OGSA

Newsletter

Orissa Geological Service Association

August 2003
Volume-XVII

Inside this Issue

EDITORIAL

Tipped as one of the costliest projects ever; the proposed Rs 5,60,000 crores "Interlinking of Rrivers" initiative has raised the eyebrows of most of the environmentalists, geographers, earth-scientists, economists and planners of this country. Such an ambitious project involving a staggering sum aims to resolve the issue of drought and water shortage across India, once and for all. But the concept is not enjoying unequivocal acceptance among the country's technocrats and is being debated every nook and corner though preliminary measures have already been initiated by the Water Resources Department of the Government of India.

The diversion of rivers aims at linking the perennial Himalayan rivers of north India with the rivers of the water stressed Deccan regions and construction of long canal systems. In a densely populated country like India it will involve displacement of people on a colossal scale and affected citizens are never likely to agree for such measures. It is often argued that the project is potential enough to generate interstate water disputes and diplomatic row with Bangladesh and Nepal. Further it is aptly advocated that it may alarmingly enhance the incidence of water logging and submergence of a very big chunk of country's vast forest growth. Preserving rivers in free flow condition is considered ecologically necessary. Even the construction of large dams is now legally prohibited in parts of USA and in whole of Sweden. All over the world, there is a perceptible trend to move away from gigantic projects of dubious utility and concentrate on smaller self-sustenance schemes with the community and the human being at the centre of the development process. The technical challenges to be faced in redrawing the geography of the country are many and may lead to dangerous consequences. The debt burden on the country will be stupendous and it is difficult to foresee the long-term impacts of this massive borrowing on the country's economy.

Instead of contemplating on such mega-schemes with uncertain consequences it would be more sensible and prudent to encourage the traditional practice of conserving rainwater where it falls. This is what our ancestors tried to do and succeeded. The water availability scenario in India is never bad compared to many other parts of the world. The average amount of rainfall received over the plains of the country is around 117cm against the global average of only 70cm. This annual precipitation amounts to as much as 370 million hectare meter of water, which is adequate for our requirement. It is for us to manage these resources wisely and well. Rainwater harvesting is never a new concept. Some NGOs have already made stride in reviving this technique and have achieved success in Rajsthan, Maharashtra and Madhya Pradesh. What is now needed is a big push to the programme and make it a mass movement. A pond measuring 2000 sq ft with 1m depth can provide water for a hectare. If we have to fight drought on a large scale the construction of small water storage tanks at sites is inevitable. Further, prevention of wastage of water, particularly in agriculture sector has to be achieved at all cost.

What we need in India is an effective plan to deal with drought and flood. Interlinking of rivers is no solution, it may backfire.

RECASTING INDIA'S GEOGRAPHY – DREAM OR NIGHTMARE?

GEOMORPHOLOGICAL STUDIES OF ORISSA COAST BY REMOTE SENSING TECHNIQUE

J P BEHERA, GEOLOGIST

Out of 5700kms of total Indian coast, Orissa accounts for over 480kms. This makes around 8.42% of the total length of the Indian coastline. The Orissa coast experiences huge quantities of sediment transport, action of very strong littoral currents, wide tidal variations (micro-macro) and devastating effects of flood, cyclone and storm surges. As a result of which different geomorphic features like beach, beach ridges, delta, sand dune complexes, estuaries, tidal flats, mud flats, swales, spits, wetlands, marshes, mangroves, lagoons etc. have developed on the coastal tract. As geomorphology and land use/ land cover types are closely related, analysis of geomorphic features is required for planned utilisation of land resources. With this view, under the sponsorship of Ministry of Environment and Forest, Government of India; Directorate of Geology, Orissa has taken up the project to identify and delineate various geomorphic features and associated land use/ land cover patterns. For the purpose, IRS 1C/1D PAN images are used for preparing the above maps. The maps thus generated can be used by many user agencies for following purposes.

