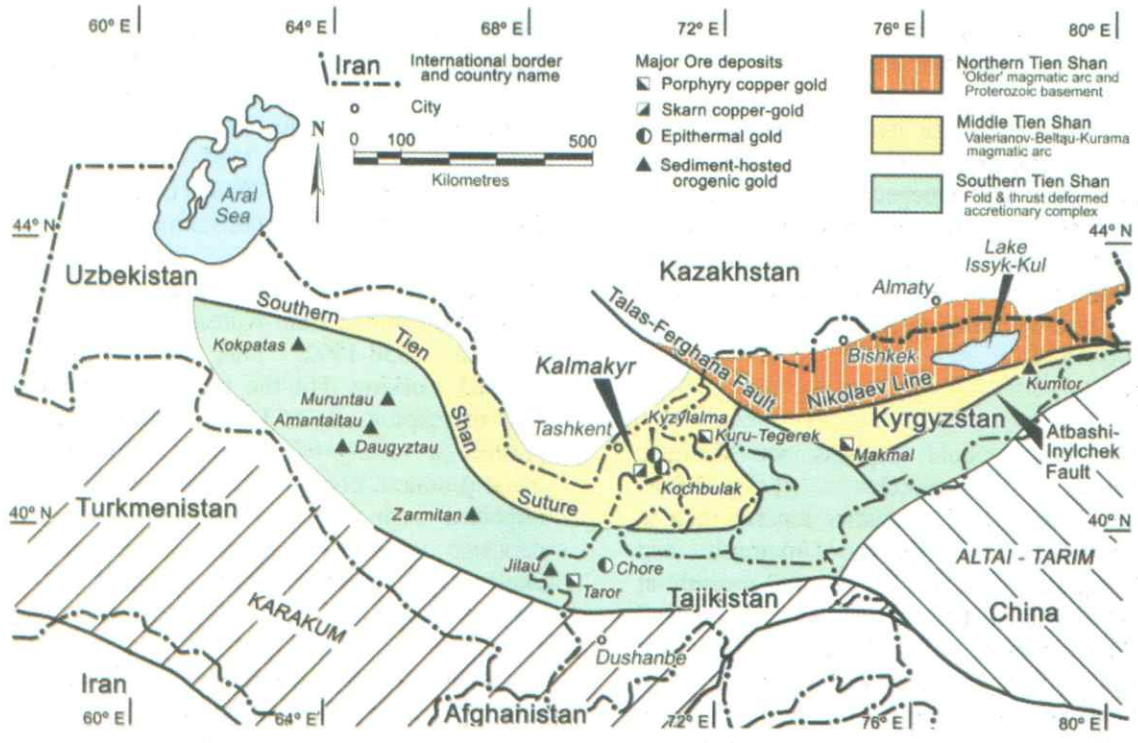


Fig-1: Geological map of Tien Shan

The Republic of Kyrgyzstan possesses a significant potential of many useful minerals. The leading metal is gold, but deposits of mercury, antimony, coal, rare earths, tin, tungsten, uranium, non-metalliferous minerals, and underground waters are also worked. There are deposits for possible development of iron, titanium, vanadium, aluminum, copper, molybdenum, and beryllium, as well as tantalumnobates and cobalt ores, zirconium, lithium, and gem stones. There are numerous deposits of coal and construction materials, and limited fields of oil and gas.

Several government organizations are responsible for geological investigations in Kyrgyzstan:

The M.M. Adyshev Institute of Geology, National Academy of Sciences of the Kyrgyz Republic (IGNAS), are scientific organizations carrying out fundamental research on the regional geology, mineral deposits and metallogenesis.

The State Agency for Geology and Mineral Resources carries out geological surveys, issues licenses for geological exploration and manages all activity connected with the underground resources of Kyrgyzstan.

The U.A. Asanaliev Kyrgyz Mining-Metallurgical Institute, part of the Ministry of Education, Science and Culture, trains engineers in geology, mineral exploration, mining development, refining and metallurgy.

The Institute of Seismology (NAS) carries out investigations of earthquake activity and tectonics.

The State resources inventory includes more than 17,000 known mineral occurrences and more than 250 prospected mineral deposits of coal, oil, gas, non-ferrous metals (gold, silver, copper, lead, zinc, antimony, tin, tungsten and others), radioactive elements and construction materials.

Gold

The largest gold deposits are Kumtor, Jerooy, Makmal, Taldy-Bulak-Levoberezhny. The smaller deposits include Andash, Kuru-Tegerek, Unkurtash and Dolpran. Gold was mined until recently at the Makmal deposit by the State owned "Kyrgyzaltyn". The Kumtor mine in the eastern Kyrgyz Republic had an estimated 17M oz resource at the beginning of mine operations some 11 years ago, occurring within carbonaceous shales of the Middle Tien Shan sequence. Other mining operations are planned at Jerooy, Taldy-Bulak-Levoberezhny. These gold deposits are mostly complex ores, such as gold-copper, gold-antimony-arsenic, and gold-in-polymetallic deposits.

Silver

Silver has been mined on the northern slope of the Talas ridge since ancient times. However no significant silver deposits have recently been proposed for development.

Coal

About 70 coal deposits and showings are known to exist in the Republic. They are grouped in the four basins of South-Fergana, Uzgen, North Fergana, and Kavaksky, and in three smaller areas of Chatyrkulsky, Alay,

and South Issykul. There are 1.3B mt coal in the reserve base, 76% of which is in categories equivalent to proved and probable. Coal production in the pre-independence period of 1985-1991 ranged from 2.9 - 3.6M mt/yr. Production is now 500K mt/yr for domestic consumption.

Rare earths of the cerium and ytterbium series were mined from Kutessay II deposit between 1958-1992. This deposit has stopped working, but the processing plant near the capital city of Bishkek, which can produce a variety of rare-earth oxide and metal products, continues to work using ore imported from China. A number of other deposits within Kyrgyzstan have been explored, including Aktuz, Kuperlisay, Jangart, and Kenkol.

Uranium ores were produced from several mines within Kyrgyzstan and were processed at the still-operating refinery in KaraBalta. Areas of interest for development of uranium production may be focused upon the explored ore deposits in the basin of the Saryjaz River and uranium-thorianite placers of the Kzyl-Ompul group.

MINING SECTOR

During Soviet times, Kyrgyzstan and the other Central Asian countries were developed as natural resource supply areas for the greater Soviet Union. During World War II, metallurgical industries were moved from European sectors of the USSR to escape the invaders, and a number of enterprises also sprang up as green-field production centers within the region. Kyrgyzstan was an important source of minerals for the Soviet Union, including uranium, tin, tungsten, rare earths, mercury, lead and zinc. Gold was not an important commodity (except for some small placer

operations) until the 1980s when the Makmal mine was opened. The mineral industries required a great exploration effort, and the State Agency for Geology has mapped and surveyed the country from one end to the other, with particular emphasis for strategic metals. The geologic database created by this effort has been registered, catalogued, and archived by the Agency and constitutes an important asset for the country.

Under market conditions that have existed since independence in 1991, the Agency for Geology has greatly reduced its expenditures for field exploration, while many foreign companies have taken up exploration licenses and conducted exploration programmes. Today, some 10 foreign companies are involved in gold exploration and are joined by many local and other CIS-based companies. The increase in the gold price over the past several years has greatly encouraged exploration companies.

Producing operations now consist of Kumtor and Makmaul gold mines (Sary Jaz mine on stand-by), antimony refining at Kadamjai, mercury retorting at Hydarkan and uranium processing and gold refining at Kara-Balta. Tin ores are mined at Enilchek for shipment to a smelter in Siberia. Several gold mines are now at the feasibility study/construction stage, including Jerooy, Taldy-Bulak on the Left, and Andash; a number of other exploration projects are moving to this stage.

BUSINESS DEVELOPMENT

A number of political risk assessment organizations and Non Government Organizations have conducted studies of the business environment in nations around the world. Two groups have studied the situation in Kyrgyzstan: AON Political Risk Services and Transparency International.

AON provides risk consulting and insurances services for private businesses conducting business around the world. This company is best known for its annual Political and Economic Risk Map, which ranks each country on a five-step scale: Low risk, Medium-low risk, Medium risk, Medium-high risk, and High risk. Kyrgyzstan is ranked as a High risk country (based on 2008 data), as are most of the other Central Asian nations. Kazakhstan, on the other hand, has been upgraded two positions from High risk to Medium risk, as has Russia. Transparency International is a German-based NGO which provides an annual Corruption Perceptions Index for most of the nations of the world. This group uses a series of surveys to develop a country's score for corruption, with scores ranging from 10, highly honest, to 0, highly corrupt. Kyrgyzstan scores 2.3, (based on 2006 data) along with Ecuador, Democratic Republic of Congo, Kazakhstan and Belarus. Other risk-assessment groups, such as Political Risk Services Group, Inc., also publish annual surveys, which do not include Kyrgyzstan, most likely due to the small market size in this country and the small number of foreign investors.

Exploration companies have not been subject to government interference. Most exploration managers report good relations with the government, especially the State Agency for Geology, which has been encouraging to investors.

MINING LAW

The mining law of Kyrgyzstan was converted from the Soviet code in the early 1990s to a set of interim regulations, and then a formal "Law of the Kyrgyz Republic On Subsoil" was enacted (with technical assistance from The World Bank) in July 1997. This law was amended in June 1999

and in February 2002. The law is generally considered to be a modern, reasonable mining code. The Law on Subsoil provides for:

- The State Agency for Geology to issue licenses for mineral exploration by tender and direct negotiations with private investors. Exploration licenses are issued for 2 years with the possibility of extension to 10 years.
- The State Agency for Geology to convert an exploration license to a license to develop mineral properties. Development licenses are issued for 20 years with extensions to the depletion of the deposit.
- The Local Governing Bodies to issue land allotments to the subsoil licensee for the use of the surface needed in the mineral enterprise.
- The State Agency for Geology to regulate and control activities upon the license area, both during exploration and production phases, in order to ensure that there will be no “irrational selective working” of the deposit.
- The State Agency for Geology can suspend or terminate subsoil use licenses when the user is in breach of regulations.

