



# **ANNUAL REPORT (2010-2011)**

**CENTRE FOR TECHNO-ECONOMIC MINERAL POLICY OPTIONS (C-TEMPO)**

*(A Registered Society under Ministry of Mines, Govt. of India)*

*([www.c-tempo.org](http://www.c-tempo.org))*



# ANNUAL REPORT

2010-11

## Centre for Techno-Economic Mineral Policy Options

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

Block No. 11, 5th Floor, C.G.O. Complex, Lodhi Road, New Delhi –110 003

Tele: 011-24363199, Fax: 011-24367641

Website: [www.c-tempo.org](http://www.c-tempo.org) ,Email: [ak.bhandari@nic.in](mailto:ak.bhandari@nic.in)



# C O N T E N T S

S.No.	Topic	Page No.
<b>1.</b>	<b>About the Centre</b>	<b>5</b>
1.1	Technical Planning & Policy Committee (TPPC)	5
1.2	Centre for Techno-Economic Mineral Policy Options	7
1.3	Aims and Objective of the C-TEMPO	7
1.4	Meeting of the Desirous Persons	8
1.5	Website of C-Tempo	8
<b>2.</b>	<b>Activities of The Centre</b>	<b>9</b>
<b>3.</b>	<b>Technology Sub- Sector</b>	<b>9</b>
3.1	Status and Strategy for Exploration and Development of Nickel and PGE Resources in India	9
3.2	Study on Exploration Techniques and Technology for location and Development of Deep Seated Metals in India	10
3.3	Study on all aspect of Strategic Metals and Super Specialty Alloys in India	11
3.4	Study on sand utilization and its substitute	11
3.5	Position paper on Rare Earth Metals	12
<b>4.</b>	<b>Economic Sub-Sector</b>	<b>13</b>
4.1	Preparation of Country Dossiers on Geology and Mineral Resources of mineral rich countries and MoUs countries	13
4.1.2	Preparation of Dossier on Mineral rich states of India	14
4.2	Coordination of Efforts for Raw Material Assets and technology Assets Abroad	14
<b>5.</b>	<b>Techno Economic Sub-Sector</b>	<b>14</b>
5.1	Study of Pelletisation of Iron Ore Fines in India and utilization of low grade iron and fines	14
5.2	Consultation with stakeholders on Aluminium Mission Plan 2010-20 submitted by Aluminium Association of India	16
5.3	Potential of recycling of non ferrous metals in consultation with MAIT	17

S.No.	Topic	Page No.
<b>6.</b>	<b>Social Sub-Sector</b>	<b>17</b>
6.1	Create a Forum for Development of Corporate Social Responsibility Policies in Mining Sector with Special reference to PSU's	17
<b>7.</b>	<b>Environmental Sector</b>	<b>19</b>
7.1	Document and Publicize Success Stories in Sustainable Development Initiative in Mining in India	19
<b>8.</b>	<b>National Geoscience Award</b>	<b>19</b>
<b>9.</b>	<b>Conference / Meetings</b>	<b>20</b>
<b>10.</b>	<b>Audited Accounts of C-Tempo for the year 2010-11</b>	<b>21</b>
<b>Annexure-I</b>	List of General Body Members of C-TEMPO for the year 2010-11 and 2011-12	
<b>Annexure-II</b>	List of Governing Council Members of C-TEMPO for the year 2010-11 and 2011-12	
<b>Annexure-III</b>	Technical and Administrative staff	
<b>Annexure-IV</b>	Organizational Structure	

## 1.0 ABOUT THE CENTRE

In view of the opening up of the mineral sector and announcement of National Mineral Policy 2008, it has become imperative that new strategies are adopted in the exploration, exploitation and process extraction technology for optimum recovery from the ores. The three major areas of concerns are:

- I. Conceptualization of the geological environment for mineral potential locales, strategies for exploration of deficient / scarce and high-tech minerals
- II. Scanning for appropriate process extraction technology for utilization of low grade ores their optimum recovery and associated metals like cobalt nickel etc.. Major thrust in the areas of the recovery of base metals like indium, gallium, germanium etc. which find special application in electronic industry.
- III. Mineral economics / intelligence by conducting international market research, classifying suitable deposits of various mineral commodities and assessing their future demands / availability in India vis-a-vis the World.

A need was felt to set up group of experts comprising economist, academicians and professionals to develop and generate new initiatives for mining sector. A decision was taken to utilize the setup available in the Technical Planning & Policy Committee (TPPC) by strengthening it / forming a registered society.

### 1.1 TECHNICAL PLANNING & POLICY COMMITTEE (TPPC)

TPPC was constituted vide Ministry of Mines, Government Resolution No. F14 (3)/86-Met V

dated 17<sup>th</sup> August, 1988. TPPC as originally envisaged was to act as a forward looking group for scouting latest technologies for induction in the mineral and non-ferrous metal sectors in the country, to develop policy options on various issues for the consideration of the Ministry, to enhance the technical content in the decision-making of the Ministry and to assist the Ministry in monitoring the functioning of PSU's under its control. In brief, TPPC was setup to provide technical advisory support to SSAG and to the Ministry of Mines. The original functions of TPPC included :-

- ★ To provide secretariat support to the Standing Scientific Advisory Group of the Ministry of Mines and to the Empowered Board for Strategic Minerals Development and assist in follow-up/ implementation of their decisions.
- ★ To keep scouting the latest technological developments in the industrial minerals and non-ferrous metals sector.
- ★ To provide/enhance technological content in the plans and programmes of the Ministry of Mines.
- ★ To render technical advice on selection of technologies for imports and technological choices for promotion in the industrial minerals and non-ferrous metals sector.
- ★ To discharge the functions of 'Forward Looking Group' in creating awareness regarding potentialities of new technologies and their relevance for our industries and conditions.
- ★ To interact with the Department of Science and Technology on all technological and scientific issues.

- \* To assist in the formulation of Five Year Plans and Perspective Plans for development of minerals and metals under the charge of the Ministry of Mines.
- \* To perform overall coordination of the various activities within the Ministry of Mines dealing with all issues relating to scientific and technological activities including M.I.S. on Science & Technology.

TPPC was headed by the Chief Technical Advisor (CTA) who will be its in-charge and would be assisted by four Advisors specializing in the disciplines of geology & exploration, mining, non-ferrous metallurgy and beneficiation.

Appointment of all the officers and staff for the TPPC will be on purely temporary basis for a period two year initially. Continuous extensions for subsequent periods will be based on the evaluation of performance of the individuals on time to time basis. All the expenses for setting up and running of the TPPC (both capital and recurring) shall be met fully and shared equally by the PSUs.

In the past 10 years PSU's has contributed Rs 96.43 Lakhs to TPPC. The breakup is given in table as mentioned below-

TPPC was neither a statutory body nor an institution registered under the Societies Act. No grant-in-aid or any other financial assistance was provided to TPPC from the Consolidated Fund of India.

With the announcement of National Mineral Policy – 1993 opening of mineral sector to the private entrepreneurs and economic liberalization the role of TPPC was also reinvented. In the 9<sup>th</sup> Board Meeting of TPPC held on 26-08-93, it was pointed out that in the changed scenario of economic liberalization it was difficult to defined the objectives, however, there were certain areas e.g. reduction in the cost of production of non-ferrous metal and improvements in the by product recovery etc. which would be examined by TPPC. It was felt that technology scan was a big job particularly in the today's context and each company had to evaluate and determine the right choice of technology in its own way. The Chairman constituted a small group consisting of CMD- HZL, CMD- BALCO and Advisor (S&T) to review the aims, objectives and specific achievements of TPPC since its inception to take a view on the role of the TPPC in the changed economic scenario.

Secretary (Mines) took a review meeting on 11-05-1994 and after considering the views expressed by the participants, it emerged that :-

#### Contribution from PSUs to TPPC

(Rupee in Lac)

	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
NALCO	1.00	1.00	4.00	4.00	4.00	7.00	13.00	15.00	14.00	NIL	14.00
HZL	NIL	1.00	1.00	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
BALCO	1.00	1.00	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
HCL	NIL	NIL	NIL	NIL	2.00	2.00	2.00	3.25	3.18	NIL	NIL
MECL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL

- \* Change in the role of TPPC are inescapable and, therefore, its objectives need be expanded and re-written.
- \* The role of TPPC needs to be clearly spelt out vis-à-vis role of S&T wing of the Ministry of Mines
- \* The head of the TPPC should be an eminent person who can provide an effective & dynamic leadership to the organization. If necessary, such a person can be at a very senior level
- \* The TPPC is not an executing agency and it should have best technical expertise available in the country
- \* A small permanent core group should from the essence of TPPC which would take experts in different disciplines as and when required.
- \* TPPC should work as “Think Tank” and would throw up Policy options for a final decision by the Ministry of Mines.
- \* A Committee headed by Shri A C. Wadhawan, CMD,HZL may submit a report taking into account the above facts and suggest a suitable structure of the TPPC

The Wadhawan Committee submitted its reports in December, 1994 and suggested its name may be changed from Technical Planning & Policy Committee to *Technical Planning & Policy Cell*.

