

(Approved)



Centre for Techno-Economic Mineral Policy Options

(A Society registered under Ministry of Mines, Government of India)

ANNUAL REPORT

2012-13

About the Centre:

The Centre for Techno-Economic Mineral Policy Options (C-TEMPO) was set up under the aegis of Ministry of Mines as a 'think tank' to evolve policy options for the consideration of the Government and the stake holders in the mining and mineral sectors and address technology and management gaps in the non-ferrous mineral sector.

The object of C-TEMPO is to prepare and present attributable and non-binding techno-economic advice to the mineral and mining sectors and facilitate effective interactions among the investors, entrepreneurs, mining industry and the Central and State Governments for a sustainable development.

The Centre maintains a data bank of information on geology, mineral resources, export potential, technology etc. in respect of countries of interest as country dossiers, in coordination with the Indian Missions abroad. This information is leveraged to meet the growing demand of minerals in India as well as for strategic planning.

The Centre prepares and presents Position Papers on techno-economic issues pertaining to the mining and mineral sectors for the consideration of the Government, industry and other stake holders and helps coordinated research in the mineral sector through networking of Government and the Industries.

ANNUAL REPORT (2012-13)

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Centre for Techno-Economic Mineral Policy Options (C-TEMPO)

Centre for Techno-Economic Mineral Policy Options (C-TEMPO) was setup under the aegis of Ministry of Mines, Government of India with a mandate to address technology and management gaps in specific areas of concern in the mining and mineral sectors.

C-TEMPO was registered as a society on 18th November, 2009 under the Societies Registration Act XXI 1860 and accordingly, MOA, Rules and Regulation and Bye-laws were put in place.

I. Aims and Objects of C-TEMPO

The aim of the Centre is to facilitate effective interaction among the investors, entrepreneurs, mining industry and the Central and State Governments and evolve policy options for the stakeholders in the mining and mineral sectors. The specific missions have been set as:

- To study the technology and management gaps for the Non-Ferrous and Ferrous groups of minerals
- To undertake international market research for these mineral commodities, assessing their future demands vis-à-vis availability in the strategic context of country's overall economic development
- Technology scans for appropriate process extraction technologies which have synergy with the natural endowments of the country and utilization of low-grade ores and optimum recovery of by products.
- To facilitate and enhance capability in the sector, to prepare mineral or location specific sustainable development frameworks and innovative and sustainable mine closure plans involving stakeholders, environmentalists, sociologists and community organizations.
- Help develop technology initiatives for low waste and zero waste technology for the mineral sector
- To undertake networking with academic institutions industry and government for coordinated research in the mineral sector.
- To cooperate, promote and collaborate with other national and / or foreign Institutions or international organizations to further the objects of the Society.
- To take up or sponsor studies, and research in the mineral sector
- Prepare and present Position Papers and take up studies on various techno-economic issues for the consideration of the Government, industry and other stakeholders.
- Any other matter incidental or ancillary to the above.

Studies/ Items undertaken by C-TEMPO since inception (2010)

S.No.	Name of Project	Present status	Remarks
1.	Preparation of Country Dossiers on Geology and Mineral Resources of mineral rich countries and MoU countries	Country dossier on Afghanistan, Argentina, Azerbaijan, Brazil, British Columbia, France, Ghana, Kenya, Malawi, Mexico. Mozambique, Russia, Tanzania, Tunisia, Ukraine, Uzbekistan etc. has been prepared.	Prepared as per the need of the Ministry of Mines. To be Continued
2.	A Guide to Investment in India's Mineral Industry 2010-11	Completed	Prepared jointly with FIMI Published in Sept. 2010
3.	Study on Pelletisation of iron ore fines in India and utilization of low-grade iron ore and fines. 2010-11	Completed	Position Paper on "Development of Iron Ore Pelletisation Industry in India" brought out in January 2011
4.	Study on exploration techniques and technology for location and development of deep seated metals in India 2010-11	Completed	Position Paper on Location and Development of Deep Seated Metalliferous Deposits in India brought out in January 2011.
5	Study on iron-ore Pelletisation. Vol-II 2011-12	Completed	Publication brought out on "Relevance of Iron-ore Pelletisation industry in India- A Perspective"
6.	Position Paper on Rare Earth Metals. 2011-12	Completed	"An Overview of Rare Earth Elements" brought out in Oct. 2011
7.	The Mines & Minerals Development & Regulation Bill, 2011. The Basic Framework 2011-12		Published in Dec.2011