The principal problem with the law is that it gives too much discretion to the State Agency for Geology, which can be subjected to pressure from higher government officials who may have any personal interest in the awarding or termination of licenses. Further, the local rayons and villages have considerable political power over the license holder under the land allotment provisions. These issues reinforce the point that, as a company moves into the feasibility/construction stage, it must have an

effective government-affairs department to monitor the agencies and resolve disputes.

Several study groups, including The Extractive Industries Transparency Initiative (proposed by former Prime Minister Blair and known as the EITI) programme in Kyrgyzstan, are drafting amendments to the existing law in the hopes of moving the Kyrgyz statute to the open and transparent law envisioned in the EITI.

Drafts of a new mining law aimed at boosting foreign investment have been prepared by the Kyrgyz government and are expected to be debated within the coming months.

TAXATION

Taxation of mining enterprises in Kyrgyzstan is in the form of profits taxes, royalty, Value Added Tax, Road and Emergency Tax, customs duties and smaller land and excise taxes. In addition, companies normally pay their employees' income withholding tax (salaries are usually quoted on a net to employee basis) and the entire social fund tax.

The current tax regime applied to mining companies includes:

- Profit Tax (income tax) 10%. The tax code generally follows western models for calculating taxable profit and loss, with some exceptions, particularly in regard to depreciation. Local tax counsel is required to assist in tax matters.
- VAT is 20% on materials, works, services and imports. Refined gold exports are VAT “exempt”. This means that the VAT paid by a gold producer to his suppliers cannot be recovered from

other taxes owed, but must be absorbed as a cost of production. It has been proposed in new tax legislation to lower the VAT to approximately 12 to 14%.

- Road and Emergency Fund Tax total 2.3% of gross profit. These have the same economic impact as an addition to income tax.
- Royalty is 3% of NSR for most minerals and deposits up to 50 tonnes gold; and a rate of 5% for deposits over 50 tonnes gold.
- Customs VAT is 0% for major capital items, 20% on other equipment and goods. Most equipments items for mining will not be subjected to VAT under this provision.
- Minor taxes include excise tax on diesel at \$75 per tonne (rolled into the dealer's price), land taxes at 16 to 44 com/hectare (\$0.5 to 1.10/hectare) and customs fees at 0.15%
- Withholding taxes on Employees' income is 10% (30% for non-residents). Pension Fund and Health Fund (Social Fund Tax) is levied at 19% for employers and 8% for employees. It should be noted that many salaries in Kyrgyzstan are quoted on a net basis, this means that the employer pays the entire tax for his employees.
- Depreciation is on a single declining balance basis with annual percentage rates set for a number of asset classes. The percentage rates vary from 30% for fast depreciating items such as vehicles and computers to 10% for fixed heavy assets such as electric lines and buildings. Short-life projects may not be able to recover all of the capital expenditure through depreciation, as the asset class life may be much longer than life of the operation itself.

These taxes generally are within international standards, with the exception of the VAT treatment of gold exports. The concept of value added tax is that it is to be neutral for exports, thus exporters are normally refunded the VAT taxes that they had previously paid for supplies and materials. The inability to recover VAT paid by gold miners to the supply chain has little impact on cash flow for gold prices above about \$350; however, below this price level the un-recovered VAT, which is in fact an extra tax, can harm project attractiveness.

CONSTRAINTS AND PROSPECTS

Kyrgyzstan though has an agricultural products based economy it has moderately huge prospects for mineral based industries. During Soviet Union days Kyrgyzstan and other Central Asian countries were developed as natural resource supply areas for the USSR. The mineral industries required a great exploration effect and accordingly State Agency for Geology has mapped and surveyed the country from one end to the other with particular emphasis for strategic minerals. Based on study of political risk assessment (2008) Kyrgyzstan is ranked a high risk country. It scores 2.3 (corruption varies inversely with number) when measured for corruption in a scale of 0 to 10. Mining Laws give too much discretionary teeth to the State Agency for Geology. Taxation still carries the stamp of socialistic pattern of pre-CIS era. The silver lining is, however, the draft of New Mining Laws, to bring an open and transparent system for regulating the exploration/exploitation of minerals, under study. It is expected to be launched in the near future. When the new laws are enforced Kyrgyzstan would expect to receive entrepreneurs in mineral sector from major global players.

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SEM STUDY OF GLACIOGENIC DIAMICTITE ASSOCIATED WITH PALAEO-DRUMLINS, EAST OF DURGAPUR VILLAGE, ANGUL DIST., ORISSA

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ABSTRACT

The salient textural and morphologic features of diamictites carapace of the palaeo-drumlins in a small area east of Durgapur village, Angul district, Orissa are presented based on scanning electron microscope (SEM) study. Micromorphologic study reveals the surface characters of mineral particles confirming their identification so obtained from optical microscope and XRD observations. The minerals recognised include quartz, feldspars, Kaolinite, illite, ilmenite, magnetite, rutile, leucoxene, tourmaline, garnet, zircon, sillimanite, monazite and muscovite typical of Eastern Ghats terrain and provenance lithology. Overall angularity of grains and the totality of textural attributes attest to the glacial outwash nature of diamictites.

Key words: Drumlins, Diamictite, Scanning Electron Microscope, Micromorphology, Glaciated region

INTRODUCTION

An ice moulded hummocky meso-landscape spread over a small area (700m X 200m) describing a remnant palaeo-drumlin sub-country is reported from near the southern foothills of the Supra Barakar Kamthi hills, Angul district (Paul and Das 95, Nayak, 2001). Drumlins comprising highly streamlined whale-backed swells/mounds characterised by en-echelon disposition, high degree of clustering, and asymmetric longitudinal profile with steeper blunt and gentle tapering slopes have been described from Quaternary glaciated regions of the world (Janhiainen, 1975). Drumlins have proved a valuable tool in modelling glacial activities. Located about 2.5 km east of Durgapur village (20° 55' N; 84° 53' E, Toposheet 73 D/13) on the fringe between SW part of Talcher basin and Eastern Ghats retrograde metamorphic terrain, these modified, isometrically subdued and geologically ancient residual drumlins recognised by their morphologic and morphometric characteristics describe a typical 'basket of eggs' topography

(Paul and Das, 1995). These drumlins in general belong to diamictite dominated genetic type (Knight, 1997) formed by rucking of ice melt fluvio-glacial/subglacial drift debris in a depositional regime. The major bulk of the drumlins under description is composed of diamictites, which may be equated with para-conglomerate of Pettijohn (1984) and ortho-till of Harland et al (1966). Diamictite in this context is proposed for any nonsorted /poorly sorted terrigenous boulder clay sediments that consist of sand and scattered phenoclasts of boulder, cobbles and gravel, set in a muddy matrix (Flint et al, 1960b and Gary et al, 1972). The boulder clay has a reddish brown coloured fine grained matrix texturally classifiable into sand, silty sand and sand-silt-clay in order of decreasing population (Nayak, 2007 following Shepard 1954).

Comprehensive mineralogical study of the diamictites undertaken by integrated optical microscopy, XRD, DTA and IR techniques

revealed the presence of a variety of transparent to opaque mineral phases viz. quartz (as major constituent), kaolinite, illite, orthoclase and calcite in subordinate amount, muscovite, titanite, ilmenite, goethite and lepidocrosite in minor and apatite in trace amounts. Semi-quantitative heavy mineral analysis of boulder clay indicates the presence of predominantly angular to subangular ilmenite and magnetite (30-90%), angular garnet (upto 20%), sillimanite (upto 10%) as major phases with minor proportion of rutile, zircon, tourmaline, leucoxene, and rounded grains of monazite and apatite in decreasing order. In one sample of boulder clay, high incidence of muscovite (35%) has been recorded. The heavy fraction constitutes 0.5 to 4.9% of the +230 mesh size.

Surface morphology of minerals by Scanning Electron Microscope (SEM) has been studied earlier by many workers, but there has been no specific publication on high resolution microscopic study of diamictites. The present note reports the SEM study of different heavy, light, transparent and opaque minerals of glaciogenic boulder clays with a view to substantiating the identification of various mineral phases from their micro-morphologic attributes.

SEM STUDY OF DIAMICTITE

Coned and quartered, oven dried and unclassified samples of diamictites matrix collected from the drumlin area under description were sprinkled on double adhesive conducting tape placed over an aluminium stub (10 mm dia) sputtered with gold by an ion sputter (JFC-1100) were viewed under JSM 35 CF Scanning Electron Microscope (JEOL make) operating at working voltage between 15 and 40 kV with variable beam current at working height of 15 mm. The secondary electron images produced were recorded in the form of micrographs directly photographed at variable magnification (600-1000) from oscilloscope with the help of a dedicated camera.

RESULTS AND DISCUSSION

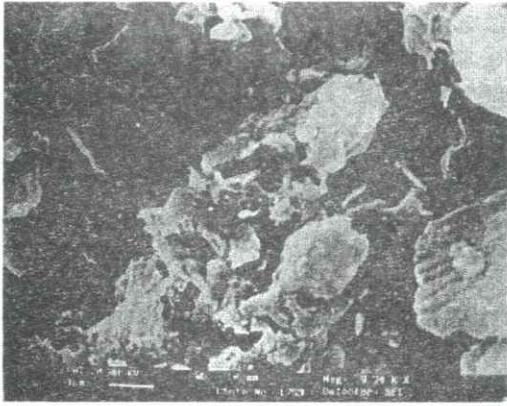
Quartz is present ubiquitously in all the samples in variable shapes and sizes as subangular to angular and anhedral grains (Figs F & J). Feldspars are texturally characterised by more or less subhedral texture and lath, elongated, tabular to prismatic shaped grains (Fig.J). Elongated, tabular and lath shaped grains are identified as plagioclase. Tourmaline is identifiable by its distinct hemimorphic habit showing termination of faces at one polar end and flat face at the other. Rhombohedral to modified rhombohedral shaped grains belong to calcite. Randomly distributed small more or less equilateral triangles represent euhedral magnetite crystals. Tabular foliated and book like grains and corrugated sheet like grains are those of muscovite. Leucoxene occurs with white spotted border conforming to doubly terminated tetragonal prism and pyramid. Mild knee bend twinning is seen in leucoxenised rutile. Sillimanite is identified as bent/curved needle shaped to stout rods with distinct cleavage. Ilmenite which alongwith magnetite constitutes the largest bulk of the heavies occurs as small elongated lath shaped well rounded crystal. Coarser laths of ilmenite is also seen. Rutile appears as doubly terminated euhedral crystals. Knee bend twinning of rutile is discernible in micrographs. Monazite appears as well rounded spherical grains with sometimes pitted surface which could be due to disintegration of radioactive elements. Zircon is seen as somewhat doubly terminated subhedral and sub-angular to rounded prismatic grains. Garnet figures (many grains) as both dodecahedral euhedra and as subangular subhedra. Illite is characterised by minute slender needles (Fig. E). Adhering particles due to precipitation of silica is seen almost on all the grain surfaces and on garnet and sillimanite in particular (Fig.A,B,C & H). Precipitation of silica is an indicator of acidic environment typical of glaciation. Poorly sorted grains of all sizes from gravel to fine sand and less than 2 micron clay is another textural feature found in low energy pool of acidic water.