- \* Technical advice & coordination of mineral exploration activities of PSU’s and other organizations, study of policy perspectives in exploration & development of minerals and identifying gaps and suggesting priorities.
- \* Formulation and development of projects in the areas such as hydro-metallurgy, bio-leaching, bio-mineral processing by product recovery of associated metal.

- \* Active collaboration with R&D institutions and industry for evolving suitable mineral processing and beneficiation techniques including processing of such minerals which are of export potential.
- \* Development of low and no waste technology including environmentally sound technologies

The Committee also recommended restructuring of TPPC into an autonomous body fully funded by the PSU’s and to function as a registered society on the line of NFTDC to be headed by a Director.

## 1.2 CENTRE FOR TECHNO-ECONOMIC MINERAL POLICY OPTIONS (C-TEMPO)

In this background **Centre for Techno-Economic Mineral Policy Options (C-TEMPO)** was setup under the aegis of Ministry of Mines, Government of India with a mandate for addressing the technology and management gaps in specific areas of concerns.

C-TEMPO was registered as a society on 18<sup>th</sup> November, 2009 under the Societies Registration Act XXI

C-TEMPO was registered as a society on 18<sup>th</sup> November 2009 under the Societies Registration Act XXI 1860

1860. As per guidelines and procedures for registration of the Society under the Societies Registration Act, 1860, Its MOA and Rules and Regulation and Bye-laws were finalized.

## 1.3 AIMS AND OBJECTIVE OF THE C-TEMPO

The aim of the Centre is to facilitate effective interaction between the investors, entrepreneurs, mining industry and the Central and State Governments and evolve policy options for stakeholders of the mineral sector. The specific mission would be as under:



- \* To study the technology and management gaps for the Non-Ferrous and Ferrous groups of minerals
- \* To undertake international market research for these minerals commodities, assessing their future demands vis-à-vis availability in the context of the overall strategy of the country's economic development
- \* Technology scan for appropriate process extraction technologies which have synergy with the natural endowments of the country and for 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 organisations.
- \* 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 on mineral sector
- \* Prepare and present Position Papers and studies on various techno-economic issues for the consideration of the Government, industry and other stake holders.
- \* Any other matters incidental or ancillary to the above.

### OBJECTIVES

- \* *To study the technology and Management gaps for the Non-Ferrous and Ferrous groups of minerals*
- \* *To undertake international market research for these minerals commodities, assessing their future demands vis-à-vis availability in the context of the overall strategy of the country's economic development*
- \* *Prepare and present Position Papers and studies on various techno-economic issues for the consideration of the Government, industry and other stake holders.*

#### 1.4 MEETING OF THE DESIROUS PERSONS

A meeting of desirous persons of C-TEMPO was held under the Chairmanship of Secretary (Mines) on 18-12-2009, wherein the organizational structure of C-TEMPO as outlined in the MoA and Rules and Regulations were discussed. It was suggested that the nucleus staff of C-TEMPO should be kept at bare minimum and the additional staff should be outsourced on contract basis.

In accordance with Rules & Regulation of C-TEMPO the General Body has elected the Governing Council in its meeting held on 18<sup>th</sup> January, 2010. The Governing Council in its meeting held on 13<sup>th</sup> April, 2010 approved the organizational structure, staff strength and also the Annual Action Plan of C-TEMPO for the year 2010-11.

#### 1.5 WEBSITE OF C-TEMPO

C-TEMPO has a well developed, informative and dynamic website. The website of the centre

(www.c-tempo.org) is fully uploaded with latest information. The Memorandum of Association, rules and regulations of the society, organizational structure, budget, Annual action plan, list of General body members and Governing council members, and list of consultants etc. alongwith all the activities of the center, its technical publications, R&D studies, Social and Economic studies (including Country dossiers of Minerals rich countries) and other information is available on its website.

The website of centre is also linked to the website of Ministry of Mines, Govt. of India.

## 2.0 ACTIVITIES OF THE CENTER

Keeping view the National Mineral Policy 2008 and to address the technology and management gaps for the non-ferrous and ferrous minerals, the activities of the centre were grouped under the following subsectors.

- (i) Technology Sub-Sector
- (ii) Economic Sub-Sector
- (iii) Techno Economic Policy Sub-Sector
- (iv) Social Sub-Sector
- (v) Environmental Sector
- (vi) National Geoscience Award

with a view to undertake techno-economic advice on various issues related to the mineral and mining sector and also to suggest policy level intervention to guide and stimulate the growth of mineral sector.

## 3.0 TECHNOLOGY SUB-SECTOR

Under Technology sub sector the following activities were undertaken

### 3.1 Status and strategy for exploration and development of Nickel and Platinum Group Elements resources in India jointly with Geological Survey of India and Institute of Mineral and Material Technology, Bhubaneswar.

#### Issue

No production and rising demand, makes India a total importer of Nickel. The country imports around 45-50,000 tonnes of Nickel annually. The PGM requirement of our country is also met by importing these metals. In 2008-09 imports of platinum alloys and related metals increased in 2008-09 stood at 53,967 kg valued at Rs. 13,680 crore. This demand is expected to rise. As per NMP 2008 Para 10.3 attention is to be given to beneficiation and agglomeration techniques to bring lower grade ore in to use.

A process had been developed jointly by CSIR (IMMT formerly RRL, Bhubaneswar) and Department of Mines (HZL) to extract Nickel from chromite overburden. After a decade long R& D efforts by a team of dedicated scientists followed by demonstration of the process flowsheet by setting up a Ni Technology Proving plant of 10 Tonnes /day Ni metal production at IMMT Bhubaneswar at a cost of 10.5 crores shared equally by Ministry of Mines and CSIR. The process developed was a modified Caron process utilizing an un beneficiated COB material containing 0.7% Ni as raw material.

Another process sheet was developed during the project "Studies on Production of Alloyed Pig Iron and Low alloyed /Stainless Steel using Chromite Overburden (S&T project of Ministry of Mines and DST) by Mecon along with IMMT. Industrial trials for the production of alloyed pig iron using sinter of beneficiated COB in submerged arc furnaces and production of low alloy stainless steel in EAF was achieved. The process has advantages that it utilizes the iron ore fines along with the lumpy

ore and produces pig iron containing Nickel and Cobalt.

#### Process for extraction of Nickel from Lateritic Overburden

- \* Pressure Acid Leaching
- \* Reduction Roast –Ammonia leach (Caron) Process
- \* Smelting Processes
  - Ferronickel Smelting
  - Matte Smelting
  - Nickel Pig Iron
- \* Heap Leaching
- \* Atmospheric Agitated Tank Leaching

Techno Economic Feasibility Report (TEFR) for establishing a commercial scale plant for extraction of Nickel from COB in Sukinda region could not be established.



**Chromite Overburden (COB) Sukinda Valley, Orissa**

#### Efforts taken by C-Tempo

C-Tempo approached Secretary (Mines) for a suitable date to convene a meeting with the involved stake holders to explore the possibility of indigenous production by adopting suitable extraction process and develop a future action plan for the utilization of COB under his chairmanship. He has given his consent to hold the meeting on 4<sup>th</sup> April 2011.

### 3.2 Study on exploration techniques and technology for location and development of deep seated metals in India.

#### Issue

The mineral deposits are geological entities within the earth's crust having anomalous concentration of some elements of value. Such concentrations are inhomogenously distributed in the earth's crust. With the exhaustion / fast decline of the mineral deposits within shallow depths, today it has become imperative world over to look for deep seated mineral resources for meeting the ever growing need of mankind.



The search of deep seated metalliferous deposits may be driven by :

- \* Concept based mineral belt modeling (especially in virgin or Greenfield areas)
- \* Data based expectation (on the basis of shallower level deposits existing in the Brownfield area) and geoscientific possibility of similar metallization at depth

- ★ Chance find by random application of exploration tools with prospector's hunch.

Exploration of deep-seated ore deposits, despite its intrinsic uncertainty and risk, is essentially a sequential procedure, ideally suited for optimization. Designing of the sequential exploration programme inherited with uncertainty and risk factors, requires a probabilistic approach rather than the deterministic approach.