8.	Status and strategy for exploration and development of Nickel and Platinum Group Elements resources in India 2011-12 & 2012-13	Completed	Tata steel is utilizing the process flow sheet developed for extracting nickel from chromite overburden in Odisha.
9.	Strategy paper on Rare Earths and Energy Critical Elements- short, medium and long term options and specific policy and legislative interventions. 2012-13	Completed. The recommendations need to be followed up by the stake holders to achieve the objective of REE & ECE security.	Strategy paper on "Rare Earths and Energy Critical Elements: A Roadmap and Strategy for India" brought out in July 2012 by C-TEMPO and C-STEP. NSCS and NMCC are taking forward the recommendations. The wider circulation of the report is awaited.
10.	Revision of Aluminium Mission Plan 2010-20. 2012-13	Project transferred to Metal-I (NALCO) with the approval of Secretary (Mines).	NALCO is funding this project and therefore the project has been transferred to Metal-1
11.	National Geoscience Awards (NGA)	NGA 2011 successfully completed	C-Tempo functioned as the Secretariat for the National Geoscience Awards until 2013. It was closely involved in the processing of nominations, conducting screening committee meetings and selection procedures.

Activities of the Centre during 2012-13

During the year 2012-13 the following activities were undertaken by the Centre:

i. Roadmap and Strategy for production of Nickel from chromite over burden (COB), Sukinda Valley, Odisha

Nickel is not produced from primary sources (nickel ore) in India. Nickel sulphate used to be produced as a by-product at the Ghatsila Copper Smelter of HCL in Jharkhand. Presently, India meets hundred percent domestic requirements of nickel and platinum through imports.

In 2010-11, India imported 219 tonnes of nickel ores and concentrates, mainly from Canada and USA besides 33,306 tonnes of nickel and alloys including nickel waste and scrap (1042 tonnes). Major import of nickel and alloys were from Russia and Australia. UAE, Turkey and Germany dominated in nickel waste and scrap imports.

The major occurrence of Nickel in India is as nickeliferous limonite (in oxide form) in the chromite overburden (COB) in Sukinda valley, Jajpur district, Odisha. The total resource of nickel ore in India is estimated at 189 million tonnes (as on 1.4.2005), with 174.48 million tonnes in Odisha, with 0.2-0.9% Ni. In sulphide form it occurs along with copper mineralization in Singhbhum district, Jharkhand (9 mt). Other reported occurrences of nickel are from Karnataka (0.23 mt), Kerala, Nagaland (5 mt) and Rajasthan. Polymetallic sea nodules also contain nickel.

The Chromite Overburden in Odisha belongs to the Orissa Mining Corporation (OMC) and Tata Steel.

In the light of no commercial extraction of Nickel in the country and non chromite associated nickel resources being very small, CSIR (IMMT, Bhubaneswar) and Department of Mines (HZL) jointly developed a Process to extract Nickel from Chromite Overburden (COB) of Sukinda Valley, Odisha, after a decade long R&D efforts. For the demonstration of the process flowsheet, a Nickel Technology Proving Plant (Ni- TPP) of 10 Tonnes/day capacity was set up at IMMT Bhubaneswar at a cost of Rs.10.5 crores, with the cost shared equally by Ministry of Mines and CSIR. The process developed was a modified Caron process utilizing a un-beneficiated COB material containing 0.7% Ni as raw material. The TPP was completed in March 2001. The Report was accepted by the governing council of the project on 4th October 2001. The basic nickel carbonate produced through this process contained 47-49% nickel and 0.4-0.6% cobalt and the residue contained 45-60% iron and 2.4-3.0% chromium oxide.

Engineers India Limited (EIL) was engaged to prepare a TEFRR for a commercial scale Basic Nickel Carbonate Plant of 10,000 t/annum Ni or 24965 t/annum nickel carbonate (14.3.2008) and found it uneconomical in then market scenario (production cost: \$ 9000/ton in 2009 was slightly more than market price). Current price of nickel quoted at London Metal Exchange is around USD 15,000/- per ton.

Keeping in view the strategic nature and increasing demand of Nickel and the fact that 40% of world production comes from lateritic sources; there was a need to scout for process options available for utilizing the indigenous lateritic nickel reserves. Further, in the absence of a viable technology to extract Nickel from COB, there is a problem of storage of COB and consequent environmental degradation in Sukinda Valley, Odisha.