CONCLUSION

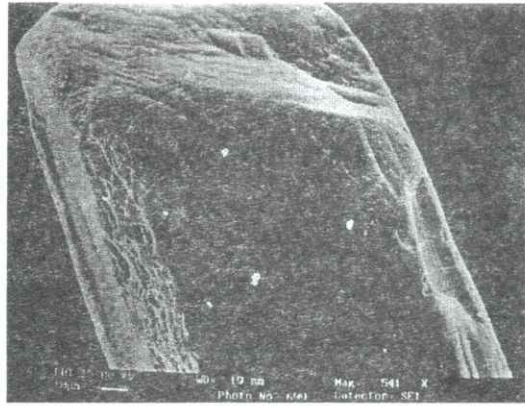
Most of the minerals recognised under optical microscopic examination for heavy minerals and combined XRD and DTA techniques for both heavy and light phases have been micromorphologically characterised and identified by SEM study. The suit of heavy mineral assemblage characterised by lack of magnetite – ilmenite exsolution intergrowth indicates igneous granite provenance. Prevalent incidence of garnet and sillimanite attests to a high grade metamorphic provenance ie. Eastern Ghats province. Textural attributes of heavy minerals brought out through microscopic and SEM study point to the predominance of very angular to sub-angular nature of the diamictites suggesting sedimentation under short distance fluvio-glacial transport from morainic embankments (Nayak, 2001).

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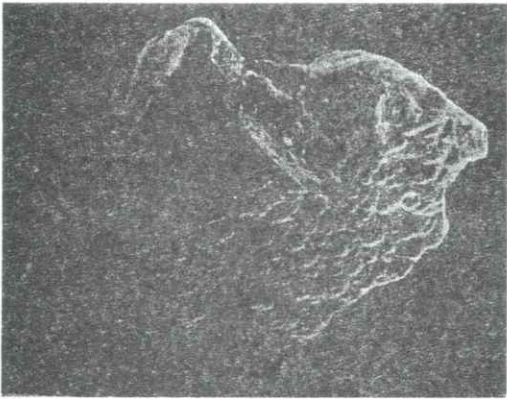
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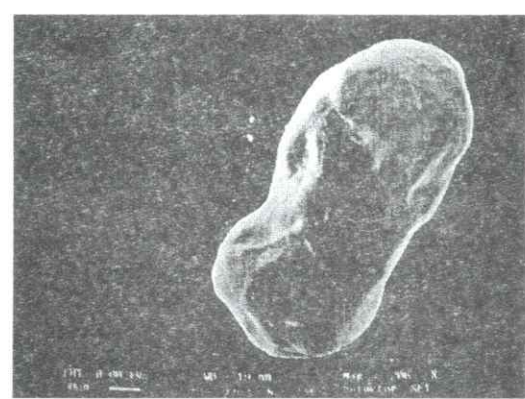
A



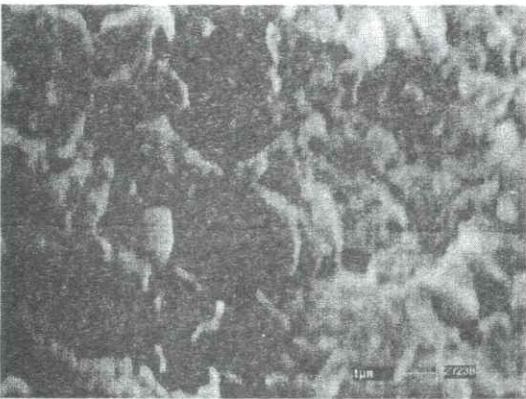
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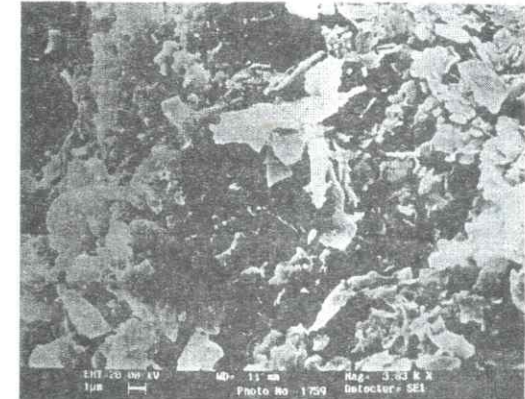
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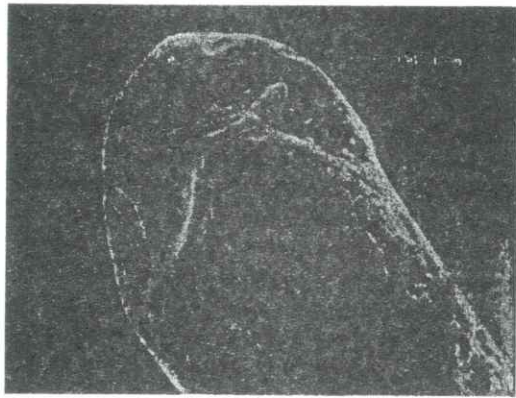


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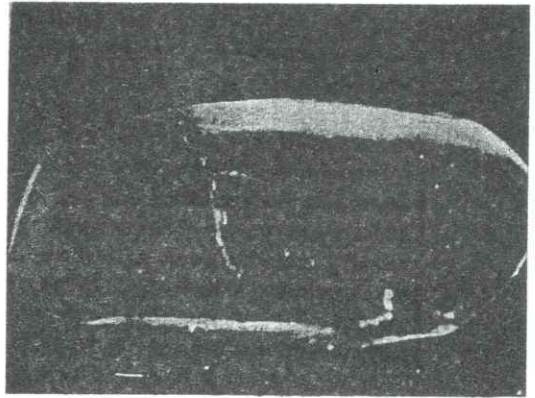


F

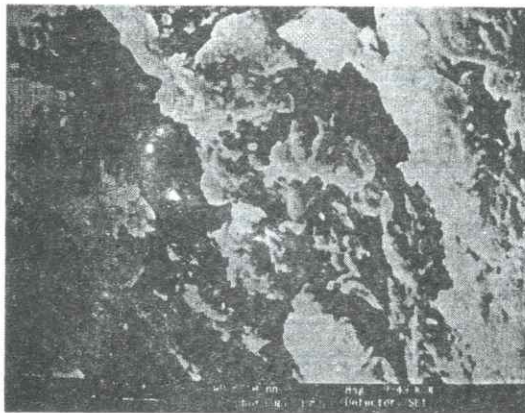
A: Kaolinite, Limonite B: Sillimanite, C: Garnet, D: Ilmenite E: Kaolinite, Muscovite, Illite
 F: Kaolinite, Quartz, Muscovite



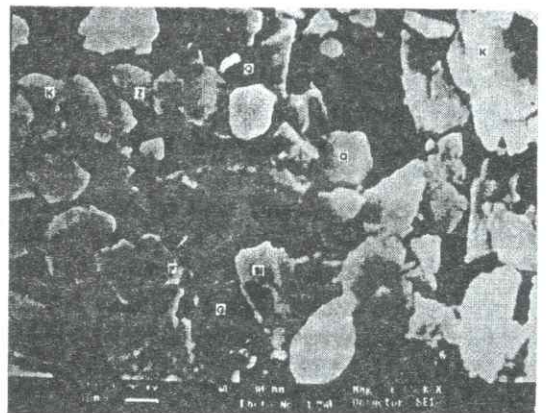
G



H



I



J

G: Ilmenite
Kaolinite

H: Zircon

I: Kaolinite, Goethite

J: Quartz, Feldspar, Sillimanite, Garnet, Zircon,

POWER SCENARIO IN ORISSA VIS-A-VIS REQUIREMENT FOR FERRO ALLOYS INDUSTRIES

R.K. Jena, Managing Director
Balasore Alloys Ltd., Balgopalpur, Balasore

Abstract

In the recent past Orissa was one of the power surplus states with reasonable power tariff. Orissa being endowed with occurrences of important minerals – Chromium, Iron, Aluminium, Manganese and Quartz – draws investor's attention to set up mineral based industries. But the power scenario has deteriorated since and does not match the requirement of power for mineral based industries, due to sporadic shut down of power generating units, shortage of coal supplies to thermal power plants and lack of rains during the monsoon has affected adversely the power generation. This led to a blanket order, by the Government, to cut down 50% of power load by the industries. Orissa has the scope for more Ferro Alloys plant to increase value addition to the scarce mineral available in the state. The above power scenario stands as a deterrent to such ventures. It is right time for state government to increase the power generation capacity either through NTPC or private investors in the state.

