

NOTES

INDIAN GEOLOGICAL CONGRESS (IGC) SILVER JUBILEE WORKSHOP ON EXPLORATION AND EVALUATION OF COASTAL AND OFFSHORE RESOURCES (MINERALS AND ENERGY)

Symbolising the second Silver Jubilee event of the Indian Geological Congress, the above Workshop on "Exploration and Evaluation of Coastal and Offshore Resources (Minerals and Energy)", was held under the joint auspices of the Department of Marine Geology, Mangalore University, Mangalagangothri, from Feb. 25 to 27, 2003. The programme was sponsored by a number of government departments, public and private enterprises and scientific organisations. About 90 participants, including local students and faculty members, drawn from different organisations, particularly from GSI, AMD, CMRI, NGRI, ONGC, NIO, CMRI and several universities, participated in the three-day deliberations on the theme of the workshop. Forty-eight abstracts were received for presentation. These were divided into seven Technical Sessions: (I) Recent

advances in marine geology - oil & gas and hydrates, (2) Polymetallic nodules and placer deposits, (3) Base metals, experimental and geochemical studies, and ornamental rock deposits, (4) Coastal aquifers, (5) Coastal environments 6) Marine and island environments, and (7) GIS and remote sensing. The abstracts were printed in a separate volume, available for purchase from IGC office.

In a well-organised programme ably supported by the university administration, headed by the Vice-Chancellor, Prof. B. Hanumaiah, the tempo of the scientific and technical deliberations remained salubriously wholesome upto the last minute. The organisers propose to bring out the entire discussions, presentations, and keynote addresses in a special volume.

The Workshop was inaugurated by the former



At the Inaugural Session : Persons on the dais from L to R : Prof. T. R. Sreedhara Murthy, workshop Convenor. Mini Ramakrishna, Chairman, the Mysore Minerals Ltd., Prof. B. Hanumaiah, Vice-Chancellor, Mangalore University; Shu B. R. J. Rao, Former Dy. Director General, GSI; and Prof. O. P. Varma, Chairman, Organising Committee and Executive President, IGC.

Deputy Director General of the Geological Survey of India, Shri B. R. J. Rao, and the function was presided over by the Vice-Chancellor of Mangalore University, Prof. B. Hanumaiah in the distinguished presence of Shri Ramakrishna, the Chairman, Mysore Minerals Ltd., and Prof. O. P. Varma, Executive President, IGC.

Prof. T. R. Sreedhara Murthy, Convenor of the workshop, welcomed the guests, delegates and the invitees. The assembly of delegates included local invitees and distinguished scientists from various universities, mineral industry and research organizations.

Inaugurating the workshop, Shri B. R. J. Rao, said that the university-institute nexus for larger development of exploration and mining processes of minerals had become imminent as technology and know-how were possible only through research and study and the physical operations had to be undertaken only with the full knowledge of the mining experts.

Stating that the ocean-bed and the continental shelf deposits of minerals would be the future areas of mining, Mr. Rao said that India has been a late entrant into these areas of mining as technology and know-how were not readily available and also due to lack of initiative and coordinated approach. He said that oceans were the storehouses of minerals and could yield substantial mineral raw materials for generations to come, but it is imperative to protect the environment without any detrimental effect on the marine ecology.

He said that before 2005, India would get an additional exclusive economic zone over and above the existing Indian territorial waters, which meant greater potential for harnessing the various minerals and oceanic energy sources. But we cannot take any advantage of it unless there is advance planning, research and a data bank in aid of the mining of ocean-bed for minerals.

He felt that there were conflicting sets of rules and regulations for exploration between the Union and State Governments, preventing professional bodies, such as the Department of Ocean Development, the Geological Survey of India and the National Institute of Oceanography for taking research personnel on board their vessels.

The Defence Ministry also had laid down some restrictions on additional research personnel travelling on research vessels. He said those stipulations were to be followed without a second thought, but if there has to be consortia approach in research and exploration for minerals, there had to be participation from the private sector to act as a buffer to the existing research teams. He pointed out that there were restrictions on publication of the seabed maps without which there would be no interest in the private

sector to participate in exploration of minerals or investment in mining.

Earlier, the Executive President and Chairman of the Silver Jubilee Committee, O. P. Varma, outlining the need for deeper studies in exploration and evaluation of the coastal and offshore resources, said that the well-established land-based resources were in the process of being depleted rapidly as a result of exploitation of terrestrial deposits by industrialised nations up to great depths. India was not an exception to these developments as due to rapid industrialisation, some land resources of minerals have started dwindling and several already depleted. The energy crisis and the present day bill of unbearable magnitude and unabated consumption of petroleum and gas underscore the need for intensification of search for alternative energy sources on land and offshore regions.