- Development of coastal zone management schemes
- Development of wetlands for aquaculture, water sports and tourism
- Planning to avoid drainage congestion
- Identification of suitable sites for shelter belt and other forest plantations
- Development of rescue zones for the time of devastation
- Protection of mangrove forests and creation of the same through plantation
- Development of groundwater resources to negotiate saline water intrusion
- To facilitate agricultural activities of the area
- To locate heavy mineral resources
- Finding suitable locations for siting ports, harbours and industries
- To improve road network
- Eco-restoration, preservation and weed management (of Chilka Lake)
- Biodiversity studies

All these features of coastal environment address continued attention for conservation and development of the rich natural resources of the coastal zone with inter-disciplinary studies and scientific management in long term basis.

TWO GENERATIONS OF FOLDING IN SHEARED BANDED ACID GNEISS OF JAMANKIRA IN SAMBALPUR DISTRICT

S SAHOO, PETROLOGIST

The "Sheared banded acid gneiss" of Jamankira in Sambalpur district exhibits two generations of folding megascopically as well as under the microscope. An elongated minor tight fold with double closure which simulates a boat in shape may be named as 'kano fold'. This is cut by the foliation parallel to the banding indicating its pre-banding formation. The megascopically identifiable S-plane is formed of conspicuous foliation due to parallel arrangement of dark minerals and the concordant felsic intra-veins. The foliation along with the intra-veins has been plicated into gentle open folds characterised by large dihedral angle of the order $150^0 – 160^0$.

The microscopic study reveals that this is a differentially- generated rock banded with hornblende and biotite, which impart foliation. Minerals in granulose band are untwinned feldspar; perthite and quartz showing differential granulations. Locally, the feldspar crystals are large showing development of shear plane. Along the shear planes of feldspars, secondary biotite has developed. Despite granulation, the original gneissic banding is preserved. Quartz and feldspars are strained as evidenced by wavy extinction. In the schistose zone, the minerals are hornblende, cleaved as well as massive biotite, opaques and sphene. This schistose band shows micro folds of open to close nature and also complex superposed nature. More than one metamorphic episode is interpreted based on mutual orientation of the mafic minerals.

WHAT IS MOVING THESE DAYS (INTERESTING FINDS IN THE GEM TESTING LABORATORY)

A B MISHRA, GEOLOGIST

Hessonite: (A new simulant for yellow sapphire)

In course of gem testing it has been ascertained that very light yellow hessonites are being circulated in the local market as yellow sapphire.

The said stone has astonishing resemblance in colour with that of yellow sapphire. These are semi-transparent to transparent having hardness 6 to 7, specific gravity 3.59 to 3.62, singly refractive with RI ranging from 1.730 to 1.748, inert to both long and short waves. Under microscope, they show clouds of unidentified tiny crystals.

Kunzite: (Ruby for the layman)

These are purplish red stones with striking superficial resemblance with ruby and passing off in the gem market as ruby. These stones have been identified as kunzite, a variety of spodumene (Li-Al-silicate).

The stones are brittle with almost a soapy feel. Hardness is 6 to 7, specific gravity of 3.19 is 3.22, RI 1.65 to 1.67. They are strongly pleochroic, shows weak to moderate glow under UV light, no characteristic spectrum. Under Gemmolite Microscope, they show cleavage cracks glowing with rainbow colours.

Hiddenite: (The fool's emerald)

An emerald green stone weighing 8.42 carat was recently tested in the laboratory, which had baffling resemblance with that of natural emerald. Prolonged careful testing confirmed it to be hiddenite, also a variety of spodumene. The stone was translucent having specific gravity 3.23, RI 1.66 to 1.67, showing moderate pleochroism and was inert to ultraviolet fluorescent test. Under spectroscope, it showed chromium doublet at $6900A^0$ and few weak lines at 6450, $6690A^0$. Microscopic observation revealed cleavage traces giving a fibrous look with blotchy colour concentration.