Key words: Power situation, strategic minerals, captive generation

Orissa was considered as one of the power surplus state with a reasonable power tariff. Orissa is endowed with strategic minerals like Chromite, Iron-ore, Manganese, Quartzite and host of other minerals. The available vast land mass is ideal for establishment of industries. Proactive policy for industrializing the state started with the visionary Chief-Minister Late Biju Pattanaik

which was followed up by subsequent Govts. The first Ferro Alloys Plant in Orissa was established in late 60's by IMFA. Subsequently taking advantage of Orissa's infrastructure many industrial houses established ferro alloys industries in the state. The list of Ferro Alloys Industries and their power requirement is as below-

| <u>Name of the Unit</u> | <u>Plant Location</u> | <u>No. of furnaces</u> | <u>Capacity MVA</u> | <u>Product produced</u> |
|-------------------------------------|--------------------------|------------------------|---------------------|-------------------------|
| Balasore Alloys Ltd. | Balgopalpur, Balasore | 5 | 57 | HC Fecr/Simn |
| Ferro Alloys Corporation Ltd. | Randia, Bhadrak | 1 | 45 | HC Fecr |
| Indian Metal & Ferro Alloys Ltd. | Therubali | 1 | 82 | HC Fecr/Fesi |
| Indian Charge Chrome Ltd. | Choudwar | 1 | 48 | HC Fecr |
| IDCOL Ferro Chrome & Alloys Ltd. | Jajpur Rd | 2 | 15 | HC Fecr |
| Jindal Stainless Ltd. | Duburi | 5 | 201 | HC Fecr/Femn/Simn |
| Mangilall Rungta | Dhenkanal | 1 | 9 | HC Femn |
| Nava Bharat Ventures Ltd. | Dhenkanal | 2 | 45 | HC FeCr |
| Pradhan Industries Limited | Jajpur | 1 | 3 | HC Fecr |
| Rohit Ferro Tech P.Ltd. | Jajpur | 4 | 66 | HC Fecr/Simn |
| Tata Iron & Steel Co.Ltd. | Bamnival | 1 | 30 | HC Fecr |
| Tata Iron & Steel Co.Ltd. | Joda | 2 | 24 | HC FeMn |
| Utkal Manufacturing & Services Ltd. | Utkal | 1 | 27 | HC Fecr |

| | | | | |
|-------------------------------------|----------------|-----------|--------------|---------|
| Visa Steel Limited | Jajpur | 2 | 33 | HC Fecr |
| Hind Metals & Industries Ltd. | Dhenkanal | 2 | 16.5 | Simn |
| Rawmet Ferrous Industries Pvt. Ltd. | Cuttack | 2 | 33 | HC Fecr |
| | Total - | 33 | 734.5 | |

The power generation vis-a-vis Requirement in the state is as below—

| | | |
|---------------------------------|--------------|------------------|
| HYDROPOWER | Total | 1994.5 MW |
| THERMAL POWER | Total | 880.0 MW |
| CENTRAL SECTOR (ORISSA's SHARE) | Total | 1070.0 MW |
| | TOTAL | 3944.5 MW |

Total Peak Hour Load Requirement 2900-3000 MW.

Total Off Peak Load 2500-2600 MW.

Sporadic shut down of different generating units leads to occasional power deficiency situation. As grid is now being loaded to its maximum capacity issues relating to quality of power, uninterrupted supply of quality power in right quantum is relevant.

In spite of Govt's claim, as late as last two years, that Orissa is a surplus power state, the situation is quite different today and the state is reeling in acute power crisis. During current year the situation has aggravated due to no rainfall for 10 months and delayed monsoon, leading to less generation of hydropower. Shortage of coal supply to Thermal power stations and breakdown of units in IbThermal and Talcher Thermal power stations has further reduced the power generation. A blanket order has been issued to impose 50% load restriction to the industries. The worst hit are the ferro alloys industries who do not have their captive generation units.

SCENARIO AT BALASORE PLANT

Our Ferro alloys plant in Balgopalpur, Balasore has installed load of 60 MVA and have 44 MVA contract demand with

NESCO. We have five furnaces with capacity of 57 MVA and 3 more furnaces totaling 71.5 MVA are planned to be installed in near future. Power shortage this year has jeopardised our operation forcing us for occasional stoppage of some furnaces.

ANOMALY IN POWER SUPPLY AND POWER CHARGE

As stated above the power situation during the current year was critical. The restriction of 50% load imposed by state load dispatch centre (SLDC) was against the spirit of order given by OERC wherein it was stipulated that a 10 % round the clock load restriction and 15-20% load restriction during evening peak hours was to be enforced on the industries till 15th July or when the power situation improves whichever is earlier.

Though 50% load restriction has been imposed on the industry, while raising the bill the distribution companies are calculating the units at the maximum demand hit in the month and calculate the load factor on that basis which does not appear to be rational.

In normal case it should have been done on Pro-Rata basis. Thus the Ferro alloys industries are being penalized for no faults of theirs.

The Power tariff in Orissa is being steadily increased from Rs 2.50 per unit in year 2007 to Rs 2.90 per unit in 2009-10.

CONCLUSION

Capacity addition and establishing more number of Ferro alloys plant in the state is

the need of the hour to increase value addition of the scarce minerals available in the state. The above power scenario stands as a deterrent to such ventures. It is high time for the state govt. to increase the power generation capacity either through NTPC or private investors in the state.

**SYNOPSIS OF IGCP 514 INTERNATIONAL SYMPOSIUM HELD IN GUILIN, CHINA
DURING 14-18 OCTOBER 2009**

Dr. B.M. Faruque, Director, GSI (Retd)

Advisor, Geomin Consultants P. Ltd.
Zahir Land, Tinkonia Bagicha, Cuttack-753001

The International Geological Correlation Programme (IGCP) is a co-operative enterprise of UNESCO and IUGS and has been encouraging comparative studies in the Earth Science since 1972. IGCP provides thousands of earth scientists from about 150 member countries, a multidisciplinary forum to exchange knowledge and methodology on geological problems of global significance. IGCP promotes collaborative projects with emphasis on benefit to society, the advancement and sharing of knowledge between developed and developing nations.

IGCP-514 Fluvial Palaeo-Systems: Evolution and Mineral Deposits was launched in 2005 for a period of five years slated to close in December 2009. The 4th International Conference was held in Guilin, China co-sponsored by the Guilin University of Technology and Beijing Research Institute of Uranium Geology during 14-18 October 2009. Twelve geoscientist delegates from Russia, China, India, Australia and Canada participated in the symposium with oral presentations.

The symposium was initiated with the paper "Statistical Analysis of Mineralogical Characters and Lithological Facial Zoning of Fluvial System" by Dr. Anna Bochnova, Alexander Lalomov and Roman Chefranov of Russian Academy of Sciences, Moscow. The Ilmenite-Zircon placers of Oligocene Miocene of Khanty-Mansiisk region is formed by littoral processes. The provenance, of the placer minerals, is the weathered crust of Ural Mountains and placer concentration of older sediments, in

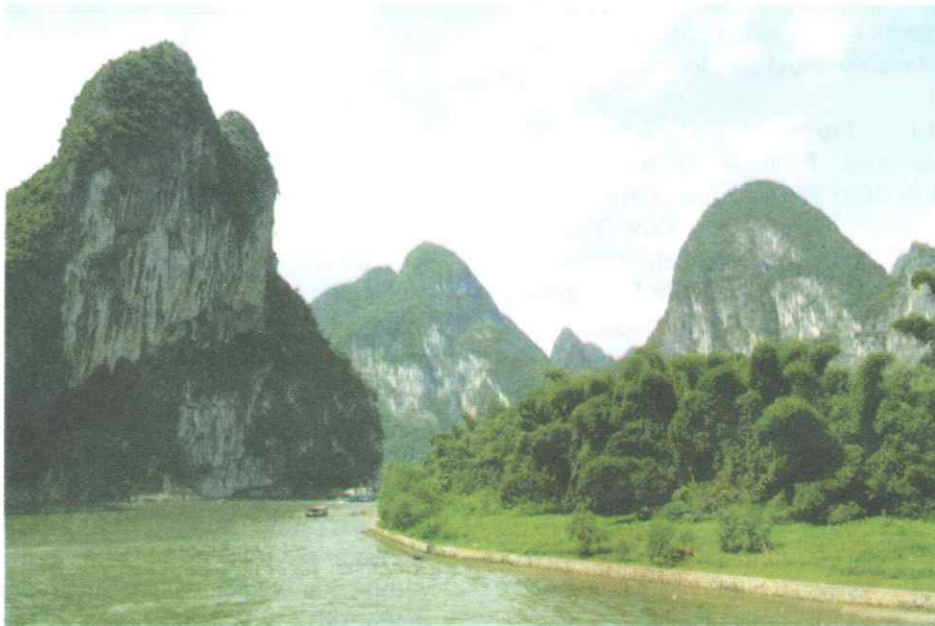
the Western Siberia. On the basis of textural characters, granulometry, statistics and mineralogy the thicknesses of the placer deposits in the adjoining facial zones were determined. The four environments of deposition are i) Transit zone of fluvial placers, valleys and sub-aerial delta, ii) Beach and submarine delta zone, iii) Zone of shallow sea with moderate hydrodynamic activity (shoal) and iv) Zone of local depression free from influence of wave activity. The authors conclude that the beach zone followed by zone of shoal form the important geomorphic features as loci of placer minerals.

The second presentation by was made by Dr. B.M. Faruque, Director (Retd.) GSI and Advisor to Geomin Consultants (P) Ltd., on the variation in the composition of sediments, in the near shore zone, to the mineralogy of the seabed samples, drawn from outershell in the 50 km wide continental shelf off Aryapalli-Kushabhadra sector, along east coast of India. The heavy mineral assemblage consists of garnet, ilmenite, sillimanite, zircon, rutile and monazite are confined to the near shelf zone within 50m depth, where the sediment is rich in silica sand and contains some amount of calcareous sand also. The sediment on the outer shelf from 63m onward is predominantly calcareous sand, coral debris and shell fragments and silica sands. The absence of heavy mineral in the palaeo beach ridges of Last Glacial Maxima at 122m depth and later at 76m depth is attributed to cold and arid climate prevalent at that time, due to Last Glacial Cycle.

Aridity along with cold climate of the glacial period might have frozen the fluvial activity to a low energy trickle. Hence heavy minerals could not be carried down to the palaeo-beach ridges.

Prof. Baohong Hou, of Australia described the depositional features of heavy mineral placers in the palaeoshoreline sequence 380 km inland from the present shoreline of Eucla Basin in southern Australia. Weathering, erosion, palaeo-fluvial activity, sea level change and tectonic movement for over 40 million years have influenced the concentration of heavy mineral sands along a 2000 km arc of palaeoshorelines of the Eucla Basin. The study combined sea level episodes and palynological dating of onshore sediments to reconstruct palaeo-shoreline evolution together with predictive models for sites of heavy mineral (HM) concentration. The prospects of the eastern

margin of the basin was identified following reinterpretation of earlier geological studies and exploration drilling data leading to a revised model for evolution of the beach-barrier dune complex. The record of marine, marginal marine, estuarine, fluvial and lacustrine environments, as constrained mainly by an extensive borehole data-set, reflects major depositional events during Eocene to Pliocene. Subsequent mineral exploration located several high grade HM (ilmenite, zircon, rutile) provinces in Southern Australia. Sediment provenance studies indicate that zircon, rutile were derived mainly from the Musgrave province and possibly Albany-Fraser Orogen, with minor contributions from the eastern Gawler Craton. Several cycles of marine transgression during the Cenozoic have left beach placer deposits buried beneath the present landscape.