He said during this decade the mineral industry had also to face severe environmental restrictions on the activities of prospecting, development, mining, refining and smelting, though the steps seemed to be sensibly desirable.

Prof. Varma said that the presence of large reserves of ilmenite and magnetite on the continental shelf had been proved by various agencies, including National Institute of Oceanography, Geological Survey of India, and other organisations. So far, exploitation of these near-shore deposits in the country had been elusive, while other countries had been able to work out profitably in the shelf deposits for bulk mineral quantities. He said apart from the beach placers and shelf mineral resources, India had to give due attention to manganese nodules of the deep sea, which constituted potential source for the future needs of base metals. Although the Pacific Ocean manganese nodules came to be known in 19MJs, no deep mining operations had been underway in any part of the earth yet.

The Vice-Chancellor of the Mangalore University, B. Hanumaiah, who presided over the inaugural function, said that the universities were looking upon the professional organizations for funding their research programmes. He said universities were no doubt the storehouses of knowledge but harnessing this knowledge-bank through "meaningful research" needed participation from the professional organizations.

The Chairman of the Mysore Minerals Limited, Ramakrishna, who released the souvenir, said that India was one of the few countries where systematic geological mapping has been carried out for exploring and evaluation of mineral deposits. He said the State of Karnataka occupied a prominent place in earth science education and research in the country due to the excellent foundation laid by renowned geologists. The State has rich deposits of

dimension stones of export quality. Though there were problems with its marketing, the future appeared to be bright for the State, particularly when the government was showing interest in the development of these resources.

The workshop concluded on Feb. 27, 2003, after the valedictory session, presided over by Prof. O. P. Varma; the Chief Guest on the occasion was Shri M. Senthippan, Director, Marine Wing, GSI, Cochi. At this session, a comprehensive chart of recommendations was presented and adopted after some discussions. A 16-page brochure of recommendations has since been printed and sent to all concerned. A gist of these recommendations are summarised further below.

On behalf of the IGC, Prof T. R. S. Murthy, the Workshop Convenor, gratefully acknowledged the sponsorship provided by Tata Steel, DST, DOD, ONGC, GSI and M/s Remote Sensing Instruments and Atomic Minerals Division, Hyderabad. Financial support had also been extended by M/s HLS Asia Ltd., New Delhi; Sadhana Minerals, Chillakur (A.P.); Kudremukh Iron Ore Ltd., Electrotech Internal INC, Chennai; Karnataka Bank, Ltd., Bangalore; Sarvada Distilleries, Mangalore - all of which is greatly appreciated. He also profusely thanked the university administration for having given necessary cooperation and infrastructural facilities for the organization of the workshop. Due acknowledgement was also made to the help and support extended by his departmental colleagues and the students, who worked tirelessly to make the workshop so eventful and successful.

Gist of Recommendations that emerged from the workshop are as follows:

The workshop took note of the rising demand for minerals by the industry, which are in deficient supply in India, and as such the need for intensive search for new mineral resources to augment the fast diminishing reserves of some minerals, including hydrocarbons. The oceans as the potential alternative source of minerals and energy becomes evident. At the same time, current status of the indigenous technology and the need for trained manpower was also highlighted.

It was strongly felt that oceans can eliminate shortages of many substances of human consumption - food, medicines, minerals, including water and hydrocarbons, and even of shelter. India is fortunately endowed with sizable potential of placer sands, primarily of monazite, rutile, garnet, ilmenite, kyanite, zircon, sillimanite, and magnetite, and deposits of calcareous sand and also those of hydro-carbons. The workshop recommended and placed on record that beach placers apart, continental and deep-sea bed deposits of minerals will be the future areas of

mineral exploration and exploitation. Govt, of India should, as a matter of policy, encourage exploitation of beach and near-shore deposits.