A meeting was held under the chairmanship of then Secretary (Mines), Govt. of India on 4th April 2011 to discuss the status on the exploration for Nickel and Platinum Group of Elements in India. The meeting was attended by representatives from IMMT, GSI, NALCO, C-TEMPO and Dr. V.I. Lakshmanan, CEO, Process Research ORTECH Inc. Canada.

In this meeting, the Secretary (Mines) stressed the urgent need to develop technology for nickel extraction from the COB, to fill the vital raw material gap.

It was pointed out in the meeting that extraction of nickel from the COB in Odisha is an energy intensive process with environmental hazards besides issues of social acceptability.

Off shelf technologies are not available, as these are deposit specific and the process flow sheet has to be economically viable, energy effective and environment friendly.

Dr. Lakshmanan (Vice Chairman and CEO, Process Research ORTECH, Canada) who is Founder Member of India- Canada Foundation, during a meeting with Secretary (Mines) in May 2011 offered to evaluate their patented technology developed for recovery of Nickel, for recovery of Nickel from the COB of Sukinda valley. He suggested lab scale and mini pilot scale studies at PRO's own facilities and on successful completion; it could be scaled up in India with active participation of IMMT Bhubaneswar.

The idea for testing the samples of COB with their patented technology by PRO was well appreciated by the stakeholders- NALCO, IMMT, OMC, IBM, GSI and C-TEMPO, for finding an economically viable process for extraction of Nickel from the COB.

Five samples of COB from Sukinda Valley (weighing about 8 tonnes) were collected from Baula and South Kaliapani (OMC) and Sukinda (Tata Steel) mines after obtaining necessary statutory permissions and approvals from Dy. Director Mines, Directorate of Mines and Geology, (Dept. of Steel and Mines), Govt. of Odisha and shifted to PRO Canada for testing at their own cost, following due procedures.

Twenty eight samples were tested for 32 elements including PGM at SGS Labs, Chennai and Shiva Lab, Bangalore. The values obtained for PGM, Cobalt and Nickel were encouraging.

The PRO tested the bulk samples with Mixed Chloride Technology- acid concentration, chloride concentration and reduction roasting and calcinations methods. It was seen that the **best results are obtained by Mixed Chloride Concentration method wherein, 99.8% of Nickel, 81% of cobalt and 99% of Iron is recovered.** As per PRO the results are highly promising.

The Progress report on the test work and Process flowsheet developed by PRO on the five samples of COB for extraction of Nickel by using their patented technologies was circulated among stakeholders i.e. Institute of Minerals and Materials Technology, Bhubaneswar, National Aluminum Co. Ltd, Deptt. of Steel and Mines, Govt. of Odisha, Bhubaneswar, Odisha Mining Corporation Ltd, Tata Steel Limited and NMDC for seeking their comments and suggestions, on 17.2.2012.

Tata Steel found the technology cost effective and environment friendly, recovering nickel, cobalt and iron in the process. They visited the labs of the PRO Technologies, Canada to understand the process and to evaluate it against cost of production, environmental impact, quality of product and the scalability of the developed process.

OMC has informed that they do not possess any expertise or competence to comment/suggest on the process flow sheet and the technology developed by PRO, Canada vis-à-vis other options available for extraction of nickel from lateritic overburden.

Tata Steel has further informed that they and ORTECH have signed an agreement to work together and plan to do pilot study at the Hydrometallurgical facility of National Metallurgical Laboratory (NML), Jamshedpur. ORTECH has agreed to provide a report which will include capital and operating costs for the commercial plant of a suitable operating capacity and Tata Steel has drawn a road map for next 18 months (till end of 2014) in this regard.

Tata Steel has already initiated action on the PRO flowsheet in association with NML, Jamshedpur and the pilot plant trials are likely to commence by the year end (2013). The results of these studies will be known only after about 18 months time.

The initiation by the Ministry of Mines to find a suitable method to extract nickel from the enormous quantity of chromite overburden available in the Sukinda valley, Odisha is seeing success and as desired Tata steel is working on the technology developed by PRO, Canada. If the pilot plant trials succeed, 175 million tones of nickel ore associated with the chromite overburden in Odisha could be fruitfully exploited.

ii. **Position Paper on Rare Earth Elements (REE) and Energy Critical Elements (ECE)**

The “Rare Earths” (RE’s) are a group of 17 chemically similar metallic elements- the Lanthanides (La-Lu) and Scandium (Sc) and Yttrium(Y) and eight elements are included in the Energy Critical Elements (ECE’s), which are extensively used in renewable energy applications.