Limestone country's karst topography along Lijiang river near Guilin

Gailan Gan and Cian Song described the Geological Characteristics and Formation of Dachang Alluvial Tin Deposits in Guangxi of China. Ore minerals were distributed in

the vicinity of the primary karst valleys. Ore type is generally gravel and gravel type, folders clay, clay layer and sandy clay layer type. The type of (diluvial) alluvial or mixed

types were in valleys and depressions away from the original deposits. Heavy mineral assemblage consists of cassiterite, galena, sphalerite, sulfur salt, limonite, pyrite, arsenopyrite etc. The north-west structure control the development trend of the terrain. The formation of placer deposits are attributed to combined action of geological structures, primary occurrence of cassiterite, tectonic movement changing the landforms and activating erosion and the warm, humid subtropical climate.

Mathematical modeling of formation of fine cassiterite distal placers in fluvial channel was presented by Alexander Lalomov of Russian Academy of Sciences. The sources of alluvial placers of tin in Chukotka region of North-Eastern Russia are related to the quartz-cassiterite formation associated with acid magmatic intrusive and series of porphyrite dykes. During glaciation of Pleistocene-Holocene, mechanical breakdown erosion gave rise to coarse grained eluvium as placer deposits. Lalomov establishes a relation between coarse grained heavy minerals forming proximal placer deposits with reference to the provenance. Fine grains are transported by fluvial systems far from the source and deposited (distal placers) in suitable geomorphological zones and congenial hydrodynamical conditions. Mathematical modeling based on Mass Balance Method allows determination and defines location of distal alluvial placers of fine heavy minerals.

William LeBarge of Yukon Geological Survey of Canada spoke on placer geology, palaeogeography and exploration potential of Pliocene-Holocene alluvial terraces in Indian River, West Central Yukon, Canada. There are several generations of low to high level gravel terraces in the Indian River area, which vary in age from Pliocene to Holocene. Most of the historic placer gold has been recovered from Holocene river alluvium; however a significant amount of

placer gold has also been mined from older low-level intermediate level and high level gravel terraces. Fine grained placer gold has also been found in previously untested glacio-fluvial gravel units. The potential for untapped placer gold reserves in these terraces is significant, however, few detailed investigations have taken place to date. High level terraces represent a Pliocene Palaeo-Indian river, which flowed in the same direction as the modern stream. These terraces were formed by a long period of bedrock weathering, aggradations and subsequent degradation, which resulted in a concentration of placer gold mainly at the bedrock contact. Holocene alluvium is the main placer-gold bearing deposit that has been exploited in the Indian River. Placer gold concentration has been found to be inconsistent and may be related to the availability of gold from older alluvium or local bedrock.

Ziying Li from Beijing Research Institute of Uranium Geology described the origin of Dongsheng Sandstone Type Uranium Deposit in Jurassic palaeochannel system in north eastern Ordos Basin, China. It is generally controlled by a transition zone between greenish and grayish sandstones. The greenish colour of the palaeo-oxidised sandstone result from chloritisation and epidotisation due to natural oil and gas secondary reduction processes. It is spatially related to Jurassic Zhiluo Formation with braided palaeo channel systems. The uranium contents are usually high in the Archaean and early Proterozoic crystalline and granitoid rocks of different ages. Yanan Formation, Zhiluo Formation and Huaci-Huanpre Formation formed in warm and humid climatic conditions contain lots of humus, carbon and coal seams which have strong properties of adsorbing and reducing uranium. Uranium migrates as carbonate in many processes of typical sandstone type uranium mineralization. Kerogen and coal produce abundant organic acid by pyrolysis.

The oxygen containing groups of kerogen can also produce organic acid. Organic acid has a great affinity to take uranium away. When uranium bearing fluid flow to differing physical and chemical condition stable compounds become unstable. Uranium stops migration and deposits. Uranium mineralisation takes place. The important medium changing conditions of Uranium bearing fluids is organic matter, which reduction and absorption role in uranium depositional processes.

Shu Lixia from Guilin University of Technology explained the "Ionic conductivity anomalies in soil cover of blind mineralization beneath regolith cover" by Xianrong Luo, Meilan Wen, Lixia Shu, Baohong Hou and J.L.Keeling. The paper deals with the formation of ionic conductivity anomalies in soil cover and the characterization of ionic composition that forms conductivity anomalies, based on theory of geoelectrochemical halo. The authors – based on some practical results of soluble ions in soil cover and soil conductivity derived from a number of mining areas of both China and overseas – present the correlation of a conductivity anomaly with the ionic composition and establish a model for the formation of conductivity anomalies in soil cover. A conductivity anomaly is formed as a result of electrochemical and chemical processes, by transformation of ore-body into various ionic haloes through four physico-chemical processes: 1. Dissolution of the ore-body, 2. Migration of dissolved matter, 3. Conversion of matter near the surface and 4. Formation of ionic conductivity anomalies. The ionic conductivity of soil (ICS) is a useful prospecting method for exploring concealed ore-bodies. The ICS anomaly can be regarded as the product of various halo-forming ions derived from orebody which migrate and concentrate near the surface due to various processes. The ICS anomaly is a comprehensive geochemical indicator which

could give strong information of the ore-body. The ICS method is useful in exploring for deep seated ore-bodies.

Igor Shmakov of Arlan Investment Company, Russia presented the Geological Evolution of Diamondiferous Placers of western flank of the Ural Mountain. The primary source of these diamonds is possibly Pre-Cambrian kimberlite of Finland and Kola Peninsula. Diamonds and kimberlite indicator minerals have reached their present locations transported by ancient glaciers and palaeo river and deposited in Devonian layers. Continuous reworking during the Mesozoic to Recent of these Devonian sediments have liberated and concentrated diamonds in younger sediments. Diamond enriched layers are better preserved within karstic depressions, sinkholes that contain reworked basal Devonian. Quaternary delluvial, fluvio-glacial and alluvial sediments have inherited diamonds from Meso-Cenozoic and Neogene layers preserved in karst type potholes.

The final presentation of the two day seminar was delivered by Lidiya Sporykhina of Russian National Institute of Mineral Resources, Moscow. Lidiya described Cassiterite alluvial placers in the karstic areas in Northern Vietnam. Southern south-eastern areas of China and northern provinces of Vietnam belong to one of the largest karstic provinces of the world. Tin bearing areas of northern Vietnam are confined to meso-cenozoic belt of the Indo-Sinian massif and southern frame of Chinese platform. The major tin bearing primary source which provided cassiterite placers are related to younger granitoid complexes of Pia Oac, Songchu Ban Chieng and Deo Ka are dated to be equivalent to Getaceous Palaeogene. The most prominent tin bearing placers of Northern Vietnam are of two types: placers of erosion-karstic valleys – Chau Kyong, Ban Ko, Nguyen Binh etc, and

placers of erosion-karstic valleys with alternation of a superficial and underground drain, including placer of closed valleys – Tinh Tuc, Nam Kep in Pia Oac area. The analysis of features of placers in karstic provinces of southeast Asia has shown various characters of influence of karstic processes on formation of tin placers.

A round table conference followed the deliberations chaired by Dr. Alexander Lalomov, Global co-leader of IGCP-514. Dr. Lalomov, announced that he will be finalizing the Final Report of IGCP 514 in early 2010. That the presentation of fluvio-marine processes shaping the placer mineral

deposits in the inner shelf off Aryapalli-Kushabhadra, along the east coast of India, will be included in the Final Report, for which he requested Dr. B.M. Faruque, to submit a detailed paper.

The technical sessions of the Fourth International Symposium IGCP 514 was concluded on the 16th October. Subsequently, two field trips -- 1. Dachnag tin placer and 2. Lijiang River -- were conducted for participants of the symposium. On the 15th October the delegates were taken on the river cruise of river Li meandering through the limestone country in and around Guilin.

SUMMARY OF PROCEEDINGS & RECOMMENDATIONS OF WORKSHOP ON "REQUIREMENT OF POWER FOR MINING & MINERAL BASED INDUSTRIES IN ORISSA"

BACKGROUND

SGAT organized a one day Workshop on "Requirement of Power for Mining and Mineral Based Industries in Orissa" on 1st August 2009 at Bhubaneswar by inviting experts, planners, officials of State and Central Govt.s, Regulatory Authorities, Generating Companies, Transmission and Distribution Agencies and Consumers of Mining and Mineral Based Industries for an in-depth discussions on the prevailing issues and related problems to be taken care. The Workshop was attended by 106 delegates from the above fields, Guest Speakers, Invited Guests, and representatives of Press & Media.

The Workshop was inaugurated by Sri Prafulla Chandra Ghadei, Honourable Minister of Finance, Govt. of Orissa as the Chief Guest and Sri R.V.Shahi, Former Secretary, Power, Govt. of India was the Guest of Honour. The Workshop consisted of two technical sessions. Dr. Ashok Dalwai, IAS, Commissioner-cum-Secretary, Steel & Mines Department, Govt. of Orissa was the Guest of Honour in the Valedictory Session.

INAUGURAL SESSION

Sri R.V.Shahi, Former Secretary Power, Govt. of India in his inaugural address stated that in spite of the global recession, India in the recent past has performed better than many developed countries. Compared to China, increase in generation capacity during the last decade is much less in India. We have to attempt to be close to China at the earliest and in order to continue with 9% growth India has to generate 8 lakh MW Power in next ten years from 1,50,000 MW

at present. Since the Power sector has not suffered from the impact of global slowdown, industrial houses can look at this sector for future growth. He further said that Orissa having the potential has failed in increasing generation. In fact, it is the pioneer State in bringing reforms in power sector. Orissa could have performed well by adding new generation capacity, improving the transmission and distribution systems and by reduction of distribution loss. The proposed thermal power plants in the State can considerably increase generation in the coming decade which would surely help in growth and prosperity of the State. There has to be comprehensive change in approach along with toning of administrative procedures to install the State to the place of pride in the country. He emphasized that failure in rural electrification has also to be taken care and at the same time other sources of power has to be explored.