QUATERNARIES AROUND INDRAKSHI VILLAGE, GANJAM COAST

P C MISHRA, GEOLOGIST

In the outskirts of Indrakshi near Kanisi village on Ganjam coast (TS No. 74A/16) a hillock of sand and mud spreading over $8000m^2$ (approx.) area with a height of about 20m above *msl* has been located for the first time during a recent study. Quaternary sediments comprising chiefly of fine sand, silty sand, silty clay, sandy clay and clay with calcic laminations and concretionary nodules are stacked together above fine grained sandy horizons in a more or less layered fashion. Within the sandy clay, silty clay and clayey sand, layers of enormous quantities of marine as well as estuarine shells (pelecypods, gastropods, oysters, crab legs and other skeletal remains) have been entrapped. In addition to shell remains, there are layers of broken earthen materials (pitchers, cooking ware etc.) within the sediment. There are clear signatures of secondary calcification (biogenic?) represented by calcareous concretions (earthenware being the nucleus), calcareous concretionary nodules and fine calcic laminations.

The base of the hillock is represented by fine-grained brownish sand over which sandy clay sediments of 38 cm thickness, devoid of organic shells have been deposited. Above this a 32cm sediment layer comprising sandy clay, shell fragments, calcareous concretions and earthenware have been noticed. This layer is overlain by silty sand and clayey sand along with organic remains. Although the hillock consists of soft sediments, which are prone to weathering and erosion, the present shape of the hillock bears geological and geomorphological significance, which warrants attention of the geologists to establish its depositional environment.

Preliminary studies of satellite data over the area, however, indicate that the mud-hill might be the manifestation of a NE-SW fault lineament, which passes through the area. But other evidences for corroboration are lacking because of thick pile of sediments surrounding it.

A PROMISING GEM GARNET TRACT ENCOUNTERED

A K MOHANTY, T B MUNDA GEOLOGISTS

The exploration of gem garnets around Luhuramunda and Khaliapali of Balangir and Subarnapur district, FS 2002-03, encountered a promising gem garnet bearing belt stretching over 22km in strike length from Matiapali in the east to Chhelia RF in the west with an average width of 500m where 24 pockety occurrences of gem garnets are located (TS No. 64P/05 and 64P/09). The gem garnets i.e. rhodolite and almandine occur in association with garnetiferous chlorite schist and garnetiferous biotite schist as small pockets within khondalite and quartzite. The gem garnet pockets are erratic in distribution. The rhodolite garnet recovered are up to the weight of 1gm and can be compared with the famous rhodolite of Siali. This promising mineralised belt follows the Ong shear zone in east-west trend and may extend

in further east and west direction. The amphibolite/ basic granulite and the quartzo-feldspatic permeations in course of granitic intrusion might be responsible for refinement of garnets associated in Easternghat granulite facies to gem varieties of primary source. This belt may find place in the gem tracts of Orissa reported earlier.

INTERLINKING OF RIVERS

B C SAHU, GEOLOGIST

Interlinking of major Indian rivers is the brainchild of irrigation expert Sri K L Rao, the then Irrigation and Power Minister, who initiated this in 1960s. But the proposal did not get support of its successive Governments. In November 2002, Prime Minister A B Vajpayee, announced in parliament, his government's commitment to linking all the major Indian rivers which was supported by all members including the leader of opposition Mrs Sonia Gandhi. The project aims at diverting surplus water from flood hit areas to water deficit drought hit regions. Following the Supreme Court's directive to link all major rivers of the country by 2012, a task force headed by Suresh Prabhu, former Union Minister of Power was set up to implement the plan with an estimated cost of Rs 5,60,000 crores, which envisages the largest man made water network in the world. The present one seeks to divert floodwaters from 14 Himalayan tributaries of the Ganges and Brahmaputra in northern India and Nepal and transferring them to south via 16 links in peninsular basin. The pre-feasibility study has been conducted by the National Water Development Agency (NWDA), a Government of India body, set up in 1982, to look into this and prepare the feasibility report. Feasibility study in six of these thirty links have already been done. The detailed project report would be prepared by the year 2008.