Both the Rare Earth Elements and Energy Critical Elements due to their inherent unique properties are indispensable for a variety of emerging critical applications in clean energy technology (wind mill, hybrid car batteries and engines, solar cells, etc), advanced electronics and information technology and high-tech defence and civil applications.

China with a resource potential of 89 million tons is the world leader in rare earths. CIS Nations and the USA are next to China in resources. **India stands fourth with an estimated rare earth resource potential of 1.3 million tons.** China has been catering to 97% of world demand of rare earths through exports and of late, as a strategic move, drastically cut down production and exports, leading to an unforeseen shortfall in supply.

Presently, production of rare earths in India is insignificant and it meets the entire requirement through imports, mainly from China. During 2010, India imported about 779 tons of rare earths and energy critical elements, besides other finished products containing RE’s.

Traditionally Bastnasite, Monazite and Xenotime are the principal minerals for rare earths. India possesses the largest deposits of monazite in the world, found mainly in the coastal sands of Odisha, Andhra Pradesh, Kerala & Tamil Nadu. GSI and AMD (Atomic Minerals Division) have identified many potential areas for REEs in Jharkhand, Chattisgarh, Rajasthan, Gujarat, Meghalaya, Assam, Tamil Nadu, Karnataka and West Bengal.

The Indian Rare Earths Limited (IREL), with an installed capacity to produce 1800 tonnes of rare earths per year has been the sole producer and exporter of rare earth compounds in India. It stopped RE production in 2004.

C-Tempo prepared a concept paper on - Rare Earth Elements in India and its future exploration strategy based on literature survey and inputs from experts.

In view of expertise available with the Centre for Study of Science, Technology and Policy (CSTEP) Bangalore, the concept paper was shared with C-STEP and it was requested to join in preparing a roadmap on the status of Rare Earth in India.

A Steering Committee was constituted under the chairmanship of Secretary, Mines and Chairman, CSTEP as Co-Chairman and members from DST, GSI, BARC, IREL, DRDO, AMD, IMMT, NML and Director, C-TEMPO as Secretary to develop a

strategy paper on the status and availability of Rare Earth Elements (REE) and Energy Critical Elements (ECE) in India.

The strategy paper “Rare Earths and Energy Critical Elements: A Roadmap and Strategy for India” was prepared by C-TEMPO (MoM) in association with C-STEP, Bangalore with scientific inputs provided by the members of the Steering Committee.

The report furnishes an over view of current status of REE and ECE with regard to their availability and as a means to reduce dependence on imports, proposes a number of measures for achieving self reliance by revamping exploration, extraction, recycling and substitution techniques and strategic planning and policy initiatives.

Recommendations on Exploration: Principal source for rare earths are the minerals bastnaesite, xenotime and monazite. India has rich deposits of monazite however, due to the presence of radioactive uranium and thorium, safe extraction of rare earths poses many challenges. GSI and AMD have identified many REE potential areas in different states. The paper recommends use of modern concepts and tools in exploration by GSI and AMD to search and locate potential areas for REE/ECE deposits. GSI has already given high priority to exploration of REE in the XII Plan and AMD too is giving special attention.

Recommendations on Extraction: The Energy Critical Elements (ECEs) namely Germanium, Gallium, Indium, Selenium, Tellurium etc. are produced as by-products during the production process and smelting of base metals like lead, zinc, copper, aluminium, and tin etc. Their production is technology intensive.

Gallium is extracted as a by-product from the Bayer-liquor during the processing of bauxite to alumina. Though laboratory and pilot scale studies for extraction of gallium have been carried out, but no gallium is produced by NALCO. The report recommends that NALCO should revive the Gallium Extraction Plant at Damanjodi (Orissa).

Indium is essentially obtained as a by-product of refining zinc. Hindustan Zinc Limited (HZL) should make efforts to recover this metal during the processing of Zinc.

Both Selenium and Tellurium are by-products of the electrolytic refining and smelting of copper. Selenium (Se) is currently produced only in small quantities in India. The report urges Hindustan Copper Limited (HCL) should step up its production from the Ghatsila Copper Smelter in Jharkand.