Shri P.C. Ghadei, Hon'ble Minister of Finance, Govt of Orissa said that rapid industrialization, urbanization, farm mechanization etc is the present policy of the State. It would increase demand of power in future. Govt is aware of this and for that purpose MoUs have been signed for new power plants. Though the demand will be on coal based power plants, he insisted to have nonconventional sources of power like solar, wind, tidal etc besides nuclear, mini hydel and natural gas based plants. Shri Gadei observed that there is urgent need to reduce losses in all fronts and plug theft of power. Technological development should be inculcated to ensure optimum use of coal. He wished the Workshop would be a success and assured that Govt would take necessary steps as recommended by Mr. Shahi and also the views expressed by the

experts in the Workshop to augment the power position in the State.

After the presidential address by Dr. R.C. Mohanty, Dr. S.K. Sarangi, Vice-President, SGAT offered vote of thanks.

TECHNICAL SESSION I

This session was chaired by Shri C.J. Venugopal, IAS, Chairman OPTCL. The session had six selected papers on issues relating to requirement of power by mining and mineral based industries in Orissa.

(i) Requirement of Power for Mining and Mineral Based Industries in Orissa

This Keynote Paper was presented by Shri B.C. Jena, Former M.D, OPGC; CMD, GRIDCO & Member, OERC.

Taking into account the expected growth of steel, ferroalloy and aluminium production in Orissa, Sri Jena informed that demand of power in the State is likely to increase at a faster rate. During 2009-10 the deficit in the State has gone up due to poor monsoon and less generation of hydel power which accounts for 50% of power generation in the State. As such, there have been restrictions in power supply to industries. Since 1997 State has not planned either brown field expansion or green field generation projects and hence this situation may continue if new generations are not added soon.

Referring to present shortage in power he advised the major industries to reduce specific consumption of power by maintaining international standards. He advised the consumer industries to jointly plan for CPPs which would be beneficial. Referring to the constraints of coal based thermal plants, he opined that availability of water and coal has to be taken care and land, infrastructure etc. for the new projects have to be ensured. He recommended for Gas

based plants, Nuclear plants and Renewable Energy sources for the future.

(ii) Requirement of power for Ferroalloys Industries in Orissa

Mr. Dinesh Shastri, EIC, Ferroalloys and Mineral Division (FAMD), Tata Steel & Vice Chairman, Indian Ferroalloys Producer Association (IFAPA) voiced the concern of ferroalloy producers referring to recent constraints in achieving production due to restriction in power supply. Ferroalloys sector being totally dependent on power supply he requested for stable and steady quality power for this sector in future. He also opined that there has to be reconsideration of power tariff for this sector and the captive power plants should be encouraged with sale of surplus power.

(iii) Captive Generation – an Evangelic for Orissa

Sri Sanjeev Das of IMFA representing the group of Captive Power Generators in the State opined that Captive Power Plants have helped the State in different periods of power scarcity in the past. Even today after meeting internal demands, contribution of this sector is quite significant. In spite of this, there are number of problems yet to be solved. Fuel security is essential for the CPPs besides allocation of water and solving of evacuation and transmission problems. He expressed doubts about the success of IPPs signing MoUs and recommended for helping CPPs by cost driven tariff, captive coal mines, permitting trading in exchange or trading through State utilities with profit sharing. He opined that growth of captive power generations would be in the interest of the State.

(iv) Orissa in the Aluminium Map of the World

Shri Rabindra Misra, Joint President, HINDALCO Industries Ltd briefly outlined

about the bright prospects in future of aluminium sector in Orissa. Though the expected growth has not been achieved in last 20 years, he recommended that State should help in allotment of coal block for captive mining and assured supply of water for captive power plant, which is essential for growth of aluminium smelters. Additionally support in availability of land and law and order problems is also equally essential for growth of this sector, he said.

(v) Power System Framework Design for Supply and Distribution System of Integrated Steel Plants

Sri Sanjay Raich of Tata Steel presented the paper on behalf of Shri Amkit Kumar Chattarjee, CEM, Tata Steel. He dealt with the details of power distribution system of proposed Kalinganagar steel plant of TISCO. This distribution system would take care of various aspects of providing stability to the power system which is critical for operation, emergency systems and shut down system etc. He viewed that this system would help in achieving low specific consumption of power.

(vi) Requirement of Power in Iron Ore Mines - A Case study by Tata Steel

Sri Saroj K. Banerjee of TATA Steel indicated different areas of additional power requirement for an iron ore mine going for expansion with mining low grade ores, its beneficiation and establishment of pellet plants.

TECHNICAL SESSION II

This session was chaired by Shri B.K.Mohanty, Advisor, SGAT. In this session four technical papers were presented which covered the subjects like availability of Power, Role of Regulatory Authority, Reforms of Power Sector, Prospects and Constraints of Power Supply in the State.

(vii) Role of Regulatory Authority for Availability of Power for Mining and mineral Based Industries in Orissa

Sri B.K.Mishra, Member, OERC in his key note address briefly introduced the power scenario in the State and indicated that Mines and Mineral Based Industries are the highest consumer of power. He indicated that Regulatory Authority is to ensure availability, accessibility and affordability of power to consumers and advise Govt. as and when required. He informed that adequate steps have been taken by the commission to ensure availability and accessibility of power to industrial consumers. The Regulators in the State have made earnest efforts not to increase the electricity tariff for last 9 years where as there is an appreciable rise in the input cost of power as well as WPI and CPI. He advised industries to plan for group captive generating plants with ultra super technology where the cost of generation would be competitive even with Ultra Mega Power Plants. He opined that this would also help in having captive coal mines or suitable coal linkage. He also discussed various models for trading of power by CPPs which would help in sale of surplus power.

(viii) Requirement of power by Mining Sector

Dr. S.K. Sarangi, Vice-President, SGAT briefly introduced mining scenario and expected increase in power requirement for mining sector in different mineral bearing/mining zones of the State. He emphasised the immediate need of power in Keonjhar-Sundergarh iron and manganese areas. Further, he opined that the coal mines should get stable and assured power from the nearby thermal power plants. For other interior mining areas he suggested for considering development of mini hydel or renewable energy sources. He viewed that

this should also help in development of mineral belts.

(ix) Orissa Power Sector Reform- At the Crossroads?

Sri V.K.Sood, M.D., Wesco, Nesco & Director, Southco representing Distribution Companies highlighted the importance of additional power generation at the earliest in order to improve the power scenario in the State. He opined that unless investments are also made in transmission and distribution systems even with additional generation, there would be constraints in meeting the required demand. In order to reduce loss and improving power supply to various consumers Govt. support is essential, he said.

(x) Prospect and Constraints of Power Supply in Orissa

In place of this paper of Shri J.P. Das, Chief General Manager, OPTCL; Sri A.C.Mallick, Director (Commercial), GRIDCO presented the overall power scenario in the State and actions planned by GRIDCO & OPTCL to meet the future challenges. He also assured that State has kept in view the future demand of industries. He dealt in detail about the future plans of the State and informed that necessary steps are being taken by GRIDCO & OPTCL to tide over the present situation of shortage. He assured that availability of power would improve by 2011. There is also a contingency plan for improvement, he said.

VALEDICTORY SESSION

In the valedictory session Dr. R.C.Mohanty, President, SGAT summed up the proceedings of the inaugural and the two technical sessions.

Dr. Ashok Dalwai, Secretary, Steel & Mines, Government of Orissa in his valedictory address indicated about the rich

mineral resources of the State and growth expected in exploitation and value addition of minerals. Referring to Government plans for faster economic growth in the State based on development of mineral resources, he emphasized on technical improvement in proper utilization of limited mineral resources. He also highlighted on the importance of conservation of water and energy. He highlighted about the growing awareness of people on various aspects like availability of water, utilization of limited agricultural land and forest areas, environmental issues with increasing levels of pollutants and global warming. He advised that the industries in future have to look into the socio-economic aspects and development of local area around the mining and industrial belts. He laid importance on sustainable development with better planning and coordination with the local people.

OBSERVATION & RECOMMENDATIONS

1. Power scenario in Orissa during last 40 years has been with ups and downs. When a new generation unit was added the State became surplus which was followed by deficit till another new unit came into operation. Presently Orissa is passing through a period of deficit. In view of the increasing demand of industrial loads it is necessary to add new generation both in the State and private sectors matching with the requirement. The progress of work of the IPPs should be closely monitored by the Govt. at the highest level to ensure that these generation capacities are added as planned, since State's requirement is heavily dependent on their generation.

(a) Immediate steps have to be taken for establishing new Thermal Power Plants and expansion of existing units of both State and Central

Sectors. An Ultra Mega Power Project (UMPP) has to be planned immediately besides the proposed plants of OPTCL and expansion of OPGC in the State Sector.

- (b) Proposed IPPs and CPPs have to be supported by providing coal blocks/linkages, land, water and other required facilities besides support in law and order and necessary clearances/permissions.
2. Group captive power plant concept should be encouraged for the E. H.T. industries.
 - (a) Trading and evacuation of surplus power is to be ensured with suitable tariff regime and permission for free trading should be made available through open access mandatory by the Electricity Act 2003 and Rules there in.
 - (b) State should ensure nondiscriminatory open access to the CPP owners to sell their surplus power to consumers outside the State through the interstate transmission net work.
3. The transmission and distribution net work have to be improved to ensure steady availability of power not only to the existing but also to the proposed industries in the newly developing industrial areas in consultation with the industries, IPICOL and IDCO. Advance planning have to be made for this.
4. Though hydel and coal based thermal power plants would be required initially, the State has to plan for nuclear and gas based power plants for future. Availability of water being a matter of concern some new plants are to be advised to utilise sea water.
5. Alternate energy sources like solar, tidal, wind etc have also to be planned besides mini hydel projects as distributed generation which would help mining belts and also rural electrification where Grid connectivity is not possible.
6. Industries have to be eco-friendly and attempt for achieving international standard in specific consumption of coal, water, power etc.
7. Power sector in Orissa has better growth prospects which is to be availed by industrial houses and investors. Govt. has to ensure suitable environment by addressing governance issues.
8. Steps have to be initiated with R&D efforts and technology imports for developing renewable energy sources for sustenance in future.