### Efforts taken by C-Tempo

The present position paper has been developed based on basic contributions made by Dr. Anupendu Gupta, Former Deputy Director General (GSI) and valuable inputs from Dr. S.K.Haldar, Director (Technical) MECL and DR K.Rajaram, Deputy Director General, GSI, Nagpur. It has been brought out as a technical publication of the C-TEMPO in January 2011. The same is uploaded in the website. The paper is well received by exploration agencies.

### 3.3 Study on all aspects of strategic metals and super specialty alloys in India.

#### Present Status:

As per para 10.6 of the National Mineral Policy. Research will be directed towards raw material required for production of materials of high purity for use in advanced technology applications.

Status paper on strategically important minerals and technology metals is being developed jointly by Dr. K. Balasubramian, Director, Non Ferrous Material Technology Development Centre (NFTDC) and C-TEMPO.

### 3.4 Study on Sand utilization and its Substitute, defining the problem and methodology for the study and formulating the proposal

#### Issue

The issue of haphazards sand mining and

environmental degradation caused by it is a matter of concern. Its depletion has led to river sand crisis in many areas. Environmental damages caused by unregulated river bed mining of sand bazari and boulders including in the coast areas are attracting considerable attention.

Keeping in view, that sand is treated as minor mineral as defined in clause (e) Section 3 of MMDR act, 1957 along with gravel, building stone, ordinary clay etc. In their report on Environmental Aspects of Quarrying of Minor Minerals, March 2010, MoEF has observed that major and minor minerals need to be classified based on their end use rather than level of production. Since mining of sand affecting the subsurface water system, its quarrying should be covered with environmental clearances and it may restricted to unsaturated zones only.

#### MAJOR CONCERN

- ★ Sand mining is a direct and obvious cause of erosion, and also impacts the local wildlife.
- ★ Unsustainable sand mining can cause disturbance of coastal marine ecosystems and upset the ability of natural marine processes to replenish the sand.
- ★ Sand mining is regulated by law in many places, but is still often done illegally.

Sand is vital for sustenance of rivers. Uncontrolled sand mining from the riverbed leads to the destruction of the river eco-system. The removal of sand from the river bed increases the velocity of the flowing water, the distorted flow-regime eventually erodes the river banks. As the demand for sand increases, to meet the demand of industry and construction, it is imperative that suitable substitutes are found to meet this demand.

The need for a study on sand substitutes is not merely a study on impact of sand mining, but will focus on :

1. Substitute of Sand w.r.t. different uses
2. Chemical, Physical, Mechanical & other properties required w.r.t. various uses
3. Optional materials available & producers of substitutes if any.
4. R&D required to develop potential material
5. Techno-economic feasibility of different substitutes
6. Efforts made by sand poor countries to cope up with the problem

#### Efforts Taken By C-Tempo

Discussions were held with “National Council for Cement and Building Materials” (NCCBM), an apex body dedicated to continuous research, technology development and transfer, education and industrial services for the cement and building material industries, for evolving an approach paper for the study on 08.12.2010. The agency has submitted their scope of work. The approach paper received from NCCBM has been forwarded to DGM’s of Andhra Pradesh, Maharashtra & Kerala for their comments and to share their findings in this field & also to join in this collaborative study

The NCCBM has been requested to give the timeframe and budget for the study.

### 3.5 Position Paper on Rare Earth Metals

#### Issue

The technological advances of the past few decades are bringing demand for rare earth metals which is influencing the mining industry. The resources estimates of monazite in the beach and inland placer is 10.21 million tonnes. The country import all its current requirement from China. Indian

Rare earths are characterized by high density, high melting point, high conductivity and high thermal conductance. These unique properties make them indispensable for a variety of emerging and critical technology applications relevant to India’s energy security

Rare Earths, the state-run producer which halted output in 2004 in the face of cheaper competition from China, is now stepping back into production with investment of Rs. 140 crore in a 5,000 tonne capacity plant, it hopes to produce material by 2012.

Apart from Monazite sands, which has high thorium content, India has to look for rare earths from the primary source rocks. In India, concentration of REE in hard rock has been recorded in association with carbonatites, syenites, albitites, granites, pegmatite, apatite and phosphorites and carbonaceous schists by Geological Survey of India and GSI and AMD has carried out preliminary search for REE in carbonatite in Koraput and Kalahandi districts of Orissa, pegmatite and the granite terrains in Bhilwara, Ajmer and Udaipur districts of Rajasthan, carbonatites of Tamilnadu, West Bengal, Meghalaya and Assam.

#### Efforts Taken By C-Tempo

C-Tempo has prepared a concept note on Rare Earth Element, which was shared with Center for Study of Science, Technology and Policy (CSTEP) and Atomic Mineral Division (AMD) . As suggested by CSTEP a meeting will be organized with involved stakeholders like AMD, IREL, GSI, IISc Bangalore to prepare a strategy paper for the Govt. providing short, medium & long term options along with proposals for specific policy & legislative interventions.

#### 4.0 ECONOMIC SUB-SECTOR:

##### 4.1 Preparation of Country Dossiers on Geology and Mineral Resources of mineral rich countries and MoU country.

###### Issue

The Ministry of Mines is repositioning it from its current role of a mere regulator into a role which make it more attuned to facilitate the Indian Mining Sector from a global techno-economic perspective. It has been observed that during the visits of mining and business delegation from mineral rich countries for signing of MoUs, bilateral discussion on area of mutual interest, exploring area of investment etc, updated knowledge of the geology, mineral commodities in terms of their production, exports, investment opportunities, mining assets acquired by the Indian companies abroad and their companies in India is lacking. This information is vital in view of the growing demand of minerals in India to sustain the GDP and also from the view of strategic planning. World over the Governments are supporting the mining industry by such interventions.

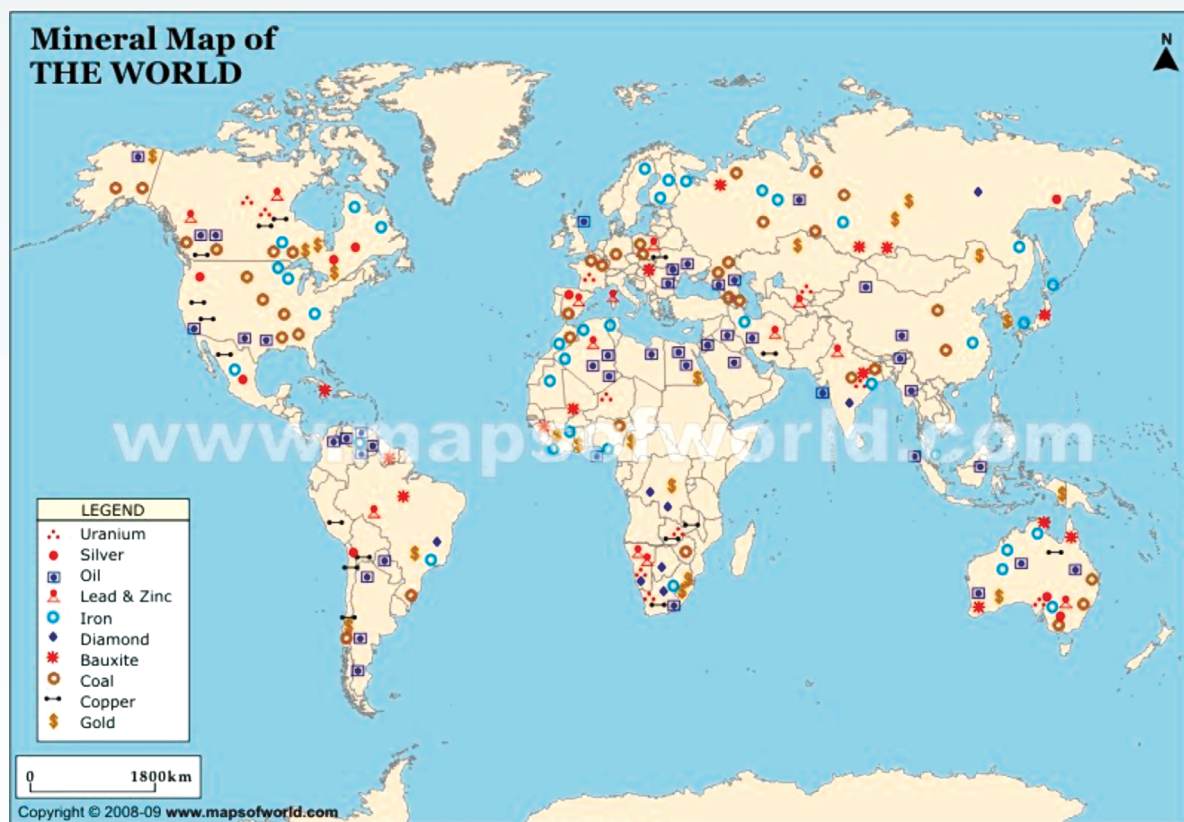
###### Efforts taken by C-Tempo

The Centre is creating a data bank of the mineral rich countries (country wise folders), in respect of their geology, mineral resources, export potential, MoUs signed with India, visits, presence of India companies in these countries and their companies in India. C-Tempo is in constant touch with the embassies / consulates of countries to obtain information on development of mining sector of these countries and also on the international events (mining and mineral sector) being held in these countries from time to time.