In case of REE the key issue is the separation of the individual REE from parent mineral and managing the associated radioactive elements. The report recommends pooling of state-of-the-art rare earth metal extraction technology including the expertise and facilities to cover the gap areas. Analysis of blast furnace slags from two different sources by the National Metallurgical Laboratory indicated presence of Yb and Lu in levels similar to that in bastnasite. With large scale availability of such slags, a good amount of valuable REEs could be recovered.

The area of Process Research and development has remained dormant for the past few decades. There is a compelling need to reactivate this sphere by drawing attention of process metallurgists to solve many of the pressing problems. The report recommends incentivizing process research in DAE, IREL and CSIR laboratories - NML, IMMT and Central Electrochemical Research Institute (CECRI) to take up such programmes.

Recommendations on Recycling and Substitution: As REEs and ECEs are scarce metals, and therefore recycling is a cheaper and quicker way to get more out of less, than going in for exploration activities that are time consuming. For this reason many countries have banned export of end of life products that contain these elements.

In India, recycling technologies for recovery of REEs and ECEs from e-waste are yet to be developed. A techno-economic analysis is needed to prioritize which elements are worthy of recycling and appropriate steps taken to encourage setting up of recycling facilities.

Recommendations on policy Initiatives: Stockpiling of rare commodities, bilateral agreements with countries to ensure short term and long term supplies, and acquisition of assets abroad are some of the salient recommendations. Countries like Afghanistan, Mozambique and Ukraine hold potential for rare earths and ECE and Bolivia for Lithium.

An area of special concern in the report is cooperative research among various research organizations, to share and widen knowledge base to benefit the sector.

The report gives broad guidelines/recommendations for attaining self reliance in REE/ECE. Development of strategies and drawing action plans to implement these recommendations are vested with varied agencies.

Since a large number of organisations/institutes under different Ministries are involved in the implementation of the recommendations, the report recommended creation of Working Groups to oversee this task under the overall supervision of an Apex Board under the Ministry of Mines.

The report and its recommendations were discussed in meetings held at the NSCS and NMCC and it was decided that the recommendations would be suitably taken forward to achieve the goal of national mineral security.

iii. **Preparation of Country Dossiers/Note on Geology and Mineral Resources of mineral rich countries and MoU country.**

C-TEMPO prepares country dossiers containing information on geology, mineral resources, mining, mineral export /import potential, MoUs signed, visits of delegates, Indian companies belonging to the mineral industry present etc, for mineral rich countries and countries with which India has signed bilateral agreements and MoUs. The data is prepared and updated in consultation with the respective Embassies / Consulates in India. The country dossiers prepared as on date include- Afghanistan, Argentina, Australia, Azerbaijan, Brazil, British Columbia,

Canada, Chile, China, Czech Republic, Democratic Republic of Congo (DRC), France, Ghana, Indonesia, Iran, Kazakhstan, Kenya, Malawi, Mexico, Mozambique, Namibia, Peru, Russia, South Africa, Tanzania, Tunisia, UAE, Ukraine, Uzbekistan and Zambia

During 2012-13, the Centre prepared Country Dossiers for **Czech Republic, France, Namibia, Kazakhstan, Ghana, Indonesia, Brazil, DRC, Kenya, Afghanistan, Peru, Tanzania, Tunisia, Uzbekistan** etc. in respect of their geology, mineral resources, mineral export/ import potential, MoUs signed with India, bilateral visits of delegation etc as per the requirement of the International Cooperation Cell (I/c cell) of the Ministry of Mines. The Centre also assisted the I/c Cell by providing these data for JWG meetings and mining events abroad.

iv. Revision of Aluminum Mission Plan 2010-20

The Aluminum Association of India (AAI) prepared a draft Aluminum Mission Plan (AMP), to highlight various issues that were hampering the growth of the aluminium industry in India and after several revisions, submitted the same to the Ministry of Mines on 19.1.2010. It sought government intervention in the key areas of allocation of bauxite mines and supply of coal to the aluminum industry and administrative and legislative measures to help the industry.

The Secretary (Mines) emphasized that the Aluminium Mission Plan should encompass the entire sectoral perspectives from national interest and the aim should be to frame a document which contains an in-depth analysis of issues on which Government intervention may be required, with sufficient justification so that, with the approval of the Cabinet, it may be made a National Mission Document. It was suggested that the AMP may be appropriately re-casted to addresses the issues concerning the aluminium industry sector-wise- primary, secondary and downstream production and end user applications.

