GreenCOM
Environmental Education & Communication Project

Research







Study of Indian Stakeholders on CO_2 Emissions Mitigation

Prepared for GreenCOM
By Rathina Kumar and Mohan Krishnan.
Business & Industrial Research Division of the
Indian Market Research Bureau, New Delhi

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Abbreviations Used

AP	Andhra Pradesh
APGENCO	Andhra Pradesh Power Generation Corporation
BALCO	Bharat Aluminum Company
BS	Business Standards
BOD	Biological Oxygen Demand
CER	Certified Emission Reduction
CET	Carbon Emission Trading
CFC	Chloro-Fluro Carbons
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
COP	Conference of Parties
CPCB	Central Pollution Control Board
CSE	Center for Science and Environment
EMC	Energy Management Center
ESP	Electro Static Precipitator
DAI	Development Alternatives, India
FE	Financial Express
GHG	Green House Gas
GJ	Gega Joules
IGIDR	Indira Ghandi Institute of Development Research
INDAL	Indian Aluminum Ltd.
IS	Indian Standards
IT	India Today
MEA	Ministry of External Affairs
MEDA	Maharashtra Energy Development Agency
Mn	Million
MNC	Multi National Corporation
MoC	Ministry of Coal
MoEF	Ministry of the Environment and Forests
MoI	Ministry of Industry
MoP	Ministry of Power
MoS	Ministry of Steel
MNES	Ministry of Non-conventional Energy Sources
MP	Madhya Pradesh
MW	Mega Watts
NALCO	National Aluminum Company

Nox	Nitrogen Oxides
NPC	National Productivity Council
PC	Planning Commission
PCB	Pollution Control Board
Rs.	Rupees
SAIL	Steel Authority of India
Sox	Sulphur Oxides
SSI	Small Scale Industries
TARA	Technology and Action for Rural Advancement
TCD	Tons Crushed per Day
TERI	Tata Energy Research Institute
TN	Tamil Nadu
Tpa	Tons per annum
UNFCCC	United Nations Framework Convention on Climate Change
UP	Uttar Pradesh

Executive Summary

GreenCOM is a worldwide USAID-funded environmental and communication program. A consortium implements GreenCOM. The main contractor is the Academy for Educational Development; an NGO based in Washington DC.

USAID/Delhi hired GreenCOM to assist in the implementation of two activities in support of the Climate Change Outreach and Awareness Program, a component of the Greenhouse Gas Pollution Prevention Project (GEP). These activities included the development of messages to be included in future educational materials for Indian stakeholders and the outreach to Indian journalists regarding green house gas mitigation strategies. In support of the development of educational materials, GreenCOM suggested the implementation of a study to understand the stakeholders' knowledge, attitudes and practices regarding energy efficiency (EE) and carbon emissions trading (CET). For the purpose of that research, stakeholders include energy-intensive industry, pertinent central government ministries and offices; environmental NGOs concerned with energy and world climate change issues, and journalists targeting the business community. This document summarizes the findings of that research.

The study focused on the knowledge, attitudes and practices about:

- Energy efficiency and green house gas emissions
- Carbon emissions trading
- Foreign investment.

In addition, it inquired about:

- Related topics on which stakeholders desired further information, and
- The preferred communication channels for obtaining it.

79 in-depth semi-structured interviews were held with representatives from the different stakeholder groups. The breakdown of study participants per stakeholder group is presented in Table 1. This table includes the number of interviews for which contacts were made and the number of interviews actually conducted.

This study focused on five energy intensive industrial sectors: sugar, cement, power, steel and aluminum. The selection of industrial firms within those sectors was based on three criteria: degree of energy efficiency determined by existing public information (high vs. low), type of ownership (private, public and cooperative), and geographic location. In the aluminum sector, however, all but one of the firms operating in India were included in the sample. In some specific cases, size and proximity to urban centers was also included in the criteria, particularly in the power sector. Study participants from the government sector included representatives from pertinent ministries

and agencies identified by USAID. The selection of NGOs in the study was also intentional representing different known perspectives regarding carbon emissions trading. All major newspapers for the business community in Indian were also interviewed. Table 1 shows the breakdown of study participants by stakeholders.

Table 1 – Breakdown of Study Participants

	Contacted	Conducted
Industry		
Sugar	19	18
Cement	15	15
Power	14	12
Steel	6	6
Aluminum	4	4
Sub-Total	58	55
Government		
Ministry of the Environment	1	1
Power	1	1
Industry	1	1
Steel	1	1
Coal	1	1
External Affairs	1	1
National Productivity Council	1	1
Central Pollution Board	1	1
Energy Management Center	1	1
Planning Commission	1	1
Indian Renewable Energy Development Authority	1	1
Ministry of Non Conventional Energy		
Sub-Total	1	-
	12	11
State Government		
AP State Pollution Control Board	1	1
Maharashtra Pollution Control Board	1	1
Orissa Pollution Control Board	1	1
AP Power Generation Corporation	1	1
Maharashtra Energy Development Agency	1	1
Orissa – Department of Energy	1	-
Sub – Total	6	5

NGOs		
Centre for Science & Environment	1	1
Development Alternatives	1	1
Tata Energy Research Institute	1	1
Indira Gandhi Development Institute	1	1
Sankat Morchan Foundation	1	-
Indian Environmental Society	1	-
Sub-Total	6	4
Journalists		
Business Standards	1	1
Financial Express	1	1
India Today	1	1
The Hindu	1	1
Newsbreak	1	-
International Journal of Sustainable Development	1	-
Business India	1	-
Sub Total	7	4

Private Sector

Regarding industry, the data permit to draw the following major conclusions.
55% of the visited industries were classified as highly efficient, 15% as moderately efficient, 20% as inefficient, and for 9% no information was available to classify them.
There was evidence of some level of commitment to energy efficiency as one of the study participants is already discussing carbon emissions trading with a Japanese counterpart. Furthermore, in the aluminum sector, study participants reported the existence of environmental resource conservation committees, which address energy efficiency measures, the use of rewards for energy efficiency ideas that are submitted by staff and/or the existence of self-imposed energy audits, which are practiced periodically. There is one company in the aluminum sector that has an awareness program to educate energy users and operators about the right operational methods and the correct operational parameters. Reflecting on the general approach to energy efficiency, one of the study participants from the cement sector indicated that in the firm he represented "energy efficiency is a continuous process", arguing that in that sector energy represents up to 40% of the production cost.

There is also evidence that there is concern for environmental issues in general, even though this may be the exception rather than the rule. But in one company in the aluminum sector, has an electronic journal on environmental management called Enviro-Mail.

Self-reported primary motivations for adopting energy efficiency measures among the highly and

moderately efficient firms include: 1) reduction of operating costs, 2) increasing competitiveness, 3) increasing revenue, and 4) improving the company's image which would potentially lead to increased market share. Secondary motivations include interest in reducing: 1) CO_2 emissions, 2) pollution in general. Barriers for adopting energy efficiency measures among the inefficient firms include: 1) lack of funds, 2) no access to (appropriate) technology, 3) poor quality of raw materials making the investment unjustifiable, and 4) fear of privatization (in the case of one firm in the steel sector).

As far as knowledge gaps to be filled and existing misconceptions to be corrected, the findings show that in some sectors such as the sugar and cement sectors, the connection between energy efficiency, C02 mitigation and global warming is not always easily made, and in some more limited instances it is not made at all. Some of the study participants in these two sectors also argued that car pollution is more important industrial pollution when it comes to environmental pollution in general and carbon pollution in particular. Other study participants from the sugar and cement sectors also argued that any debate on green house emissions mitigation should be concerned with how CO_2 mitigation goals will affect industry and not how industry affects $C0_2$ mitigation. Study participants from the industry in general asked what CO_2 mitigation goals has India set for itself, and how will industry be required to meet those objectives. Among some firms, the possibility of carbon emissions trading is unknown. Equally, in some cases, plant managers believe that planting of trees around their plants is enough of a measure to mitigate CO_2 emissions.

Among the more efficient firms, however, carbon emissions trading is for the most part feared for it may imply additional regulations and consequently the demand to adopt further energy efficiency measures. The question that arises, then, is whether or not sufficient energy efficiency measures have been already adopted, and where would firms obtain funding to make those additional investments.

Topics of interest for future dissemination efforts include:

- details on climate change policy in India,
- technologies for CO_2 mitigation and relative merit vis-à-vis current options,
- cost and economies of these proposed technologies,
- funding options and mechanisms for arranging these funds,
- guidelines for carbon trading mechanisms,
- explanation about procedures to be adopted for the establishment of baseline for determining mitigation efforts and trading,
- institutions involved in monitoring and certifying CO_2 emissions mitigation, and long term implications of implementing carbon emissions reduction trading mechanisms.

Financial information to be disseminated in future EE&C interventions need to be addressed to top management and technical information needs to be addressed to Chief Engineers and/or Heads of Technical Departments.

Credible sources of information are industrial associations such as the Confederation of Indian Industries and the Federation of Indian Chambers of Commerce.

Preferred media include mainly print (newsletters, booklets or books). Firms are also interested in training workshops for the staff provided that they are held in proximity to plant locations. Study participants from the industrial sector have also suggested that the information needs to flow through different mechanisms, for different levels in order to be mutually reinforcing.

Government

Results pertaining to government indicate that three out of ten study participants from the government are more favor overall CET. The rest, eight out of eleven, expressed reservations or were openly skeptical about it. The skepticism is more apparent concerning the implementation of a CET program that about its general objectives.

Supporters indicated that CET would have three major advantages for India:

- Increased industrial efficiency
- Permit transfer of technology, and
- Permit a cleaner environment for all.

Study participants from the government expressing reservations or skepticism indicated that:

- The Indian Government has yet to publicly announce its position on CET; particularly via the Ministry of the Environment and Forests.
- Reduction of CO_2 emissions and climate change do not constitute at this point a priority for India;
- India is not a major CO_2 world-wide polluter;
- Developed nations bear more responsibility to the problem and they need to reduce CO2 emissions in their countries as well;
- The efficacy of proposed CO_2 mitigation programs needs to be tested;
- Success of pilot programs needs to be known before accepting CET at face value.

Preferred channels of communication to convey information on CET are:

- Written information disseminated through government and NGO literature;
- Electronic media; and
- Seminars targeting both government and industry with experts from a CET managing body permitting interaction and dialogue.

Content of interest would include details on how CET would operate:

- who sets baseline,
- how it is done,

- who monitors projects,
- who certifies projects,
- how is credit monetized.

NGOs and Media

In general, the level of skepticism and at times opposition to CET is apparent among the NGO community and journalists participating in the study.

Although NGOs expressed that CET will increase foreign investment in big projects, they also believe that:

- Developed nations should address the reduction of CO_2 emissions without having to recur mainly/entirely to credits via CET obtained from developing nations;
- The ratification of the Kyoto Protocol by the US Senate is still pending and may not happen any time soon or it may not happen at all;
- CO_2 mitigation goals should be set on a per capita basis;
- Projects developed independently of A convention on Carbon Emissions Trading will not get credit under that program;
- There is no CET structure in place yet;
- Who is going to be in charge and decide about how to establish baselines, a monitoring system and certification of CO_2 mitigation;
- CET may end up being too expensive for industries in general.

NG0s expressed a preference for CET information to be conveyed to them through training programs, workshops and seminars targeting industries, government officials and the NGO community.

Journalists expressing neutrality on the CET issue suggested that CET will allow for financial assistance from the North to the South and help increase the productivity of Indian industry. The concerns expressed by the opponents are similar to those expressed by NGOs included in this study. Additional concerns include: an interest in developing nations retaining for themselves part of the CO_2 mitigation credit and the fear that to protect themselves developed nations would either provide obsolete technology or limited capital access to developing nations.

Journalists also expressed interests in being invited to participate in fora that bring together all the different stakeholders considered in this study. They express an equal interest in seminars and debriefings for the press.

Potential Messages Emanating from Research Findings

Industry

Potential messages for less efficient firms may include the following:

- You can SAVE MONEY (reduce operating costs) by being more energy efficient.
- You can consequently increase profits and competitiveness.
- There are highly energy efficient firms in India. Examples from all sectors.
- India must take control of its regional climate regardless of developed nations perceptions, intentions and actions.

Potential messages for energy efficient firms may include the following:

- Besides saving money by being energy efficient, you can MAKE MONEY by selling carbon emissions reduction credits. This is the frosting on the cake.
- Case Study: One Indian firm is already involved in negotiating CET with Japanese counterpart.
- Examples of CET benefits in other countries.
- Ways to prepare for CET and be ready when it the ball gets rolling: monitor and establish your baseline now, etc.
- Carbon emissions trading is coming: Here is HOW to do it.
- International buyers provide both funds and technology.
- Boost to industrial sectors via CET will make India more competitive in world market.
- EE firms are environmentally friendly and this improves their public image.
- Technology and capital infusion via CET will help Indian economy providing capital and jobs to mitigate social and environmental concerns.

Potential clarification messages for all firms, particularly in the cement and sugar sectors, could include the following.

- CO_2 is one of the Green House Gases that contributes to global warming.
- Since low-grade coal, which is a big CO_2emitter, is used in India for power, EE firms can do a lot to reduce the emissions of CO_2.
- Reducing CO_2 emissions slows global warming.
- India has signed the Climate Change Convention calling for efforts to slow Green House Gas Emissions.
- India's current energy efficiency goals and standards are . . .
- Regardless of the international agreement made by governments on the Kyoto Protocol, there will probably be some form of carbon emissions trading.

Government

Possible messages targeting the government sector include the following.

- India must take control of its regional climate regardless of developed nations' perceptions, intentions and actions.
- Help shape CET policy. Express your perspective on CET to the Ministry of the Environment now.

- CET programs will enhance India's image in environmental concerns in South East Asia.
- Boost to industrial sectors via CET will make India more competitive in the world market.
- CET will bring funds and technology to help mitigate social and environmental concerns in India.
- CO_2 emissions mitigation will help reduce global climate problems such as melting of glaciers in Himalayas and flooding in countries like Bangladesh.

INTRODUCTION

Section I BACKGROUND

The Greenhouse Gases (GHGs), which include water vapor, carbon dioxide, methane, nitrous oxide and ozone, help warm the lower atmosphere and maintain an equilibrium level that is conducive to sustenance of flora and fauna. However, increased human activity in four key areas - energy production and use, agriculture, changes in land-use and use of certain chemicals in manufacturing sectors (like CFCs), has contributed to the enhanced greenhouse effect. Globally, there has been an increase in concentration of CO_2 by about 0.5% to as much as 4% or more for certain CFCs. Even in fairly optimistic scenarios, carbon emissions from burning fossil fuels (in the form of CO_2) are predicted to increase quite dramatically. They will probably double from a total of 6.5 Gigatons of carbon today to 13.8 Gigatons by 2050. Overall, about 80% of greenhouse gas (GHG) emissions from human activities are related to the production and use of energy—and particularly the burning of fossil fuels.

Climate changes caused by the green house effect are one of the major global environmental challenges, requiring new levels of international co-operation. Unless policies to reduce GHG emissions are widely implemented, global average temperatures will rise a further 1 to 3.5 degrees Celsius by the year 2100, with sea levels rising too. This warming would bring about adverse impacts on human health, ecosystems, agriculture, water resources, and human settlements, inter alia. The impacts of the warming are likely to lead to major disasters for island states and low-lying countries such as Bangladesh.

In 1992, most nations signed the United Nations Framework Convention on Climate Change (UNFCCC). Subsequent meetings of the Conference of the Parties established the Kyoto Protocol where most industrialized countries committed to reduce their collective greenhouse gas (GHG) emissions by at least 5 per cent compared to 1990 levels by the period 2008-2012. With the goal of reaching these targets at the lowest possible cost for countries that

committed to reductions, the Protocol created flexibility mechanisms, including the Carbon Emissions Trading (CET), where companies in industrialized countries can invest in developing countries to achieve carbon reduction objectives. The CET is essentially a project-based GHG emissions offset trading program between countries with GHG emissions reduction commitments and those without. Under CET, the owners of certified projects can sell or trade their Certified Emissions Reductions (CERs). The CET is also intended to be an opportunity for developing countries that did not accept binding emissions reductions at the international conference on climate change and GHG to be involved in GHG mitigation.

India, the second most populous country, is the fourth largest emitter of GHGs in the world according to the Energy Information Administration of the United States Government based on 1988 consumption levels. Thus India will be an important player in meeting the climate change challenge in the coming years. India could take advantage of these efforts to address climate change and thereby increase foreign direct investment, technology transfer, and job creation while reducing environmental impacts.

As part of the effort to mitigate the impact of GHGs, USAID, New Delhi has contracted with the Environmental Education and Communication (GreenCOM) project implemented by the Academy of Educational Development of Washington, D.C., to carry out a study of Indian stakeholders involved in GHG issues. The study was intended to throw light on issues pertinent to development of educational materials for these stakeholders relating to reduction of greenhouse gases, and finally to test these materials developed before rollout. IMRB conducted this study in the form of in-depth interview with key officials in energy intensive industries, nodal government agencies and NGOs active in environmental area. This report gives the findings of the study.

Section II OBJECTIVES OF THE STUDY

The main objectives of the survey will be as follows:

- To understand GHG stakeholders in terms of their current attitudes and knowledge levels, new flexibility mechanisms including the Carbon Emissions Trading mechanism, Foreign Direct Investment and incentives/obstacles to new investments.

- To identify issues that are pertinent for communication to these stakeholders in building test communication material aimed at creating awareness and knowledge about unique investment opportunity like CET etc.

Section III INFORMATION NEEDS

The following are the information areas that need to be reviewed during the discussion with various stakeholders:

- Extent of knowledge about impact of CO_2 emissions.
- Perceived information gaps in knowledge about impact of CO_2 emissions.
- Knowledge of international conventions on CET & its ramifications for particular industry and/or for the country - pros/cons & view points from the point of view of industry status, economy, political, social and regulatory aspects.
- Knowledge about Carbon Emissions Trading (CET) mechanism - pros/cons & viewpoints and interest in participating.
- Opportunities in attracting Foreign Direct Investment for mitigating GHGs.
- Enablers that will allow the entity (ministry/organization) to participate in the CET.
- Decision-makers and gatekeepers in organizations and facilitating aspects in speeding up process.
- Detailed views on the nature and type of communication material needed to assist in decision to participate in the CET.

Section IV STUDY METHODOLOGY

Selection of sample units

USAID and GreenCOM identified four broad stakeholders who need to be studied for their views: industry, government, NGOs & the media. 79 interviews were conducted. Among industry, five sectors were covered in the study: aluminum, cement, power, steel and sugar . These were selected based on their energy intensity and their overall contribution to CO_2 emissions. Among government pertinent central government agencies and state government were selected. NGO's chosen represented different positions concerning CET. And journalists writing to the business community through all the major Indian newspapers were included in the study. Further details per stakeholder follow.

Industry

To construct the sample from the manufacturing sector and understand the spread in awareness levels and disposition about CO_2 mitigation and CET, GreenCOM originally proposed to have a mix of doers and non-doers with respect to energy efficiency and actions pertaining to CO_2 mitigation. The initial list of doers and non-doers was based on the company's participation in training events and seminars organized by USAID around CO_2 mitigation and CET. IMRB suggested to use one more criteria: specific energy consumption. In the sectors like aluminum, steel and power we could get such data for most of the unit operating in India. In cement an equivalent parameter of specific coal consumption was available. Only in the sugar sector no such data could be collected.

Apart from the above, in each of the industrial sectors, some specific criteria unique to that sector

were also used to have a true picture of that sector. In sugar sector, representation to different type of ownership (private, public & co-operative) and various geographical areas (states) have been given. In the aluminum sector, all except one of the units have been covered. In the power sector, among the state level utilities, a mix of energy efficient and energy inefficient ones have been chosen. The sample also includes two power generation companies of Central Government, two from the private sector and two Independent Power Producers. In the cement sector again, more energy efficient to less energy efficient units have been covered. Also representation to all the corporate groups have been provided in the sample units. A few cement units which use imported coal for better energy efficiency have been also included. In the steel sector, energy efficient and inefficient public sector units have been covered. Apart from this, an existing and an upcoming private sector unit was included.

Based on the above criteria, we had selected a list of units in each sector for the survey. This list was vetted by both USAID/New Delhi and GreenCOM.

Government

In the Government sector, authorities that have a direct or indirect role to play in the CET were contacted. The Ministry of Environment is the nodal ministry for matters pertaining to environment. Others included are Ministries of Energy, Power, Coal and Industries. Apart from this, the policy making body - the Planning Commission - and the Ministry of External Affairs that advises on matters pertaining to role and influence of foreign governments were included. Beyond ministries, certain quasi-government bodies are also covered. It was decided to contact the energy department / agency and pollution control boards of some of the state government also. For this purpose, Maharashtra, Andhra Pradesh & Orissa were selected in consultation with USAID. In the government, respondents were generally departmental secretaries or directors of the agencies.

NGOs and Media

The NGOs were selected for their active role in environment, energy and developmental issues. The media was drawn from business newspapers and magazines and those having special interest in environment.

Among the NGOs, the chief or senior personnel were selected for the interview. In media, the journalists who write on environmental issues were chosen.

Survey procedure

The survey was conducted by way of personal interviews. Only one of the 79 odd interviews had to be conducted through telephone due to difficulties in getting respondents time. A discussion guide approved by GreenCOM was the basis for the interviews. Separate guides, also approved by GreenCOM, were used for industries and other segments.

In each of the cases, the interviews were held with a person responsible for decision making or for highlighting environmental issues to the decision-maker. It was seen to that sufficiently senior level persons who are knowledgeable of the operations as well as perceptive enough to discuss the issues were contacted. Prior appointments were fixed with these personnel for the interviews. Some times this took even a week. The whole interview took 45 minutes to 90 minutes depending on the involvement of the respondent.

Problems faced

Most of the units to be contacted were in interior places with no direct travel links. Though IMRB had envisaged this at the start of the survey, what we did not foresee was the repetitive

visits required to get time with respondents. In the case of public sector units, getting approvals for interviews from top management took some time. It must be noted that in all the industry, the environment is a sensitive subject and people would not talk unless they are sure that the interview will not have negative consequences.

Though we had been highly persuasive in getting the interviews, there were also failures and refusals. One of the peculiar aspects of the study is that we could not give away much about the objectives of the study as the awareness and knowledge of the issues to be assessed may get leaked out. So we had to assure them about genuineness of the study without disclosing all the details about the study.

Sample achieved

The following table indicated the breakdown of survey participants by sector. It also indicates the number of refusals.

Table 1. Breakdown of Study Participants

Sector / Segment	**Achieved**	**Failure / Refusal**
Sugar	18	1
Cement	15	-
Aluminum	4	-
Steel	6	-
Power	12	2
Central Government	11	1
State Government	5	1

Media	4	4
NGO	4	2
TOTAL	**79**	**11**

The refusals / failures are:

No.	Unit	Sector	Remarks
1.	Chengalvarayan Co-op Sugars	Sugar	Could not get permission from top officials
2.	TN Electricity Board	Power	Could not get permission from top officials
3.	Delhi Vidyut Board	Power	Refused
4.	Min. of Non-Conventional Energy	Government	Refused
5.	Dept of Energy, Orissa	State Government	Denied any role
6.	News Break	Media	Could not locate
7.	International Journal of Sustainable Development	Media	Could not locate
8.	Environmental & Pollution Control Journal	Media	Refused separate interview
9.	Business India / Business Today	Media	No right person
10	Sankat Morchan	NGO	Could not locate

Analysis of the interviews

The interviews were compiled and then analyzed for the content. Attempts were made to evolve the common views in each sector / segment on the different issues. Wherever there are no consensus or there are difference in opinion, these have been flagged. To give a true perception of the interviews, some of the verbatim quotes have been noted and presented in the report as such.

FINDINGS - INDUSTRY STAKEHOLDERS

SECTOR : SUGAR

Section I INTRODUCTION

The sugar industry is one of the largest agro-based processing industries in India, and plays a pivotal role in the economy. India shares the distinction of being the largest sugar producer in the world with Brazil. In the last decade, the largest expansion of the sugar industry in the world happened in India.