###### Present Status:

The centre has prepared the Country Dossiers on **Australia, China, Canada, Iran, South Africa, Chile and Colombia** in respect of their geology, mineral resources, export import potential, MoUs signed with India, bilateral Visits of delegation etc & uploaded in the website of C-Tempo.

Centre is assisting International Cooperation Cell (I/c cell) of Ministry of Mines in JWG meeting and also participation in Mining events abroad.



#### 4.1.2 Preparation of Dossier on Mineral rich states of India

The centre is also preparing dossiers on mineral rich states of India on similar lines highlighting the investment potential in the state to attract the FDI.

State dossier of Rajasthan has been prepared. Dossier of Andhra Pradesh is under preparation.

#### 4.2 Coordination of efforts for Assessment of Critical Raw materials, demands and suggestions for acquisition of Raw Material and Technology assets from Abroad.

##### Issue

The global minerals and metals market has been witnessing fundamental changes that pose various challenges for the countries in ensuring secured access to strategic metals. Recognizing the critical dependence on these materials, various countries have started adopting strategies to address security concerns.

An end to end technology development with systems approach and deployment paradigm in a consortium mode with dedicated mission projects is necessary as a strategy.

As we are starting very late in the entry into process technologies for technology metals, we can take advantage of developing energy efficient and environment friendly routes by acquiring technology and raw material assets from abroad.

To analyze and assess the implications of changing global dynamics on India's security at both the strategic as well as economic levels, the understanding of potential constraints on supply of these metals is important for the development of a strategic policy framework to secure reliable and undistorted access to these materials.

#### Efforts taken by C-Tempo

C-Tempo is planning to hold a meeting with representative of HCL, HZL, Hindalco, ERI and ILZDA under the Chairmanship of Secretary (Mines) to discuss the proposal of TERI. A suitable date is sought from Secretary (Mines) to hold the meeting.

#### 5.0 TECHNO ECONOMIC SUB-SECTOR:

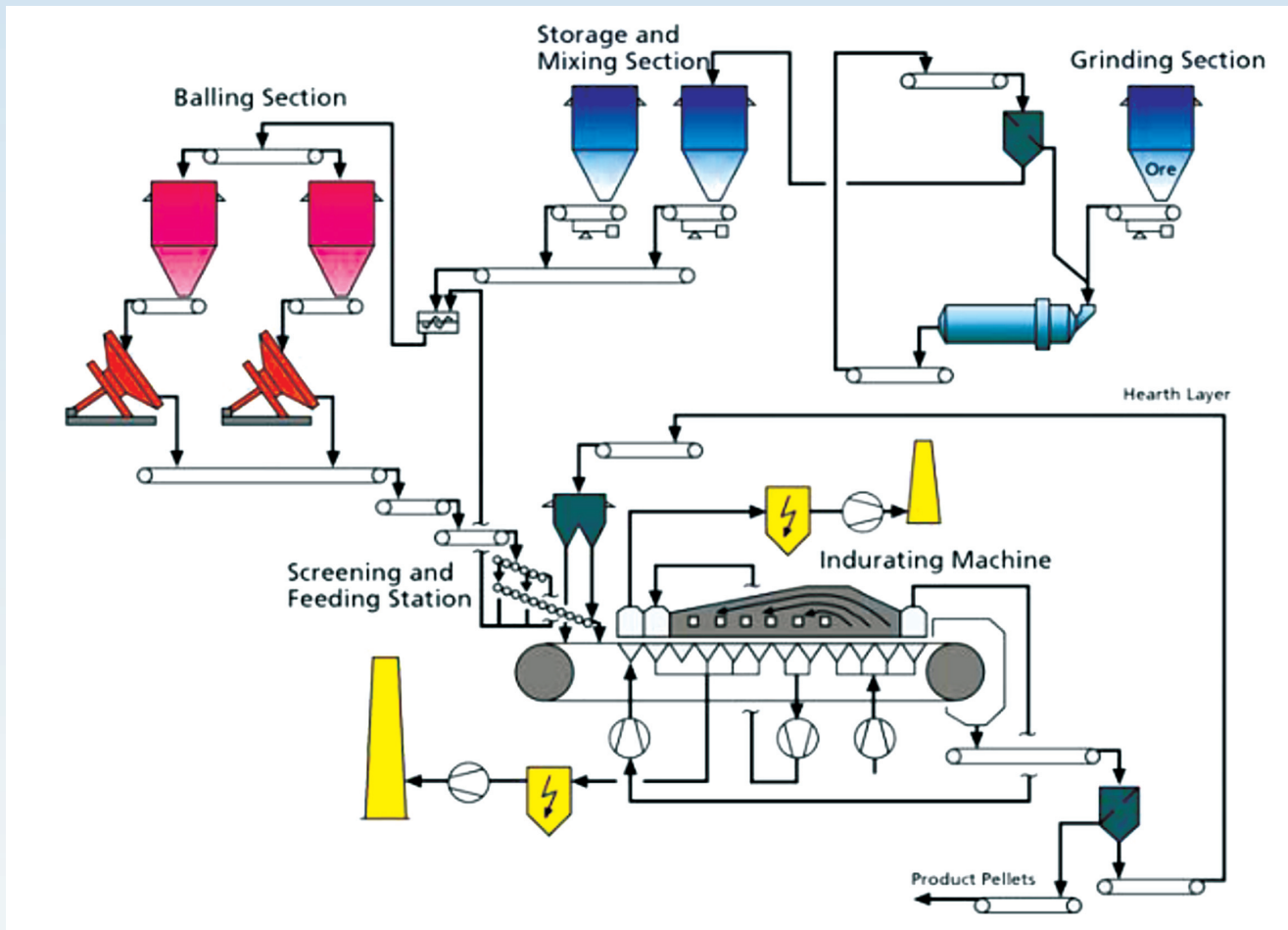
##### 5.1 Study on Pelletisation of Iron Ore Fines in India and utilization of low grade iron ore and fines

##### Issue

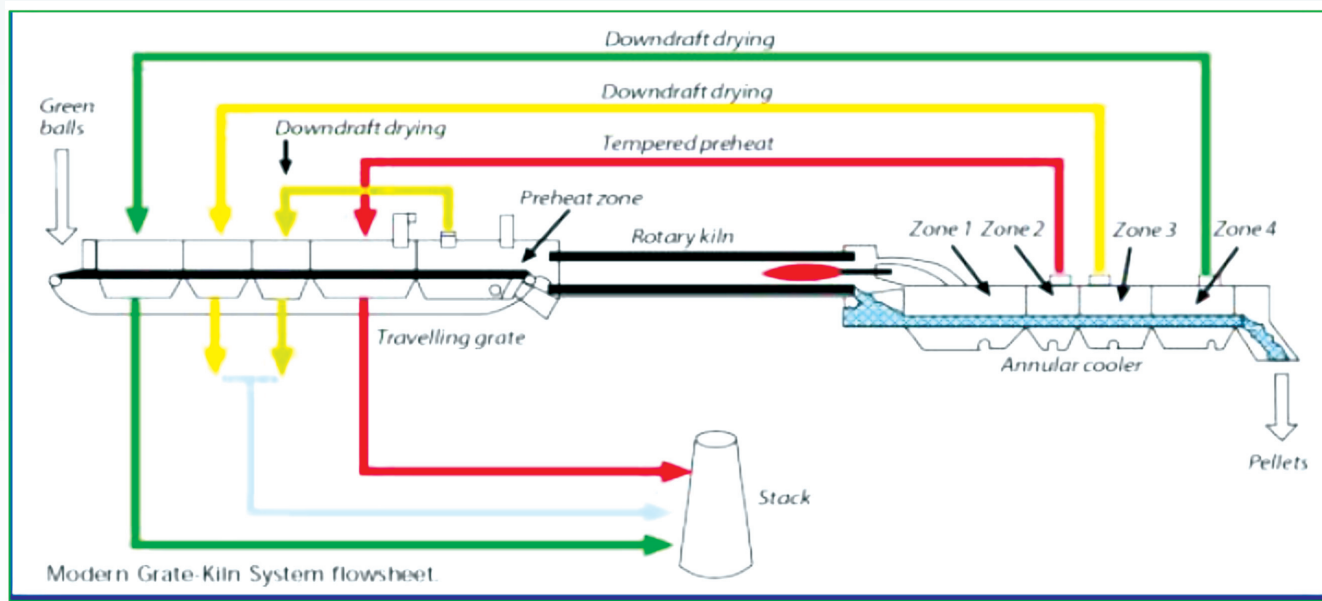
Steel Industry in India is on an upswing because of the strong global and domestic demand. Total iron ore resources in India are approximately 25,249 million tones. The annual production of Iron Ore during 2009-10 was 226 million tones. Out of the total production, 56% of iron ore production comes out as fines. More fines are generated as lumps have to be sized to 10-30 mm for blast furnaces and 6-18 mm for sponge iron plants. Thus it is necessary to agglomerate the Iron ore fines into pellet for domestic use. The use of pellets increases the productivity in blast furnace and reduces coke consumption.