The Ministry constituted a Core Committee comprising representatives from Aluminium Association of India, JNARDDC, NALCO and M/s White Metals Ltd, with Director, C-Tempo as coordinator, for selecting a consultant to revise the AMP prepared by the AAI.

Expression of Interest was invited and based on evaluation of technical and financial bids, the Core Committee recommended M/s Ernst & Young (E&Y) for undertaking the task of revising the AMP. In this regard, M/s E&Y made a presentation before the Secretary (Mines) on 31.7.2012 outlining the scope of work, methodology, approach and timeline of the study. In this meeting the Secretary (Mines) emphasized that the revised Aluminium Mission Plan should not be an update on existing survey reports on reserves and resources but a fresh one prepared in consultation with primary/secondary stakeholders, covering the issues and concerns of both primary and secondary sectors, process R&D and policy initiatives. He added that it should lay importance on changing world scenario and duly evaluate external threat in terms of technology and growth. He emphasized

that the AMP should have deliverables in terms of policy interventions, fiscal initiatives for growth and man power requirement. He also suggested that the AMP should be in tandem with 5 year plan and therefore, should be 2012-22 and beyond.

The meeting also decided that the Economic Adviser along with a core team from NALCO, AAI and C-Tempo would interact with the consultant during the study on behalf of the Ministry of Mines and the expenditure for the study would be borne by NALCO.

Concurrence of the Secretary (Mines) for engaging M/s E&Y to revise the Aluminium Mission Plan was obtained on 21.12.2012 and the work order for revising the AMP was issued to M/s E&Y on 15.1.2013 for a fee of Rs. 8,50,000/-, plus out of pocket expenses (OPE) at 10% of the fee and service tax as applicable.

M/s E&Y was given 24 weeks time to complete the project and was asked to submit firm agreement, standard terms and conditions and timelines for undertaking the study.

The kick off meeting was proposed to be held on 30.1.2013 under the chairpersonship of the Economic Adviser, MoM but got postponed due to certain administrative changes.

Meanwhile, M/s E&Y sent draft copies of Engagement Letter, Statement of Work and Terms and Conditions to C-Tempo via email and the copies of the same were circulated among the Core Committee Members on 4.4.2013 for comments.

M/s E & Y is envisaged to revise the AMP as per the Terms of Reference (TOR) prepared by the Core Committee.

The highlights of the revised Mission Plan are the following:

The revised Aluminium Mission Plan will be a National Mission Document. It will have a **Vision and Mission** statement for the entire spectrum of the aluminium industry. The Mission Plan will address various issues related to the aluminium industry in respect of energy and raw materials, environment, waste management, carbon foot prints, etc. A chapter will be dedicated to new applications, R & D and new technologies. SWOT analysis will be done across the value chain to arrive at right conclusions. The document will also look into the feasibility of setting up of LME (London Metal Exchange) registered Warehouse in India. It will also look into policy and fiscal initiatives needed for encouraging overall growth of the aluminium industry.

C-TEMPO coordinated the process until the selection of the consultant. With the current level of functioning and man power it was found that C-TEMPO would not be in a position to coordinate the project as desired. Therefore, **C-TEMPO put up a proposal for NALCO to take up the revision of the Aluminium Mission Plan since it is a beneficiary of the Aluminium Mission Plan and is the principal agency which deals with aluminium in the Ministry of Mines. Further, Nalco**

has sufficient expertise and manpower to execute the project and it is funding the studies too.

The proposal was approved by the Secretary (Mines) and accordingly, all relevant files and documents pertaining to the Aluminium Mission Plan were transferred to Metal-I section in the Ministry of Mines, which deals with NALCO.

v. National Geoscience Awards- 2011

The National Mineral Awards Scheme was instituted in the year 1966 by the Ministry of Mines, Government of India. The scope of the awards scheme was expanded and changed into National Geoscience Award (NGA) from the year 2009. The scheme honors individuals and teams of scientists for their extraordinary achievements and outstanding contributions in the field of fundamental / applied geosciences, mining and allied areas.

To implement the National Geoscience Awards (NGA) - 2011 of the Ministry of Mines, C-Tempo functioned as the secretariat of the award making authority chaired by the Secretary (Mines). In this regard, C-Tempo processed 91 valid nominations and organized Expert Committee Meetings to review and evaluate the nominations under various sections.

Sectional Scrutiny Committee meetings of Sections I, II, III and IV were held on 30-31 Oct and 6 and 9 Nov, 2012 and nominations were shortlisted for the National Geoscience Award - 2011.