India has over 430 sugar factories with sizes ranging from 400 Tons of sugar cane Crushed per Day (TCD) to more than 10000 TCD. The Government has announced that the minimum economic size of a sugar factory must be at least 2500 TCD. The total installed capacity in India is about 15 Mn tons of sugar. There are sugar factories owned by the private sector and the public sector as well as by the co-operative sector. The sugar factories are concentrated in the states of Maharashtra, UP, Tamilnadu etc.

Processes Employed

In India, sugar factories use the waste bagasse for producing process steam as well for power generation. With more efficient technology, the emissions of pollutant gases can be reduced and the excess power generated can be sold through the utility grid. In India, there is lot of demand for molasses, a by-product of sugar manufacturing. It is advantageous to establish integrated sugar factories to produce downstream value added products from molasses. In the competitive market, integrated plants find it easier to survive the vagaries in the sugar market.

Machinery

The sugar plant & machinery manufacturers in India design and fabricate some of the most efficient machinery for the extraction of juice and conversion into sugar. Indian machinery prices are also amongst the most competitive in the world. So there is very little need or

incentive for sourcing machinery or technology from abroad.

Pollution Control Measures

Most sugar factories have installed pollution control measures for primary treatment and secondary treatment of effluents.

Power generation

The bagasse from the sugar cane is utilized to produce power through co-generation. The Ministry of Non Conventional Energy Sources (MNES) assists such co-generation projects. In 1999-2000, five projects with an aggregate capacity of 51 MW were commissioned. Besides the above another 16 projects in 10 states aggregating over 150 MW are in various stages of implementation.

In the manufacture of sugar, press mud is produced which is the solid residue by product obtained from sugar cane juice before crystallizing sugar. Press mud has essential nutrients for biogas production. Presently press mud is used as manure. It is estimated that about 350 MW of power could be generated by producing biogas from press mud. This is apart from the 1500 MW of power that could be generated by way of co-generation using bagasse. In fact, a Task Force Constituted by MNES, had projected a surplus power generation potential of around 3500 MW if all the 430 sugar mills in the country switched over to the modern techniques of co-generation. Both the above processes, when considered in their entirety shall lead to carbon-dioxide emissions reduction and also usage of emissions trading in the sugar industry.

Criteria used for selection of sample units for the study

There is no data available on the energy efficiency in this sector. As per the Indian Sugar Mills

Association, there have been no attempts to collate and compare the energy efficiency data of different mills. It is not until now that they are contemplating collecting such data. In its, the sample units have been selected based on a mix of known doers and others. The sample units contain public, private and co-operative sector units. Also the sample units have representation from all the sugarcane growing areas. Though about 15 sugar units were proposed to be contacted, a higher number was selected considering possible difficulties in conducting the interview.

Section II PROFILE OF COMPANIES

Profile of the units contacted in this sector

Among the units contacted, 12 are in the private sector, 3 in the public sector and 3 in the co-operative sector. Seven of the units contacted were relatively small having a capacity of less than 5000 TCD, eight are large having capacity between 5000 - 10000 TCD, and two units are very large having capacity more than 10000 TCD. The units were located in the states of Uttar Pradesh, Tamilnadu, Maharashtra, Andhra Pradesh and Karnataka.

No	UNIT	Capacity (TCD)	REMARKS
1.	UP State Sugar Corporation., Lucknow	44,000 *	Public sector unit belonging to State Government of Uttar Pradesh
2.	Nizam Sugar, Medak, AP	5,500	Public sector unit belonging to State Government of Andhra Pradesh
3.	Sudalagunta Sugar, Chittor, Andha Pradesh	3,000	Private sector unit in Andhra Pradesh
4.	Tamilnadu Sugar Corpn, Tanjore, TN	3,500	Public sector unit belonging to State Government of TN
5	EID Parry, Nellikuppam, TN	6,000	Private sector unit in TN
6	Thiru Arooran Sugars, Tanjore, TN	5,500	Private sector unit in TN
7	Sakthi Sugar, Erode, TN	6,000	Private sector unit in TN
8	Dharani Sugars, Tiruvannamalai, TN	6,000	Private sector unit in TN
9	Aruna Sugar, Pennadam, TN	4,500	Private sector unit in TN
10	Bannari Amman Sugar, Erode, TN	4,500	Private sector unit in TN
11	Krishnamurthy Co-operative Sugar, Cuddalore, TN	3,500	Co-operative sector unit in TN
12	SV Sugars, Kanchipuram	3,000	Private sector unit in TN
13	Bajaj Hindustan, Kheri, UP	9,000	Private sector unit in UP
14	Dhampur Sugar, Bijonor, UP	10,000	Private sector unit in UP
15	Triveni Engg, Muzzafarnagar, UP	11,000	Private sector unit in UP
16	Shankarrao Co-operative Mill, Solapur, Maharashtra	4,500	Co-operative sector unit in Maharashtra
17	Bhima Co-op Sugar, Pune, Maharashtra	5,000	Co-operative sector unit in Maharashtra
18	Ugar Sugar, Karnataka	7,500	Private sector unit in Karnataka

* All its plants together.

All the interviews except the UP State Sugar Corporation were plant level interviews. Only UP State Sugar Corporation which has many plants under it was contacted at the headquarters.

Section III KNOWLEDGE & ATTITUDES TOWARDS ENERGY EFFICIENCY & CO_2 EMISSIONS

Key issues in the sector

The key issue faced by most of the companies in this sector is finance and fund availability. Almost all the respondents have mentioned this as one of the key issues. Though industries in India generally face difficulties in mobilizing funds for capital investment, the problem with the sugar sector seem to be slightly different. In spite of being profitable, the industry faces cash flow problems often resulting in delayed payment to even sugarcane farmers.

The other key issue dominant in the sector is the raw material shortage and its quality. Traditionally the sugar plants were assured of sugarcane from a captive area surrounding it. With number of new plants coming up in proximity, the captive area has got reduced and the availability of sugar cane has also reduced. Whereas some plants were in operation for around 180 days earlier, now they find it difficult to keep running for even 150 days. The yield from the sugar cane also has gone down. The Government fixes the support price for sugar cane. But this does not in reality take into account the variation in sugar content.

The levy sugar which is procured by the Government at a fixed price puts a burden on the sugar sector. Any resulting loss has to be made up in the open market sale of sugar. The levy sugar, support price for sugar cane and locational policy of the plants together make government interference an important key issue in the sector.

Energy and its usage is another important issue in the sector. Generally in this sector, the waste bagasse is used as a fuel to generate steam for the process as well as power. Earlier during the crushing season, the entire power requirement of the plant was met by captive generation.

Almost the entire bagasse was used and very little was left as excess. With increasing cost of raw materials, it has become necessary to use the waste bagasse optimally. To improve the profitability, one of the key measures implemented in the sugar sector is to reduce the energy consumption in the process as well as to generate more power from the same bagasse by more efficient turbines operating at higher temperature and pressure. The excess power generated provides an additional stream of revenue.

The environment is also mentioned as a key issue by many of the units in this sector. This is because the disposal of effluents from the plant poses a problem. Earlier the effluents were let out into ponds in the surrounding. As it percolated down and polluted the land around and the subsoil water in the neighborhood, there were objections from the inhabitants. How to overcome this disposal problem is one of key issues in many units. Many units have bought out land around the plants. Others have built disposal ponds lined with plastic sheets to prevent percolation. There are also attempts to segregate the sediments from the ponds for disposal as manure.

Marketing is also mentioned as a key issue by many. But it seems to do more with the price variations in the market. The prices, which fluctuate based on the arrivals and demand, make it difficult to realize remunerative prices at times. With imports and exports allowed more liberally, this issue has assumed a keener role.

Technology availability and labor management is considered to be key issue by relatively less number of units.

Areas for energy efficiency measures

In all the sugar plants, boiler is an area that gives scope for energy efficiency measures. The process of sugar manufacture itself is open for improvement in the utilization of steam and

energy. There is no furnace or kiln in a sugar plant where energy efficiency measures can be implemented.

Generally public sector units were lax in undertaking energy efficiency measures. As compared to smaller plants, larger ones have undertaken more measures towards energy efficiency. There is not much of regional variation in undertaking energy efficiency measures.

Impediments for energy efficiency measures

In undertaking energy efficiency measures, funds are felt to be a constraint by most of the sugar plants. Some of them have not undertaken any energy efficiency measures mainly due to the inability to mobilize funds.

Equipment is the other major impediment in implementing energy efficiency measures. Sourcing right equipment with reasonable amount of reliability is said to be a difficult task. And many a times, the energy efficiency measures are delayed due to inability of the suppliers to deliver the equipment on time.

Technology and fuel availability are felt to be impediments by relatively less number of plants.

Energy efficiency measures undertaken

Many of the plants have not taken any significant energy efficiency measures in the last three years. The measures undertaken by others are mostly co-generation of power and heat recovery related. These include installation of high pressure, high temperature boilers and generators that are more efficient. The other measures are heat recovery systems, power factor improvement etc.

Role played in undertaking energy measures

The energy efficiency measures are generally identified or initiated by lower or middle level operational staff like supervisors and engineers. Many a times an energy audit is conducted by an independent external agency to identify the energy efficiency measures required. These energy audits are financially supported in part by the government and by the industry associations. The energy efficiency measures are discussed and evaluated by the middle management including the general manager, production manager, financial controller etc. Depending on the investment in the energy efficiency measures, the discussions are taken to the upper echelons of the management. The duration of this process also varies depending on the size of the investment. The ultimate decision or approval for the measures is always given by the Chairman / Managing Director. In public sector plants, the governmental department in charge of the plant takes the ultimate decision. One of the respondents from a public sector unit that has not undertaken any measures said, *"The Government has not decided to do anything".*

Reason for not undertaking energy efficiency measures

The major or sole reason cited for not undertaking energy efficiency measures is lack of funds. In instances where the plants could not even carry out regular maintenance operations because of financial problems, there is very little incentive to carry out energy efficiency measures. In the public sector, lack of energy efficiency measures is attributed to the government's indecision on proposals.

Energy efficiency measures being contemplated

In many of the plants energy efficiency improvement is a continuous process and the measures are implemented almost continuously one after another. Most of the measures being

contemplated are similar to ones that are implemented like efficient boilers, turbines, heat recovery etc.

Motivators of energy efficiency measures

Financial advantage / profitability seems to be the prime motivator of energy efficiency measures. The private sector plants feel that they can not have social commitment like the public sector plants. They claim *"We have to look at the returns on the investment".* Whatever environmental concern evinced is intended to give better public image and opinion. Only a lone respondent considers environment to be a prime motivator. He feels that climatic changes can ultimately spoil the conducive atmosphere for cultivation of sugar cane.

Many of the plants feel that as long as they are within the pollution norms specified by the Pollution Control Board (PCB), they do not have any reasons to be concerned about environment. They say that environment is important but they have already undertaken 'precautionary' measures and so need not have any further concern. Obviously for many, the concern on environment is limited to be on the right side of law and regulations and nothing beyond. One of the respondents said, *"When the (PCB) norms become stricter, we will think (of the environment)".*

There is no significant difference in the motivators for energy efficiency measures among firms that participated or not participated in workshops about energy efficient and CET. Generally, financial returns seem to be the prime motivator for both.

Effect of poor energy efficiency on environment

Though we attempted to study how far the plants associated poor energy efficiency with environmental problems, many of them denied any ill effect on the environment caused by their

operation. They claimed that they have undertaken appropriate measures to take care of such effects. Except inefficient burning of fuel which could lead to emission of unburned fuel, no other effect on environment was cited.

Areas of environmental concern

Most of the plants tend to claim that they are concerned about all aspects of environment. It can be seen that they are highly sensitive about discussing environmental issues. Before any probing could be done, they insisted that every area of concern has been attended to appropriately and there is "no problem". Some even go to the extent of claiming that there is no CO_2 emissions. The real concern for most of them seems to be mainly meeting the PCB norms.

COD / BOD (Chemical Oxygen Demand / Biological Oxygen Demand) seemed to be the concern among large number of plants. As before letting out the effluents, the plants are expected to check COD/BOD, they are of prime concern. Large investments by way of aeration tanks and blowers have been made by many plants showing their concern to be within the COD / BOD norms. The other major concern evinced is NOx / SOx for which also there are norms by the PCB. As almost all the plants have a boiler, this seems to be an area of concern.

The other concern widely found was disposal of effluents. Unlike earlier years, the plants are unable to let out the effluents into the surrounding area due to objections from nearby inhabitants. So they have to acquire lands and line them with non-permeating plastic sheets before disposing off the effluents.

Many of the respondents have also mentioned emissions of CO_2 as one of the concerns without knowing the implication of such emissions. They assume that it is one more of the air

pollutants.

Effect of CO_2 emissions

Most of the respondents were unaware of the effects of CO_2 emissions. Only some of the respondents are able to connect CO_2 emissions to warming and Global Climatic change. Many consider it to be merely a health hazard like other air pollutants. There are responses like *' we are supposed to inhale oxygen and more CO_2 in the air will reduce the content of oxygen'*. Many of the respondents have presumed that CO_2 emissions caused air pollution like NOx and SOx emissions and suggested that stricter emissions control will reduce the ill effects. By relating CO_2 emissions to other air pollutants, the respondents fail to note that the effect of CO_2 emissions would be global, long term and irreversible. One of the respondents felt that CO_2 emissions from vehicles should be more of concern than those from industries.

Impact of Global Warming

As compared to the effect of CO_2 emissions on global warming, more people are aware of the likely impact of global warming. Obviously as mentioned by a few respondents, there had been articles about this in general magazines. One of the respondents said *"Already there was an issue of this global warming in 1990s, I had read it in some magazines"*. As such, awareness level about the impact of warming was similar among known doers and others. The predominant impact of global warming recalled by the respondents is the melting of ice, rise in ocean levels and submergence of low-lying areas by ocean. As mentioned these articles had appeared in different Indian languages. A few of the respondents mentioned human health deterioration and reduction in agricultural production.

Relevance of Global Climatic Change to the industry

When exposed to the concept of Global Climatic Change many of the respondents are able to

identify the impact on agriculture as one that has direct relevance to the industry. As the industry is dependent on the cultivation of sugar cane, any effect on agriculture has a relevance to the industry. Lowering of the agricultural yields will reduce the sugar cane availability for crushing resulting in reduced operation and profitability for sugar plants. A few of the respondents even after being exposed to the concept feel that as they meet the PCB norms, they are insulated from the impact of Global Climatic Changes.

Role of the company in helping the country meeting the climatic challenge

From the responses we had obtained it is seen that the companies are not clear how exactly they could help in meeting the challenge. A few had mentioned that they could dig bore wells etc. to compensate for loss in production / yield of sugar cane. Some have said they would try to go for technologies that could absorb the heat and convert it into energy. A few have even mentioned absorption of CO_2 itself. *"Will put up energy effective systems to absorb the heat".*

Some companies having effluent treatment plants generate methane from the effluents. The gas is used as a fuel leaving CO_2 and water vapor after combustion. The CO_2 is bottled and sold as an industrial gas. Though this is not the main CO_2 emission that is of concern, the companies claim mistakenly that they already utilizing the CO_2.

Section IV AWARENESS & VIEWS ON CO_2 EMISSIONS MITIGATION

Knowledge about international convention on the topic

Except a stray respondent, all others do not seem have knowledge of conventions on the topic. Obviously very little publicity had been given to the conventions. Also as the participant

in the convention is the government itself, it is presumed that the country's interests would be taken care. From the Indian Government also, there seem to have been little efforts to publicize about the convention. As a respondent said *"we are in a remote area - do not get to know what is happening".*

Views on the convention

When exposed to the information about the convention, respondents were, in general, in agreement with the thrust of the convention. Many of them mentioned that they would try to take note of the mechanisms developed in the convention in future. They felt happy that developed countries are helping with funds and technology to reduce the problem caused by emissions. Some of them felt that though they would like to make use of the mechanisms, the Government's permission will be required. They thought the Government should take stock of the advantages of the mechanisms and then introduce it among industries. Some said that with the little information provided to them they could not form any views and would require more details.

Awareness about carbon emissions trading

None of respondents were aware about Carbon Emissions Trading or mention it on their own.

Role of India in CO_2 mitigation

The general opinion is that India can play a major role in CO_2 mitigation. It is felt that the Government can easily introduce tighter norms of emissions to ensure CO_2 mitigation. Also, mitigation measures can be easily introduced at the time of licensing the sugar plant itself. One of the respondents said, *"Our country can play a major role as it can introduce this system (Carbon Emissions Trading) when they issue the license to start the factory itself".*

Disposition towards emissions trading

None of the respondents have expressed any dislike for emission trading. At the most they have asked to have more information to evaluate. In general, all the respondents have positive disposition on the carbon emission trading concept they were exposed to. Many of them immediately feel that they could make use of the mechanism in their plant.

Irrespective of whether they are known doers or not, the respondents uniformly see advantages in carbon emissions trading to the company.

Many respondents fail to grasp the concept card on carbon emissions trading they were exposed to. They see carbon emissions trading as a ready-made program/ project to be installed to mitigate CO_2 emissions.

Sugar industry is agriculture based and is rural-based. Because of this, during the survey, the respondents were generally found to be relatively less sophisticated compared to other sectors. Their exposure to matters outside their circle seems to be limited. Consequently they had very little to say or were not able to articulate what they wanted to say.

Information to evaluate carbon emissions trading

Many respondents were keen to know to how to implement the carbon emissions trading through some case studies. They said that evaluation would be possible with practical example only. Generally all of them were of the opinion, the concept as it was introduced is inadequate to completely understand the carbon emissions trading and evaluate it. They said that three or four lines can not explain the mechanism and would require more details. They seek both

technical and commercial information.

Motivators for emissions trading

Technology and funds both seem to be equally motivating factors in utilizing emissions trading. Though both are motivators for many, some of the cash rich companies feel that technology alone is the motivator for emissions trading. Some others feel that if funds are available, the appropriate technology can be easily accessed.

Reservation against foreign investment

No one seems to be having any reservation against foreign investment under carbon emissions trading. But many have indicated that they would require permission from the Government to avail and make use of these funds. Many wished the country to take a pro-active role in carbon emissions trading. *"Our country itself should take steps to bring out and make use of the advantages of carbon emissions trading".*

Respondents are all open to funds irrespective of the source. No one also felt that such investment would affect India's interests. The country of origin of the funds and technology seem to be immaterial. Though there is no reservation against funds from any country, some have indicated preference for US and Germany. On the face of it, they could not explain the reason for the preference. But on probing it is found that technology from Germany is considered to be better and dependable. Similarly, the US is considered to be dependable and consistent source of funds. Irrespective of the ownership, i.e., whether they are owned by Government or not, the respondents were willing to take in the foreign funds.

Role of Government in emissions trading

Most of the respondents expect Government to be an intermediary and a facilitator in the emissions trading. They say that only Government can be the intermediary as it is part of the convention. It has to play the role of facilitator in the transfer mechanism. Some of them want the Government to be a regulator also. Overall the respondents expect a very active role for the Government in the emissions trading process. Also the role of the Government is expected to be different in the case of public and private sector. It may be an administrator in the case of public sector and intermediary and facilitator in the case of private sector. Some of the respondents expect the Government to evaluate the mechanism before forming the policy guidelines for using / implementing emissions trading.

Section V PREFERENCES & INFORMATION NEEDS ON CARBON EMISSIONS TRADING

Information on emissions trading

There is no single important information that the respondents are looking for. They want to know about CO_2 mitigation technology vis-à-vis existing technology, cost economics of the technology, implications of climate change policies to the industry and method of funding. There seem to be lot of eagerness to know more about the emissions trading and its working.

Recipient of information

Unanimously everybody wants the information to reach the top - Chairman, Managing Director, President, or Vice President. Obviously the decision making in these concerns is top down. Also emissions trading is felt to be involving policy issues and only the top man can take the decision. Without a nod from the top, emissions trading may not even be taken up for

evaluation. Most of the respondents feel the information sent to the top will be redirected in due course to appropriate levels. As far as emissions trading is concerned, the technical managers are also considered to play an important role. The information on CO_2 mitigation technology and merits against existing options are expected to be sent to works managers. The information about cost economics, funding options and method of arranging funds is expected to be sent to the managing director.

Medium of information dissemination

First the respondents want the details about emissions trading to be sent by way of brochure, write-ups etc. This they want to be followed up by a training program. Without any initial idea about emissions trading, they feel that participation in the training program will not be useful. Also an initial familiarization brochure can increase the interest in the training program and bring in more people. One of the respondents said, *"Firstly write in detail and if required we will ask for a training program".*

Generally they want the training program to be conducted within the premises or nearby so that more number of people could participate in it. More than discussing the merits of emissions trading in a common forum, respondents expect an evaluation of emissions trading be prepared before hand and presented in the program. All the respondents are themselves keen to participate in the program.

Source of information

In the public sector and co-operative sector, Government is considered by many to be an authoritative informer. It is felt that the Government would be in a better position to evaluate and formulate policies on emissions trading. After Government, it is the international

development agencies particularly USAID, which has lot of credibility as source of information. After this, NGOs are considered to have a role in dissemination of information. Dissemination through mass media like newspapers is expected to add to credibility and have a higher reach.

SECTOR : ALUMINIUM

Section I INTRODUCTION

Aluminum, by virtue of its attractive properties (for example, lightness, high strength to weight ratio, high resistance to atmospheric corrosion and chemical attack, good thermal and electrical conductivity, easy formability, good modulus of elasticity, high reflectivity, non-toxicity, attractive appearance etc.), has established prominence worldwide and is the most important metal next to steel. Aluminum products find numerous applications in various end-use sectors from kitchenware to electrical conductors and from railway coaches to defense equipment and space crafts. The present application of aluminum products in India is mostly confined to the conventional rolled, extruded and cast product in electrical, transport, building & construction, consumer durables, canning etc. The per capita consumption of Aluminum in India is at 0.50 kg, compared to the world per capita average of 5 kg.

Present production scenario

The production of Aluminum in 1998-99 was about 5,44,000 MT/year and is expected to be over 6,00,000 MT/year in 1999-2000. The cumulative production growth at the end of the first eleven months of 1999-2000 was 14.5% as opposed to a 2.4% decline in production during the corresponding period of the previous year

Historical background

Production of aluminum first began in India with the setting up of an aluminum smelter with a capacity of 2500 MT/year at Alupuram in Kerala by INDAL in collaboration with Alcan Canada in 1943, based on imported raw materials. After a period of slow growth, aluminum industry made rapid strides in the past two decades achieving an average growth rate of 9%. The growth of the aluminum industry in India is closely linked and dependent on the growth in the power sector. At present there are 5 companies producing aluminum in India. Their total capacity is about 700,000 tons per annum.

Technology utilized

Production of aluminum is based on the world wide accepted Hall-Heroult technology. The process provides for production of aluminum through electrolysis of aluminum dissolved in fused electrolyte, which is a chemical mixture of sodium fluoride (NaF), and Aluminum Fluoride. Gases evolved are transferred to the gas cleaning plant for treatment. Molten metal is tapped from electrolytic cells and cast into ingots. About 2.5 tons of bauxite is required to produce one ton of aluminum and about two tons of aluminum is required to produce one ton of aluminum metal.

The major technical facilities required for production of aluminum are:

- Electronic cell houses.
- Gas cleaning facilities.
- Cryolite regeneration facilities.
- Anode Carbon plant.

A number of modernization / revamping programs of aluminum smelter have been initiated by the primary aluminum producers in order to reduce the energy consumption and to improve the technical parameters. The developments considered pertain mainly to electrolytic cell design, including cathode design, anode design busbar arrangement & computerization of process; carbon technology as it plays a vital role in aluminum production. Cathodes prepared with carbon blocks/plates are based on Calcined Petroleum Coke (CPC) anthracite, metallurgical coke, graphite & pitch. Similarly for anodes CPC & pitch are used.