The National Steel Policy envisages investment in modern mining and beneficiation methods for value addition and utilization of iron ore fines. Low grade iron ore, iron ore fines and iron ore tailings/slimes accumulated over the years at mine heads and generated during the existing washing processes, need to be utilized. However, these concentrates are too fine in size to be used directly in the existing iron making processes. For utilizing this fine concentrate, pelletization is the only alternative available.

Flow diagram of Traveling Grate process



Flow diagram of Gate- Kiln process





There is need to focus on the development of pelletisation activities for the beneficiation of Indian steel Industry.

#### Efforts by C-TEMPO:

The Centre for Techno-Economic Mineral Policy Options (C-TEMPO) has undertaken study through experts on issue of Pelletisation of Iron Ore Fines in India and developed a position paper on “**Development of Iron Ore Pelletisation Industry in India**” based on the contributions made by Dr. Deependra Kashiva, Former Industrial Advisor (Ministry of Steel), valuable suggestions from Dr. A.K. Mukherjee, Scientist (Tata Steel) and subsequent inputs from C-TEMPO. This paper was circulated during the seminar on “Iron ore % value addition through Technology and financial instruments” held at Goa from 28<sup>th</sup> -29<sup>th</sup> January, 2011 arranged by FIMI. The paper has been uploaded in the website of C-Tempo.



## 5.2 Consultation with Stakeholders on Aluminium Mission Plan 2010-20 submitted by Aluminium Association of India

### Issue

India has the 5<sup>th</sup> largest bauxite reserve in the world. In spite of having 5<sup>th</sup> largest bauxite reserve, the per capita national consumption of aluminium is very low as compared to developing and developed countries. Thus there is a vast scope of increasing the applications of aluminium in India.

In this context, Aluminium Association of India (AAI) had submitted a draft “Aluminium Mission Plan 2010-20” to the Ministry of Mines seeking government intervention in the key areas of allocation of bauxite mines, coal supply to the aluminium industry.

### Efforts taken by C-Tempo

Centre for Techno-Economic Policy Options, New Delhi (C-TEMPO) and Jawaharlal Nehru Aluminium Research Development and Design Centre, Nagpur (JNARDDC) both under the aegis of Ministry of Mines, Govt. of India organised a one day Seminar on “Consultation with stakeholders on draft aluminium mission plan” on 1<sup>st</sup> December, 2010 at New Delhi, which was inaugurated By Hon’ble Minister of Mines. The seminar was participated by Govt. agencies, academia and Industry.



*Seminar on draft aluminum mission plan 2010-20 at New Delhi*

**Present Status :**

Recommendations are being finalized by JNARDDC in consultation with AAI and C-Tempo.

**5.3 Potential of Recycling of Non-Ferrous Metal in consultation with MAIT.****Issue**

Metals play an important part in modern societies and have historically been linked with Industrial development and improved living standards. Society can draw on metal resources from Earth's crust as well as from metal discarded after use in the economy. Inefficient recovery of metals from the economy increases reliance on primary resources and can impact nature by increasing the dispersion of metals in ecosystems.

Recycling of metals has a great potential. It not only reduces extraction and processing from virgin areas, but also in energy savings and waste generation. To meet the increasing demand of raw material and to mitigate the adverse impacts, recycling have to made a part of our future strategy.

**Efforts taken by C-Tempo**

C-Tempo intended to take study on metal recycling in consultation with Dr. Lakshmi. Raghupahty,

(Former Director, Minister of Environment & Forest), Advisor, GIZ-MAIT. However she didn't spare time for the same. In the meantime we have approached Metal Recycling Association of India to provide their inputs on :

- (i) Recycling units in India
- (ii) Potential of recycling metals in India
- (iii) How to incentivize recycling in an organized sector
- (iv) Available recycling technologies and R&D gaps

**Present Status**

Reply from Metal Recycling Association of India is awaited.

**6.0 SOCIAL SUB-SECTOR****6.1 Create a Forum for Development of Corporate Social Responsibility Policies in Mining sector with special reference to PSU****Issue**

Corporate social Responsibility is a company's commitment to operate in an economically, socially and environmentally sustainable manner, while



recognizing the interests of its stakeholders. It is closely linked with the practice of sustainable development.

Department of Public Enterprises issued revised Guidelines on Corporate Social Responsibility for Central Public Sector Enterprise in April 2010 which was circulated to HCL and NALCO for appropriate action. Based on the guidelines both NALCO and HCL were requested to draw their five year action plan for the company.

***“The business value of CSR is that it can help safeguard license to operate, facilitate access to capital, contribute to reputation and enhance engagement of stakeholder including employees”***

#### Action taken by C-Tempo

C-Tempo has taken initiative by holding a meeting under the chairmanship of Secretary (Mines) on 21-06-2010 on the CSR action plan of NALCO and HCL. The meeting was attended by Govt. officials and NGOs like SAMATA, CSE, PRASAR, HAQ etc.

In the meeting the actionable points which emerged were :

- (i) For an effective CSR Plan baseline survey is of outmost importance to identify the quality and attitude of the stakeholders, their needs, right to health, education and employment to be respected
- (ii) CSR Action Plan has to shift from the casual approach to the project based accountability approach, integrated with the social and environment concerns related to the business of the company.
- (iii) Selection of activities under CSR to be linked to the existing developmental

schemes, to add value to it and bridge the gaps if any

- (iv) CSR is to be implemented by Specialized Agencies and generally NOT by staff of the CPSE concerned.
- (v) The CSR activity should not only stress on the visibility alone but also on impact.
- (vi) Organize a HELP CENTRE for local communities in the remote areas to act as a link between the communities and district authorities.

NALCO and HCL were advised to have separate meetings with Ministry of Rural Development, Ministry of HRD(SSA) and Ministry of Women and Child Development (ICDS) and NGO's to bridge the gaps in the existing schemes.

A follow up meeting were held :

#### Meeting was taken by Additional Secretary (Mines) on 24-09-2010 at New Delhi.

- \* Companies should carry out baseline survey in the area to assess the local need
- \* CSR activities to be earmarked by designated agencies and linked to the Sustainable Development of the area.
- \* Companies should have a focused approach and not spread out its activities in many areas.

#### Meeting held on 28<sup>th</sup> February, 2011 under the Chairmanship of Secretary (Mines).

- \* Smt. Santha Sheela Nair, Former Secretary, Ministry of Mines & Mentor (CSR), also attended.

- ★ It was suggested that the CSR project to be evolved keeping in mind the intended beneficiaries and its targets should not only be in terms of expenditure alone but in terms of the number of people affected.
- ★ These should be continuous evaluation of the ongoing projects in terms of the intended benefits.
- ★ NALCO Foundation to evaluate the critical gaps in the development in an area and ask the NGO to share their ideas of development for the region.
- ★ NALCO was also advised to develop an intuitional frame work to implement the proposed “inclusive” growth for the local / population as envisaged on the MMRD Act and focus in Damanjodi area.

**Present Status:**

Based on the experience of HCL and NALCO in implementation of CSR action plan it is proposed to evolve a model CSR plan and implementation methodology, which can be applied to the Mining PSUs across board in consultation with IRMA and NALCO foundation.