The proposed Mahanadi-Godavari link canal project aims the diversion of surplus water of Brahmaputra basin (thorugh M-S-T-G, G-D-S & S-M links) and surplus of Mahanadi basin towards south. 31,240 million cu.m of surplus water will be available at Manibhadra (with 20,064 mcm from M-S-T-G, G-D-S and S-M links and 11,176 mcm surplus of Mahanadi basin).

As a part of the Geotechnical investigation for the above work to ascertain the foundation characteristics, the head work and other link canal structures (upto Vamsadhara river crossing) drilling work in 62 boreholes along the alignment sites with necessary field testing has been assigned to the Directorate of Geology, Orissa, Bhubaneswar. The Geological Survey of India will provide necessary guidelines, suggest the drill hole points and log the drill cores. Central Soil and Materials Research Station (CSMRS), New Delhi has been assigned with the burrow area survey and collection of distributed and undistributed samples for determination of engineering parameters of the soil for the purpose of design. The canal will be 10cm thick CC lined with bed width of 57m upto Rushikulya river crossing and 37m beyond that. The proposed canal will pass through Nayagarh, Khurda, Ganjam and Gajapati districts of Orissa and Srikakulum district of Andhra Pradesh. The link canal will irrigate about 3,52,223 hectares and 1,02,006 hectares using 3,307mcm and 547mcm water in Orissa and Andhra Pradesh respectively. In addition a quantity of 6,500mcm will be diverted from Dowlaiswaram (AP) with the rest being accounted for as transmission loss. 960 megawatts of power will be generated and 6,57,432 hectares of land will be protected from flood. It will also help in inland transportation of goods, thereby reducing atmospheric pollution and effecting fuel conservation.

There is hue and cry by different organisations and individuals about the construction of the link canals in the name of submergence of 8,000 sq km of land, displacement of three million people, ecological imbalances and potential conflicts among different states and nations involved. Normally, any river project (may it be a dam or canal) is opposed by a section of people in the society. But ultimately it brings about economic upliftment of the people in the command area and greenery in the chronically draught-prone areas. Punjab is a golden example of this.

TARGETING SOAPSTONE IN UDALA SUBDIVISION, MAYURBHANJ DISTRICT, ORISSA

S N PARIDA, GEOLOGIST
S G A RABBANI, JDG

Occurrence of soapstone has been brought to light during the course of mineral targeting (based on HRAMS data) carried out around Sarat in Udala subdivision of Mayurbhanj district (TS No 73 K/07). The area exhibits litho-assemblages such as Singhbhum granite, quartzite, gabbro-anorthosite suite of rocks, dolerite dykes, ultramafites (pyroxenite) and vein quartz bodies. The country rocks strike in NNE – SSW to NNW – SSE directions dipping moderately to either directions. The soapstone is found occurring in basic igneous rocks.

The occurrences of soapstone have been reported near Champusahi, Kashijharan, Sukuapata, Barabanla, Nedam, Mahulpanka and Asanbahali villages and were delineated by geological mapping on 1:25,000 scale, supported by surface grab sampling. The different occurrences measure from 20m x10m to 500m x 40m in size, the average depth being about 10m as observed in abandoned quarries. These bodies strike in N-S to E-W directions with moderate dip. The analysis result of soapstone samples has MgO content varying from 20-32%. The mineral confirms to grade I and grade II of standard classification.

The soapstone occurrences have a wider scope for exploitation and industrial applications due to their dimension, good grade and above all locational advantages. The mineral can be used in refractory, ceramics, paint, paper and cosmetic industries. In addition to it, the soapstone bodies of a few localities like Nedam and Mahulpanka may be utilised as decorative stones and for carving of statues.

GEO-ENVIRONMENTAL STUDIES AROUND JODA-BARBIL- BAMEBARI AREA

M D BEHERA, GEOLOGIST

Extensive opencast mining is continuous in operation since 1927 in Joda-Barbil-Koira belt over an area of 1000 sq km. Rampant mining has affected the environment in many ways.