Energy consumption

Aluminum production is power intensive with energy accounting for nearly 40% of the

production cost. Large proportion of the energy consumed (as much as 80%) is electrical energy used for smelting and grinding of bauxite. Oil is used mostly for firing calcining kilns and in some units for generating steam required for digestion and evaporation. Because of the huge power requirement, all the units have coal based thermal power stations. Based on the process efficiencies and the fuel mix used, the coal consumption of the aluminum plants varies from 0.59 tons to 1.35 tons per ton of aluminum produced.

Environmental aspects

All the three forms of pollutants namely gaseous, solid and liquid are generated during aluminum smelting. The main atmospheric emissions are gaseous hydrogen fluoride, sulphur dioxide, carbon oxides, carbon tetrafluoride, tar vapors and particulates of fluorides, cryolite and carbon. Gaseous and particulate emissions from smelter and anode baking are noxious in character and require more attention to control before discharge into atmosphere. Solid wastes are relatively minor pollutants and require less attention. Spent cell linings are the main solid wastes. Liquid effluents, which arise from wet scrubbers and from routine operations, are either recycled or dumped at separate locations.

The main type of pollutants from aluminum smelter are given below:

Sl. No.	Source/Type of pollution	Pollutant
1.	Gaseous emissions	Carbon monoxide, carbon dioxide, hydrogen fluoride, sulphur dioxide, silicon tetrafluoride, carbon tetrafluoride, water vapor, etc.
2.	Particulate emissions	Alumina, Cryolite, aluminum fluoride, calcium fluoride, carbon, iron oxide.
3.	Liquid effluents	Fluorine compounds, hydrocarbons, entrapped water.
4.	Smelter wastes	Spent linings, anode butts, dust from gas cleaning, material from cell skimming, spills, etc.
5.	Paste preparation Emissions and wastes	Coke dust, fines, pitch dust, hydrocarbon fumes.
6.	Anode baking emissions	Hydrocarbons, sulphur, etc.
7.	Cast house emissions and wastes	Fluxing fumes.
8.	Ancillary operation and wastes.	Dust from bulk material handling, demolition of old cells.

Criteria used for selection of sample units

As there are only 5 units we have decided to cover all of them except one unit which is relatively small and facing closure due to poor economies of scale and inefficient process. Two of the selected units are in the public sector and the other two are in the private sector (one owned by an Indian company and another by a MNC). INDAL has the capacity spread out in multiple locations so the interview was conducted at one of the plants.

No	UNIT	Energy efficiency (GJ / ton)	REMARKS
1.	Hindalco Industries, Renukoot, UP	57.74	Most **energy efficient;** Private sector unit belonging to an Indian Group
2.	National Aluminum Co, Angul, Orissa	60.09	**Public sector** unit belonging to Government of India
3.	Indian Aluminum Co, 1)Alupuram, 2)Hirakud 3)Belgaum	60.46 (Hirakud) 63.33(Alupuram) 65.34(Belgaum)	**Private sector** unit belonging to a **MNC**
4.	Bharat Aluminum Co, Korba, MP	65.96	Most **energy inefficient;** Public sector unit belonging to Government of India

All the interviews were done at the plant level.

Section II PROFILE OF COMPANIES

National Aluminum Company Ltd (NALCO)

Nalco, established in 1981, is the largest manufacturer and exporter of aluminum in India. It has largest integrated facilities from mining to smelting. Its capacity is shown below.

Bauxite mining	2.4 Mn tpa
Alumina refining	800,000 tpa

Smelter	230,000 tpa
Captive power plant	720 MW

During 1998-99, its production of aluminum was 146,000 tons. The turnover in last financial year, 1999-2000, was Rs. 21,420 Mn. and the net profit was Rs. 5120 Mn. It has 6400 employees.

NALCO is a public sector unit with 87% of the equity held by the Government of India. Recently the disinvestment commission has recommended 30% of the equity to be divested but no final decision has been taken so far.

The company has ISO : 9002 & 14001 certification. The company's investment in pollution control measures adds up to more than Rs. 2000 Mn. It has planted more than 5 Mn trees in the vicinity. The captive power plant has an ESP installed and also a stack of 150m height to reduce pollution due to flue gases.

The company has plans to almost double the capacity to 4.8 Mn tpa of bauxite, 1.575mn tpa of alumina, 375,000 tpa of aluminum and 840 MW of power.

Bharat Aluminum Company Ltd, (BALCO)

BALCO is a public sector undertaking set up in 1968. It has two plants, one at Korba in Madhya Pradesh and another at Bidhanbag in West Bengal.

BALCO has a capacity for 200,000 tpa of alumina and a 100,000 tpa smelter. It has captive power plat of 270MW. It has 6600 employees.

During the financial year 1999-2000, the turnover was Rs. 8980 Mn and the net profit was Rs. 700 Mn.

Indian Aluminum Company Ltd (INDAL)

Established in 1938, INDAL was till recently a subsidiary of Alcan Group and Alcan Aluminum Ltd. Canada held 54.6% of the equity. Recently it has been sold to Hindalco.

INDAL has plants at Alupuram in Kerala, Hirakud in Orissa and in Belgaum in Karnataka. It has a capacity to produce 117,000 tons of aluminum per annum. It has 6500 employees.

INDAL has ISO 9002 certification as well as IS 14001 Environmental Management System Certification. It has an electronic journal on environmental management called Enviro-Mail.

Hindalco Industries Ltd (HINDALCO)

Hindalco is private sector unit belonging to Birla Group. It has the plant at Renukoot in Uttar Pradesh.

Hindalco has capacity of 242,000 tpa of aluminum. It has 12,000 employees.

During the financial year 1999-2000, the company's turnover was Rs. 20310 Mn and the net profit was Rs. 6120 Mn.

Section III KNOWLEDGE & ATTITUDE TOWARDS ENERGY EFFICIENCY & CO_2 EMISSIONS

Key issues

The key issues faced by the units in the industry seem to vary depending on their location and ownership. The only common issues among the units are technology and Government interference. The importance attached to different issues by the individual units is shown below by the rank of priority where '1' indicates the highest priority.

	NALCO	INDAL	HINDALCO	BALCO
Technology – availability, cost etc.	-	1	-	1
Government. Interference - Policy, tax etc.	1	4	3	-
Finance - funds availability	-	-	1	-
Energy – efficiency, better usage	-	-	2	2
Labor	2	-	-	-
Market – demand, competition	-	2	-	-
Environment	3	-	-	-
Pressure from politicians, anti-socials	-	3	-	-

Hindalco by its corporate culture pays heavy attention to finance and it is the only unit mentioning finance as a key issue. On other hand it feels, "*technology is available from many sources"* and is not an issue.

The issues like labor problems and political pressure are dependent on the specific location of the units. Generally private sector units have less of labor problems. Hindalco says *"We haven't had any disruption since 1974".*

BALCO have mentioned energy efficiency as an important issue faced as it has the lowest energy efficiency among all the four aluminum units (65.96 GJ/ton). Hindalco, which is one of the most competitive producer worldwide, also feels that energy efficiency is a key issue to cut down the costs.

Only NALCO has indicated environment as one of the key issues as it is located in an area surrounded by thick forests. All the others claim that they have taken sufficient measures and that it is not an issue. In fact Hindalco says *" We are pretty knowledgeable (on environment) and are always within (statutory) limits".*

Though global market undergoes cyclic ups and downs, only INDAL feels market demand to be an issue. Hindalco, which has taken over the Alcan's equity in INDAL feels that it is in a strong market position with this take over. (By the latest unconfirmed news reports on 13th July, Hindalco is also vying for a share in BALCO).

All the aluminum companies seems to have taken elaborate steps in creating their own infrastructure for power, roads, water etc. at the time of setting up the plant itself and do not find it to be an important issue. Only problem they face because of their interior location is accessibility.

Areas for energy efficiency measures

NALCO sees scope in process and furnace and INDAL sees scope in process alone. Hindalco feels that it has reached high level of energy efficiency. It says, *"Only in our old type furnace, some saving in energy consumption is possible"*. BALCO which has poor energy efficiency sees scope for energy efficiency measures in all the areas - furnace, kiln, boiler and process. All the units feel that there is scope in the usage of energy in the process.

Impediments in undertaking energy efficiency measures

All the units except Hindalco have cited equipment or technology as one of the impediments in undertaking energy efficiency measures. NALCO, which is facing labor problems, have said that the attitude of the employees is one of the constraints in implementing the energy efficiency measures. Hindalco considers poor quality of coal as the only impediment in attaining energy efficiency. *"We get D grade coal with as much as 47% ash content and our equipment are not designed for this kind of coal".* BALCO, which is a public sector unit, is expecting a divestment of part of the Government equity. So it is not going ahead with any investment towards energy efficiency measures.

Energy efficiency measures undertaken

NALCO had earlier improved the calciner and the smelter. NALCO's energy efficiency measures are at present more software oriented. It has an awareness program to educate energy users and operators about the right operational methods and the correct operational parameters. *"If the operations are carried out correctly that itself can avoid lots of wastage in energy".* This program is a continuous on-going one. As part of the ISO 14001 certification also there are set procedures for monitoring and controlling energy consumption.

INDAL has undertaken energy efficiency measures in the electrolytic process as well as to cut down the auxiliary power consumption. It has reduced transmission losses and improved the insulation of cooling towers. It has also replaced much of the equipment like compressors with more efficient ones.

Hindalco seems to have undertaken lot many measures to improve energy efficiency. It claims to be the first in the world to put up energy efficient "Gas Suspension Calciner". In the pot room (electrolytic process), it has modified the bath chemistry, has changed the size of the

anodes and introduced optimization through microprocessors to achieve current efficiency of 95%. *"Even the best units in the world have only 90% efficiency".* In the Alumina plant, it has introduced Renault Indirect Steam Heating Process to cut down energy consumption.

BALCO had undertaken modernization of the smelters resulting in reduced energy consumption. They have introduced new technology in the kilns and have replaced the burners. This has reduced the oil consumption substantially. At present though no substantive measures are under implementation, it has initiated a project to modernize the boilers. The consultants of BALCO are evaluating various options. BALCO has tried on an experimental basis additives to the flux. But these are yet to show any clear results by way of reduction in energy consumption. BALCO has undertaken non-conventional energy usage in a small way by implementing hot water systems in their canteen and club.

Decision making process

The decision making process is generally more top-down though avenues for suggestions from the bottom are kept open. Identification of the energy efficiency measures come from the individuals or groups at the operational level. Similarly in INDAL there is an Environment Resource Conservation Committee which identifies new areas for energy efficiency. In Hindalco, there is a Quality Circle in every department that comes out with energy conservation ideas. Hindalco claims that energy efficiency measures are '*bottom driven"* in their company so that they will be effectively implemented. Only in NALCO, the energy efficiency measures are identified at the unit general manager level. In BALCO, energy audits conducted periodically and suggestion schemes throw up ideas for energy conservation.

Discussions on the energy efficiency measures are generally held in groups. In NALCO, these are held in 'management review meetings'. In Hindalco, the discussions are held at Chief

Engineer/Supervisor level. In BALCO they are discussed *"right from grass roots level to the boardroom".*

Final approval always comes from the top management. In NALCO, the Executive Director gives the approval. Chairman gives the approval in the case of INDAL. In Hindalco, it is the President of the company. In BALCO, there is some amount of delegation of the powers for approval depending upon the level of the process and the investment.

Future energy efficiency measures contemplated

Generally the implementation of energy efficiency measures are a continuous process in the units. NALCO says, *"We always update, review and modify the energy efficiency measures".* It has plans to replace many of the old equipment with more efficient ones. INDAL has plans for introducing instrumentation controls and automation in the plant. It also plans to introduce energy efficient lighting and solar heaters. Hindalco, which already has achieved high level of energy efficiency, plans to cut down the specific power consumption further. BALCO says that only one phase of the modernization of its smelters has been completed and work will continue in phases. It plans to introduce automation at many places including feeding of aluminum.

Motivators for energy efficiency measures

Monetary concerns seem to be the primary motivator for energy efficiency measures. Though the units claim that environmental concern is also a motivator, it is only secondary. NALCO says, *"Energy efficiency measures help us to have good margins. We know that we are heading for tough competition both domestically and internationally. In these circumstances, to keep us competitive and ahead of others such measures are required".* It claims, *"Energy efficiency measures do depict our environmental concern as it is part*

of efficient use of material resources We always take into account global view on these issues". The motivator for INDAL is return on capital. Saving on resources and recognition are the other motivators for them. INDAL has an internal reward system for energy efficiency ideas. For Hindalco, cost-benefit advantage is the motivator for energy efficiency measures. Better company image is another motivator. It says the energy efficiency measures per se would not improve the products. BALCO says, *"Energy efficiency is the need of the day".* It feels that energy efficiency measures are required to reduce the cost of production. BALCO feels that environment is less of a priority than production. *"We have to be competent enough to survive, then only can think of environment".*

Impact of poor energy efficiency on environment

All the respondents concur that poor energy efficiency will affect the environment. NALCO says that any inefficient use of energy will dissipate energy outside the system as heat or other forms and will affect the life around. It will also create shortage of available natural resources. Hindalco says that if the equipment like kiln does not operate efficiently, the oil consumption will go up affecting the environment. Similarly bad quality of coal will lead to higher generation of fly ash affecting the environment. BALCO feels that poor energy efficiency due to improper burning of fuel will lead to higher emissions of particulate matter and other gases.

Areas of concern pertaining to environment

Effluents, emissions of particulate matter and emissions of NOx & SOx are the major areas of concern indicated by the units. Hindalco has mentioned spent pot lining as a toxic substance affecting environment. It claims that it had invested in R&D to recycle this. All the units are on the defensive about environment saying, *"We are within limits on all these areas and there is no reason to be concerned about these"*. Hindalco and Indal mention CO_2 emissions as an area of concern.

Effect of CO_2 emissions

All the units are broadly aware about the effects of CO_2 emissions. But the extent of their understanding varies. Some of them have notions that may be scientifically incorrect. NALCO says, *"Globally it will have a warming effect but locally it will have a positive effect by helping the growth of vegetation and trees."* NALCO feels that it can reduce the effect of CO_2 emissions. It says, *"Our aim is to have sufficient plantations to neutralize CO_2 emissions. Trees act as barriers to many environmental effects on the community".*

INDAL believes that both global warming and ozone level depletion are caused by CO_2 emissions. Hindalco is aware of the global warming effect caused by CO_2 emissions. *"We can feel the heat going up every year".* BALCO says, *"CO_2 emissions will result in rise in temperature if not today tomorrow".*

Impact of global warming

The impact of global warming is well known among the units. But as in the case of CO_2 emissions, there are misconceptions among some. NALCO says, *"The average temperature of earth and atmosphere will go up. I have read in newspapers that the polar icecap will melt within 100 years".* INDAL says, *"With glaciers melting, water level will go up. Low lying areas like Bangladesh will immerse. Land area will shrink".*

Hindalco says, *"The level of oceans will rise, lands will submerge".* But its executive feels that global warming can be a boon sometimes. *"With increased population in future, we would require more water for consumption. Global warming can bring higher evaporation and condensation thus increasing the quantum of water cycle"*

Relevance of Global Climatic Change on the industry / company

General opinion is that Global Climatic Change will have very little impact on the industry and

is not highly relevant. Particularly it is felt that there can not be any direct impact on the industry. Whatever relevance is limited to them being part of the globe. INDAL executive says, *"With the present level of operation the impact on us will not be much".* Hindalco executive says, *"Aluminum industry is a small player and it won't affect us".* He goes ahead to say, *"Here we are already having extreme climates of 5 Degree C to 42 Degree C and we are used to it. Another 2 Degrees more won't matter. There will not be much of difference in the comfort levels".* BALCO executive says, *"It does not directly affect. The production is not affected though there may be some slippage in the productivity".*

Role company can play

The companies see their role mainly as efficient usage of energy. NALCO says, *"We will go for energy efficiency by having complete assessment of the operation. We can educate people and our employees on economic use of energy because benefit will come from it. We can also help to consolidate opinion on efficient use of energy in common forums like CII".* Hindalco says, *"We can look for avenues to cut down fuel consumption. We can switch over to better quality fuels. We can also adopt if any better technology exists and if it is viable".* BALCO says, *"We can replace GHG usage in fire extinguishers, compressors etc. We can plant trees. We can efficiently use the fuels".*

Section IV AWARENESS & VIEWS ON CO_2 EMISSIONS MITIGATION

Awareness about convention on CO_2 emissions

Most of the respondents have heard of international conventions on environment. But some of them are unable to say or do not know anything beyond the name of the convention. Also Montreal protocol and Rio convention have better top-of-mind recall. In fact some of them are

confused about the subject matter of each of these.

NALCO executive says, *"I am aware of the conventions starting from Montreal Protocol, Rio…. Kyoto".* Hindalco says, *"We are aware of Kyoto Protocol and emissions trading. Our President is the Vice-Chairman of International Primary Aluminum Institute and one of the major agenda before IPAI is climate change".* BALCO executive says that he is aware of the convention but unable to say anything beyond.

Relevance of the convention to the industry

None of the respondents could say clearly the relevance of the convention to the industry. NALCO executive says, '*The convention is advantageous, it facilitates flow of funds. It will improve the health and safety of people"*. BALCO executive calls the convention *"the requirement of the day".*

Thrust of UNFCCC

Generally the respondents are positive about the convention though there have been some strong negative views. NALCO executive says, *"This convention is propounding a very good concept. Developing countries can get much needed funds to improve environment. At the same time developed countries can also have opportunity for growth by purchasing environmental credit. This is a mechanism for sustainability".* INDAL executive says, *"This convention treats earth as one single platform to sustain it for the future".*

Hindalco feels that though there are advantages it may be used to market the products of developed countries. It also considers that emissions trading may completely let off the developed countries from having any commitment to the ideals of the convention and continue

with their lifestyle. Its executive says, *"We agree in principle to the convention. But the mechanism will be put down our throats. By emissions trading, they may continue with emissions levels. It will also be used to sell their equipment. However it may bring more job opportunities in our country".* Surprisingly the Hindalco executive is under the impression that the developing countries also have commitment on emissions reduction.

India's role in the region

The respondents feel that India can play an important role in emissions reduction in the region by being a model for others. NALCO executive says, *"It is possible to share clean energy across borders in the SAARC region. Bangladesh has natural gas; Pakistan has hydro power".* INDAL executive says, *"India's actions will be in the lime light".* BALCO executive says, *"India is a leader in the region; what it does today, others will follow tomorrow".*

Steps taken towards utilizing the flexible mechanisms

Though none of the companies have taken any steps towards utilizing the flexibility mechanism, they are all taking note of the developments. NALCO executive says, *"We are watching, it is going to take lot of time for the mechanism to become functional. Independent certifying bodies have to be set up. Country specific, industry specific norms have to be developed".* Hindalco also has not taken any steps towards utilizing the mechanism. Its executive says, *"We have it in mind (of using). It is not that we don't know".*

Disposition towards carbon emissions trading

All the units are positively inclined towards carbon emissions trading. The main attraction seems to be the funding under the mechanism. NALCO executive feels that it can be used to improve profitability and competitive advantage. INDAL executive is attracted by the easy access to funds. But he says, *"The pollutants may be shifted to developing countries".*

Hindalco executive feels that it is positive mechanism. He says, *"External funding is always welcome"*. BALCO executive feels that there is no question of liking or disliking. He says, *"Clean environment is the need of the day; everybody has to follow and contribute"*.

Ways of using

None of the units have clearly identified areas for carbon emissions trading. A NALCO executive says, *"There are lot many places (for using). Let it come. We are there to make use of it efficiently and effectively"*. An INDAL executive says, *"It can be used to replace obsolete technology with upgraded better technology"*. A Hindalco executive says, *"It can be used to replace equipment"*. A BALCO executive is not sure where it can be used.

Additional information needed for evaluation

A NALCO executive wants to know the standards applicable to aluminum industry, the independent body that will audit and certify and details about credit mechanism. INDAL executive wants to know the impact on the economics of the project. Its executive says, *"We want to know the success stories in using emissions trading. Some live examples can be indicated"*. Hindalco executive wants to know the technologies available and their relevance to our country.

Motivators to emissions trading

Generally the funding and the financial advantage seem to be the main motivators. NALCO executive feels that apart from financial benefit, global goodness is also a motivator. INDAL executive feels that improvement in profitability will be the motivator. Hindalco executive feels that both access to technologies and funding will be motivators. BALCO executive feels that access to technologies will be the motivator.

Reservation against foreign funds

None of the units have any reservation against any foreign investment coming in. None of them feel that such funding will affect India's interests. INDAL though does not have reservation on funding, feels that uncertainty in foreign exchange rates can cause difficulties. BALCO executive says, *"Already there are plans to divest part of the Government's holding and it is open to foreign companies also".*

Preference among countries

There is no preference on where the funding comes from. BALCO executive says, *"Money is money as long as it used for betterment. We have taken equipment funding from different countries like Hungary, Russia and UK".*

Role of Government in emissions trading

There are differing opinions on the role of Government. Whereas some feel that Government should be only a facilitator and should not have any regulatory role others expect Government to play a regulatory role also. NALCO says, *"The Government should not have any regulatory or administrative role. It should only formulate recommendations. It can be also a facilitator as the trading involves international exchange of credit".* INDAL also feels that Government should play a regulatory role but of different nature. It says, *"The Government should take care to protect the country's economy. It should ensure that no single sector takes all the funding".* Hindalco says, *" Government should not come in between. It should formulate policy guidelines and stop at that. If Government is allowed a role in the transaction, red tapism will affect the trading".* BALCO says, *"Government should play a regulatory role. It should see to that the funds are used*

properly and are not diverted. It should also ensure that no obsolete technology is brought in". In the aluminum sector, there is no concurrence among the industries on the role Government should play in CET.

Section V PREFERENCES & INFORMATION NEEDS ON CARBON EMISSIONS TRADING

Specific information needs on emissions trading

The respondents generally feel that they know very little about emissions trading. Hindalco executive says, *"We would require the entire literature on this. We know only what we hear from here and there".* They would like to know all aspects about it like implications of the emissions reduction policies on the company, relative merits of technologies for CO_2 mitigation, cost economics of the technologies and the funding mechanism.

Key people to receive information

Generally it is felt that the information on emissions trading should reach the top management - Director, Chairman, President. A Hindalco executive said, *"Our president will mark it to person concerned".* Obviously the President is expected and expects to be in the know of what is happening. A BALCO executive said, *"Our directors may be busy, so a copy can be sent to environmental department".* In most of these organizations, there is a director level person in charge of safety, health and environment. Instead of the plant level people, it is generally suggested that the information should be sent to the head office or to corporate management. Also it is felt that the policy and funding information should be sent to corporate management and the technical information to the plant.

Mode of information dissemination

There are different opinions on the mode and form of information. NALCO executive says, *"At present, we would require it in hard copy - in book form, but in future it can be done through electronic media like websites".* Hindalco executive says*, "Newsletter would be the best as we have a culture where people like to read".* INDAL executive says, *"Training program to senior managers would be the best".* BALCO executive says, *"Form depends on information, one mode will not give full impact. Literature alone may not be sufficient, training program is necessary to make them get involved. Also repetitive opportunities to see are necessary".*

Participants in the dissemination program

Interest in participating in the program seems to be widespread. Unit managers, environmental executives, finance people, corporate management etc. are expected to be the interested participants. BALCO executive says, *"Everybody will be interested in such a (important) matter".*

Content of the program

The content should be of both technical and commercial nature. Policy, funding mechanism, advantages / benefits to the country and company etc. some of the suggested contents. Hindalco executive says, "*Along with details about the mechanism, there should be spicing by way of financial benefits as we are a commercial organization".* NALCO executive says, *"More concrete information should be provided, not mere concepts or philosophy".* BALCO executive says, *"The focus should be on problems not of today, but for generations to come. That the survival of humankind depends on maintaining the environment should be highlighted".*

Way of organizing

Everybody wants the program to be organized in their place. Hindalco executive says, *"We have all the facilities for holding the program. It should be of short duration preferably one session of 2 to 4 hours so that even top level executives can participate"*. INDAL executive says, *" It should be held at least within our state"*. BALCO executive says, *"If you organize it at our place, the involvement will be more and more people can participate"*.

Interest in participating

All the respondents are keen in participating in the program.