**7.0 ENVIRONMENTAL SECTOR**

**7.1 Document and publicise success stories in sustainable development initiatives in mining in India**

**Present Status:**

Publication is to be bought out in consultation with FIMI highlighting the Sustainable Development Framework / Corporate Social Responsibility initiative taken by Mining Companies.

**8.0 NATIONAL GEOSCIENCE AWARD**

**Present Status**

To implement NGA 2009 of the Ministry of Mines, C-Tempo acted as secretariat of the award making authority for receiving and processing the nominations.

Section wise compilations of bio-data and the highlights of the achievements of 108 nominees for the four section’s, Award for Excellence and Young Researcher award were compiled and circulated to the experts. Meeting of the experts committees for selection of awardees were held. After evaluation the recommendation of the sectional scrutiny committee, screening committee of experts and high level committee of experts, the award making authority finalized the awardees for NGA 2009 in Dec 2010.

Award presentation ceremony was held on 4<sup>th</sup> feb 2011. Hon’ble Vice president of India conferred the awards.



*Fig-Shri Dinsha Patel, Hon’ble Minister of State for Mines (IC) with National Geoscience Awardees.*

## 9.0 CONFERENCES, WORKSHOP & MEETING ATTENDED

1. Meeting taken by Secretary, Ministry of Mines to review progress of ongoing mineral development projects in NER at Gangtok, 22<sup>nd</sup> January, 2010
2. Technical Sub-Committee meeting of Standing Committee on Promotional Project of Mineral Exploration Company Limited at Nagpur 22 – 23<sup>th</sup> April 2010
3. 17<sup>th</sup> AGM and GC of NFTDC to be held on 5<sup>th</sup> July 2010 at Hyderabad
4. 3<sup>rd</sup> meeting of CGPB Sub-Committee Group – VIII on Geology and Mineral Resources of NER, 4<sup>th</sup> August, 2010, Shillong
5. Representative Ministry of Mines as Panelist on “Mining, Mineral and Metal Sector – Policy and Regulatory Imperatives for Accelerating Investment” by CII, 9<sup>th</sup> September, 2010 at Kolkata
6. One day seminar on Consultation with Stakeholders on Aluminium Mission Plan 2010-20 held on 1<sup>st</sup> Dec. 2010 organised with JNARDDC jointly.
7. Shri A K Bhandari, Director, C-TEMPO give the Keynote Address in Capacity Building Workshop for the mining industry in India at New Delhi on 2-3 December, 2010
8. 15<sup>th</sup> meeting of the Peer Review Committee meeting & Departmental Promotion Committee of NIRM at Bangalore, 28-30, December, 2010
9. Supported Ministry of Mines –IC Cell in following event
  - (i) Canada India Mining and Metals Forum 2010, 27-29 September, 2010 at Toronto
  - (ii) China Mining & Expo 2010-16<sup>th</sup> to 18<sup>th</sup> November, 2010 at Tianjin

**ARUN DEEPAK & CO.  
CHARTERED ACCOUNTANTS**

**154, MADHUBAN,  
DELHI-110092.  
Phone No.42445369**

**AUDITORS REPORT**

**TO,**

**THE MEMBERS OF  
Centre for Techno – Economic  
Mineral Policy Options  
Lodhi Road  
New Delhi 110003**

We have audited the attached Balance Sheet of CENTRE FOR TECHNO ECONOMIC MINERAL POLICY OPTIONS, as at 31<sup>st</sup> March 2011, and also the Income and Expenditure Account along with the Receipt and Payment Account for the year ended on that date annexed there to. These financial statements are the responsibility of the Society's management. Our responsibility is to express an opinion on these financial statements based on our audit.

1. We conducted our audit in accordance with auditing standards generally accepted in India. Those standards require that we plan & perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatements. An audit includes examining, on a test basis evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion. We report as under :-
  - a) We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purpose of our audit.
  - b) In our opinion, proper books of accounts have been kept by the Society so far as appears from our examination of those books.
  - c) The Balance Sheet and Income and Expenditure Account referred to in this report are in agreement with the books of accounts.



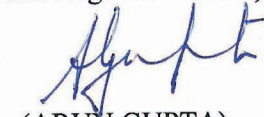
d) In our opinion and to the best of our information and according to the explanations given to us, the said Balance Sheet and Income and Expenditure Account read together with significant Accounting Policies and Schedules annexed thereto, gives a true and fair view : -

i In case of the Balance Sheet, of the state of affairs of the Company as at 31<sup>st</sup> March 2011.

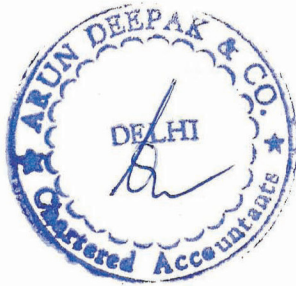
ii In case of the Income and Expenditure Account, of the excess of Expenditure over Income for the year ended on 31<sup>st</sup> March 2011.

Place: New Delhi  
Date : 26.09.2011

For ARUN DEEPAK & CO.  
Chartered Accountants  
( Firm Reg. No. 4016N )



(ARUN GUPTA)  
Partner  
M. No. 082161



**CENTRE FOR TECHNO ECONOMIC MINERAL POLICY OPTIONS**  
**BLOCK 11, 5th FLOOR, CGO COMPLEX, LODHI ROAD, NEW DELHI 110003**

**BALANCE SHEET AS AT 31st March, 2011**

<u>LIABILITIES</u>	<u>AMOUNT</u>	<u>ASSETS</u>	<u>AMOUNT</u>
<b><u>CORPUS FUND</u></b>	40,638,609.47	<b><u>FIXED ASSETS</u></b>	
<b><u>CURRENT LIABILITIES</u></b>		( As per Schedule B )	200,348.00
<u>Expenses Payable</u>		<b><u>CURRENT ASSETS</u></b>	
( As per Schedule A )	1,60,774.00	TDS	164,371.00
Corporation Bank CLSB	55,645.53	Recoverable from Staff	7,441.00
		<b><u>CASH AND BANK BALANCES</u></b>	
		Corporation Bank CLKCC	40,481,317.00
		Cash in hand	1,552.00
	<u>40,855,029.00</u>		<u>40,855,029.00</u>

SR.ADMINISTRATIVE OFFICER

DIRECTOR

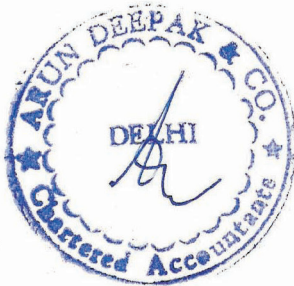
AUDITORS REPORT

As per our separate Report  
of even date attached.

FOR ARUN DEEPAK & CO.,  
CHARTERED ACCOUNTANTS

Place :- Delhi  
Date :- 26.09.2011

(ARUN GUPTA)  
PARTNER





## CENTRE FOR TECHNO ECONOMIC MINERAL POLICY OPTIONS

BLOCK 11, 5TH floor, CGO COMPLEX, LODHI ROAD, NEW DELHI 110003INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31st March, 2011

PARTICULARS	AMOUNT	PARTICULARS	AMOUNT
<b>Establishment Expenses</b> ( As per Schedule C )	911,248.00	By Bank Interest	1,643,992.38
<b>Administrative Expenses</b>		By Excess of Expenditure over Income	377,224.40
To Bank Charges	150.00		
To Consultancy Fees	517,200.00		
To Computer Expenses	10,808.46		
To Depreciation	70,128.00		
To Miscellaneous Expenses	1,450.00		
To Newspaper & Periodicals	2,270.00		
To Office Expenses	6,858.00		
To Postage	587.00		
To Printing & Stationery	24,401.32		
To Professional Charges	10,000.00		
To Staff Welfare	2,335.00		
To Technical Publication Expens	62,140.00		
To Telephone	23,798.00		
To Travelling and Conveyance	377,843.00		
	<u>2,021,216.78</u>		<u>2,021,216.78</u>



SR. ADMINISTRATIVE OFFICER



DIRECTOR

## AUDITORS REPORT

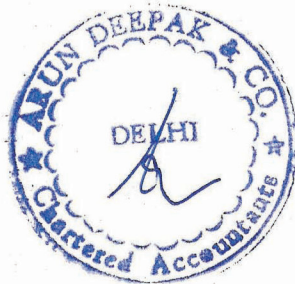
As per our separate Report  
of even date attached.