1. *Ambient Air Pollution:* Drilling, blasting, ore handling, transport and installation of a number of crusher units tend to increase the SPM level in the air. Air quality studies undertaken in the area indicates:

- SPM level of more than 200μg /m^3 in the residential areas of Joda, Barbil, Thakurani, Banspani, Bileipada, Jurudi, Jaribahal and Bamebari, where it ranges from 211-2817μg /m^3.
- SPM level of more than 500μg /m^3 at the crusher sites of the area ranging from 555 to 3819μg /m^3.
- High dust concentration in Jurudi, Jaribahal, Barbil, Dubna and Gurda where it ranges from 8.12-41.35 g/m^2.

Dust is the most important environmental menace. It must be prevented from becoming airborne. At the first instance, efforts should be made for reducing the generation of dust by using sharp drill bits and tarring of roads wherever practicable. Inevitably, generated dust must be arrested or suppressed by covering ore transfer points and by sprinkling of water. Air quality must be monitored periodically to know the effectiveness of the protection arrangement made.

2. *Problem of Solid Waste Generation and its Management:* Waste generation is directly proportional to mineral utilisation. The powdered waste material creates more problem in terms of

- Loss of agriculture, forest and other land
- Loss of groundwater storage capacity
- Increased SPM in air.

Waste management:

- Suitable sites should be selected for dumping the excess waste/ over burden if any after back filling.

- Proper terracing, suitable dump slopes (< 20%), retaining walls, and garland drains to prevent wash off from waste dumps need to be checked frequently.
- Afforestation is the best method for stabilization of dumps.

3. *Water Quality Study*:

The surface and groundwater of the area has not been influenced much by the mining activity as no much chemical pollutant is found. However, turbidity and microbiological impurities need to be reduced.

4. *Noise Level Study:* Noise level exceeds the day time standard of 65 dBA in the residential areas of Joda, Barbil, Thakurani, Jurudi, Bamebari, where it ranged from 40 to 76 dBA. In active mines the noise level ranges from 44 to 86 dBA.

Noise and vibration do damage to the environment and therefore need to be controlled. Even here generation of noise can be reduced by proper lubrication of moving parts of machinery and use of delay detonator and sequential blasting machines.

5. *Land Use and Land Cover Mapping:* shows that land degradation in the Joda-Barbil area is caused by rampant mining and its ancillary activities in about 6% of the land (26 sq km out of 432 sq km) studied. Reclamation of mined out areas and profuse afforestation in the degraded land are suggested.

6. *Health Hazards:* The main health hazards due to mining are pneumoconiosis silicosis, deafness-partial, headache, hyper-tension, malaria, malnutrition, bronchitis, gastrointestinal disorder and skin disease.

7. *Socio-economic Aspects:* More than 2/3rd of working category population are employed in mining, transport and other mining related activities. The mining activities have uplifted the socio-economic status of the area. Facilities and services, which have come up due to the requirement of the mines would otherwise not have been able to develop.

Mining is essential and serves the civilisation adequately. Hence the need of the hour is eco-friendly mining for which scientific mine planning, adequate anti-pollution measures, optimisation of resource utilisation, regular monitoring, biological reclamation and rural community development are absolutely essential.

PRIMARY SOURCE OF DIAMOND

B C SAHOO, GEOLOGIST

In recent years the geoscientists of the Directorate of Geology have unearthed one more valuable hidden gift of nature i.e. the primary source rock of diamond for the first time in the history of Orissa by their hard, sincere and consistent effort. They have consequently succeeded to prove it to be diamondiferous in the year 2001. This diamondiferous ultrabasic rock (kimberlite/ lamproite) is located within the northern part of Nuapada proterozoic basin near village Kalmidadar in Nuapada district of Orissa in the toposheet no. 64L/05. Incidentally the diamond does not crystallise in kimberlite/ lamproite. But these rocks are the carriers of the diamond, mantle xenoliths, indicator minerals (pyrope garnet, picro-ilmenite, chrome diopside, chromite etc.) along with the crystallisation product of kimberlitic magma.