Role of different parties

There is no consensus on the role to be played by different parties. Government is generally is expected to play an enabling role as a facilitator. Hindalco executive says that Government's role should be policymaking. BALCO executive says, *"Government should be an informer and provide directive guidelines"*.

There seems to be some amount of dislike towards NGOs among the respondents. This may be due to the activities of NGOs in organizing people in the neighborhood for some collective demands. A Hindalco executive says, *"I don't like NGOs, they are more of nuisance value in our place. There are only a few good ones"*. An INDAL executive says, *"True NGOs can be opinion makers"*. NALCO feels that NGOs can be the independent certifying body. BALCO executive says, *"We are not in tune with them"*.

Industry associations have a good rapport with the companies. Associations are considered to be good for organizing seminars and circulating information. INDAL executive says, *"They are ideal for interchange of ideas and views".*

International Development Agencies are expected to create awareness and fund promotion programs. Hindalco executive says, *"They can provide the knowledge and funding".*

Multilateral agencies are expected to help in developing policies in association with the Government. INDAL executive says, *"They should restrict their role to their functional area".*

Most credible source

Industry associations like CII, FICCI etc seem to be the most credible source. NALCO executive says, *"We can have friendly exchange of views with them".* INDAL executive says, *"We understand (each other) better and there are no politics".* The only other credible source mentioned is Government. BALCO executive says, *"We know them better and they are approachable".*

SECTOR : POWER

Section I INTRODUCTION

Historical background

Power development efforts on a large scale started in India only after independence. It was recognized as a major input for economic development at the formulation of the first five-year plan in 1951. Since then, the outlays for the power sector have been raised in successive five-year plans. While the first two plans focussed on hydropower, the following plans have laid emphasis on thermal power projects.

Present production scenario

With the impetus given to power generation, the installed capacity of power utilities increased from 1,362 MW in 1947 to 93,249 MW in 1998-99. Electricity generation rose from 4.1 billion kWh in 1947 to 448.4 billion kWh in 1998-99. Length of transmission lines has increased from 29,271 kms. in 1950 to more than 4 million kms. in 1998-99.

The rate at which power generation capacities have increased in India after independence is indicated in the following table where figures are in MW.

Year	Thermal	Nuclear	Hydro	Total
1950 – 51	1,100	0	600	1,700
1960 – 61	2,736	0	1,917	4,653
1970 – 71	7,906	420	6,383	14,709
1980 – 81	17,568	860	11,791	30,214
1990 – 91	45,768	1,565	18,753	66,086
1998 – 99	67,617	2,225	22,439	92,281

Planned Capacity Addition

In the eight plan period (1992 - 97) it was planned to add a capacity of 48000 MW. However, on the basis of shortage of resources, this target was reduced to 30,538 MW. Finally, only 16,423 MW was added during this period (which is even lower than the 21,401 MW added in the seventh plan period (1985 - 90)). Reasons identified for this slippage include paucity of funds, non-resolution of inter - state disputes, unresolved issues of fuel linkages and resettlement and rehabilitation problems. The announcement of policy for private sector participation in power generation was seen as an opportunity for states to minimize their own involvement in power projects and hence projects scheduled for commissioning through state sector resources were not provided adequate funds for timely completion.

Plant Load Factor (PLF)

PLF which had been a poor 45% in 1980 - 81 has steadily increased from 54% in 1990 - 91 to about 65% in 1998 - 99.

Transmission & Distribution (T&D) Losses

The T&D losses in India are much higher as compared to most countries in the world. India has a T&D loss of about 24% as compared to about 5% to 8% loss in the developed countries. Large-scale theft is attributed to be one of the major reasons for such high losses. Other reasons given are inefficient transmission systems, inadequate capacitors and a huge LT distribution network.

Environmental aspects

Some of the major environmental concerns in the power sector can be divided as those due to coal transportation and those due to power generation.

Coal Transportation related Environmental problems

To obviate the need for transporting coal over long distances, most of the coal-based power plants are located at the pitheads of the coal mines themselves. In the cases of power plants not located near the source of coal, the Government of India has made coal benificiation a thrust area. According to a notification issued by the GOI on 19th September 1997, only benificiated coal with an ash content not exceeding 34% can be used by:

- any thermal power plant located beyond one thousand kilometers from the pithead, and
- any thermal power plant located in an urban or sensitive area or critically polluted area irrespective of their distance from pithead except and pithead power plant.

This is to become effective from June 1st, 2001.

Suggestions have been made to improve the means of transportation of coal so that the power generation program does not suffer setbacks because massive coal traffic requirements from mines to power stations cannot be met. These suggestions include development of inland waterways, coastal canals, coastal shipping, rail-cum-water way transport systems and coal slurry piping systems.

Power Generation related Environmental Problems

Environmental Pollution sources in a coal based thermal power plant are transportation of coal, handling and pulverizing of coal, emissions through stack, water effluents from the plants being discharged on mainland / water bodies and waste generated (mainly coal ash and fugitive dust emissions). To counter these pollution, power plants have been provided with many pollution control devices like dust extraction / suppression systems for coal handling plants, low NO_x burners, high efficiency Electro-Static Precipitators (ESPs), tall stacks, integrated effluent treatment plants, etc. These devices cost about 10% of the capital cost of the project.

While efforts to generate maximum power with the existing capacities are being done, the efficiency of generation are to be improved which would eventually result in reduced CO_2 emissions per unit of electricity generated. While there is no limit on developing countries as yet to reduce their CO_2 emissions, even a 1% increase in the efficiency of over 50,000 MW of thermal power capacity in the country could result in a saving of more than 2.5 million tons of CO_2 emissions.

Criteria used for selection of sample units

In the public sector, central Government's corporation for thermal power generation, NTPC was contacted at its headquarters. Apart from this, two of the NTPC's thermal plants have been chosen based on the size and likely environmental impact due proximity to urban areas. One more power utility in the public sector, namely NLC, which is into lignite mining and power generation using lignite was contacted. Among the state EBs, one energy efficient EB, one energy inefficient EB and two average efficient EBs were contacted. Two generating companies in the private sector were contacted. Two of the newly coming up private sector IPPs were also contacted.

Section II PROFILE OF COMPANIES

The brief profile of the companies contacted for the study is indicated in the following table.

No.	UNIT	Energy efficiency Coal consumption (Kg / kWh)	REMARKS
1	NTPC, Delhi*	-	Headquarters of thermal power generation utility
2	Ramagundam Thermal Plant, Ramagundam, AP	-	One of the largest thermal plant of NTPC
3	National Capital Thermal Power Project, Dadri	-	Thermal plant of NTPC in proximity to urban area
4	Neyveli Lignite Corpn, Neyveli, TN	-	Public sector power utility belonging to Central Government using lignite as fuel.
5	Punjab State Electricity Board, Patiala*	0.70	EB having most energy efficient thermal generation
6	Maharashtra State Electricity Board*	0.80	
7	Andhra Pradesh State Electricity Board, Hyderabad	0.80	EB having average energy efficient thermal generation (close to national average of 0.74)
8	BSES, Mumbai*	-	Private sector power generation licensee
9	CESC, Calcutta*	-	Private sector power generation licensee
10	Tata Electric Companies, Mumbai	-	Private sector power generation licensee
11	SPIC Power Corporation, Chennai*	-	IPP implementing thermal power project
12	DLF Power Corporation, Delhi*	-	IPP implementing various power projects

The ones marked with * were done at the headquarters / corporate office. Others were done at the plant level.

Section III KNOWLEDGE & ATTITUDE TOWARDS ENERGY EFFICIENCY & CO_2 EMISSIONS

Key issues

The key issues that are discussed by the top management are the three factors that are inter-linked namely raw material, environment and efficiency.

As of today, almost all the thermal power projects in India are coal based. The Government of India is presently encouraging setting up of thermal power projects based on other fuels like LNG.

Most of the Power Plants mentioned environment as a key issue. The other key issues that were predominantly mentioned were efficiency, raw material quality and availability of funds.

The raw material quality is linked to the environment factor as respondents feel that with better quality raw material (coal), the ash generated could be reduced significantly and further, the efficiency of the plant too could be improved.

Stray mentions of market (competition) were made. These were from the western region (Maharashtra) where the competition has increased with the commissioning of the first phase of the large private sector Dhabol Power Company project.

Areas for energy efficiency measures

Most power plants feel that there is scope for energy efficiency measures in the turbine. The other area where there is a feeling that there is scope for energy efficiency is boiler.

Impediments in undertaking energy efficiency measures

When it came to undertaking energy efficiency measures, the major barriers mentioned were fuel quality and funds. A couple of companies mentioned outdated equipment as a barrier to undertaking energy efficiency measures.

Energy efficiency measures undertaken

Most power plants maintain that the measure of energy efficiency is a continuous ongoing process. It is only the steps are taken to improve the efficiency as and when funds are available for the same.

Some of the energy efficiency measures taken recently in Power Plants are listed below using quotes.

'Energy efficient motors and off line testing instruments have been installed' (NTPC)
'ESPs were fixed to control flying ash' (NLC)
'Software package to detect online efficiency of boilers was purchased.' (BSES)
'Power factor improvement capacitors were installed in the systems' (BSES)

Decision making process

The energy efficiency measures are generally identified at the supervisor level and discussed at the department head level. In the public sector undertakings, the decision making is always a top-down process. However, in some of the privately run power companies, there is enough encouragement for middle level and supervisory level employees to voice their opinions and suggestion on how to improve efficiency.

The final approval for energy efficiency measures comes from the top management.

Future energy efficiency measures contemplated

Most power plants said that energy efficiency measures continue to be reviewed on a regular basis. Some of the specific measures mentioned follow.

'Conventional power generation unit will be converted to a combined cycle unit' (TEC)
'Try to use better quality coal to improve overall efficiency' (NTPC)

Motivators for energy efficiency measures

As already seen, most Power Plants believe that the energy efficiency measures are an ongoing process. When questioned on the major motivators for the steps they take for energy efficiency measures this is what some of the respondents had to say:

'Cost (control) along with concern for environment are the major reasons' (NTPC).
'Profit and company image are important. By being concerned about environment, company image goes up' (MSEB).
'People live close to our plant and we also have our own township nearby. Hence we have to keep the environment clean' (NLC).
'Financial gain. Every loss in the Plant is a monetary loss for the company' (BSES).

Most respondents mention cost savings as the major motivator for undertaking energy efficiency measures. However, when questioned, they say that environment is also a key factor and in any case environment protection is directly related to efficiency.

The major concerns on environment related matters are effluents, particulate matter, SO_x, NO_x emissions, noise and emissions of CO_2. Of these, emissions of particulate matter and

emissions of CO_2 are considered the most important.

Impact of poor energy efficiency on environment

Energy efficiency is considered very important for power plants both from the viewpoint of savings in operational costs (mainly fuel) and reduction in emissions. This was the viewpoint of almost all the companies contacted in the power sector.

Areas of concern pertaining to environment

Particulate matter and CO_2 were considered the major areas of concern in thermal power plants. A few mentioned effluents as a cause of concern as well.

Effect of CO_2 emissions

Most of the power plants were of the view that CO_2 emissions cause global warming. Some of the views are:

'Global warming. The sea level will increase and coastal areas will get submerged.' (NTPC)
'Global temperatures are changing. 1998 was one of the hottest years of the century. Ocean / Sea activities are changing' (BSES)

However, there are some respondents who feel that the effects of CO_2 will not be all that much. Some such views are:

'There will be some warming but the effects will not be to the exaggerated levels as put forward by many western scientists' (MSEB)
'There is no harm caused by CO_2. Plants absorb it. All this talk of CO_2 emissions are built up by western nations to sell their technologies' (TEC)

Impact of global warming

Most respondents felt that there will be adverse effects like general temperature increases and some respondents even mentioned ocean levels rising to submerge coastal areas. A few respondents did feel that the changes in temperatures would be minimal and all the issues of global warming are largely exaggerated.

Relevance of Global Climatic Change on the industry / company

Many companies view CO_2 emissions as relevant to the company. Some examples,

'The issue of climate change is relevant not only to our company but of relevance to the entire global power generating industry.' (NTPC)

'CO_2 emissions are of relevance to our company as we are large-scale coal users. If better quality of coal is economically available, we can be more efficient and hence less polluting' (MSEB)

'Global Climatic Change has relevance everywhere as the Global Atmosphere is one. Everyone has a role to play in protecting the atmosphere from excess emissions' (BSES)

However, there are companies who do not think that CO_2 emissions are of any relevance to them.

'There is no restriction in our country for CO_2 emissions. It is more of a ploy by vested interests' (TEC)

Role company can play

Many power plants say that their company is already taking the necessary steps.

'We have put forward a proposal to clean the coal. This will help in improving efficiency hence reducing emissions' (MSEB)

'We have planted 10 lakh trees around our plant so this will take care of most of the CO_2 that is emitted to be absorbed.' (NTPC)

'Latest technology is used in our plant. By this way, we have kept our CO_2 emissions to the minimum' (BSES)

One totally different view that was given was
'We can educate people not to get fooled by western countries and produce more power and move towards development' (TEC)

Section IV AWARENESS & VIEWS ON CO_2 EMISSIONS MITIGATION

Awareness about convention on CO_2 emissions

Most of the respondents are aware of some kind of convention / movement on climatic change. However, very few respondents were actually able to mention Kyoto Protocol. Some mentioned Rio Conference, Earth Summit, and Convention of the International Institute for Sustainable Future.

Relevance of the convention to the industry

On being introduced to the UNFCCC, most respondents felt that it was relevant to them.

Thrust of UNFCCC

The views of most respondents on UNFCC and CET are, by and large, positive:

'We welcome it provided there is transfer of technology' (NTPC)
'It is good. These conventions should not be conducted and forgotten. Implementation has to be done' (MSEB)
'The thrust of the convention is agreeable to us. However, smaller industries should also benefit from this with help from the Government' (NLC)
'If somebody from developed countries joins hands with us through this protocol and offers financial assistance, it would be most welcome' (BSES)
'Basic framework is good but how it will be implemented has to be seen' (NTPC)
'It is good provided all the countries sincerely participate in it' (MEDA)

However, there are a few negative responses too:

'The whole convention is a scare to stop developing countries from producing more power' (TEC)

India's role in the region

Companies feel that India can lead by example and reduce GHG emissions by adopting the new technologies of the developed countries. However, some respondents sounded wary and said that India should adopt a 'wait and watch' attitude, as there is no immediate danger from CO_2 emissions.

Steps taken towards utilizing the flexible mechanisms

None of the companies have taken any steps towards utilizing the flexible mechanisms. The power companies, mostly being in the Government / Public Sector, are waiting for the Government of India to take a stand on the issue before making any plans towards utilizing these mechanisms.

Disposition towards carbon emissions trading

The views on CET varies from positive to being guarded as can be seen from the following views:

'Proven technology should be transferred under CET' (NTPC)

'Basic information is available. Implementation should be taken up' (MSEB)

'I like CET but it is up to the Government to decide on implementing it' (NLC)

'If developed countries are honest about their commitments then both parties can be benefited' (BSES)

'CET is presently in the draft stage and it is difficult to say anything right now. Looks like it will benefit new projects. Government of India's view on the subject is of primary importance' (TEC)

'CET sounds good. We feel we can benefit by any technology that will reduce our CO_2 emissions' (NTPC)

'Under CET, we may be able to get Clean Coal Technologies at a low price' (APSEB)

Ways of using

Companies have not yet thought about ways and means of using CET. Once again most companies mentioned that they are waiting for the Government to decide on the issue before looking at ways of using it.

Additional information needed for evaluation

The areas on which respondents in the power sector sought information are as follows:

- Different technologies available under CET with comparative evaluation by an independent body
- Climate change policy details and its implications to the company / industry
- Information on funding options and the mechanism for arranging these funds
- Complete information on the outline, history and formulation of CET

Motivators to emissions trading

Generally funding and access to latest energy efficient technology were mentioned as the major motivators. Some respondents did mention other reasons

'Global environment is our responsibility also as a good corporate citizen' (BSES)

Reservation against foreign funds

Most respondents did not seem to have any reservations against foreign investment under CET. They feel that there are already a lot of foreign investments in India in various industry sectors and hence foreign investments under CET should not be a problem. However, there were some reservations:

'Investments under CET should be selective and properly spelt out. It should not be a sell out like Enron' (BSES)

Preference among countries

There was no specific country preference on the country from where investments would be coming. Respondents are of the view that the government already has policies on foreign investments and hence this should not be a matter of concern.

Role of Government in emissions trading

In the power sector the role of the Government in emissions trading is seen as that of a policy maker, facilitator and regulator. Information dissemination is also seen as a role that the Government can play.

Section V PREFERENCES & INFORMATION NEEDS ON CARBON EMISSIONS TRADING

Specific information needs on emissions trading

The areas on which respondents in the power sector sought information are as follows:

- Different technologies available under CET with comparative evaluation by an independent body
- Climate change policy details and its implications to the company / industry
- Information on funding options and the mechanism for arranging these funds
- Complete information on the outline, history and formulation of CET

Key people to receive information

Generally, it was felt that the information should reach the top management as well as the department heads. While general information on CET and its mechanisms would be helpful for top management, information on technologies would be helpful to the senior technical personnel for them to study in detail before passing their views on the same to top management for decision making. In the Power sector, most of the power generation units are still under the government and hence these units look up to the Government (ministry of power) to give them guidelines on all issues of importance. Hence, personnel in Power Plants felt that all

information would have to be first sent to the Ministry of Power and then be routed to them through the Ministry.

Mode of information dissemination

Companies had varied opinions on the way the information should be provided to them. Some of the more knowledgeable companies who already had a fair idea of CET looked forward to seminars and common forums to exchange views and opinions of CET. Others who did not have much knowledge of CET wanted the basic information in printed form.

Participants in the dissemination program

All the respondents said they would like to understand training programs on CET. The feeling was that these training programs would be more suitable for the technical / operational and R&D personnel in the company.

Content of the program

Most of the respondents wanted the training to focus on studying of the new technology and the in depth details as to the implementation of the project under CET.

Way of organizing

None of the respondents were very particular as to when and where the program should be organized.

Interest in participating

All the respondents showed a keen interest to participate in the program.

Role of different parties

Respondents were asked as to what role did they expect parties like the Indian Government, NGOs, Industry Associations, International Development Agencies like USAID and the multilateral agencies like UN / WTO to play in the helping the companies to understand and implement CET. The views are summarized in the following paragraphs.

The Government of India is expected to play the role of a Facilitator, Policy Maker and Regulator in CET projects. NGOs are expected to create general awareness of CET, express their fears with reasons for the same and share information that they have on CET. Industry associations are expected to disseminate detailed information among their respective industries regarding CET its benefits, technologies, fears / doubts, etc.

The sole role that respondents saw for International development agencies was for funding projects. Respondents felt that bodies like UN and WTO could play the role of forming global policies on CET and lay down the laws for the same. These bodies could also be mediators in the CET process and would be the awarding agency of the carbon points.

Most credible source

In the power industry, most of the respondents felt that the Government of India is the most credible source

SECTOR : CEMENT

Section I INTRODUCTION

Cement is the basic construction material and plays a critical role in the development of the nation. It is well known that a strong cement industry in the country indicates strong economic development. Cement is of tremendous importance in India where the per capita consumption of cement is one of the lowest in the world.

Cement is used for binding bricks or for bonding solid aggregate particles such as stone chips with or without reinforcement such as steel bars to form a monolith or reinforced concrete/prestressed concrete.

Historical Background

Cement production recorded a 14% growth during 1999-2000, the highest in the last decade. The buoyancy coupled with a price increase of about 4% during the above period reflects strong demand for cement during the year.

Cement was first manufactured in India in very small wet process kilns of as low as 60 Tons per Day (TPD) capacity. The manufacturing process developed over the years may be classified under the following categories:

- Wet Process
- Semi-wet/Semi-dry Process
- Dry Process

Over the years the capacity of plants in India increased to 300-600 TPD. Then came the advancement s in the pneumatic homogenization techniques in the sixties. This development brought

dry process of cement manufacture by suspension pre-heater (SP) kilns, reducing fuel requirements substantially. The unit capacity of SP kilns grew from 600 to 1200 and 1500 TPD and ultimately reached over 3000TPD with the introduction of pre-calciner technology.

New technological developments

During the last three decades, besides the above changes, the technological developments in the cement industry include on line computer process controls, on line quality monitoring and control systems incorporating X-ray analyzers, extensive instrumentation and automation. The above advancements have led to better energy economics and better process controls for producing superior quality cement with a greater consistency. Drive for energy conservation led to the development of vertical roller mills, five stage pre-heater and improved versions of pre-calciner along with appropriate instrumentation and control systems.

The Current Scenario

The cement industry in India is currently undergoing a process of expansion and consolidation. There has been a spate of mergers and acquisitions recently and Lafarge has been one of the big players. Lafarge has already taken over Raymonds Cement and Tisco. Cement Francais, Blue Circle, Cemex and Holdersbank are also looking for a possibility of acquisition. Gujarat Ambuja, India Cements and L&T have been on an acquisition spree and thus, consolidating the cement industry.

Criteria used for selection of sample units

For the study, a spectrum of most energy efficient to less energy efficient to inefficient units has been selected. The most energy efficient or the more energy efficient does not mean that they are the best in the world. In fact, they are rated as the more energy efficient by the Indian standards.

All the large conglomerates have been represented in the selected units. There are a few units that import coal for better efficiency. Some of them have export capabilities to offset the foreign exchange required to buy imported coal. A few of such units have been selected.

Section II PROFILE OF COMPANIES

Overall, fifteen companies have been interviewed. Their profiles are as follows:

No	UNIT	Coal consumption per ton of cement (in tons)	REMARKS
1	Maihar Cement Plant II, Maihar, MP	0.12	Most **energy efficient** among 1Mn plus plants
2	Raymond Cement, Bilaspur, MP	0.13	Most **energy efficient** among plants belonging to JK Group
3	Birla Vikas, Satna, MP	0.52	Most **energy inefficient** plant
4	ACC, Wadi, Karnataka	0.30	Most **energy inefficient** among plants belonging to ACC Group and among 1 Mn plus plants; one of the oldest cement plants in India.
5	L&T, Raipur	0.16	Most **energy efficient** among plants belonging to L&T Group
6	Malabar Cement, Palakaad, Kerala	0.11	Most energy efficient among **public sector** plants belonging to State Government of Kerala (the most environmentally 'aware' state)

No	UNIT	Coal consumption per ton of cement (in tons)	REMARKS
7	Idcol, Bargarh, Orissa	0.17	Energy efficient **public sector** plant (belongs to State Government Orissa)
8	TN Cement, Ariyalur, TN	0.17	Energy efficient **public sector** plant (belonging to State Government of Tamilnadu)
9	CCI, Tandor, AP	0.24	Most energy inefficient among **public sector unit** (belonging to Government of India)
10	DCM Shriram Cements (DSCL)	NA	
11	Dalmia Cements, Delhi	NA	
12	Kutty Cements	NA	Mini cement plant
13	India Cement, Erode		**Imported coal user**
14	Madras Cements, Tulakapatti, TN		**Imported coal user**
15	Shree Cement, Beaver, Rajasthan		**Imported coal user**

Except Dalmia Cements, all other interviews were done at the plant level. Dalmia Cements was interviewed at the corporate office.

These companies were further classified as Efficient and Inefficient. The imported coal users have also been classified as the efficient companies. The efficient companies have been further

subdivided into private sector and public sector enterprises. The detailed classification of the industries is given in the table below.

S.NO.	Company	Town/City	Zone	Energy Efficiency	Type of Company
1	Raymond Cements	Bilaspur	Central	Efficient	Private
2	Maihar Cement	Satna	Central	Efficient	Private
3	Larsen & Toubro	Raipur	Central	Efficient	Private
4	Dalmia Cements	Delhi	North	Efficient	Private
5	Shree Cements	Beawar	North	Efficient	Private
6	DSCL	Kota	North	Efficient	Private
7	India Cements	Erode	South	Efficient	Private
8	Madras Cements Ltd.	Tulakapatti	South	Efficient	Private
9	IDCOL Cement	Bargarh	East	Efficient	Public
10	TANCEM	Virudhnagar	South	Efficient	Public
11	Malabar Cements	Palakkad	South	Efficient	Public
12	Birla Vikas Cement	Satna	Central	Inefficient	Private
13	Associated Cement Companies Limited	Wadi	South	Inefficient	Private
14	Kutty Cements	Rajpalayam	South	Inefficient	Private
15	Cement Corporation of India Limited	Tandor	South	Inefficient	Public

The above classification is used throughout the following sections.