FOR ARUN DEEPAK & CO.,  
CHARTERED ACCOUNTANTS

Place :- Delhi  
Date :- 26.09.2011



(ARUN GUPTA)  
PARTNER



**CENTRE FOR TECHNO ECONOMIC MINERAL POLICY OPTIONS  
BLOCK 11, 5TH FLOOR, CGO COMPLEX, LODHI ROAD, NEW DELHI-110003  
RECEIPT & PAYMENT A/C FOR THE YEAR ENDED 31st MARCH 2011.**

<u>RECEIPTS</u>	<u>AMOUNT (Rs.)</u>	<u>PAYMENTS</u>	<u>AMOUNT (Rs.)</u>
<u>OPENING CASH &amp; BANK BALANCES</u>			
Corporation Bank CLSB	25,618.87	Consultancy Charges	418,017.00
Corporation Bank CLKCC	920,511.00	Computers and Accesories	86,850.00
<u>CORPUS FUND</u>			
NALCO	40,000,000.00	Taxi Charges	211,761.00
<u>BANK INTEREST</u>			
CLKCC	1,479,510.37	Consultancy Charges Payabl	36,200.00
CLSB	628.00	Conveyence Payable	600.00
<u>CLOSING BANK BALANCE</u>			
Corporation Bank CLSB	55,645.53	Dearness Allowance payable	3,234.00
		Over Time Allowance Payabl	4,950.00
		Salary Payable	46,719.00
		TDS	49,059.00
		Telephone Expenses Payabl	2,202.00
		Telephone Expenses	
		Payable (Reimb.)	2,767.00
		Bank Charges (CLKCC)	516.99
		Ad Hoc Bonus	3,454.00
		Bank Charges	150.00
		Computer Expenses	10,808.46
		Conveyence Expenses	5,550.00
		Honorarium	14,000.00
		Interest (TDS)	2,563.00
		Miscellaneous expenses	1,450.00
		News Paper	2,270.00
		Office Expenses	6,858.00
		Over Time Allowance	16,500.00
		Postage Expenses	587.00
		Printing & Stationery	24,401.32
		Professional Charges	10,000.00
		Salary	780,789.00
		Staff Welfare	2,335.00
		Technical Publication Exp.	56,140.00
		Telephone Expenses	21,897.00
		Telephone Exp. (Reim.)	17,816.00
		Travelling Allowances	158,600.00
		<u>CLOSING CASH &amp; BANK BAL.</u>	
		Cash in hand	1,552.00
		Corporation Bank CLKCC	40,481,317.00
	<u>42,481,913.77</u>		<u>42,481,913.77</u>

SR.ADMINISTRATIVE OFFICER

AUDITORS REPORT

As per our separate Report  
of even date attached.

DIRECTOR

FOR ARUN DEEPAK & CO.,  
CHARTERED ACCOUNTANTS

(ARUN GUPTA)  
PARTNER

Place : Delhi  
Date :- 26.09.2011



**CENTRE FOR TECHNO ECONOMIC MINERAL POLICY OPTIONS****SCHEDULE 'A'****LIST OF EXPENSES PAYABLE**

<u>PARTICULARS</u>	<u>AMOUNT</u>
Consultancy Charges	45,000.00
Conveyence	900.00
Over Time Allowance	3,300.00
Salary	72,772.00
Technical Publication Expenses	6,000.00
Telephone Expenses	4,518.00
TDS Payable	12,441.00
Travelling	15,843.00
	<u>160,774.00</u>

**SCHEDULE 'B'****SCHEDULE OF FIXED ASSETS**

<u>SL. NO.</u>	<u>PARTICULARS</u>	<u>RATE</u>	<u>BALANCE AS ON 1.4.2010</u>	<u>ADDITIONS BEFORE 30.09.2011</u>	<u>ADDITIONS AFTER 30.09.2010</u>	<u>DEPRECIATION DURING THE YEAR</u>	<u>BALANCE AS ON 31.3.2011</u>
1.	COMPUTER	60%	24,976.00	35,650.00	43,200.00	49,336.00	54,490.00
2.	UPS	15%	0.00	0.00	8,000.00	600.00	7,400.00
3.	Office Equip	15%	86,537.00	0.00	0.00	12,981.00	73,556.00
4.	A/c Coolers	10%	19,031.00	0.00	0.00	1,903.00	17,128.00
5.	Furniture ar	10%	53,082.00	0.00	0.00	5,308.00	47,774.00
	<b>TOTAL</b>		<b>183,626.00</b>	<b>35,650.00</b>	<b>51,200.00</b>	<b>70,128.00</b>	<b>200,348.00</b>

**SCHEDULE 'C'**

<u>PARTICULARS</u>	<u>AMOUNT</u>
<b><u>ESTABLISHMENT EXPENSES</u></b>	
Ad hoc Bonus	3,454.00
Honorarium Expenses	14,000.00
Over Time Allowance	19,800.00
Reimbursement of Telephone Expenses	20,433.00
Salary Expenses	853,561.00
	<u>911,248.00</u>



CENTRE FOR TECHNO- ECONOMIC MINERAL POLICY OPTIONS

SCHEDULE D

**SIGNIFICANT ACCOUNTING POLICIES**

1. The accounts have been prepared on historical cost convention as per applicable accounting
2. Mercantile system of accounting has been followed during the year.
3. Fixed Assets have been capitalised at Cost. Depreciation has been provided at rates prescribed under Income Tax Rules





## ANNEXURE-I

### List of General Body Members of C-TEMPO (2010-11)

- |     |  |                      |
|-----|--|----------------------|
| 1.  | Shri S. Vijay Kumar<br>Special Secretary to Government of India<br>Ministry of Mines   | Chairman             |
| 2.  | Prof. B. B. Dhar,<br>Former Director, CMRI, New Delhi  | Vice Chairman        |
| 3.  | Shri Sundeep K Nayak<br>Joint Secretary to Government of India, Ministry of Mines  | Institutional Member |
| 4.  | Shri N. K. Dutta<br>Director General. Geological Survey of India, Kolkata  | Institutional Member |
| 5.  | Shri C.S. Gundeswar,<br>Controller General, Indian Bureau of Mines, Nagpur   | Institutional Member |
| 6.  | Shri A K Srivastava<br>Chairman-Cum-Managing Director<br>National Aluminium Company Limited, Bhubaneswar                                 | Institutional Member |
| 7.  | Shri Shakeel Ahmed<br>Chairman-Cum-Managing Director<br>Hindustan Copper Limited.Kolkata   | Institutional Member |
| 8.  | Dr. B. K. Mishra,<br>Director, IMMT,Bhubaneswar  | Institutional Member |
| 9.  | Shri L. Pugazenthy,<br>Executive Director, Indian Lead Zinc Development<br>Association, B-2/158, Safdarjung Enclave,<br>New Delhi-110029 | Member               |
| 10. | Prof. K K. Chatterjee<br>Former Chief Mineral Economist, IBM, Nagpur,<br>A-18, Vastu Shilpa Nagar, Katol Road, Nagpur-440013             | Member               |
| 11. | Shri A. K. Bhandari,<br>Director, C-TEMPO, New Delhi   | Member-Secretary     |

*Contd....*

### List of General Body Members of C-TEMPO (2011-12)

- |     |  |                      |
|-----|--|----------------------|
| 1.  | Shri S.K. Srivastava,<br>Additional Secretary to Government of India,<br>Ministry of Mines         | Chairman             |
| 2.  | Prof. B. B. Dhar,<br>Former Director, CMRI, New Delhi  | Vice Chairman        |
| 3.  | Shri G. Srinivas<br>Joint Secretary to Government of India<br>Ministry of Mines                    | Institutional Member |
| 4.  | Shri A Sundaramoorthy<br>Director General.<br>Geological Survey of India, Kolkata                  | Institutional Member |
| 5.  | Shri C.S. Gundeswar,<br>Controller General, Indian Bureau of Mines,<br>Nagpur                      | Institutional Member |
| 6.  | Shri BL Bagra<br>Chairman-Cum-Managing Director<br>National Aluminium Company Limited, Bhubaneswar | Institutional Member |
| 7.  | Shri Shakeel Ahmed<br>Chairman-Cum-Managing Director<br>Hindustan Copper Limited.Kolkata           | Institutional Member |
| 8.  | Dr. B. K. Mishra,<br>Director, IMMT,<br>Bhubaneswar  | Institutional Member |
| 9.  | Representative from Ministry of External Affairs   | Institutional Member |
| 10. | Representative from NMCC   | Institutional Member |
| 11. | Shri L. Pugazenthy<br>Executive Director, ILZDA, New Delhi   | Member               |
| 12. | Prof. K K. Chatterjee<br>Former Chief Mineral Economist<br>Indian Bureau of Mines, Nagpur          | Member               |
| 13. | Shri A. K. Bhandari<br>Director, C-TEMPO, New Delhi  | Member-Secretary     |