1. The beaches and the shallow offshore areas around Indian coast have immense possibilities for future exploration and mining, especially for placer minerals and calcareous sands. These deposits are easy to explore. Instead of directing attention to the deeper portions of the sea, Govt, of India should encourage exploitation of these deposits.
2. Detailed studies of the likely impact of mining on various aspects of environment and ecology be undertaken in association with other organizations before large-scale mining is commenced. In this area, societally relevant issues, such as coastal erosion and pollution, sediment-transport, sea-level changes and impact on biodiversity and numerical modelling on environment should be actively carried out.
3. With regard to capacity-building for coastal placer mining, the workshop felt that the indigenous technology is reasonably well-advanced for working near-shore deposits and for mining continental shelf and ocean-bed deposits. Path-breaking technologies should, however, be gradually developed through R&D efforts in universities, NIO, CMRI, etc.
4. Expressing its views on the vital issues related to manpower and technological build-up, it urged the Govt, to project long-term needs of manpower for mining on-shore deposits, so that teaching and training programmes in universities could be strengthened and modified as per the projected technical manpower needs of the industry and R&D agencies. Attaining technological excellence dictates that we strengthen our currently operative courses in marine geology and geological oceanography in the existing few centres of post-graduate teaching. It further stressed the need for consolidation and gearing up of the syllabii of courses of teaching and training to begin with and also strongly recommended intensification of mineral dressing component in courses to meet the larger and more sophisticated technological demand for experts in this area.
5. To assess the needs for upgrading the course syllabii, the workshop urged the DOD to support a programme of Group Discussion for drafting an up-to-date model syllabus for post-graduate marine geology course after wider and detailed consultations with the MOM, DST, UGC, CSIR, INSA and AICTE.
6. In the area of mining geology and mining, R & D project studies on placer deposits, development of

appropriate exploration technology, mineral beneficiation and technology, environmental pollution impact assessment should be generously supported.

7. In the changed conditions of liberalization/globalisation, national laboratories and marine research centers in universities be authorized to evaluate the estimated ore reserves and reports on the placer deposits arrived at through independent efforts of entrepreneurs, in addition to GSI, AMD and IBM - as against the trio at present being authorised under the Mineral Concession Rules (MCR), framed in late 50s. Similarly, heavy mineral analyses and analytical results on mineral concentrates and rocks done in the well-established Indian universities should be accepted as authentic, when performed for mining entrepreneurs. Such a provision would give support to strengthen R & D institutions and at the same time would encourage the industry to support R & D programmes in the academics. Authentication by the heads of the faculties of marine geology of the exploration carried out under their overall guidance should also normally be accepted by the government, -when application for ML are submitted by entrepreneurs.

These provisions, the workshop opined, may also help in optimal utilisation of equipments, which often lie idle for want of assignation of laboratory tasks and analytical tests, often needed by the mineral & mining industry.

8. It is prudent to invest sufficient funds in the development of technical manpower and equipments for coastal mining technology. Regretfully, the mining machinery for this sector is still imported.
9. The workshop observed that at present the mining ventures are exporting their mineral production in the raw state, despite a very clear-cut policy directive of the Govt, for exporting only value-added products of mineral commodities. Firm steps be taken so that mining enterprises abide by the stipulations of National Mineral Policy in regard to value addition to raw mineral produce.
10. The delegates viewed with concern our inability to stand in competition in the export of domestic mineral-rich sands with upto 30% concentration of heavies in the world market, while foreign companies are mining mineral sands only of 3% grade and are able to offer their produce at cheaper rates. Removal of the preventable causes, which create obstacles to domestic placer industry, should go a long way to help overcome hurdles in the way of mineral processing at cheaper rates from domestic high grade sands.

11. Ore deposit types have time-bound importance and value. In consideration of this fact, the workshop participants requested Govt, of India to avoid conflict of interest of mining with the Ministry of Environment & Forest and the Department of Atomic Energy (AEC) for smooth exploitation of coastal placers, which are found to have enriched zones only within 500 m landwards from high tide line. Necessary amendments to the existing policy of the government may be made to permit exploitation of placer mineral deposits in the prohibited zones. Likewise, some mechanism of arriving at some understanding with aquaculture operators be devised.
12. Some kind of regulations be made along with suitable mechanism for strict implementation of the provisions under Mineral Concession Rules to compel mine owners to earmark certain percentage of their profit for R&D in institutions of higher learning in the area of ocean mineral resources and mining environment.
13. Apart from the routine exploration, basic research in the field of sea-level changes, landward migration of sediments, locales of inland buried deposits, beneficiation of low-grade placers, characterisation of placer minerals, provenance, sediment budget and beach capacity-building should be liberally supported to facilitate new mining ventures.
14. It recommended that an effort be made under Integrated Coastal Zone Management (ICZM) to delineate the setback lines on scientific basis, after accounting for coastal geomorphology of the country in all its manifestations (landforms classification, stability/fragility to erosion, resource availability, etc.), and be based on erosion-rates and projection of inundation in the event of sea-level rise. These two criteria may also determine resource availability; for example, ground water. In addition, atmospheric conditions, such as cyclonic storms, should be considered in certain disaster-prone areas.