Section III KNOWLEDGE & ATTITUDE TOWARDS ENERGY EFFICIENCY & CO_2 EMISSIONS

Context of energy efficiency measures

The Indian cement industry is slowly catching up with the world. The dry process technology is gaining popularity and so are the energy efficiency measures. Almost all of the respondents surveyed are following dry process technology. The only exception found was a sludge-based plant set up by Lafarge, France for DSCL in Kota. This plant uses wet process technology but is

highly energy efficient. The plant is an example of conservation of natural resources and rational utilization of time rich waste sludge from calcium carbide plant. The plant in itself is an environment control and energy efficiency measure.

The cement industry in India is realizing the benefits of energy efficient systems and environment control measures. The energy efficient plants have most of their systems and equipment in place. Following is the status of energy efficiency measures in a typical private energy efficient plant:

"The pollution and environment control systems are already in place. The level of air and water pollutants is well below the prescribed limits".

In the efficient public sector companies, the systems are again in proper place and functioning well. New methods are being tried and new areas are being explored to improve energy efficiency. According to IDCOL, *"We are using hybrid coal for better energy efficiency. The motor ratings have also been optimized to conserve energy".*

In Malabar Cements, another efficient public sector plant new techniques to control pollution and increase energy efficiency are constantly applied.

The inefficient cement plants are contemplating new projects with better technology. This could probably be due to the realization for energy efficiency measures. For instance, Birla Vikas and ACC proposed a new cement plant of capacity 1.2 Million Tons Per Annum (TPA) and 4 million TPA respectively. Birla Vikas already has the clearance from Ministry of Environment and Forest. However, both of them are not going ahead with these projects because of the poor market demand and lack of funds. In spite of these two major barriers, the inefficient plants are taking up small measures in modernizing their existing plants. However, there are a few inefficient plants, which consider environment and energy efficiency measures as least important. Funding is the main

impediment for undertaking energy efficiency measures in the inefficient cement plants. A typical public sector, inefficient cement plant had the following to say about the lack of energy efficiency measures in their plant.

"We are not undertaking too many energy efficiency measures as this is a government concern. For any such measures constant funding is required. However, this is not so as government. has its own procedures and they take a lot of time." (Cement Corporation of India (CCI))

In a typical private sector plant – *"We have identified a lot of scope for energy efficiency measures, but they all need capital investment. If the capital investment has a pay back period of 2-3 years, then we can afford it, else not"* (ACC)

The efficient private plants have a different tone and claim that energy efficiency measures are undertaken continuously and they consider it as an ongoing process.

"Energy efficiency is a continuous process and our company will constantly undertake energy efficiency measures depending on the applicability" (L&T)

It goes for the efficient public sector companies as well. *"New techniques to control pollution and EE are constantly applied."* (Malabar)

In fact the energy efficiency measures are considered crucial for cost reduction in the energy efficient plants. *"For a cement company, the energy costs are 40% of the cost of production. Thus, any saving in energy would lead to an overall increase in profitability"* (L&T)

Key issues discussed by the top management

The cement industry is in a crisis in India right now. The market demand is falling and with the entry of foreign majors like Lafarge, the competition has intensified. Thus, it is obvious that market demand and competition are discussed by the top management of the cement industry across public and private sectors. The other key issue discussed is the poor quality of coal and other raw material. It is a well-known fact that Indian coal is not very efficient and generates a lot of ash. A few cement products (near ports) have already shifted to import coal to increase their energy efficiency and reduce their costs.

Areas for energy efficiency measures

The Indian Cement industry is slowly rising to the challenges in the energy efficiency area. They are still below the world standards and have some way to go. The private efficient companies are the front runners, the public-efficient are the followers and the inefficient industries are the laggards, who are slowly catching on. According to a private energy efficient enterprise,

"Energy efficiency is a never ending process. The scope for energy efficiency is there in all the areas. It is a continuous process of upgrading. This process cannot stop, even if there are a few barriers like technology" (DSCL)

Even an inefficient private company says, *"Energy efficiency is an ongoing process and we have certain groups under Total Productivity Management (TPM), where designated engineers are looking into the possibility of energy efficiency."* (ACC)

The energy efficiency measures can be classified as Major, Regular and Minor measures depending

on the effort and cost involved. A few examples of such measures found among the companies surveyed are listed in the following table.

Classification of energy efficiency measures

Major	Regular	Minor
♦ Modification of kilns ♦ Gas conditioning towers ♦ Loom pressure cyclone ♦ Modern Burners. ♦ Wind mills for power generation ♦ Installation of high thorough crushers ♦ Cogeneration plant	♦ Installation of Mechanical Transportation System (MTS) ♦ Mechanical Elevators to replace pneumatic handling ♦ Efficient coolers ♦ Variable speed drive motors	♦ Modification of coolers ♦ Fiber Reinforced Plastic (FRP) fans replacing metallic blade fans ♦ De Duster (DD) Cones ♦ Electro Static Precipitator (ESP)

Energy efficiency measures undertaken

The progress on energy efficiency measures of the cement companies is mapped with regards to the above classification.

Current energy efficiency measures

Major	Regular	Minor	No Measures
Private Sector, Energy Efficient			
♦ Raymonds Cement ♦ Maihar Cement ♦ Dalmia Cement ♦ Shree Cement ♦ DSCL Cement	♦ Dalmia Cement ♦ Maihar Cement ♦ Shree Cement ♦ Madras Cements ♦ DSCL Cement	♦ L&T Cement ♦ India Cement ♦ Shree Cement ♦ Madras Cement	
Public Sector Energy Efficient			
		♦ TANCEM ♦ Malabar ♦ IDCOL	
Inefficient			
	♦ ACC	♦ ACC ♦ Birla Vikas Cement	♦ Kutty Cement ♦ CCI

It is clear from the table that the private efficient plants are taking measures ranging from major to minor. Heavy investments have been made to install energy efficient systems. According to a typical private sector energy efficient plant,

In another plant, *"the plant leads the world in electrical energy efficiency. It also has one of the most thermally efficient kilns in the world."*(DSCL)

There are very few plants that are taking only minor measures in the energy efficiency area. These measures are for lower coal consumption, better instrumentation control for reduced power consumption, replacing of metallic fan blades by FRP fans and installation of ESPs.

Impediments in undertaking energy efficiency measures

In contrast to the efficient plants, the inefficient plants are undertaking only minor measures in the

energy efficiency area or are not undertaking any measures at all. The reason stated for this is deficiency of funds. For instance, Kutty Cements has said that funding is the only barrier in undertaking energy efficiency measures.

Decision making process

The energy efficiency measures are generally identified at the worker/supervisor/unit head/department level, discussed at the senior managerial/department head level and approved by the top management/Chairman/President level.

Future energy efficiency measures contemplated

The following table summarizes the future energy efficiency measures planned by various cement plants.

Future energy efficiency measures

Major	Regular	Minor	No Measures
Private Sector, Energy Efficient			
♦ Maihar Cement ♦ India Cement			♦ Raymonds Cement
Public Sector Energy Efficient			
♦ IDCOL ♦ TANCEM ♦ Malabar			
Inefficient			
♦ ACC ♦ Birla Vikas			♦ CCI ♦ Kutty

The Cement industry has chalked out some good plans for the future in the energy efficiency area. The industry is generally looking at the kiln and the processes to improve upon.

As seen in table above, the Public Sector Energy Efficient companies are planning to take major

energy efficiency measures. According to a typical Public Sector Energy Efficient enterprise,

"In future, the company is contemplating to start a co-generation plant for which the discussions are on with a consultant." (IDCOL)

The inefficient plants are also contemplating to take some major measures in the energy efficiency area. Most of these measures would be undertaken in the kiln and the process area. For instance, ACC says that,

"Further improvements are possible in the kiln and the process area."

However, the two companies who are not undertaking any energy efficiency measures currently are also not planning to do anything in the future. The main reason cited for this is lack of funds. Raymonds Cement, which has already taken up major energy efficiency measures, would be unable to do so in the near future due to lack of funds. They also seem to be reasonably satisfied with the achievements in the energy efficiency area.

Impact of poor energy efficiency on environment

We have seen that the Indian Cement industry is trying to be more energy efficient. The public sector enterprises are joining the bandwagon in a big way with several major projects planned in the future. The concern for energy efficiency is also growing amongst the inefficient cement producers. Along with implementation of the energy efficiency measures, the companies are also looking to protect the environment from any possible damage. They reckon that with a better energy efficiency, costs would be reduced and the environment would be safeguarded. A major private energy efficient concern has the following views for its energy efficiency policy:

"Energy Efficiency measures are undertaken by the company to reduce manufacturing costs, bring involvement among workers on environment and indirectly improve the company's image" (Maihar)

Others also have similar things to say on the relation between the energy efficiency and the environment. For instance,

"Poor utilization of fuel and poor energy efficiency leads to environment problem" (Maihar)

Even an inefficient concern, whose main motivation for undertaking energy efficiency measures is getting financial advantage, says that,

"Whatever energy we generate, affects the environment and if we are more energy efficient, then there would be lesser damage to the environment." (ACC)

Thus, we can see that most of the companies are realizing the importance of environment and the relation between the environment and energy efficiency. However, a few others are not able to correlate energy efficiency and the adverse effect on environment. For example,

" By saving energy, we are indirectly controlling the environment. However, if we are having poor energy efficiency there is no direct impact on the environment. If you are using some extra fuel for the processes and your pollution control systems are in place then there won't be any damage to the environment." (Birla Vikas)

Areas of concern pertaining to environment

Most of them had specific concerns with regards to effluents, particulate matter (as lot of dust is

generated in the cement manufacturing process), CO_2 and noise (as cement manufacturing is a very noisy process and most of them had to give ear protectors to their workers). NOx and SOx are not regarded as a major concern as the cement industry produces negligible amount of these.

Effect of CO_2 emissions & impact on global warming

Most of the respondents found CO_2 emissions as a cause of concern and very relevant to the cement industry. Many of them were also aware of its harmful effects and the impact it can have on the global environment in the form of global climate change. As efficient private sector cement producer says,

"CO_2 emissions have a global impact. Global warming takes place due to CO_2 emissions." (Shree)

Another one says that,
"The impact of CO_2 can be severe and can cause Global Warming. It would increase water level in few areas by melting the polar ice caps and decrease it in other areas by drying up of lakes, reservoirs, ponds and rivers." (Raymonds)

The efficient public sector companies are also aware of the impact of CO_2 on the environment.

"The impact of CO_2 can be there on the environment as it can cause global warming. Adverse effects would also be there on the human health." (IDCOL)

The inefficient producers of cement are not fully aware of the adverse effects of CO_2. For example, they say, *"CO_2 emissions spoil the environment and can cause a lot of health problem."*

"CO_2 emissions are naturally absorbed by the environment. They are harmful only if they are in excess and there is a disproportion between released CO_2 and refined CO_2. If CO or CO_2 is generated in excess, then there would be some harm to the environment."

Relevance of Global Climatic Change on the industry / company

Many of the companies view CO_2 emissions and the resulting climate change as relevant to the company. For example,

"The issue of climate change is very relevant to our company. We are a part of the animal kingdom, sharing our environment with others. We have to reduce the CO_2 emissions to make world a better place to live in." (Shree)

However there are companies which don't see any harm in CO_2 emissions or do not find global climate change relevant to the company. For instance,

"Global Climate Change will not have any adverse effect on the cement industry." (L&T)

"There is no impact on the environment due to the CO_2 being emitted by us. As the chimneys are very high and there is a lot of plantation around the plant. If there is plantation, then there won't be any global warming." (Birla Vikas)

Role company can play

Many of the companies, specially the energy efficient ones say that they already have things under control. For example,

"The company has already planted 700 thousand trees around the cement plant, so the CO_2 emissions are controlled." (Maihar)

Some companies are willing to meet the challenges posed by climate change. They are ready to participate actively in mitigating CO_2 in the region. They are looking at different ways to reduce the CO_2 emissions. A few of them are hoping that tree plantations around the plant as the only solution. For instance,

"In the interest of mankind we are ready to put up plantations around the factory to further reduce CO_2 emissions" (L&T)

"We can utilize the heat produced by converting it into energy. This would lead in an overall reduction of CO_2 emissions." (Malabar)

"The company can take up mass education programs and even participate in them to help India face challenges imposed by climate change." (Malabar)

Conclusion

It is clear from the chapter that the companies can connect energy efficiency and the environment. They are aware of the harmful effects of the CO_2 emissions and its impact on the global climate. They are a bit defensive and claim to be taking care of the environment by installing the pollution control equipment. They feel that tree plantation and/or energy efficiency is the solution for Global Climate Change.

Section IV AWARENESS & VIEWS ON CO_2 EMISSIONS MITIGATION

Awareness about convention on CO_2 emissions

The Cement industry is not very well aware of the various movements and conventions on Global Climate Change. In response to this, they have mentioned about the Rio Conference, a conference in South America and a Green Peace conference.

However, on being told about the United Framework Convention on Climate Change (UNFCCC), almost all of them had strong views on the convention and its relevance to the company and the industry.

Views on the thrust of UNFCCC and CET & relevance to their industry

As mentioned earlier, most of the companies had strong views on the convention. Most of them (across energy efficient private, energy efficient public and inefficient cement companies) agreed that the convention is very relevant to them. They feel that the convention and the mechanisms arising out of this convention would help them in increasing the energy efficiency in their plant and mitigate CO_2 emissions in the Asian region by transferring better technology from the developed nations to the developing nations. These companies have been depicted as the Group 1 companies in the table below. Most of them are excited about the fact that this convention would help them in getting additional finance and a better technology.

"The convention would help India take technology from the Western countries and will help India in reducing CO_2 in the Asian region. India is one of the more industrialized countries in

the Asian region. It can bring down CO_2 emissions in the plants by modernizing the equipment and by using a better quality fuel." (L&T)

" *The outcome of this convention is very positive. India can use the foreign investment coming through this channel to install energy efficient plants. Steps can be taken at both, the consumption and generation level. New technology can be used to generate power with minimum fuel."* (Shree)

Companies considering the UNFCCC as relevant(Group I) and irrelevant(Group II)

Group I Companies (UNFCCC is relevant)	**Group II Companies (UNFCCC is irrelevant)**
♦ L&T Cements ♦ Shree Cements ♦ India Cement ♦ IDCOL ♦ TANCEM ♦ Birla Vikas Cement ♦ Kutty Cement	♦ Raymond Cements ♦ Maihar Cements ♦ DSCL ♦ Malabar Cements

In spite of the excitement in the above companies, there are others who think otherwise and consider the convention as irrelevant for their company as well as their industry. These companies are the efficient companies. They have been depicted as the Group II companies in the table. There are two reasons that have been pointed out by the companies on why they consider the convention to be irrelevant to their industry or company. Either they have already done a lot of work in the area (by installing pollution control systems, mass scale plantations around the factory, some other energy efficiency measures) or are still unclear on the thrust of the convention and its mechanisms. For example,

"The convention is not significant for the company as we are one of the lowest CO_2

emitters. Whatever CO_2 emissions are there, they are nullified by planting more trees in the surrounding areas." (Maihar)

"The convention is irrelevant to us as CO_2 levels are already very low in the plant. Further, we have a lot of plantations around our factory which control CO_2 emissions." (Raymond)

Views on Carbon Emissions Trading

It is clear that there are two distinct groups on UNFCCC issue. On Carbon Emissions Trading mechanism three distinct groups are seen. These groups can be made on the basis of whether a company is eager to undertake projects using Carbon Emissions Trading mechanism, the company is displaying caution in this regard or the company is reluctant to take up any projects under Carbon Emissions Reduction mechanism. This classification is mapped in the table below.

Stand on Carbon Emissions Trading

Eager	Cautious	Indifferent
♦ Maihar ♦ L&T Cements ♦ Malabar Cements ♦ IDCOL ♦ TANCEM ♦ Birla Vikas ♦ ACC ♦ Kutty	♦ Dalmia Cements ♦ Shree Cements ♦ DSC ♦ India Cements ♦ Madras Cements	♦ Raymonds

The *Eager* group is the group of cement companies who are very excited by the prospects of getting the necessary funding and technology through Carbon Emissions Trading. **All the inefficient plants are part of the *Eager* group**. They definitely look at carbon emissions trading as an innovative way to get the necessary funding and technology to increase the energy efficiency in their plants and curb CO_2 emissions. Following are some of the comments made by these companies.

"We can definitely adopt Carbon Emissions Trading, as it can help us in purchasing cement producing machinery as well as dust control machinery. If any good technology comes up to clean up the environment, we are ready to accept it." (Birla Vikas)

" I like Carbon Emissions Trading. If we have to continue with the development process, we have to accept Carbon Emissions Trading, else we cannot survive." (ACC)

The efficient ones are also willing to accept Carbon Emissions Trading mechanism to take advantage of the additional funding and new technology. However, they display an environment concern as well.

"Carbon Emissions Trading mechanism is a good concept; can improve the environment. Our company is equally worried about the environment and global warming" (Maihar)

"*No point in liking or disliking Carbon Emissions Trading mechanism. We are way behind on standards and norms. Whatever new technology would come under Carbon Emissions Trading mechanism would be beneficial for the country."* (Malabar)

The *Cautious* group comprises of only the energy efficient private sector companies. They are ready to accept Carbon Emissions Trading mechanism, but have many apprehensions about it. Most of their concerns are directed in the area of long term implications, the costs involved, the technology that would be transferred to them, etc. The responses from typical cautious industries are as follows :

"*Currently the company is doing a cost benefit study on Carbon Emissions Trading mechanism. If we find the venture profitable, then we would implement the project, else*

not." (Shree Cement)

The *Indifferent* group has only one cement manufacturer under it – Raymond Cement. Raymond is a private sector efficient company. They consider Carbon Emissions Trading unnecessary as they consider their emissions to be very low and any investment in this area would not be helpful for them.

Reservation against foreign funds and preference among countries

None of the cement manufacturers have any reservation against any form of foreign investment or partnership under Carbon Emissions Trading mechanism. A few of them have voiced their preferences, though for investments and technology coming from a particular country. Germany seems to be the most favored country for getting technology. The main reason cited for this is that the German machinery is already functional in many plants and it seems to be running well.

"*The technology should be coming from Germany as we feel that German technology is better than American*." (Malabar Cements)

Conclusion

There is a good acceptance of the Carbon Emissions Trading. Most of the companies are apparently looking forward to it for getting better efficiency (lower costs/higher profits) through better technology (through the transfer mechanism). They are also looking forward to some investment in the efficiency measures through this mechanism. And then they want to contribute to the mitigation of green house gas emissions and clean up the global environment to get a better public opinion. However, there some concerns on the long-term implication of CO_2 trading mechanisms.

Section V PREFERENCES & INFORMATION NEEDS ON CARBON EMISSIONS TRADING

The awareness level of the companies is very low on the conventions and conferences held on the climate change issue. Many of the companies have not heard anything about the UNFCCC and Carbon Emissions Trading mechanism. Lack of information on the above subject has also created several concerns within these organizations. In fact in the previous section, there were as many as five companies which were ready to accept the mechanisms developed in the UNFCCC and The convention on CET , but were apprehensive about it. This may be the reason why they are having a cautious stance on the issue. (However, this does not necessarily mean that the companies in the Willing Group are fully aware of these mechanisms).

There exists a large scope for reduction of CO_2 emissions in India. The industries are adaptive to the new technology being offered to them. Many innovative funding schemes, like Carbon Emissions Trading mechanism are there for environmental control measures. However, the awareness is not there in the industries. In fact, an efficient Public Sector enterprise says that,

" India can play a major role in CO_2 mitigation in the Asian region. All the Indian industries are capable of reducing emissions. The mechanisms like Carbon Emissions Trading mechanism are there, the guidelines are there, but they are not reaching us properly and there is a lot of confusion about the approach. More awareness would required on these issues." (IDCOL)

In this section, we would be looking at the areas of information need, the key people to whom the information should reach and the mode through which it should reach the concerned people.

Specific information needs on emissions trading

The information that most of the companies need can be put under the following heads:

- Climate Change policy details and implications for our company.
- Technology for CO_2 mitigation and its relative merit vis-à-vis existing options.
- Cost and economies of these technologies.
- Funding options and mechanism for arranging these funds.
- Guideline on trading mechanisms.
- Baseline data.
- After effects of using the technology – cost advantage in the long term.
- Long term implications of implementing Carbon Emissions Trading mechanism.
- Who will be the monitoring and certifying body for Carbon Emissions Trading mechanism.

There are a few specific concerns that also need to be dealt with. For instance, a private sector company that has made huge investments in a thermal project is deeply concerned.

" Would we have to scrap the large thermal projects, on which we have made huge investments, if their efficiency is not improved."

"Would the investment made in plantations around the cement plant be counted as measures undertaken to curb CO_2 and other GHG emissions."

The above concerns are not concerns made in isolation, but are the inherent concerns of the whole cement industry. The cement industry wants to know about the whole concept. Thus, we cannot assume the above list to be exhaustive. We can expect that the concerns would keep on rising with due time. The trading mechanism which has generated so much excitement may not be accepted if the concerns are not satisfied and the information is not provided on time. As the implementation starts, further areas for information would arise.

Key people to receive information

The energy efficiency measures are generally identified at the worker/supervisor/unit head/department level, discussed at the senior managerial/department head level and approved by the top management/Chairman/President level.

The discussions on Carbon Emissions Trading would be done by the top brass of the company. They would be taking some help of the supervisors, workers and the unit heads for getting the technology details and what kind of technology would be best suited for their company. However, the cost and economics would be calculated by the top management only and they would be the main decision-makers.

Thus, the information on climate change policy details, cost and economies of the technologies that can be transferred and the long term benefits/hazards of adopting new technology via Carbon Emissions Trading mechanism should be addressed to the top management. The top management in a typical cement company consists of Chairman, a Board of Directors, President, Vice-Presidents and General Managers.

The information on the technologies available can be passed on to the Unit Heads, Works Manager and the Supervisors. It was noticed in the survey that a few companies had Quality Circles and Environment groups. The information on climate change and the role their company can play in reducing the damages to the environment can be directed to these groups.

Mode of information dissemination

The companies are not very comfortable with the internet websites and email. They prefer the information to reach them by the conventional methods.

The companies have varied preferences over the method the information should reach them.

Though most of them agree that an update brochure/booklet or a mailer would be a good mode of information, others are saying that this would not be helpful. They claim that only a full-fledged training program would help.

The best way to disseminate the information can be by sending it across in two phases. In the first phase, a detailed booklet can be sent highlighting the issue of Global Climate Change, the international conventions held on the subject, specifically, the UNFCCC and the subsequent convention on CET , the policy details of Carbon Emissions Reduction trading, followed by details of technologies that can be transferred. Regular communication and updates should be sent on the above issues. In the second phase a training program can be organized within the country, inviting all the top executives and other concerned personnel of the organization. This program should again cover the topics in detail.

The companies are looking forward to the government to make policies on the climate change matter. They expect the government to play the role of an intermediary and a facilitator. The government can be the administrator in the case of public sector enterprises.

The Cement Industry has a strong industry association in the form of CMA – Cement Manufacturer's Association. The companies want this association to play an active part in dissemination of information regarding Carbon Emissions Trading mechanism and other mechanisms. In fact CMA has been playing an active role in providing the information on energy efficiency and conservation to the cement industry. CMA has carried out projects with Asian Development Bank (ADB) which carried out an Energy efficiency support project for the cement industry. CMA also has established links with Global Environment Facility in association with NCB and the cement companies.

Many of the companies are also closely associated with CII – Confederation of Indian Industries.