The Screening Committee of Experts met on 21st November, 2012 to consider recommendations of the four Sectional Scrutiny Committees and to give its recommendations to the Award Making Authority (AMA). The High Level Expert Committee met on 29th November, 2012 to examine the nominations for the Award of Excellence.

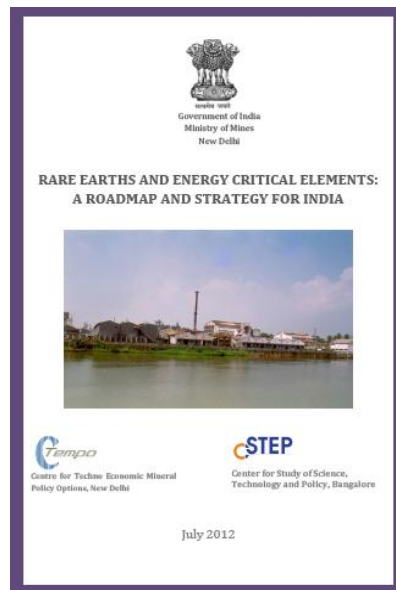
The meeting of the Award Making Authority chaired by the Secretary (Mines) and the Chairman, Award Making Authority, was held on 11th January, 2013 at Shastri Bhavan, New Delhi, to finalize the nominees for the National Geoscience Awards – 2011.

The National Geoscience Awards – 2011 were conferred by Shri Dinsha Patel, Hon'ble Minister of Mines, Government of India on 19 geoscientists, in an award presentation ceremony held on 19th March, 2013 at Vigyan Bhawan, New Delhi.



The recipients of the National Geoscience Award 2011 with Shri Dinsha Patel, Hon'ble Minister of Mines, Secretary (Mines) and other officials at the award presentation ceremony held on 19th March, 2013 at Vigyan Bhawan, New Delhi

3. Publications brought out by C-TEMPO during 2012-13



“RARE EARTHS AND ENERGY CRITICAL ELEMENTS - A ROADMAP AND STRATEGY FOR INDIA”

4. Meetings attended/ Organized by C-TEMPO during 2012-13

S.No	Date	Venue	Meeting attended/organized
1.	24.6.2012	India International Centre, New Delhi	Meeting of Association of Economic Geologists (AEG), Delhi Chapter
2.	31.7.2012	Shastri Bhawan, New Delhi	Meeting of the Core Committee on revising the Aluminum Mission Plan 2010-2020.
3.	30.8.2012-1.9.2012	Bengaluru	Mining – Exploration Convention and Trade Show (MINING MAZMA 2012)
4.	24.9.2012-28.9.2012	New Delhi	XXVI International Mineral Processing Congress (IMPC 2012)
5.	8.10.2012	GSI, DGCO Pushpa Bhawan, New Delhi	Meeting of the Association of Economic Geologists (AEG)-Delhi Chapter
6.	30.10.2012	C-TEMPO New Delhi	National Geoscience Awards-2011, Sectional Scrutiny Committee meeting- Section-I
7.	31.10.2012	C-TEMPO New Delhi	National Geoscience Awards-2011, Sectional Scrutiny Committee meeting- Section-II
8.	6.11.2012	C-TEMPO New Delhi	National Geoscience Awards-2011, Sectional Scrutiny Committee meeting- Section-III
9.	6.11.2012	Gurgaon	The meeting of the World Economic Forum on India, Industry Partnership Programme
10	7.11.2012	Shastri Bhawan, New Delhi	Meeting for skill development and setting up of Centre of Excellence (CoE) in mining sector.
11.	9.11.2012	C-TEMPO New Delhi	National Geoscience Awards-2011, Sectional Scrutiny Committee meeting- Section-IV
12.	21.11.2012	C-TEMPO New Delhi	National Geoscience Awards-2011, Screening Committee meeting of Experts
13.	22.11.2012	Shastri Bhawan, New Delhi	Review Meeting of Centre for Techno Economic Mineral Policy Options (C-TEMPO) by the Secretary (Mines)
14.	29.11.2012	C-TEMPO New Delhi	National Geoscience awards-2011, High Level Expert Committee meeting
15.	11.1.2013	Shastri Bhawan New Delhi	National Geoscience awards-2011, Meeting of the Award Making Authority, chaired by the Secretary (Mines).
16.	12.2.2013	TIFAC, Vishwakarma Bhawan New Delhi	Second meeting of the Project Review and Monitoring Committee (PRMC) to review the draft report on "Technology Roadmap for Indian Aluminium Industry".