## ANNEXURE-II

### List of Governing Council Members of C-TEMPO (2010-11)

1.	Shri S. Vijay Special Secretary to Government of India Ministry of Mines	President
2.	Prof. B. B. Dhar Former Director, CMRI, New Delhi	Vice President
3.	Shri Sundeep K Nayak Joint Secretary to Government of India Ministry of Mines	Institutional Member
4.	Shri N. K Dutta Director General Geological Survey of India, Kolkata	Institutional Member
5.	Shri C.S. Gundeswar Controller General Indian Bureau of Mines, Nagpur	Institutional Member
6.	Shri A K Srivastava Chairman-Cum-Managing Director National Aluminium Company Limited Bhubaneswar	Institutional Member
7.	Shri Shakeel Ahmed Chairman-Cum-Managing Director Hindustan Copper Limited Kolkata	Institutional Member
8.	Dr. B. K. Mishra Director, IMMT, Bhubaneswar	Institutional Member
9.	Shri L. Pugazenthy Executive Director, Indian Lead Zinc Development Association, B-2/158, Safdarjung Enclave New Delhi-110029	Member
10.	Prof. K K. Chatterjee Former Chief Mineral Economist, IBM, Nagpur, A-18, Vastu Shilpa Nagar, Katol Road, Nagpur-440013	Member
11.	Shri A. K. Bhandari, Director, C-TEMPO, New Delhi	Member-Secretary

ANNEXURE

*Contd....*



### List of Governing Council Members of C-TEMPO (2011-12)

- |     |  |                      |
|-----|--|----------------------|
| 1.  | Shri S.K. Srivastava<br>Additional Secretary<br>Ministry of Mines, New Delhi                           | President            |
| 2.  | Prof. B.B. Dhar<br>Former Director, CMRI, New Delhi  | Vice –President      |
| 3.  | Shri G Srinivas<br>Joint Secretary<br>Ministry of Mines, New Delhi                                     | Institutional Member |
| 4.  | Shri A Sundaramoorthy<br>Director General<br>Geological Survey of India, Kolkata                       | Institutional Member |
| 5.  | Shri B.L. Bagra<br>Chairman-Cum-Managing Director<br>National Aluminium Company Limited<br>Bhubaneswar | Institutional Member |
| 6.  | Shri Shakeel Ahmed<br>Chairman-Cum-Managing Director<br>Hindustan Copper Limited<br>Kolkata            | Institutional Member |
| 7.  | Dr. B. K. Mishra<br>Director, IMMT,<br>Bhubaneswar   | Institutional Member |
| 8.  | Representative from Ministry of External Affairs   | Institutional Member |
| 9.  | Representative from NMCC   | Institutional Member |
| 10. | Shri L. Pugazenthy<br>Executive Director, ILZDA<br>New Delhi   | Member               |
| 11. | Shri A. K. Bhandari<br>Director, C-TEMPO<br>New Delhi  | Member-Secretary     |

## Composition of C-TEMPO

**A) Technical**

Director	Shri A K Bhandari
Advisor	Vacant
Consultants	
Two Executive form NALCO on Loan Basis	Shri Neeraj Kapoor Manager  Shri Rahul Raghav Junior Manager

**B) Administrative Staff**

Administrative Officer	Shri Y. P. Rawat Sr. Administrative Officer Ministry of Mines (Part-time)
Secretary of the Centre	Shri Rahul Raghav
Assistant	Shri Vijay Bhatt
Personal Assistant	Vacant
Computer Typist	Shri Prakash Deep
Office Attendant	Shri Nand Kishore Tamata

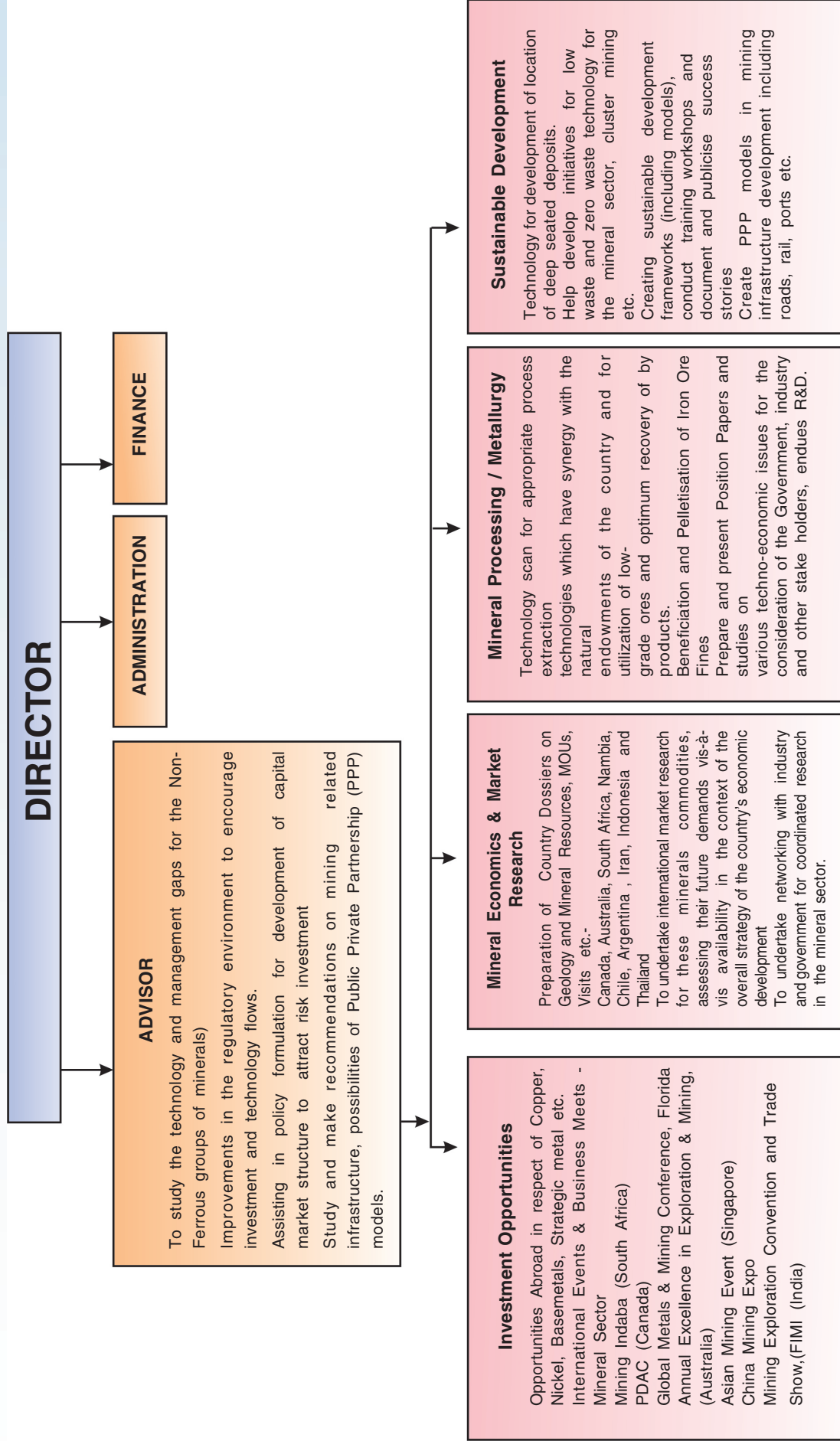
The following Temporary Status Worker of Ministry of Mines since 2004, will be on the on the strength of C-TEMPO till their absorption in the Ministry of Mines:-

- (i) Shri Ravinder Singh, Sweeper
- (ii) Shri Ghanshyam Singh, Driver

## ANNEXURE-IV

## CENTRAL FOR TECHNO-ECONOMIC MINERAL POLICY OPTIONS (C-TEMPO)

## ORGANISATIONAL STRUCTURE



Contact us :

**Center for Techno-Economic Mineral Policy Options**

*(A Registered Society under Ministry of Mines, Govt. of India)*

Block No.11, 5th Floor, C.G.O. Complex, Lodhi Road, New Delhi-110003

Tel : 011-24363199 ▶▶ Fax : 011-24367641

Website : [www.c-tempo.org](http://www.c-tempo.org) ▶▶ E-mail : [ak.bhandari@nic.in](mailto:ak.bhandari@nic.in)