They also expect CII to play an active role. In fact, the Cement Industry would prefer that all the information were routed through CII and CMA as they are a very credible source of information. In fact, one of the respondents says that,

"CII is the most suitable from our company's viewpoint as they are aware of our needs and know how to communicate us timely and regularly."

Therefore, on an overall basis we can say that, the cement industries are aware of the problems that can arise due to CO_2 emissions and the subsequent climate change. They are not aware of the conventions being held on these issues but are optimistic on the outcomes of these. They are excited by the mechanisms that have been developed in these conventions, but have a few concerns. They want these concerns to be addressed through a training program and booklets/brochures, which can give them sufficient information on Carbon Emissions Trading mechanism. They are willing to participate in these programs and subsequently can implement projects under Carbon Emissions Trading mechanism.

SECTOR : STEEL

Section I INTRODUCTION

Introduction

The total world annual production of steel is about 800 million tons of which India contributes 25 million tons. India's per capita consumption of about 26 kilograms compares very poorly with the consumption level in developed countries.

Historical Perspective

Before India's independence in 1947, only two integrated steel plants - The Tata Iron & Steel Company (TISCO) and the Steel Corporation of Bengal (later known as Indian Iron and Steel Co-IISCO) were in operation. Their combined production of steel ingots was only 1.25 million MT in 1948.

The Industrial Policy Resolution of 1956 laid down that the integrated steel industry, requiring huge funds and long gestation period, would be reserved for development in the state sector. A decision was taken to set up three steel plants in the public sector as a first step to raise the steel capacity in the country. The first of these three steel plants came up at Rourkela with collaboration from M/S Fried Krupp of Germany as a package deal with financial aid, the plant was commissioned in 1962. The second plant with Soviet aid was commissioned earlier than the first by Feb. 1961 in Bhilai with an initial capacity of 1 million MT of steel per year. The third plant was commissioned in 1962 at Durgapur by a British consortium and aid. All these three plants were initially of 1 million MT/year capacities. The fourth steel plant in the public sector-Bokaro Steel Ltd - after a period of uncertainty was finally set up with Russian aid having a capacity of 1.7 million MT/year.

The plant was commissioned in Jan, 1975. All these plants were later integrated under Steel Authority of India Limited to take advantages in common distribution (through own stockyard) and marketing set-up.

Another integrated steel plant was added to the public sector by the nationalization of IISCO in 1972. The Visakhapatnam Steel Plant (VSL) was the fifth steel plant to be set up in the public sector VSL with a capacity of 2.82 million MT/year is the most modern plant with latest technologies in iron & steel production, incorporating several energy optimization management & environmental engineering features.

With the industrial liberalization policy of July 1991, this sector witnessed abolition of licensing, price and distribution controls and freight equalization mechanism in respect of integrated steel plants like SAIL, TISCO, RINL etc. During this period there was an increased interest in the private sector to set up several green field integrated steel projects. While some like the Essar Steel, ISPAT Industries have succeeded, others could not do some when market demand sagged from 1997 onwards. In the last one year, the fortune of this industry has started looking up.

Present Steel Production

During 1999-2000 finished steel production grew the rate of 8.8%, when compared to 3.2% in the previous year. It is pertinent to point out that in 1999-2000, the production of all major iron & steel products increased when compared to 1998-99 as per details given below:

Production trends between 1999-2000(million MT)

Products	**1998-99**	**1999-2000**
Sponge Iron	5.17	5.20
Bar & Rods	8.09	8.71

H R Coils/Skelps	5.25	6.89
H R Sheets	0.40	0.55
C R Sheets/Coils	3.19	3.53
Others	1.54	0.83
Finished Steel	**23.64**	**25.71**

Environmental & Technological Development

The pollution control schemes being adopted for steel production in India include:

Air pollution controls: Electrostatic precipitators (ESP) for blast furnaces, sinter plant, SMS burden handling; wet scrubbing for gas cleaning for blast furnace, LD converters, continuous casting cutting fumes, picking fumes; bag filters for raw materials handling, lime dolomite kilns etc;

Water pollution control: Re-circulation of direct cooling water and indirect cooling water after treatment and cooling; neutralization of acidic wastes; treatment of phenolic wastes in 3-stage treatment units, the final stage being a special biological treatment unit;

Noise control: Provision of noise insulating enclosures, on line monitoring of noise and vibration for rotating machinery.

- Modern developments: Certain recent developments in technology tend to reduce pollution. These include:
- Smokeless charging for coke ovens
- Dry quenching of coke instead of wet quenching
- DCDA process for sulphuric acid production in the coke ovens by-product plant instead of SCSA
- Suppressed combustion type LD gas collection system instead of full combustion system

- Continuous casting in place of conventional casting
- HCL pickling instead of H_2 SO4 picking in CRM

However, given the current level of energy efficiency, there is further scope for improvement across most integrated steel plants. Some of the more recently established plants have better efficiencies due to deployment of modern technologies. Also, some of the older plants like SAIL and TISCO have been through significant modernization efforts in the last 2-3 years that have resulted in increased efficiencies.

Criteria used for selection of sample units

For the study, a spectrum of most energy efficient to less energy efficient to inefficient units has been selected. The most energy efficient or the more energy efficient does not mean that they are the best in the world. In fact, they are rated as the more energy efficient by the Indian standards.

Since SAIL, a government owned company accounts for over 40% of the country's steel output, we have covered the company at the corporate office level as well as at the plant level (SAIL owns about five plants in India). Overall, six interviewed have been conducted covering 4 independent companies (SAIL, Bhilai Plant and Rourkela Plants form one entity).

Section II PROFILE OF COMPANIES

The profiles of the six entities covered are as follows:

Profile of the companies interviewed

No	Entity	Reason for selection
1	Steel Authority of India Ltd. (SAIL)	Public sector **holding company** for the 4 ISPs belonging to Government of India
2	Bhilai Steel Plant	Most **energy efficient** plant of SAIL; Public sector unit belonging to Government of India
3	Rourkela Steel Plant	Most **energy inefficient** plant of SAIL; Public sector unit belonging to Government of India
4	TISCO	The only ISP in the **private sector** and also the **oldest** steel plant in India
5	RINL	Most **energy efficient** ISP and also the most recent one
6	Ispat Industries	**New private** sector steel plant

Of the above, except SAIL all others are plant level interviews.

These companies were further classified as efficient and inefficient. The efficient companies have been further subdivided into private sector and public sector enterprises. The detailed classification of the industries is given in the table below.

Classification of the Steel companies

S.NO.	Company	Town/City	Zone	Energy Efficiency	Type of Company
1	TISCO	Jamshedpur	East	Efficient	Private
2	Ispat Industries	Raigad	West	Efficient	Private
3	RINL	Vizag	South	Efficient	Public
4	Bhilai	Bhilai	East	Efficient	Public

5	Rourkela	Rourkela	East	Inefficient	Public

The above classification is used throughout the following sections. Participation in energy efficiency and world climate change workshops and seminars did not seem efficient as a classification criteria in their case.

Section III KNOWLEDGE & ATTITUDE TOWARDS ENERGY EFFICIENCY & CO_2 EMISSIONS

Issues facing top management

The older Integrated Steel plants have gone through major internal restructuring and modernization in recent years. This was necessitated by sagging market demand and reduced availability of funds to manage day-to-day operation of plants. Companies like the Steel Authority of India and TISCO have recently completed a long phase of modernization. With the industry recovering from low demand scenario, it is expected that they will better days ahead to embark on planned modernization efforts unlike the past where they were forced to shape-up.

The steel industry does realize the importance of energy efficiency in the context of their overall process. This is bought out by comments by Director (operations) of the Steel Authority of India:

"Energy efficiency is a major issue as steel is an energy intensive product. Roughly, 35% of cost of steel is energy."

However, the common refrain across both the efficient and inefficient units relate to poor quality of raw material.

"The Indian coal we use in the power plants is of poor quality and not up to the standard" - SAIL

"Poor quality of coal is the key issue" Rourkela plant

The other issue related to availability of funds to implement energy efficiency measures.

"The main issue facing our top management is funds availability" Ispat industries

Other problems facing the industry include poor market demand condition, increased competition and labor retrenchment issues (particularly in older plants, which have excess labor).

As regards environmental issues, it is not so much on the top of the management's problems. However, most state that it is an issue they have to tackle given the large-scale operation of the plants with significant environmental impact in townships around their plant.

"SAIL has invested about Rs 7 billion in the last 5 years on Pollution control equipment…we have not been able to control everything so far"

To sum up, poor quality of raw material is the key issue facing top management in the industry. Some in the private sector as well as the inefficient plant like Rourkela talk about lack of funds as a major issue.

Areas for energy efficiency measures

Major measures taken in the steel industry pertain to improving the process of burning coal given the poor quality of raw material. This is clearly bought out from the following comment:

"We have started using imported coking coal with 9% ash. The brings down total level of the coal and increases the energy efficiency of furnace." SAIL

Energy efficiency measures undertaken

The specific measures taken by plants center around the blast furnace. These involve processes to improve effective burning of coal. Other measures include carrying out of regular energy audit to identify inefficient units, which could then be closed and replaced with more efficient units through modernization.

Some of the measures stated by the plants covered include:

"We have already installed coal dust injection system at the blast furnace as partial replacement for coke making and reducing CO_2 emissions" Bhilai Plant

"We have reduced our overall energy consumption by 4.28%. TISCO

Unlike the older units which have been taking measures to improve efficiency (possibly because there are large gains accrued due to old processes in place with them), the more recent ones like RINL and ISPAT are not aiming to introduce new measures for energy efficiency. However, they do agree that energy efficiency is an ongoing process and would need to be continuously looked into.

"The only major energy efficiency measure undertaken in the past three years is recycling of waste. The plant is (already) using an advanced technology so there is very less scope for improvement in energy efficiency. However, it (energy efficiency) is an ongoing process and

the steps are being taken to conserve more energy" Ispat Industries

Motivators and impediments in undertaking energy efficiency measures

The motivator to such improvements is clearly financial. Other advantages stated include improved environment and better public perception of the company.

"The motivators for undertaking energy efficiency measures are profitability and lower pollution" SAIL

However, the barriers to implementation of energy efficiency measures are varied. While Public sector companies talk of lack of availability of funds and policy of government as reasons, the private companies cite reasons like poor quality of fuel, lack of equipment and technology as reasons.

"No further energy efficiency measures have been planned. When we have funds, we will think about it." SAIL

"Equipment, technology and the funds are the key barriers" Rourkela Plant

Decision making process

In the Public sector companies, energy efficiency measures are identified at the shop floor level, discussed at the General Manager and Executive Director level and approved by the Managing Director and Chairman. The Board of Directors and the Ministry of steel give the final approval.

Unlike this the decision making process is a lot faster in the private industries. In the case of TISCO, the measures are identified at the Head of the department level, discussed at the Senior

General Manager level and approved by VP Operations. However, measures involving significant improvement would need to be discussed at the Managing Director and the board level.

Future energy efficiency measures contemplated

All the plants covered see scope for energy efficiency in all the areas, especially in the blast furnace and the steel making process.

"There is scope for energy efficiency measures in the furnace, kiln, boiler and the process" Rourkela Plant

Some of the plants are already planning to take certain steps in that direction:

"We are planning for installation of coal dust injection units at the blast furnaces." Bhilai Plant

Impact of poor energy efficiency on environment

All the companies realize the impact of poor energy efficiency on environment:

"Poor energy efficiency or inefficient utilization of energy can affect the environment as then we consume more raw material and emit more in the environment" Ispat Industries

Areas of concern pertaining to environment

The Steel industry does claim to be concerned about environmental impact of their operation. Some of the specific environmental concerns pertaining to day-to-day plant operation are effluents, emissions of particulate matter, emissions of gases like NOx, SOx, emissions of CO_2, COD/BOD,

Noise and toxic substances.

Effect of CO_2 emissions

Most respondents covered were able to recount some aspects of the adverse effects of CO_2 emissions on environment. In one case, the personnel of the company (RINL) were sent for a training program on climate change at Hyderabad in 1998. The training (observation class) was conducted by DANIDA (Danish International Development Authority) for about 2 days.

Some of the effects explained by the respondents covered were:

"CO_2 emissions is undesirable as it would result in the increase of temperature of earth, thus, melting the polar ice caps. Thus, the low lying areas would submerge" Rourkela Plant

Impact on global warming

Some of the respondents were very vocal about the impact of global warming. As the Operations Director of SAIL says *" Climate change is relevant not only to the company but also to the human race".* Another respondent from Rourkela Plants says *" The issue of climate change is not only relevant to the company but to everybody. We will live together or sink together."*

Most are able to related CO_2 and other emissions as reasons leading to global warming. However, most feel that everybody is contributing in some way to global warming. For example, the official from SAIL points out that *"The industry is doing so by burning fuel. Everybody is responsible."*

The respondent from Bhilai Plant is more knowledgeable and explains that *"This major concern is being addressed through the Kyoto Protocol to the UN Framework Convention on*

Climate Change – which seeks to address the causes of climate change and calls for the developed nations to reduce Green House gas emissions".

As usual, there are some that look at the problem as an opportunity as well, to emphasize the fact that future outcomes can be uncertain. As an official from Rourkela Plant says *"If we look at the other side of the climate change, low lying areas would submerge. The steel industry would become more prosperous as more steel would be required to construct shelters, dams, etc. to rehabilitate."*

Relevance of Global Climatic Change on the industry / company

All agree that the issue is of relevance to their industry and hence to the company. However, there are a few who claim that while climate change is relevant globally, it is of lesser concern to developing countries like India. As a respondent from Bhilai Plant says *"The contribution of developing countries to climatic changes through emissions of green house gases is nominal. As on date the major contributors are the developed countries, who should set their houses in order. India's contribution is only 3.5% of the world's emissions."*

Role company can play

A few of the more efficient plants are committed to doing something about global warming. TISCO, which has been in the forefront on environmental issues has this say *"On our part, we have planted thousands of trees in and around the city. Our equipment are modern and we are already considering implementing CET along with Japan."*

The inefficient ones also show commitment to the cause. For example, official of Rourkela Plant says, *"We can make the manufacturing process more efficient and create awareness amongst the employees towards deforestation, plantation of trees, etc."*

On the other hand, more recently modernized plants like Ispat industries feel that they do not see how they can play a role. The respondent interviewed says, *"while climate change is relevant to the company, we are following norms laid down by World Bank and hence our emissions are under control"*.

Section IV — AWARENESS & VIEWS ON CO_2 EMISSIONS MITIGATION

Awareness about convention on CO_2 emissions

Almost all the companies met were aware of the convention. Many were able to name the UNFCCC and the convention on CET as well. Some of them went to the extent of elaborating about the details of the convention, as a respondent from Ispat industries has done *"Kyoto Protocol is about reduction of CO_2 emissions. The developing countries have to learn from the mistakes committed by the developed countries. We can use cleaner technology, more energy efficient technology and have an optimum utilization of raw materials."*

Some had a little more detail or interesting views to add:
"India is yet to sign the declaration" (SAIL)
"The previous system of technology transfer called AIJ was a failure" (RINL)

Though the awareness level about the convention was generally good, only the respondent from the inefficient Rourkela Steel Plant had limited knowledge about it.

Thrust of UNFCCC, CET & Relevance to Industry

The thrust of CET and UNFCCC were seen as positive all across. A respondent from Ispat industries sees it as good hope for earth. Another respondent from RINL says *"It is a system for technology transfer in return of reduction of carbon emissions through certificates".* A third from Rourkela also feels so *"I am in absolute consonance with its goals - calls for the developed nations to voluntarily reduce Green House gas emissions".*

Although many respondents stated that the aims of the conventions were lofty and worthwhile, a few feel that it is against countries like India. However, they do feel that countries need to partner to solve this problem.

"Everybody should be a partner with this but the only thing is that you should not be tilted in the favor of the western world. Today the western world is the highest pollutant community of the world. They are the people who are adding more and will continue doing so because CO_2 addition is a part of the economic prosperity of the country." (SAIL)

Another official from Rourkela Plant, after introspecting on pros and cons, was skeptical and said *"This convention is only superficial. Only symptoms are addressed. The basic issues are not addressed. Lust for spending more energy for luxurious living in developed countries is the root cause for GHG emissions. Developed countries do not want to reduce their CO_2 emissions."*

Another official of TISCO feels that the solution lies with the developed countries *"The developed countries should ratify reasonable costs for Carbon emissions mechanisms".* He goes on to add that the Indian industry can benefit from this convention as modernization of steel industry is the need of the hour. Since, Government undertakings are part of the steel sector, this convention could provide them with the necessary opportunity to update their techniques.

India's role in the region

While all the respondents feel that India has a role to play, the reasons vary. Some feel that India being a large country, is/will be a large emitter of CO_2 and hence it will have to show leadership for smaller and less developed countries. Some of the responses in this direction were:

"We have a large population so we emit more CO_2 in the atmosphere. If we can use better technology, the emissions would be less. We should demonstrate leadership to other countries in adopting better technology and monitor them" (Ispat industries)

"I think India cannot play much role in the Asian Region as we still have to develop and we have to consume more energy. Development needs more energy." (TISCO)

A few feel that India can contribute to the goals of reduction by actively involving itself with latest technology, through aid or through sharing with other Asian countries.

"India can share the technology with other Asian countries" (Rourkela Plant)

Only one respondent felt that India has lesser role to play and felt that *"The big brothers of Asia – China and Japan have a bigger role to play - as they are the most polluting countries today"* (SAIL).

Steps taken towards utilizing the flexible mechanism

It was found that Bhilai Steel Plant and TISCO are taking steps to use flexible mechanism. For example, Bhilai Steel plant is already in talks with Japan Overseas Development Corporation and has already identified energy intensive areas for improvement. On the other hand, TISCO has gone much further ahead and claims to be at the level of implementing Carbon Emissions Trading mechanism with Japan Overseas Development Corporation. *"We are implementing a Carbon Emissions Trading mechanism project with Japan. The project is hot charging of slabs in hot strip mill."*

On the other hand, a few (particularly those in government sector) claim that any step taken has to

be defined by Ministry.

Disposition towards Carbon Emissions Trading

Respondents are unable to comprehend the mechanism fully. However, many agree that its positive aspects are good technology and funding. As against such responses, Ispat Industry feels that such a trading mechanism is irrelevant to them as *"we have already adopted cleaner technology. Hence, it is not relevant to us."*

Ways of using

Those who are not already using carbon emissions mechanism feel that they will have to identify areas where it is applicable and then think of agreements to implement the mechanism.

Motivators for emissions trading

The major motivator for all is that this system is seen to provide the industry with technology and funds.

"By taking their technology and funds, we can improve our emissions. By giving them the certificates we won't be bearing any loss. Our problems would be solved." (RINL)

Interestingly, TISCO feels that *"The carbon emissions trading mechanism will lead to reduction in the cost of production and increase in profitability of the company. Additionally, it would enhance the company's image and the customers would get a better product. At the same time, environment would also be left undisturbed."*

Reservation against foreign funds & preference among countries

Most companies do not have any reservation against foreign investment/partnership under the Carbon Emissions Trading mechanism. Also, they do not have any reservation against any country as well.

"We don't have any reservation against partnership or foreign investment from any foreign country". (Bhilai & Rourkela Plant)
"Fund is the important factor, not the country." (TISCO)

RINL however feels that the restriction of which country to trade and not to trade will be dependent on government policies. *"The government may have reservations against some countries".*

Role of Government. in emissions trading

The companies feel that government should take create awareness about this mechanism, make contracts feasible. In addition, it should also monitor progress so as to remove any hurdles faced by the industry concerned. It should also play the role of regulator thorough legislation and incentives. Some of the views on government's role are given below:

"Government should take an initiative and educate the masses. It should work as an intermediary between foreign and Indian companies" (Ispat Industries)
"The government should make the contracts feasible. They should make the project techno-commercially viable. They must also monitor the progress and promote the cleaner technology either through legislation or through incentives" (TISCO)

Section V PREFERENCES & INFORMATION NEEDS ON CARBON EMISSIONS TRADING

Specific information needs on emissions trading

Many people do not know the convention on CET and the lesser number of people knows the details. Thus, all the companies met stated that all types of information pertaining to the issues would be required. However, they wanted special stress on the following issues:

- Funds, method of inflow, options and mechanisms for arranging funds (SAIL, Bhilai Plant, Rourkela)
- Technology upgrading, options, cost of technology
- Carbon trading mechanism, its pros and cons. Also its implication on arranging funds and mechanism of implementation (Bhilai Plant, Vizag and Ispat)

Mode of information dissemination

Brochure, newsletter, booklet seem to be the most common information mode stated by all companies covered. This could be sent through post to relevant people in the company. At the same time, some of them are OK with getting this information over email as well.

The other method frequently demanded is the training program option. This method should also be tried for awareness creation and information dissemination.

"The training program can be organized for the energy management department and the environment engineering department" (Rourkela Plant)

Key people to receive information

All the companies claim that the top management should be involved. This will include the Chairman, Managing Director, CEO etc.

In addition, at the plant level the following departments can be covered:

- Head of Operation/Works
- Head of Projects
- Head of technical department
- Head of environmental engineering
- Head of services (for funding etc.)

Content of the program

As expressed by the respondents, the content of the training program should be the relevant technology for the steel industry. It should not be simply theoretical and should highlight the problems and train the people in tailoring the technology to suit them. The other aspects they would like to discuss are: funding mechanism, the requirements, roles, and responsibilities of the plant and the source from where the technology is coming. It should also give a holistic picture on carbon emissions trading mechanism including details on where it is being implemented and the after effects of the mechanism if any.

Ways of organizing

There seems to be a reasonable preference for the training program to be conducted at the plant premises itself as it saves a lot of travel and time cost for the users. Some also feel that it should be organized in the form of a workshop

Interest in participating

All are interested in participating in the program. although attendance will go down if it were to be organized at a central location.

Role of different parties

The Indian Government and its ministries can play the role of information disseminator, regulator and a facilitator in transferring aid, acting as a catalyst.. The role of the NGOs would be in form of a PR exercise and to create awareness about the carbon emissions trading mechanisms. The Confederation of Indian Industry should also play a major role as they are aware of the technology transfer and such mechanisms. They must reflect the horizontal transfer of technology, i.e., if something is implemented somewhere, they must spread information about it. USAID and DANIDA can focus on the areas of aid and technology, filtering appropriate technology for specific application without biases towards any company or country

Most credible source

Most feel that the government and its ministries will be the most credible source. This opinion is reflected in the private as well as the government companies. One of the reasons cited (even by private companies) for trusting government is the feeling that carbon emissions trade affects not only the specific industry but also the common man who will be equally affected by possible effects of global warming in future.

Some private companies also cite UN as the most credible source for this type of mechanism. Only Bhilai Plant said that a combination of USAID, CII and the assisting organizations would be an effective source from the company's viewpoint.

SUMMARY OF FINDINGS FOR INDUSTRY

Industry is going to be a major stakeholder in the carbon emissions trading mechanism in India. The Indian industry is not up to the world standards in terms of technology, efficiency and energy usage. Industries like cement, steel, power and aluminum are also the major emitters of CO_2. Hence a lot would depend on the industries to make CET a success in India.

Knowledge and Attitude towards Energy Efficiency and CO_2 emissions

Funds have been an inherent problem with the Indian industry. Thus, its not surprising that availability of funds is one of the key issues discussed by the top management. The other issue that bothers the management is the quality of raw material as it is a well known fact that Indian coal is of inferior quality and generates a lot of ash. In few industries like cement, aluminum and steel, which are energy intensive, energy efficiency is also a key issue discussed.

The industry is looking at the main processes for undertaking energy efficiency measures. These pertain to the boilers, kilns, processes, etc. However, in the sugar sector, the energy efficiency measures are not very significant and are related to improvement in power factor and heat recovery. For most of the industries, energy efficiency is a continuous process. The main motivator for the industry is profitability and portraying a better image.

Most of the industries are aware of the harmful effects of CO_2. In general, they are also aware of the fact that CO_2 emissions causes Global Warming. The industries are also aware of the fact that better energy efficiency can lead to a better environment. Thus, they all feel that CO_2 emissions are relevant to their respective companies and industries.