SGAT NEWS

➤ **MINERAL DEVELOPMENT PROMOTION AND AWARENESS PROGRAMME** **Organised by Society of Geoscientists and Allied Technologists (SGAT)** **21 & 22 August 2009**

With a view to updating the students pursuing PG courses in Geoscience, Degree courses in Mining, Metallurgical and Environment Engineering about the latest developments in respective disciplines, our Society has been organising **Mineral Development Promotion and Quiz Programme** for the last 18 years on annual basis. The Programme comprises the following activities.

- a. visit to mines, processing/beneficiation plant and a mineral based industry (one full day).
- b. identification of common rock, ore, mineral samples and samples of metallurgical products.
- c. interpretation of satellite imageries and aerial photographs.
- d. identification of photographs of mines, mining and plant equipment.
- e. **Oral Quiz**
 - i. subject specific
 - ii. General

This year's programme was participated by students from 12 reputed institutions like IIT, Kharagpur; NIT, Rourkela; IGIT, Sarang, Indian School of Mines University, Dhanabad; Bengal Engineering and Science University, Shibpur (WB); Calcutta, Utkal, Sambalpur and Berhampur Universities.

The participants visited Sukinda Chromite Mines, Chrome Ore Beneficiation Plant and Environment Protection measures adopted in Sukinda valley.

The IIT, Kharagpur Geology & Geophysics team represented by Ashish Lawaniya and Ms. Sumitra was adjudged the overall winner of the programme. Calcutta University Geology team represented by Ms. Shalmali Nandi and Ms. Saradee Sengupta was the second best.

Prof. Madhusudan Chakraborty, Director, Bhubaneswar IIT was the Guest of Honour.

In his address, Prof. Chakraborti mentioned that "manufacturing" rather than IT will assume increasing importance in coming years. He has a vision to build Bhubaneswar IIT as a model Institution of excellence and sought the advice and collaboration of SGAT in materialisation of this vision. Prof. Chakraborti informed that the disciplines of Geoscience, Mining and Metallurgy will be included in an appropriate integrated course to be introduced in the curriculum of Bhubaneswar IIT shortly.

Prof. Chakraborty complimented SGAT for designing and organising such an innovative programme.

Examination, Evaluation, Quiz and field visit were conducted, supervised and co-ordinated by Prof. N.K. Mahalik, S/Shri T. Mahanta, K.C. Mohapatra, Dharmendra Sharma and Subhransu Mishra of DOG; J.N. Rath, Consultant, Shri R.N. Praharaj, (Sr. G.M. IMFA Group); Dr. T. Basa and Mrs. N. Das of OMC.

The event was sponsored by **MGM Minerals Ltd.**, and supported by IDC FeCr Plant and Tata Steel.

Dr. R.C. Mohanty, President, SGAT presided over the concluding session. **Dr. S.K. Sarangi**, Vice President, SGAT offered vote of thanks.

The Programme was designed and co-ordinated by **Shri B.K. Mohanty**, Adviser, SGAT

➤ NEWS ABOUT MEMBERS

- An international convention on Clean, Green and Sustainable Technologies in Iron and Steel making was organized at Bhubaneswar from 15th to 17th July 2009 jointly by Orissa Mining Corporation and Multi Disciplinary Centre on Safety, Health and Environment (A Govt. of Orissa sponsored autonomous institution). **Shri S.N. Padhi**, member, SGAT participated in the convention as a member of the Organising Committee.
- **Dr. Prabal K. Chand**, member, SGAT has been awarded Ph.D. in Geology by Utkal University on 10.07.09 on the topic "Petrology & Geochemistry of Mafic-Ultramafic rocks around Kaliahata, Keonjhar-Dhenkanal districts, Orissa, India under the guidance of Dr. J.K. Mohanty, Scientist, IMMT, Bhubaneswar. The thesis was evaluated and recommended by Prof. (Dr.) A.K. Sen, IIT, Roorkee and Prof. (Dr.) S. Das of IIT, Kharagpur.
- **Dr. B.M. Faruque**, Director (Retd) GSI and Advisor, Geomin Consultants P. Ltd. participated in the 4th International Symposium of IGCP 514 "Palaeo Fluvio System: Evolution and Mineral Deposits" held during 14-18 October 2009 at Guilin in China. Dr. Faruque presented a paper 'EUSTATIC AND FLUVIAL INFLUENCE ON PLACER MINERALS IN THE SHELF OFF ARYAPALLI-KUSHABHADRA, EAST COAST OF INDIA' in the symposium.
- AIT Alumni Association "Distinguished Alumni Award" for 2009 presented to **Prof. Dr. N.K. Mahalik**. Asian Institute of Technology Alumni Association (AITAA), Bangkok presented the AITAA Distinguished Alumni Award (2009) to Prof. Dr. N.K. Mahalik in recognition of his professional and technical achievements.
- One of senior active members of SGAT, **Dr. Er. Hara P. Mishra** has been accepted as a member of American Institute of Chemical Engineers.
- **Dr. P.C. Naik**, member, SGAT has been awarded with Ph.D.
- **Dr. S.C. Mahala**, member, SGAT has been awarded with Ph.D.
- **Sri G.S Khuntia**, member, SGAT and Former Executive Director (Operation), SAIL/ Director, NMDC Ltd /currently Mining Advisor to Maharastra Seamless Ltd./Director, OMC Ltd. presented a technical paper entitled "Utilisation of Low grade Iron Ore in steel making with State of Art Beneficiation & Transport - A Case Study for meeting challenges in Orissa in the International Convention on Clean, Green & Sustainable Technologies in Iron & Steel Making" was organized on 15/6/09 to 17/6/09 at Swosti Plaza Hotel, Bhubaneswar. At the instance of Chief Secretary of GOO. He was the Vice-Chairman of Organising Committee.
- **Dr. M.C. Dash**, former Vice Chancellor of Sambalpur University was felicitated as a distinguished Scientist by the Indian Science Congress, Bhubaneswar Chapter on 5th Dec'09 at the 12th Orissa Bigyan Congress.

➤ **NEW MEMBERS**

1. **Mr. Manoranjan Panda**
Geologist
O/o: Jt. Director, Geology
Zonal Survey
At/PO: Sambalpur
Dist: Sambalpur – 768 001
2. **Mr. Khitish Patnaik**
Geologist
Plot No.: N/3
203, IRC Village
Nayapalli
Bhubaneswar – 751 015
3. **Mr. Bishnu Charan Sahoo**
Geologist
MIG-96, Pokhariput BDA Colony
Phase-1
PO: Aerodrome Area
Bhubaneswar – 751 020
4. **Mr. Satchidananda Panda**
Dy. Director Geology
Directorate of Geology
Bhubaneswar
5. **Mr. Kalpataru Nayak**
Geologist
Directorate of Geology
Bhubaneswar
6. **Mr. Narottam Sahu**
Geologist
Directorate of Geology
Bhubaneswar
7. **Mr. Prasanna Kumar Behera**
Dy. Manager (Geo.)
OMC Ltd.
GL/56, VSS Nagar H.B. Colony
VSS Nagar, Bhubaneswar – 7
8. **Mr. R.K. Jena**
Managing Director
Balasore Alloys Ltd.
Balgopalpur – 756 020
Balasore, Orissa
9. **Mr. Anshuman Dutta Gupta**
Regional Geologist
Natural Resources Division (G-8)
General Office (3rd Floor)
Tata Steel Ltd.
Jamshedpur – 831 001 (Jharkhand)
10. **Mr. Rajiv Ranjan**
Dy. Manager
Balasore Alloys Ltd.
Balgopalpur – 756 020
Balasore
Orissa
11. **Mr. Shishir Kumar Patnaik**
Geological Consultant
OMC Ltd.
HIG 2/52, Satyasai Enclave
Khandagiri
Bhubaneswar – 751 030

➤ OTHER NEWS

India Aims to Cut Down Mining Licence Wait Times

Source: DON

India's Government plans to simplify its mining laws to attract foreign investment into the sector and cut delays in securing mining licenses, Bloomberg reports. Mines minister BK Handique said the government expects the mining sector to form at least 4% of the nation's \$1.2tn economy, the news service said. "We will introduce a legal framework that ensures sustainable development and includes environment concerns," Handique said. Handique hopes to double the mining industry's contribution to the economy and legislation will be presented to parliament later this year.

China's Xinjiang region hopes to add 139 coal mines by next year. While China is closing or consolidating many small coal mines, Xinjiang Province intends to develop more mines.

Source: DON

Dorothy Kosich

The regional government of the Xinjiang Uygur autonomous region of China plans to develop 139 large and medium-sized coal mines by 2010. The Coal Industry Administration of Xinjiang hopes to build new coal mines and restructure small collieries in its 11th Five-Year Plan period, which is expected to yield a total annual output of 226 million tons as all the projects reach full capacity. China Daily reported that about 65 sites are in the region's four largest coal mine areas. Xinjiang is believed to have 2.2 billion tons of coal reserves for 40% of China's total coal output. Coal production in the region approached nearly 67.7 million tons last year. Production is expected to reach 80 million tons this year and 100 million tons in 2010,

according to the Coal Industry Administration. Coal for local use is now mined in the province as one of the biggest hurdles to developing coal in the region is the lack of transportation. In order to accelerate Xinjiang's coal exploration, China has invested money in transporting coal from west to east and in transmitting power from west to east. China's Shenhua Group announced last month that it would invest billions in the region in order to increase its coal capacity to more than 60 million tonnes in the region by 2014. Shenhua also hopes to develop coal to oil conversion projects in Xinjiang.

Satellites Unlock Secret to Northern India's Vanishing Water

Source: DON

WASHINGTON -- Using NASA satellite data, scientists have found that groundwater levels in northern India have been declining by as much as one foot per year over the past decade. Researchers concluded the loss is almost entirely due to human activity. More than 26 cubic miles of groundwater disappeared from aquifers in areas of Haryana, Punjab, Rajasthan and the nation's capitol territory of Delhi, between 2002 and 2008. This is enough water to fill Lake Mead, the largest manmade reservoir in the United States, three times. A team of hydrologists led by Matt Rodell of NASA's Goddard Space Flight Center in Greenbelt, Md., found that northern India's underground water supply is being pumped and consumed by human activities, such as irrigating cropland, and is draining aquifers faster than natural processes can replenish them. The results of this research were published today in Nature.