List of Founder Members of the Society (C-TEMPO) as per the MoA

S. No.	NAME, DESIGNATION & ADDRESS	Category of Membership	DESIGNATION IN THE SOCIETY
1.	Shri S. Vijay Kumar Additional Secretary to the Government of India, Ministry Of Mines	Founder Member	Chairman
2.	Prof. B. B. Dhar Former Director, CMRI	Founder Member	Vice -Chairman
3.	Shri V. K Thakral Joint Secretary to the Government of India, Ministry of Mines	Founder Member	Member
4	Shri Niteesh Kumar Dutta Director General, Geological Survey of India	Founder Member	Member
5.	Shri C.S. Gundewar Controller General, Indian Bureau of Mines	Founder Member	Member
6.	Shri Chittaranjan Pradhan Chairman-Cum-Managing Director, National Aluminium Company Limited	Founder Member	Member
7.	Shri Manabendu Samajpati Chairman-Cum-Managing Director, Hindustan Copper Limited	Founder Member	Member
8.	Shri L. Pugazhenthly Former National President, Indian Institute of Metals & Executive Director, ILZDA, New Delhi	Founder Member	Member
9.	Prof. Barada Kanta Mishra Director, IMMT	Founder Member	Member
10.	Prof. K K Chatterjee Former Chief Mineral Economist Indian Bureau of Mines	Founder Member	Member
11.	Shri A. K. Bhandari, Advisor, TPPC, Ministry of Mines	Founder Member	Member – Secretary
12.	Such other persons, body or individual interested in academic or research work of the Society as the General Body may decide to admit.		

List of General Body Members of C-TEMPO (2012-13)

S. No.	NAME, DESIGNATION & ADDRESS	DESIGNATION IN THE SOCIETY
1	Shri Naresh Kumar Joint Secretary, Ministry of Mines, New Delhi	Chairman
2	Prof. B. B. Dhar Former Director, CMRI, New Delhi	Vice –Chairman
3	Shri C.S.Gundewar Controller General, Indian Bureau of Mines	Institutional Member
4	Shri G. Srinivas Joint Secretary, Ministry of Mines, New Delhi	Institutional Member
5	Shri B.L.Bagra, CMD (I/c) NALCO, BBSR	Institutional Member
6	Shri S.Dey, RM HCL, New Delhi (Representing CMD-HCL)	Institutional Member
7	Shri B.K.Mishra Director, IMMT, Bhubaneswar	Institutional Member
8	Ms T.Angeline Premlatha US (I&TP) , Ministry of External Affairs, Govt. of India	Institutional Member
9	Shri Gaurav Dave JS, NMCC, New Delhi	Institutional Member
10	Shri G.Dasgupta Director, GSI, New Delhi (Representing DG- GSI)	Institutional Member
11	Shri G.S.Jaggi Director, C-Tempo, New Delhi	Institutional Member
12	Shri L. Pugazenthy Former National President, Indian Institute of Metals & Executive Director, ILZDA, New Delhi	Member
13	Shri A. K. Bhandari Senior Advisor, C-TEMPO, New Delhi	Member-Secretary

Workforce of C-TEMPO (as on 31-09-13)

Technical			
1.	Director	Shri M.Koshy John	Director, GSI, DGCO, New Delhi. Given temporary charge of C-TEMPO w.e.f. 19.2.2013. His extended term expires on 18.2.2014.
2.		Shri Rahul Raghav	Junior Manager, NALCO. On loan basis, to assist the work of C-TEMPO.
Non-technical			
3.	Computer Typist	Shri Prakash Deep	On contractual basis up to 30.9.2013
4.	Office Attendant	Shri Nand Kishore Tamata	On contractual basis up to 30.9.2013

	The salary of the following temporary status workers of the erstwhile TPPC are met from the funds of C-TEMPO till their absorption case is finalized by the Ministry, as per a decision taken in the 1 st GC Meeting of C-TEMPO held on 13.4.2010.		
5.	Shri Ghanshyam Singh	Driver	
6.	Shri Ravinder Singh	Sweeper	

*Shri A.K. Bhandari, Sr. Adviser, C-TEMPO relinquished his office on 31.1.2013
Shri Neeraj Kapur, Manager, NALCO was with C-TEMPO on loan basis and he is presently posted at Metal-I section of MoM.