Awareness and Views on CO_2 emissions mitigation

Most of the industries are aware about some convention on environment, but knowledge regarding the same is limited. However, it was found in the steel industry that all of them are well aware of the UNFCCC. In fact, two of them even recalled the convention on CET and the mechanisms evolved. They are also implementing projects under Carbon Emissions Trading Mechanism along with Japan Overseas Trading Corporation. However, rest of the industry is yet to take any significant step in this direction. They all want to take up some steps to contribute to mitigate CO_2 emissions mitigation. For this they find CET as a good mechanism and are very positive towards it. There are a few apprehensions but they are more due to lack of knowledge than due to dissidence. Technology and funds would be good motivators for implementing projects under Carbon Emissions Trading. There are also no reservations against any foreign investment. Though a few companies have given their preferred countries as US, Germany and UK.

Preferences and Information Needs on Carbon Emissions Trading

The industry is not very well aware of the Carbon Emissions Trading Mechanism. This has led to a few apprehensions within the industry. However, these apprehensions can be rectified if they are communicated properly.

Thus, detailed information would be required on all the areas defining Carbon Emissions Trading mechanism. Some information would also be required on guidelines on trading mechanism, the baseline data, long-term implications and details of monitoring and certifying bodies.

The information on climate change policy details, the cost and economies of the technology transferred, the long term benefits and the risk factors should be given to the top management which include Chairman, Board of Directors, Managing Director, President, Vice President, etc.

The technical information can be passed on to the Head Operations, Head Projects, Head

Technical, Head Environment Engineering, Head of Services and the Works department. A few companies have environment protection groups, environment departments and quality circles. The information on climate change and the role their can play should also reach them.

The industries are located in remote places and rarely have an access to internet or email. Understandably, they are not very comfortable with these modes of information. They would prefer the information to come to them in a traditional way in form of brochures, booklets and pamphlets. Most of them like the idea of a training program, but, prefer that it should be conducted either in their factory premises or somewhere nearby so that maximum people can attend them.

CII, FICCI and the industry associations are the most trusted source of information for the industries. The public sector enterprises also want the information to be channeled through the government.

FINDINGS - GOVERNMENT STAKEHOLDERS

BACKGROUND

The policies of the Government of India have undergone a sea change since the early 90's. Widespread economic reforms and liberalization have seen the entry of many multinationals in various markets in the country. Today, a license is not required for putting up a new unit in most industries. These measures have put India firmly on the development path.

For the purpose of this study, the ministries contacted could be classified as follows :

- The Ministry of Environment & Forests is the nodal ministry representing the Government of India in all matters and discussions on Carbon Emissions Trading (CET).

- The Ministries of Industry, Power and Steel and their related bodies like National Productivity Council and Energy Management Center are directly involved in the implementation of environment protection and emissions reduction as the user sectors come directly under their purview.

- The Ministry of Coal and the Ministry of Non Conventional Energy Resources (and its related body, the Indian Renewable Energy Development Agency) have an active role to play as far as implementation is concerned. However, their role is more supplementary in nature and not as direct as that of the user sector ministries.

The roles of the ministries of Planning and External Affairs is more at a strategic and policy formulation level.

Note: The Ministry of Non Conventional Energy Sources was contacted but refused to be interviewed for this study.

MINISTRY OF ENVIRONMENT & FORESTS (MoEF)

Introduction

The Ministry of Environment & Forests (MoEF) is a nodal agency in the administrative structure of the Central Government, for the planning, promotion and co-ordination of environmental and forestry programs. The principal activities undertaken by MoEF consist of conservation and survey of flora, fauna, forest and wildlife, prevention and control of pollution, afforestation and regeneration of degraded areas and protection of environment in the framework of legislation. The main tools utilized for this include surveys, impact assessment, control of pollution, regeneration programs, support to organizations, research to solve problems and training to augment the requisite manpower, collection and dissemination of environmental information and creation of environmental awareness among all sectors of the country's population. The organizational structure of the ministry covers various divisions, auxiliary bodies, associated offices and autonomous agencies.

Priorities

With development comes environment degradation and pollution. The MoEF is committed to protecting the environment and controlling pollution to the maximum extent possible without compromising on the growth aspects of the country. The MoEF understands its responsibility as the torch bearer for environment related activities. However, climate change does not seem to be the top priority of the MoEF at present as most of their recent environmental programs have been in other areas.

Summary of Views & Opinions on CET

The MoEF is of the view that the developing countries are not getting their fair share of environmental space. The developed countries continue to add a substantial amount to the concentration of GHGs in the atmosphere and yet enjoy a free ride. According to the MoEF, at the fourth convention of parties, it was identified parties who were mainly responsible for GHG emissions and hence identified actions that were required to reduce these. Domestic action for reducing emissions was to be predominant and other actions were to be supplemental. The MoEF categorically states that India intends to participate fully in the global efforts to protect and improve the environment, without hindering its own development process. Any process that would deprive India of this growth would be rejected.

Role in Environment Related Issues

The MoEF has participated in **Asian Least Cost Greenhouse Gas Abatement Strategy (ALGAS)** Project. This project has been funded by the Global Environment Facility (GEF) and implemented by the Asian Development Bank (ADB) and the UNDP. The project has been completed in India. The work was undertaken by the Tata Energy Research Institute (TERI), New Delhi and the National Physical Laboratory (NPL), New Delhi. Under the project, national greenhouse gas inventories (1990 levels) by sources and removals by sinks have been prepared for sectors such as power generation, transport, agriculture, forestry and land use change, industry, residential and commercial. The study has also identified potential mitigation options and chalked out a possible least cost abatement strategy.

The MoEF is a party to the UNFCCC. The objective of this multilateral treaty is stabilization of the greenhouse gas concentrations in the atmosphere at levels that would prevent dangerous anthropogenic interference with the climate system. The convention enjoins upon the parties to

implement commitments contained in the various provision of the convention. As per the existing commitments, India is not required to adopt any reduction and limitation of the greenhouse gas emissions. The meetings of the subsidiary bodies of the convention viz., Subsidiary Body on Implementation (SBI) and Subsidiary Body on Scientific and Technological Advice (SBSTA) were held in June 1998. Officials of MoEF and MEA attended the meetings.

Awareness of GHG (especially CO_2) and its effects / CET

The Fourth Conference of Parties (COP) to the FCCC was held in Buenos Aires, Argentina during November 1998. The Minister of E&F led a delegation to the conference, in which MoEF Secretary and officials of MoEF and MEA participated. The conference considered various issues relating to implementation of the commitments by the parties under the UNFCCC and issues relating to the flexible mechanisms contained in the the convention on CET to the FCCC. Review of the issues relating to the adequacy of commitments by the developed countries was among the salient issues. The developed countries insisted on participation of developing countries to reduce the greenhouse gas emissions. The developing countries on the other hand, opposed any participation of developing countries in reduction commitments. **Inclusion of an agenda item on voluntary commitments for the developing countries for discussion at the conference had to be dropped in view of the opposition by a number of developing countries, including India.** Another issue that engaged the attention of the Conference was related to Carbon Emissions Trading mechanism, Article Projects and Emissions Trading

The controversy on the matter related to an early finalization of the work program insisted upon by the developed countries. On the other hand, the developed countries emphasized consideration of principles, rules and modalities besides methodological and technical matters as a prerequisite to identifying a works program.

The work program on each of the CET mechanisms at this stage consists of an inventory of subjects under the categories viz. basic issues, methodological/technical issues, process issues and institutional issues. The debate on the subject was inconclusive and the future COP would continue to deliberate on the same.

Views on CET.

The MoEF feels that under the UNFCCC, a significant number of developed countries have undertaken only negligible efforts for fulfilling their commitments under the convention. The situation is more alarming as several developed countries are projecting a substantial increase in their emissions. This shows that they do not recognize the seriousness of the situation that called for such an action in the first place. The Convention had identified parties who were primarily responsible for greenhouse gas emissions and had therefore identified actions that were required to reduce these. The convention also recognized the differences between parties in terms of their luxury and survival emissions. The convention had presupposed that domestic action for reducing emissions would be predominant and other actions would be supplemental. The expectation at the time of adoption was that targets would be adhered to. Above all, the Convention had recognized the need for taking a hard look at the unsustainable patterns of consumption and standards of living whereby a disproportionately large amount of emissions was being produced by a small group of countries.

Under the circumstances, the MoEF felt that the South has not had its fair share of the environmental space; which it now needed more than ever before. The Annex I Parties continue to add a substantial amount to the concentration and thus, enjoy a free ride. Let alone paying an environment rent, some Annex I Parties are reluctant even to discuss questions of transfer of financial resources and environmentally sound technologies, except on their own terms. The delays in implementation of commitments by the developed countries are increasingly reducing the

opportunities and options available to the developing countries. The Convention recognized the fact that the emissions of the developing countries will continue to grow from the current, as yet relatively low, energy consumption levels. MoEF states that India intends to participate fully in the global efforts to protect and improve the environment, without hindering its own development process. Any process that would deprive India of this growth would be rejected.

India has taken some significant steps in achieving the objectives of the Convention. The Indian judicial system has recognized the right of an Indian citizen to a clean environment as a component of right to life and liberty. According to the MoEF, the 12th Non aligned Summit adopted a common position relating to climate change. The Summit reiterated that the primary responsibility for action in this area lay on the developed countries. It agreed that equitable entitlements would be the basis for emission trading and other flexibility mechanisms. The Summit rejected categorically all attempts by a few countries to link their ratification of the Kyoto Protocol with the acceptance by a few developing countries of the so-called "voluntary commitments". In the view of the ministry, "voluntary commitment" should mean what member states do voluntarily. When such voluntarism is sought to be incorporated in to a legal framework then it is no longer voluntary. The MoEF states that India is committed to effective international action for protection of the environment and dealing with climate change in accordance with the role assigned to various countries in the protocol and the convention. The country is ready to discuss emerging issues in this process in a co-operative and constructive way.

Central Pollution Control Board

Introduction

CPCB is under the purview of the Ministry of Environment and Forests. Their role is mainly to set standards for emissions and other pollutants (like effluents). The Ministry takes care of policy matters. Environmental surveillance is one of the important duties of the CPCB.

Priorities

The main priorities of the CPCB are to ensure that pollution control systems are in place and properly operated by industries. Further, raising of greenbelts for the abatement of pollution and environmental improvement is also being given importance.

Summary of Views & Opinions on CET

CPCB states that it is fully in acceptance with the views and opinions of the MoEF of which it is a part. The CPCB does not have any separate differing opinions of its own on CET.

Role in Environment Related Issues

The role of the CPCB is more that of a watchdog in environment related matters. While the MoEF lays down the guidelines, the CPCB is the implementing and monitoring authority.

Awareness of GHG (especially CO_2) and its effects / CET

CPCB is fully aware of GHGs and have taken steps especially in Thermal Power Stations by promoting super criticality and CCT. CPCB is of the view that CNG should be used for

transportation (especially, mass transportation).

Views on CET

Not yet convinced about the entire thing as everything is very theoretical and loosely put together at present. However, if it is being implemented in India, the CPCB feel that only they can do a good job as they already have enough details for baseline fixation, etc.

MINISTRY OF POWER (MoP)

Introduction

The Ministry of Power (MoP) started functioning as an independent body from July 1992. Earlier, Power was a department under the ministry of Energy (along with Coal and Non Conventional Energy Sources). MoP is primarily responsible for the development of electrical energy in the country. MoP is also concerned with Planning, Policy Formulation, Project Processing for investment decisions, monitoring of Power Project implementation, Training & Manpower development. MoP is also responsible for the administration & enactment of legislation in regard to thermal & hydel power generation, transmission and distribution.

MoP is under the Minister for Power who has a secretary (power) assisted by a special secretary and six joint secretaries. Important bodies that come under the purview of the MoP are:

The Central Electricity Authority (CEA)
National Thermal Power Corporation (NTPC)
National Hydro Electric Power Corporation (NHPC)
Power Grid Corporation of India Limited (PGCIL)
Rural Electrification Corporation (REC)
Power Finance Corporation (PFC)
Other autonomous bodies that are under the administrative control of MoP include:
The Central Power Research Institute (CPRI)
National Power Training Institute (NPTI)
Energy Management Centre (EMC)

Priorities

The main priority of the Ministry of Power is to substantially increase the power generation capacity in the country. However, power projects are very capital intensive and constraint of funds has been one of the reasons for the demand-supply gap in power generation. Keeping in tune with the liberalization policies of the Government of India, the Ministry of Power has decided to increase the power generation capacity by opening up this sector to foreign companies as well as Private Companies to put up power generation projects in the country. To improve the health of the State Electricity Boards (Sees) across the country, the Ministry has also taken steps to remove subsidies provided to consumers.

Summary of Views & Opinions on CET

The overall view of the MoP toward CET is positive. Views like *'Infusion of new energy efficient technologies in the power sector will spur development'* and *'there can be significant gains through CET which in turn can be used for sustainable development'* show that there is a positive feeling towards CET. There is a feeling that many private / foreign owned power projects could come up in India under the CET umbrella with India having the advantage of access to latest technologies at lower costs.

A view like 'India should not agree to any emissions cap for the next 50 years' shows the concern of the MoP. However, the MoP also feels that the Government can competently handle these issues with proper guidance from the MoEF and other Ministries.

Role in Environment Related Issues

MoP through its Energy Conservation Cell and the Energy Management Centre looks at

energy conservation (primarily reducing coal usage which in turn means reduction of emissions). They look at this from three areas namely production, transmission and usage

From the production side massive efforts are on to use efficient technology in coal based thermal power plants and super criticality is being actively introduced. Further, older thermal power plants are being renovated and modernization. This is being done in a 5-year time frame.

T&D losses are to be checked and they expect to cut losses by about 12 – 15% over the next five years.

From the demand side, energy efficiency in agriculture will be the thrust area. Over the next 8 – 9 years, about 12 million pumpsets will be replaced with energy efficient new sets. This will result in a saving of about 15% of power consumption.

Awareness of GHG (especially CO_2) and its effects / CET

The awareness of GHGs and its effects is obviously high as the Power sector is one of the largest emitters of CO_2. The awareness of CET is also high.

Views on CET.

The ministry of Power has both positive and negative viewpoints on this. On the positive side is the opportunity to avail the latest technologies at lower costs (as the incremental cost for the better technology will be borne by the developed country).

The main apprehension that MoP has is that CET should not be used as a tool to put an emissions cap on the country. In this regard, the MoP feels that no emissions cap should be set or accepted by India for the next 50 years.

On the official front, the Ministry of Power will throw their weight behind the Ministry of Environment & Forests as well as the Ministry of External Affairs who are handling all CET related issues at present.

The basic concern of the MoP is that the developed countries have been the main cause for emissions as a fallout out of industrialization. *India is in the growth phase and any measures to stunt our industrial growth should not be allowed*. In any case, there are many steps being taken to improve energy efficiency already. Further, *some developed countries have said that they will participate in CET but they will continue to increase their own emissions. Such ideas are conveying a wrong message.*

The MoP feels that pilot plants should be set up in different industries to see how CET works and how the emissions reductions can actually be verified and certified. Coal beneficiation, T&D improvement and conversion to CFL from GLS lamps could be other areas that can also be looked at under CET.

Communication means preferred and reasons

MoP feels that the present awareness of CET is poor. Sector wise awareness should be created. This should be done jointly by NGOs and the Government. However, separate forums for different sectors (like power, steel, etc) should be there. The forums should also be geographically representative (from all over the country). Issues should be debated at length

and only when awareness levels increase then only can meaningful ideas come up and India can take a unified stand on the issue.

Energy Management Centre

Introduction

Energy Management Centre (EMC) comes under the Energy Conservation Cell of the MoP. The Energy Conservation Cell lays down policies on energy efficiency. EMC is generally involved in execution of these policies and schemes. They generally undertake the following tasks :

- Energy audits
- Consultancy for increasing energy efficiency
- Training programs
- Information dissemination to the general public through the mass media
- Other related policy studies

The thrust areas for EMC are to conduct energy audits and improve energy efficiency mainly through reduction of T&D losses.

Key environment issues discussed and extent of impact of CO_2/GHG emissions

The key issue that is discussed in EMC is energy conservation. While discussing the energy conservation issues many a times the issue of reduction in pollution comes up. EMC feel that the two issues are highly correlated. If energy is conserved then pollution (specifically air pollution in form of GHG and specifically CO_2) gets reduced. EMC is well aware of the harmful effects of the air pollution.

Views on CET.

EMC feel that the Ministry of Power is very knowledgeable about these issues. EMC will follow the guidelines laid down by the MoP. Although EMC is aware of CET, they are not very clear about the details of the framework under which CET would operate. However, EMC seems to be more concerned about the modalities of implementing CET. EMC feel that CET should be implemented on project to project basis. EMC lists the following points as being very important for CET

- Total technology transfer should be assured under CET
- Time frames should be strictly adhered to
- The whole project should be closely monitored
- Reputed, capable agencies should be used to monitor these CET projects

EMC feels that the Indian government should identify sectors and industries that benefit from CET. These sectors can be the ones that require a lot of upgrading in technology like Cement and Coal based Power Generation. These industries require heavy investment in new technology and CET would definitely be more welcome in these sectors. However the technology that is transferred to India should be very good, workable and replicable.

Role in implementation of CET

EMC feel they can play a very critical role in implementing CET in India – especially in the power sector. CET can be a good answer to increase the incentive to work on reducing Transmission and Distribution Losses in the power generation and distribution industry. The reason for the above is that if the losses are reduced, more power would be available to people without generating extra power. Hence, the power plants would be less burdened. Thus, they would be emitting lesser pollutants and the GHG would be reduced.

Thus EMC can play a major role in :

- Training people

- Banking of projects – identify projects which require the CET more
- Prioritizing the areas of implementation of CET
- Costing of additionality
- Benchmarking the industry, thus accumulating data for baseline fixation

Communication means preferred and reasons

EMC feel that from the framework point of view, the communication presently available will suffice. However, regarding implementation, EMC feels that detailed communication would be required separately for different industries that should include the following points:

- Method of calculating incremental costs for different projects in different industries should be clearly spelt out
- Total transfer of technology should be spelt out in the CET agreements
- The methods of monitoring CET projects should be clearly indicated.

MINISTRY OF INDUSTRY (MoI)

Introduction

The MoI formulates and co-ordinates the policies of the Government of India towards promotion and development of the industrial sector. The MoI comprises the following departments:

- Department of Industrial Policy & Promotion
- Department of Industrial Development
- Department of Small Scale and Agro Rural Industries
- Department of Public Enterprises
- Department of Heavy Industry

Priorities

Over the last decade, the MoI has made major policy changes to provide competition for improving industrial growth. Policies towards direct foreign investment have been liberalized. In most industries, domestic competition has been introduced by delicensing of industries. Trade related reforms have seen the removal of quantitative restrictions and reduction in tariffs has increased international competition.

The present priority of the MoI is to continue the liberalized policies to spur industrial competition and growth in the country. Disinvestment in public sector enterprises is also being given importance.

Summary of Views & Opinions on CET

Overall, the MoI presents a neutral view towards CET. The MoI voices the view that it will go by the decision taken by the MoEF which is the nodal ministry in matters regarding CETs.

MoI is guarded in their views as to how successful would the CET be in India. *'The final investments under CET would be low'*. To most queries, the MoI continued to maintain the stance that they would follow the decisions taken by the MoEF.

The National Productivity Council (NPC) which is part of the MoI however feels that the CET can be beneficial but the actual implementation process is not yet clear.

Role in environment related issues

The MoI do not play a significant role in the environment-related issues. They look forward to the ministry of environment and forests for taking the policy decisions. They implement and follow these decisions. They maintain that they hardly play any role in this decision making process.

Awareness of GHG (especially CO_2) and its effects / CET

The MoI is particularly well aware of the Carbon Emissions Trading mechanism (CET).

Views on CET

The MoI is wary of the U.S. bodies imposing regulations on the Indian industries. They believe that U.S. acts like a master and imposes various mechanisms on the developing nations like India - these developing nations have to recognize the might of U.S. and accept whatever is passed down to them.

Even in CET, the MoI feels that the final investments would be very low as there is an apprehensive feeling among industries that there could be more than meets the eye on CET.

The MoI maintained that ministry of environment and forest is the right place to get more views on this issue and MoEF took, the MoI would abide by it.

Role of the organization in implementing CET

The MoI is not clear of the role that they would play in the implementation of CET. They would strictly follow the guidelines of the MoEF.

National Productivity Council (NPC)

Introduction

The basic objective of the NPC is to increase productivity in all spheres of industries and to show the way for launching productivity drive in all spheres of economic activities of the country. The NPC also stimulates and promotes productivity consciousness by disseminating information regarding productivity techniques and processes. Finally, NPC undertakes scientific research activities related to productivity.

Key environment issues discussed and extent of impact of CO_2/GHG emissions

NPC is under the MoI and looks into industrial pollution focussing in the Small and Medium Enterprises / Small Scale Industries. The are not focussing on any particular sector but the SSIs overall. The do not look at the constituents of the pollutants. Instead, they minimize the pollutants at source. They look into production and other processes to reduce pollution per se.

NPC believes the CO_2 and GHG emissions is in-built in the air pollution. So, once air pollution is controlled, GHG emissions are also controlled. Hence, when the efficiency of a boiler is improved, the CO_2 emissions is automatically reduced. Therefore, they don't look into GHG or CO_2 emissions in isolation. Indirectly they do look at GHG and CO_2 emissions while looking at causes for climatic changes.

Views on CET

NPC believes that the overall perspective seems to be beneficial but, how to implement it is not known. The Government is yet to address this issue. NPC has not taken the note of the

mechanisms developed in Kyoto. They are also looking at CET as another jargon floated around by the developing nations. NPC is of the view that maximum contribution to pollution is from developed countries. Hence, the developed nations should first talk about reducing the pollution in their areas and then only talk about reduction of pollution levels in developing nations. Otherwise it would be unfair to the developing nations.

The major role in the improvement of pollution levels has to be played by large industries. The small-scale industries are generally suppliers to the large industries. Therefore, it should be the duty of these large industries to improve pollution levels in the SSIs by educating and guiding them in this regard. On CET in particular, NPC feels that instead of concentrating on GHG and carbon emissions, a holistic approach on pollution should be taken. The Montreal protocol, which stressed upon the ozone depletion, was also a failure as it was not having a holistic viewpoint. NPC feels that will be more applicable to larger industries as the reduction in emissions from smaller industries will be comparatively low.

Role of NPC in implementing CET

NPC can play a major role where the issue is of increasing productivity. But all depends on the government policies. Most of the foreign technology that is imported is not for the use of SSIs, though they are maximum contributors to the air pollution in general. Thus, the SSIs and the industrial sectors should be identified for the transfer of technology. Only government can think about the effects of foreign investments under CET on India's interests.

Communication required

The CET in itself is not very clear to NPC. The objectives, what has been done already, what is the future plan, the implementation part and what is to be done is not clear. Information would be required on these aspects of CET.

Initially the information should be in a literature form clearly defining the objectives, the roles that different departments can play and what has already been done. Later, common discussion forums can be formed where other aspects are discussed. However, what aspects need to be discussed are still unclear and would require some initial communication.

MINISTRY OF STEEL (MoS)

Introduction

The Department of Steel is under the charge of the Minister of Steel and Mines who is assisted by the Minister of State for Steel and Mines. The Department is responsible for the planning and development of the Iron & Steel Industry, the development of essential inputs such as iron ore, lime stone, dolomite, manganese ore, chromite, ferro alloys, sponge iron etc. and other related functions. There are 10 Public Sector Undertakings under the administrative control of the Department of Steel. The Department has a Secretary, 3 Joint Secretaries, 4 Directors, 4 Deputy Secretaries, 8 Under Secretaries one Director (Official Language) and other supporting level officials and staff. The Ministry also has a common Financial Adviser in the rank of Additional Secretary and a common Chief Controller of Accounts with the Ministry of Mines. A Technical Wing, consisting of Industrial Adviser, 4 Development Officers, 2 Assistant Development Officers provides support and give advice in respect of technical matters. The Ministry has an attached office viz., Office of the Development Commissioner for Iron & Steel (DCI&S) at Calcutta. The DCI&S is an Officer of the rank of Joint Secretary and is assisted by a Joint Development Commissioner.