Keeping an arbitrary 500 m Coastal Regulation Zone (CRZ) seems unscientific and is not likely to promote sustain ability, nor avoid user conflicts, nor helpful in the event of natural hazards, such as erosion or accretion.

Awareness about the need for fixing scientifically deduced regulation zone should enthuse geoscientific fraternity to accomplish major task to unravel India's coastal geomorphology, demarcation of setback lines based on erosion rates, and projection of inundation in the event of accretion, identification of point sources of pollution, and also demarcation of ICZM pixels.

15 The workshop feels that framing of legislation on coastal/sea mining is overdue, enforcing the need for detailed exploration of the applied for area for mining lease. The legislation should also emphasise the importance of the assessment of impact on environment by mining and eco-restoration thereof should be binding on the lease holders.

Lastly, the workshop reiterated the fact that we are a recognised mining and technology nation and there is no reason to shy away from taking a lead in utilising our potential of mineral wealth of the ocean to the optimum level.

In conclusion, we once again convey our appreciation and gratitude to Prof. H. Hanumaiah, Vice-Chancellor,

Mangalore University for successfully hosting the workshop. Grateful thanks are due to DOD, DST, Tata Steels, ONGC, GSI, and various other sponsors, for their support and help. Delegates from various scientific and academic institutions who cannot be individually named here, also fully deserve our heartfelt thanks for the indomitable spirit with which they made scientific contributions and helped in the preparation of the draft recommendations.

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INTERNATIONAL CONFERENCE ON DEFORMATION MECHANISMS, RHEOLOGY AND TECTONICS - (DRT) - 2003

The above International Conference was held in St Malo, France during 14-16 April, 2003. It was the fourteenth meeting of a series of international conferences devoted to the study of deformation behaviour and rheology of rocks and minerals that started in 1976 in Leiden and is organized in different countries every two years. The organisers of the DRT-2003 were J.R Brun, P.R. Cobbold and D. Gapais of the Geosciences Department, University of Rennes, France.

The major objective of the DRT-series of Conferences is to encourage a dialogue between researchers working on all aspects of field, experimental and theoretical studies related to structural geology and tectonics. The thrust areas of the DRT-2003 were: (a) the way strain is accommodated and recorded in brittle and ductile rocks, (b) the physical mechanisms of grain-scale to aggregate-scale deformation and (c) implications at the scale of the lithosphere. Over a span of three days, there were invited talks, regular presentations and poster sessions. The following six invited talks were presented: (1) "Acadian structures that survive Alleghanian overprinting in the Appalachian Mountains: A Mountain belt's "memory" of stress events" by T. Engelder (Pennsylvania, USA); (2) "Object-centred kinematic indicators" by C.W. Passchier (Mainz, Germany); (3) "A review of deformation mechanisms and rheology of the lithospheric mantle" by M. Drury (Utrecht, The Netherlands); (4) "Rock deformation from grass to Moho" by

E. Rutter (Manchester, UK); (5) "Rheology of subducting slabs and its role in the exhumation of UHP rocks" by G. Ranalli (Ottawa, Canada); (6) "Growth of Tibet and rheology of the continental lithosphere" by P. Tapponier (Paris, France);

Each invited talk was followed by regular oral presentations. Over a span of three days a total of 39 papers were presented orally, all of which generated considerable scientific interest and debate. The author would like to highlight some of them. T. Bell (Queensland, Australia) spoke on "Rock Memory of Successive Deformations" wherein he presented "Foliation Intersection Axis" (FIA) data preserved in porphyroblasts of a part of Appalachians and discussed its implications for multiple deformation and metamorphism. D.K. Dysthe (Oslo, Norway) presented a paper entitled "There are no steady state processes in compaction" and G Wiesmayr (Vienna, Austria) spoke on "Flanking structures under transpression and transtension". M. Brown (USA) delivered a talk "The topology of syntectonic melt flow networks in the crust as inferred from melt-bearing structures in anatectic rocks" wherein he presented quantitative data from migmatites of South Brittany (France). He stated that the strain field which emerges under subsolidus conditions, controls the initial distribution of melt and with increasing melt volume a mesoscale shear and fracture system develops that enables transfer of melt from lower to upper crust. J.C. White