The finding is based on data from NASA's Gravity Recovery and Climate Experiment

(GRACE), a pair of satellites that sense changes in Earth's gravity field and associated mass distribution, including water masses stored above or below Earth's surface. As the twin satellites orbit 300 miles above Earth's surface, their positions change relative to each other in response to variations in the pull of gravity. Changes in underground water masses affect gravity enough to provide a signal that can be measured by the GRACE spacecraft. After accounting for other mass variations, such changes in gravity are translated into an equivalent change in water. "Using GRACE satellite observations, we can observe and monitor water storage changes in critical areas of the world, from one month to the next, without leaving our desks," said study co-author Isabella Velicogna of NASA's Jet Propulsion Laboratory in Pasadena, Calif., and the University of California, Irvine. Groundwater comes from the natural percolation of precipitation and other surface waters down through Earth's soil and rock, accumulating in cavities and layers of porous rock, gravel, sand or clay. Groundwater levels respond slowly to changes in weather and can take months or years to replenish once pumped for irrigation or other uses. Data provided by India's Ministry of Water Resources to the NASA-funded researchers suggested groundwater use across India was exceeding natural replenishment, but the regional rate of depletion was unknown. Rodell and colleagues analyzed six years of monthly GRACE data for northern India to produce a time series of water storage changes beneath the land surface.

"We don't know the absolute volume of water in the northern Indian aquifers, but GRACE provides strong evidence that current rates of water extraction are not sustainable," said Rodell. "The region has become dependent on irrigation to maximize agricultural productivity. If measures are not

taken to ensure sustainable groundwater usage, the consequences for the 114 million residents of the region may include a collapse of agricultural output and severe shortages of potable water."

Researchers examined data and models of soil moisture, lake and reservoir storage, vegetation and glaciers in the nearby Himalayas in order to confirm that the apparent groundwater trend was real. The loss is particularly alarming because it occurred when there were no unusual trends in rainfall. In fact, rainfall was slightly above normal for the period. The only influence they couldn't rule out was human. "For the first time, we can observe water use on land with no additional ground-based data collection," said co-author James Famiglietti of the University of California, Irvine. "This is critical because in many developing countries, where hydrological data are both sparse and hard to access, space-based methods provide perhaps the only opportunity to assess changes in fresh water availability across large regions."

Latest Coal News Headlines

Thursday, 08 October 09

Coal India says imports could jump 10 times in 3 yrs

Reuters reported that, Coal imports by state explorer Coal India Ltd could jump 10 times to 40-45 million tonnes in three years to meet a sharp rise in domestic demand, stoked by power firms, a senior company official said on Thursday.

India has 10 percent of the world's coal reserves, the biggest after the United States, Russia and China, but its coal imports have grown rapidly from almost nothing five years back as power utilities ramp up capacity.

The share of coal-fired plants in India's total installed power generation capacity will rise

to 57 percent by March 2012 from the current 53.3 percent or 80,283.88 megawatts, a recent report by PricewaterhouseCoopers has said.

Coal India plans to import 4 million tonnes of the fuel this year, Marketing Director A. Sarkar told reporters.

He said India's port, road and rail infrastructure needed to be boosted as the country's current capacity could not handle the rising import volumes.

Sarkar said Coal India was considering buying overseas projects to secure 12 million tonnes of coal by 2012. He said delay in obtaining necessary clearances for mining was a major hurdle in achieving its production target.

He said the company might miss its production target of 520 million tonnes by 2012.

The target might fall short by 33-34 million tonnes due to procedural delay in getting environment and other clearances.

The company aims to produce 435 million tonnes of coal by March 2010.

Source: Reuters

Latest Coal News Headlines

Thursday, 08 October 09

Essar unit wins INR 479cr (US\$ 103,272,401) Orissa project

The firm will develop and operate the terminal at Paradip port; the contract will stretch up to 30 years.

Live Mint reported that, Essar Shipping Ports and Logistics Ltd has won a bid to develop and operate a Rs479 crore (US\$ 103,272,401) coal handling terminal at the Union government-owned Paradip port in Orissa.

"We have received a letter from Paradip port conveying its intent to award the project to us," said V. Ashok, a director at the Essar Group.

Paradip port chairman K. Raghuramaiah said the firm was the highest bidder in a public auction.

The contract for the coal-handling project, stretching up to 30 years, will be signed after the Orissa high court disposes of a petition filed by a company that was excluded from the bidding process.

"The case will come up for hearing any day," Raghuramaiah said by phone from Paradip. Essar Shipping had quoted a revenue share price bid of 22% for the terminal with a capacity to handle 10 million tonnes of coal a year.

The firm will share that percentage of the revenue earned from operating the terminal with the port for each of the 30 years.

According to rules for auctioning port projects, the bidder willing to share the highest percentage from its annual operating gross revenues with the government-owned facility will win the rights to develop and operate the cargo-handling berths.

Essar Steel Ltd, another group company, is setting up an integrated 6 million tonne (mt) per annum steel plant just 3km from Paradip port. The first phase of the project is slated for completion by the first quarter of 2010. The coal terminal will help the company import a key raw material used for making steel.

Jindal Steel and Power Ltd, which did not qualify for bidding, challenged its exclusion in the Orissa high court, which stayed the auction process. Paradip port got the stay vacated by the Supreme Court, which also directed the Orissa high court to decide the case expeditiously.

“We are waiting for the court case to be sorted out before signing the contract,” Essar Shipping’s Ashok said.

Paradip is one of the 12 ports owned by the central government that together handle some 72% of India’s external trade shipped by sea. They handled 530mt of cargo in the

year ended March. The new project is one among several planned by the government to raise cargo handling capacity at the dozen ports to 1,016mt by 2012 from the existing 567mt to overcome capacity bottlenecks.

Source: Live Mint

• **SUBMISSION OF PAPERS FOR SGAT BULLETIN**
(Instruction to Authors)

Research papers, review articles, short communications, announcements and letters to editors are invited on topics like geosciences, mineral exploration, mining, materials science, metallurgy, mineral industry and trade, mineral economics, environment, education, research and development, legislation and infrastructure related to mining, mineral policy and mineral development planning.

Submission of manuscript implies that the same is original, unpublished and is not being considered for publication elsewhere. Two copies, complete in all respect (with copies of figures and tables) are required to be submitted. Originals of figures and tables should be enclosed separately. Each manuscript must accompany by a computer diskette (floppy) containing the electronic version of the text. Electronic files of figures, if available, should be submitted in a separate diskette. In each case, the details of software and type of equipment used should be clearly indicated. The copies of manuscripts, strictly in accordance with the instructions to authors given below may be sent to the editor of the bulletin.

Journal Format: A-4 size

Language: English

Manuscripts: Manuscripts should be typed in double spacing with wide margins in one side of A-4 size paper either by electronic typewriter or computer (size 12 point Times New Roman font). The title page should include the title of the paper, name(s) of author(s) and affiliation(s). The title should be as brief as possible. An informative abstract of not more than 500 words to be included in the beginning. Not more than 5 key words are to be listed at the end of the abstract. Text of research papers and review articles should not exceed 4000 words. The short communication is for quick publication and should not exceed 1200 words.

Headings: Different headings should be in the following format.

- (a) Title: Centrally aligned, bold, capital
- (b) Author(s): Centrally aligned, short name, bold, first letter of all words capital followed by communication address (Not Bold)
- (c) Abstract: Left aligned, bold
- (d) Key words: Left aligned, bold
- (e) Primary heading: Left aligned, bold, capital
- (f) Secondary heading: Left aligned, first letter of each word capital
- (g) Tertiary heading: Left aligned, first letter of first word capital
- (h) Acknowledgements: Left aligned, bold, first letter capital
- (i) References: Left aligned, bold, first letter capital
- (j) Figure Caption: Left aligned, first letter of first word capital, below the figure
- (k) Table Caption: Left aligned, first letter of first word capital, at the top of the table

Illustrations: All illustrations should be numbered consecutively and referred to in the text. They should conform to A-4 size and carry short captions. Lettering inside figure should be large enough to be accommodate up to 50% reduction. One set of hard copy of all figures (either tracing in ink or laser prints) should be provided in a separate envelope marked "Original Figures". Photographs should be of good quality with excellent contrast, printed on glossy paper. Colour photos are acceptable, provided the author(s) bear the cost of reproduction. Figure captions should be provided on separate sheet.

Tables: Each table must be provided with a brief caption and must be numbered in the order in which they appear in the text. Table should be organised within A-4 size and should be neatly typeset for direct reproduction. Tables will not be typeset by the printer, so their clarity and appearance in print should be taken into account while the author(s) prepare(s) them. Use of 10

points Time New Roman/Arial Font for table is recommended.

References :

- (a) References in the text should be with the name of the author(s) followed by the year of publication in parenthesis, i.e. Patnaik (1996); Patnaik & Mishra (2002); Nayak et al. (2001)
- (b) Reference list at the end of the manuscript should be in alphabetical order, in the following format: Sehgal, R.K. and Nanda, A.C.(2002) Palioenvironment and palioecology of the lower and middle Siwalik sub-groups of a part of North-western Himalayas. *Jr. Geol. Soc. Ind.*, vol. 59, pp. 517-529
- (c) Articles from the books should follow the format given below: Windley, B.F. and Razakamanana, T. (1996) The Madagascar – India connection in a Gondwana framework. In: Santosh, M. and Yoshida, M. Eds.) *The Archaean and Proterozoic terrains of South India within East Gondwana.* Gond. Res. Group Mem. No.3, Field Sci. Publ., OSAKA, pp. 25-37

- (d) Books should be referred to as: Sengupta, S.M. (1994) *Introduction to sedimentology.* Oxford and IBH Publ. Co. Pvt. Ltd., New Delhi, 314 pp.

Submission of manuscript

Manuscripts strictly conforming to the above format should be mailed directly to Editor in his mailing address available in the bulletin. Manuscripts not conforming to the format of the journal will be returned.

All the manuscripts confirming to the standard format of the bulletin will be reviewed by specialist referees before publication.

Page proofs: One set of page proofs will be sent to the corresponding author, to be checked for typesetting only. No major changes are allowed at the proof stage. Proof should be returned within three days.

Reprints: 10 free reprints of each published article will be supplied to the corresponding author. Additional reprints can be ordered through payment at the proof reading stage.