The kimberlite/ lamproite is a hybrid volatile-rich ultramafic rock, which occurs as volcanic pipes, dykes and sills, coming from a great depth of more than 150km through deep-seated reactivated fractures with a maximum speed of 150 to 200 km/hr at times. Generally it takes five to fifteen hours to reach the surface coming from the zone of upper mantle. The material is thus emplaced in the geologically stable cratonic areas. This rock is produced by the partial melting of carbonated peridotite and eclogite at the upper mantle at a depth of 150 to 350km and probably at the temperature range of 1100 to 1500 ^{0}C and 50 to 60kb pressure, transported and stored under cratons at least 110km below where high pressure and relatively cool temperature preserve them.

World over, more than 7000 kimberlite/ lamproite bodies have been discovered out of which around 600 are diamondiferous and among them only 50 have been mined.

The kimberlite/ lamproite rocks are mainly composed of minerals like olivine, phlogopite, diopside, serpentine, calcite, garnet, ilmenite, spinel with some other minor minerals and rarely diamonds. But there are basic differences between these two rocks in their habit, mineralogy, chemical composition, texture etc.

BAUXITE MINING IN ORISSA IS ENVIRONMENT FRIENDLY

M K SENAPATI, GEOLOGIST

The state of Orissa contains more than half of the total Indian bauxite resources. Only one deposit has so far been mined for utlisation by NALCO in its Damanjodi plant. Most of the major bauxite deposits are confined to the undivided KBK districts of Orissa, where the socio-economic condition of the people is worse in comparison to the other parts of the state. Poverty, hunger, malnutrition and unemployment has compelled the people to resort to earning their livelihood through felling trees. This has led to large-scale deforestation in the area. What is essential is an alternative method of engagement for these people. As the area is chronically drought prone, it has lesser prospects of organised farming as a suitable profession. In this context, mining of the huge resources of bauxite in the area is essential to provide the people with sustainable employment. The benefits will be in more than one way. Lesser people will depend on the cutting of trees and mining companies will have to grow new forests on the slopes of the plateaus and elsewhere. Mining on the plateau tops will lead to improved recharge of groundwater in these areas after the hard bauxitic layer is removed. This will certainly raise the water table in this region. As such most of the bauxite bearing plateaus are nearly bald, having no luxuriant growth of vegetation on their top. Hence, very less forest canopy will be affected due to mining of the mineral. Rather organised afforestation will bring in better forests in the area, and also alleviate the socio-economic conditions of the masses.

NEWS CONGLOMERATE

Compiled by B C Patnaik, DDG

1. 2720MW is our present nuclear power generation capacity.
2. 26.2 million tones of coal was produced in India during 2002-03.
3. 6.9 million tones of sponge iron was produced in India during 2002-03.
4. The total worth of minerals produced in India during 2002-03 was Rs 5448 crores.
5. There is around 600 million tones of crop residue and 150 million tones of waste residue in India that can be processed to be used as fuels.
6. 2.4 lakh tones of pig iron valued at Rs 169 crores has been exported by the Nilachal Ispat Nigam Ltd.
7. 35 million people are affected by arsenic problems in West Bengal.
8. The cost of the annual oil requirement of India is estimated at Rs 78,000 crores.
9. The cost of oil imported by India during April '02 to February '03 is US$ 16,062 million.

OGSA NEWS

Trainings and Courses

B C Patnaik, DDG; P K Ojha, DDG; S K Padhi, Geologist; M R Panda, Geologist and C B Das , Geologist attended a Workshop cum training programme on "UNFC" at Bhubaneswar from 7th to 9th May 2003.

Dharmendra Sharma, Geologist attended a short term course on "Alumina Technology" at JNARD, Nagpur from 27th Aug'02 to 29th Aug'02.

Mrs S Das, JDG; P K Ojha, DDG; M K Senapati, Geologist and S A Jena, Geologist participated in the World Computer Literacy Day event at NIIT, Bhubaneswar for two weeks from 02nd Dec'02.

S K Mohanty and N N Singhdeo, Geologists attended a Workshop on "Shear Zone Mapping and Analysis" at Sambalpur University, from 20th Dec'02 to 29th Dec'02.