Priorities

The MoS, as part of its role to develop the Iron & Steel industry in India, has decided to modernize the integrated steel plants in India. In this regard, the Steel Authority of India (SAIL) is modernizing its plants at Durgapur, Rourkela and Bokaro. The modernization is to help in improving the quality of process and products and also to reduce costs as well as improve energy consumption to make their products competitive in the international market.

The Indian Steel Industry, recorded a production of 23.37 million tons of finished steel in 1997-98, which was 2.8% more than the previous year. India continued to be the 10th largest steel producer in the world during 1997-98. India exported a record 3.04 million tons of iron and steel valued at Rs. 2,937 crores. India continues to be the second largest producer of sponge iron in the world. During 1997-98, India produced 5.325 Million Tons of Sponge Iron.

Summary of Views & Opinions on CET

The MoS has a fairly positive view towards CET. Basically, the MoS feels that India stands to gain from CET. *'Countries like India will get good technology and the cost for purchasing it also from CET'*.

However, MoS do have some apprehensions regarding how CET will be implemented. They feel that pilot projects will help to understand the problems that could arise during implementation.

Role in environment related issues

The MoS discussed the possibility of environmental damages by the steel industry. Present concentration is more on the smaller products (like Mini Steel Plants, small induction furnaces, etc.) as the larger units are conscious of emissions and are taking steps towards control of emissions but the smaller units are doing bigger damage. The smaller units do not have the technological know how or the money to take care of emissions. The MoS, through various studies, is trying to advice the smaller units both for reducing pollution and conversion of energy.

Awareness of GHG (especially CO_2) and its effects/ CET

The MoS is well aware of GHGs and its effects. In fact, control of CO_2 emissions is taken into consideration by trying to use the furnace oil more efficiently and by reducing burning of furnace oil. In this way, emissions of CO_2 is reduced. However, CO_2 is not looked at in isolation. MoS is aware of the CET.

Views on CET

The MoS knows that the developed countries will finance and give better technology for reducing emissions. They feel that unless the developed countries help both technologically as well as financially, it will not be possible for developing countries to implement these cleaner technologies. However, sometimes it is not clear whether the developed countries are trying to sell their technologies or are trying to help the developed countries. The MoS feels that there is a lot of talk about the framework but still the nitty gritties of the actual implementation have to be worked out. At present one does not know what problems could crop up during implementation as everything is at a very conceptual stage now. The MoS would like a phased implementation of CET. To begin with, they would prefer to have pilot projects to gauge the effectiveness of the exercise following which more widespread implementation could be taken up.

Role of MoS in implementing CET

The role of the MoS will be secondary to that of the MoEF and the MoF in the initial stages of discussion. However, the role of MoS will be much enhanced when the actual implementation

of CET comes up for steel plants. Environmental issues are being centrally monitored and when issues regarding the steel industry are raised, then the ministry becomes active involved. The steel ministry have themselves submitted a scheme to UNDP for funds for a study to identify latest technologies to control emissions in the smaller steel plants and subsequently to partially fund them, if necessary, through low interest loans. The scheme was submitted more than six months back but is still awaiting approval. However, with steel being a major industry as related to environment, the steel ministry does play an active role

Communication means preferred and reasons

The MoS is open to receiving communication in any form. Would prefer detailed communication from the Government of India (or the MoEF).

MINISTRY OF COAL (MoC)

Introduction

The Ministry of Coal has the overall responsibility of determining policies and strategies in respect of exploration and development of coal and lignite reserves, sanctioning of important projects of high value and for deciding all related issues. Under the administrative control of the Ministry, these key functions are exercised through the Public Sector Undertakings, namely, Coal India Ltd. and its subsidiaries and Neyveli Lignite Corporation Limited. Other than Coal India Ltd. and Neyveli Lignite Corporation Ltd., the Ministry of Coal also has a joint venture with Government of Andhra Pradesh called Singareni Collieries Company Limited. Government of Andhra Pradesh holds 51% equity and Government of India holds 49 % equity.

At the Secretariat level , the Ministry is headed by a Secretary who is assisted by one Additional Secretary , three Joint Secretaries (including the Financial Advisor), one Project Advisor, seven Directors/Deputy Secretaries, seven Under Secretaries, eleven Section Officers, one Desk Officer, one Assistant Director (Official Language) and one Deputy Controller of Accounts and their supporting staff.

Priorities

Keeping in view the Government of India's continued liberalization programs and encouragement of competition, one of the major priorities of the MoC was deregulating the pricing of various grades of coal. Earlier, the prices of coal were fixed by the Central Government under the Colliery Control Order of 1945. However, gradually over the last few years, the prices of certain grades of coal were deregulated. In January 2000, the Colliery

Control Order 2000 was notified which superseded the earlier order of 1945. Under the new order, the price of coal was fully deregulated.

One of the priorities of the MoC now is to improve the efficiency and output of the coal mines. This basically means improving the operations of Coal India Limited which accounts for more than 85% of the total coal mined in the country.

Summary of Views & Opinions on CET

The view of the MoC is that it is not a direct emitter of CO_2 and hence does not have any responsibility towards control of CO_2 emissions. However, the MoC is trying to address the problem of CBM (Coal Bed Methane) which is a GHG, the MoC has initiated a few projects whereby the uses of CBM are being explored.

The MoC is fairly apprehensive about CET as of now. One of their apprehensions is whether the CETs will ever take off. *'The US Senate is yet to ratify the Kyoto Protocol and if that does not happen, the whole thing is in jeopardy'*. The MoC feels that per capita emissions in India are very low and hence there should be no compulsion on India to reduce emissions.

On the positive side, the MoC feels that if any transfer of technology takes place economically, then it can only benefit the nation.

Role in environment related issues

MoC looks at the functioning of the coal industry. While undertaking coal projects, they look into all the aspects of pollution, viz., water, air and noise pollution. For every project an environment action plan is created and due clearance is taken from the concerned ministries/departments. Only after getting a clearance from these departments, the work on the project is commissioned. The CMPDI (Central Mines Planning & Design Institute) in Ranchi

is the think tank of the Coal Industry in India and the ministry takes suggestions from them and the coal companies with aspects regarding environment. The giant Coal India Limited is also consulted but they in turn consult CMPDI, which almost becomes the nodal point for the MoC to address their environment-related issues.

Awareness of GHG (especially CO_2) and its effects / CET

MoC is not directly involved in reduction/controlling of GHG and CO_2 emissions, as the coal industry itself is not a significant contributor of CO_2 and GHG emissions. Thus, no exclusive surveys on CO_2 and GHG emissions are undertaken. However, the ministry is concerned about the emission of methane (which falls under GHG). To exploit the uses of Coal Bed Methane (CBM), which was released in the atmosphere until now, the ministry has already initiated a few projects. Under these projects, they are exploring the uses of CBM, which can be tapped from the mine itself and thus, not released in the atmosphere. The ministry has taken a good note of CET and their basic understanding of these issues seems to be clear.

Views on CET

CET is considered to be quite vague right now. Much more explaining and detailing has to be done especially in the areas of baseline fixation and certification. It says that of late, Indians have become smarter and are more careful but still, it is a unipolar world now and arm twisting by the US to accept whatever they offer cannot be ruled out. The ministry has expressed many fears on the implementation of mechanisms suggested in the Kyoto Protocol, especially the CET. They are very concerned of the fact that U.S. Senate may not give approve signing the Kyoto Protocol itself (the MoC say that they came across a press article which said that the US Senate may not approve US participation although the US is a signatory). Thus, the whole thing can be in jeopardy. With the major partner being not sure of participation, the authenticity of whole thing is questionable.

The other concern that the ministry expressed was that the per capita emissions of CO_2 and GHG is one of the lowest in India and is approximately $1/30^{th}$ of what U.S. and other developed countries have. So, why is it that these developed nations are imposing their protocols upon the developing nations?

They are of the view that if some technology transfer takes place economically then it would do only good to the nation. However, they are afraid of certain embargoes like ban on setting up of new coal based plants, which the previous protocols/mechanisms were pointing at.

Role in implementing CET

The MoC will play an active role. Already involved in many projects that help in bringing down pollution due to mining and usage of coal. Presently using washeries and locating Power Plants at the pit head to reduce pollution. More reduction can be done in the area of methane gas. They also can introduce more fuel-efficient engines in the open cast mines. They can accumulate credits on various plantations / forest cover that they add to the ecology. MoC will support the MoEF actively with suggestions and in implementation.

Communication means preferred and reasons

Audio-visuals in a forum which is diverse in nature will be the first step. It is important that scientists are also invited and actively participate in the evolving and implementation of CET. MoC feel that at present, scientists at CSIR do not have much of an idea of CET. A lot of information would be required at lower levels, which would be actually implementing this mechanism. A conference or a seminar involving the coal companies would be necessary at this stage. They would like to participate in such forums / seminars to understand the mechanisms of CET better.

PLANNING COMMISSION (PC)

Introduction

The Planning Commission (PC) was constituted in March, 1950 by a Resolution of the Government of India, and works under the overall guidance of the National Development Council. The Planning Commission consults the Central Ministries and the State Governments while formulating Five-Year Plans and Annual Plans and also oversees their implementation. The Commission also functions as an advisory body at the apex level.

The Planning Commission functions through several technical/subject Divisions. Each Division is headed by a Senior Officer designated as Pr. Adviser/ Adviser/Addl. Adviser/Jt. Secretary/Jt. Adviser who function under the overall supervision and guidance of the Secretary.

The Deputy Chairman and the full time Members of the Planning Commission function as a composite body in the matter of detailed plan formulation. They provide advice and guidance to the subject Divisions of the Commission in the various exercises undertaken for the formulation of Approach to the Five-Year Plans, and Annual Plans. Their expert guidance is also available to the subject Divisions for monitoring and evaluating the Plan programs, projects and schemes.

Priorities

The main priorities of the planning commission are to formulate five-year plans for the country. Plans are both for the State and the Central Government.

Summary of Views & Opinions on CET

The PC is very apprehensive of the CET in its present form. The PC feels that the basis of any discussions on CET should be on a per capita emissions basis. The PC feels that the growth of the country could be stunted by the CET. *'Under CET, there will be a limit on the extent of emissions and hence the extent of power that we can generate will also be limited'*.

Role in environment related issues

There is an environment and forests division within the PC, which takes care of planning related matters regarding environment protection.

Awareness of GHG (especially CO_2) and its effects / CET

PC is very well aware of GHGs and CET. In fact, the PC feels that the awareness among other ministries is low.

Views on CET

The PC is against CET in its present form of framework. PC feels that the only way emissions should be calculated is on a per capita basis. Furthermore, that the US initiated this protocol and CET as reducing emissions in their own country is very expensive and hence it would be better to exploit a developing nation and still take credit for emissions reduction. What would cost US $100 for reduction of CO_2 in the US would only cost about US $ 4 in India! In other words, the developed countries have polluted the world and now they want to offset it by taking measures in developing nations without doing anything in their countries. The PC also feels that the per capita emissions of GHGs by the US has increased even after the Kyoto protocol which itself clearly shows that they do not want to do anything at their end. The average common man on the road in the US is not bothered about emissions.

The PC feels that the growth of the country could be serious impaired if we agree to CET in its present form. Over a period of time, there will be a limitation to the quantity of power that we generate (as we will be allowed only to emit up to a certain level). Power generation and consumption is directly related to the growth of a nation. Hence this will stunt our growth and this will be seen cascading in different industries like steel, aluminum, etc.

Role in implementing CET

The PC is very apprehensive about the CET in its present form and does not see any role for them at present in implementing CET.

Communication means preferred and reasons

The PC feels that communication is needed to highlight the ill effects of CET. Industry and many ministries seem to be blissfully unaware of this at the moment. The PC is of the opinion that USAID was trying all possible ways to push through the CET. The nexus of US, World Bank and others were forcing countries like China and India to accept CET immediately. Something would have to be done. Messages should be spread through Television highlighting the harm that could be caused by CET in its present form. Talks in Universities and other media could also be used.

MINISTRY OF EXTERNAL AFFAIRS (MEA)

Introduction

The Ministry of External Affairs (MEA) is concerned with all policy matters regarding international relations of India with other countries around the world. The foreign policy of the Government of India is formulated by the MEA.

Priorities

The main priorities of the MEA is to promote India as the largest democracy in the world and to project the country as being non aligned and keen on keeping good relationships with other countries. Priorities are Pakistan (after the Kargil conflict) and China both of whom are neighbors with whom India is keen to have a mutually peaceful and understanding relationship.

Summary of Views & Opinions on CET

The MEA has a fairly positive view towards CET. The main reasons for this are that there will be a significant flow of funds into India for state-of-art technology in the polluting industries.

Like other ministries, the MEA also has its apprehensions about how the CET will be implemented.

Role in environment related issues

In the UNFCCC, the MoEF and the MEA represented the Government of India. While the MoEF plays the major role in all international discussions regarding environment, emissions, etc., the MEA plays a supporting role with macro level inputs.

Awareness of GHG (especially CO_2) and its effects /CET

The MEA has taken a good note of CET and the various mechanisms associated with it.

Views on CET

The ministry has some concerns regarding CET. They can be summarized as follows:

- These international mechanisms should not lead to a situation where a developing country has to compromise on development.
- These international instruments should not impose any obligations in any form on the developing countries in general and India in particular.
- The projects that would be gaining from CET would be the big ones as only in these projects, the benefit costs are high.
- The calculation of Carbon Points and Baseline is very vague. Further, it is a very tedious and expensive job.
- The time frame for implementation of CET has to be defined.
- The companies in the developed nation would not be interested in investing in projects in developing nations just to gain Carbon benefits.
- The long-term impact of CET on the developing countries may not be good. With the improved technology, the emissions levels would reduce. However, when the demand rises in the future, the developing countries may not have technology to improve upon the emissions levels.
- The U.S. senate may not ratify the CET
- There should be a meaningful participation from the developing nations, specially, India, Brazil and China.

However, the ministry is welcoming the CET, as it would result in more foreign investments in India. The ministry is not at all apprehensive of the fact that cheap technology can be

transferred to the developing nations. They believe that this is not possible as the developing nation would not be compelled to accept anything and proper review would be taken up before any project comes up under CET.

Role in implementing CET

The MEA believes that they do not have any role in the implementation of CET as this would be the sole responsibility of the MoEF.

Communication means preferred and reasons

According to the MEA, the government would like to have a broader viewpoint than taking into account only the industries and NGOs. The MEA feels that the Government of India would like the views and perspectives of the common man also on CET. The ministry feels that the information should be provided in the form of a seminar where the industries can interact with the implementing body of CET to clear their concerns.

Maharashtra Pollution Control Board

Introduction

MPCB is a body under the State Government of Maharashtra. Their main role is to keep watch of the pollution control measures taken (especially by industry) in the State of Maharashtra.

Priorities

The main priorities of the MPCB are to ensure that industry in Maharashtra is following the norms laid down with respect to pollution / emissions. The Central Pollution Control Board specifies these norms and MPCB has to enforce these standards that are laid down.

Summary of Views & Opinions on CET

MPCB is positive towards CET and feels that with proper interaction between countries, good results can be achieved. Adoption of modern technology will be the major motivator to participate in CET.

Role in Environment Related Issues

The role of the MPCB is supervisory in that it overviews the pollution control steps taken by industry and makes sure that the steps taken are in accordance with the standards laid down by the Central Pollution Control Board.

Awareness of GHG (especially CO_2) and its effects / CET

MPCB is aware of the GHGs and its effect on the environment. MPCB respondent has also heard of some conventions on the same although they are not able to name any of the

conventions.

Views on CET

MPCB is of the view that under the convention, there should be regular interaction between countries as improvement in technologies is a continuous process and feel that availability of the latest technologies under CET would be its most positive aspect.

Andhra Pradesh Pollution Control Board

Introduction

APPCB is the body that monitors pollution control related activities in the State of Andhra Pradesh.

Priorities

The main priorities of the APPCB is to ensure that the norms laid down by the Central Pollution Control Board are strictly followed by industries in Andhra Pradesh.

Summary of Views & Opinions on CET

The APPCB seems to have a limited knowledge of CET. The APPCB merely follows the guidelines laid down by the Ministry of Environment & Forests / Central Pollution Control Board. Hence do not have any particular opinion on CET.

Role in Environment Related Issues

The APPCB feel that their role in environmental related issues is secondary as it is primarily the polluting industries that have to take all the necessary steps to prevent pollution and protect the environment. APPCB's role is secondary in that it has to see that the norms specified by the Central Pollution Control Board are enforced.

Awareness of GHG (especially CO_2) and its effects / CET

APPCB is aware of the GHGs, especially CO_2. However, they do not seem to be very aware of CET.

Views on CET

APPCB on their own do not have any views on CET.

Orissa Pollution Control Board

Introduction

Like other state level PCBs, the OPCB also plays the role of ensuring that industries comply to stipulated emissions norms by adopting / installing suitable means / devices.

Priorities

The priority areas of the OPCB are NO_x, SO_x and suspended particulate matter related pollution.

Summary of Views & Opinions on CET

The OPCB is positive towards CET in terms of the technological benefits that can be got by industry through the same. However, OPCB does not feel that they have a major role to play in CET and feel that industries should be the ones who will play a primary role and will be the ones to benefit from CET

Role in Environment Related Issues

The role of the OPCB, like other state Pollution Control Boards is to check if industries are complying with the stipulated standards of emissions as laid down by the Central Pollution Control Board.

Awareness of GHG (especially CO_2) and its effects / CET

The OPCB is aware of GHGs. They are also aware of the effects of CO_2 emissions and global warming. Regarding CET, OPCB say that the Ministry of Environment & Forests are

the ones who are dealing with the protocols. However, they are aware of CET but do not know the details.

Views on CET

OPCB feel that India can take advantage of the new technologies available under CET. Feels that industries should take the front stage and make use of the benefits available under CET.

Maharashtra Energy Development Agency (MEDA)

Introduction

MEDA promotes and propagates non conventional energy sources like biomass biogas solar, wind energy and even municipal waste.

Priorities

MEDA undertakes energy audits and help in efficient use of energy along with the promotion of non conventional energy sources.

Summary of Views & Opinions on CET

Not really aware of CET but are positive about it. They feel that Technology and Funds under CET are plus points. They however feel that prices of such technologies (especially, running costs) should be carefully monitored otherwise they may become unviable.

Role in Environment Related Issues

The role of MEDA is to promote non conventional energy sources. MEDA feel that by helping in improving energy efficiency, they also help in reducing emissions and hence, protect the environment.

Awareness of GHG (especially CO_2) and its effects / CET

MEDA is aware of GHGs and their adverse effects. However, they do not know much about CET.

Views on CET

MEDA feel that CET will help a developing country like India by way of latest technology and investment. Hence, they feel that there will be a double gain for India in terms of development and in emissions reduction. However, they feel that prices should be carefully monitored or else we may reach a stage where we will buy the technology but may not be able to afford to use it.

Andhra Pradesh Power Generation Corporation (APGENCO)

Introduction

APGENCO is the agency that plans and implements power generation projects in the state of Andhra Pradesh.

Priorities

APGENCO has to make sure that all the power plants are working efficiently. Indirectly, this also leads to less emissions .

Summary of Views & Opinions on CET

APGENCO is positive towards CET. It feels that the Government should be actively involved in forming the guidelines for implementation of CET. It considers that the advantages of CET for Power Plants is in getting the latest Clean Coal Technologies.

Role in Environment Related Issues

APGENCO checks the emissions from the chimney and liquid effluents from the thermal power plants. These have to be maintained within the standards as specified by the APPCB.

Awareness of GHG (especially CO_2) and its effects / CET

APGENCO is aware of the adverse effects of CO_2. They have heard of CET although they are not aware of the details.

Views on CET

APGENCO feel that the first round of AIJs (Activities Implemented Jointly) were a failure because there were no proper Government guidelines. If proper guidelines are laid down by the Government, such mechanisms (like CET) can be successful and beneficial for the country. APGENCO feel that CET can be implemented in India as we can get access to new Clean Coal Technologies for our power plants.

SUMMARY OF FINDINGS

Introduction

As discussed in the opening chapter, the MoEF is the nodal ministry as far as environment related issues are concerned for the Government of India. The Ministries that play the primary role as far as industries directly related to environment related matters are concerned are the MoP, MoI and the MoS. Ministries that play a supplementary role as far as industries are concerned are the MoC and the MoNES. Ministries that are more into the planning and policy framework related matters are the Planning Commission and the MEA. This is schematically shown below. The support agencies for the ministries are in italics. State level bodies like the State Pollution Control Boards and the Energy Development Authorities play only a supporting role and look up to either their controlling central body or the Central Ministry under whose purview they fall for directions.

	NODAL MINISTRY	USER INDUSTRY MINISTRIES	POLICY & SUPPORT MINISTRIES
PRIMARY	Ministry of Environment & Forests *Central Pollution Control Board*	Ministry of Power *Energy Management Centre* Ministry of Industry *National Productivity Council* Ministry of Steel	Planning Commission Ministry of External Affairs
SECONDARY	*State Pollution Control Boards (Andhra Pradesh, Maharashtra & Orissa)*	Ministry of Coal Ministry of Non-Conventional Energy Sources *Indian Renewable Energy Development Agency* *Maharashtra Energy Development Agency* Andhra Pradesh Power Generation Corporation	

Summary of Views & Opinions on CET

Some of the major points raised by different ministries are quoted below:

Apprehensions

The most common apprehension in the framework for CET seems to be the lack of initiatives that will be taken by developed nations to curb their own emissions. The other common apprehension seems to be the fear of the development of the country being impaired by any caps that could be put on emissions through the CET.

In implementation of CET, the common apprehension seems to be as follows:

*'USA will impose regulations on Indian industries under the garb of C*ET' (Ministry of Industry)

'*Some developed countries have said they will participate in CET but will continue to increase their emissions'* (Ministry of Power)

'*The US Senate is yet to ratify the Kyoto Protocol and this puts a question mark on the participation of the US although they are signatories'*(Ministry of Coal)

'*The growth of a developing country like India could be seriously impaired if the CET were agreed to in its present form.'* (Planning Commission)

The Planning Commission official contacted feels that as the emissions reduction is now less expensive in the developing countries than in their own countries, the developed nations are eager to exploit it. He avers that in future, cap will be imposed on the emissions of developing countries too . As the emissions restrictions in the present form are not based on per capita basis, it will be expensive at that time to curtail the emissions and at the same time to increase the energy production and consumption for facilitating the development of the large population in the country.

'*The per capita emissions of GHGs in India is among the lowest in the world. So why should the developed nations impose the CET on developing nations?*' (Ministry of Coal)

'*It is unlikely that companies in developed nations would be interested in investing in projects in developing countries like India just to gain Carbon Points'* (Ministry of external affairs)

'*Not convinced about the implementation part as it is very vague in the present framework. However, we can play a major role in implementation if CET is taken up by India'* (Central Pollution Control Board)

'*Baseline fixation either by industry or by location or both will be a big problem'* (Energy Management Centre)

'*The Montreal Protocol was a failure because too much of the concentration was on ozone. Similarly the Kyoto Protocol could also be a failure as there is too much emphasis on GHGs. A more holistic approach is required'* (National Productivity Council)

Positive

Respondents also felt there are benefits from CET. Some of the prominent points made are as follows:

'CET would bring investments in power and other projects' (Ministry of Power)

'*Technology transfer could take place through CET'* (Ministry of Coal)

Others

Other than apprehensions and benefits, there were other issues that were raised that respondents felt should be part of the entire CET exercise. These are:

'No emissions cap should be set for or accepted by India for the next 50 years' (Ministry of Power)

'*Developed countries should work towards reducing emissions in their own country as well'* (Ministry of Power, Planning Commission, Ministry of Coal)

'*A world wide standard per capita emissions should be the platform on which any CET activity should be discussed'* (Planning Commission)

'Sinks and other non conventional energy projects (like solar power projects) should be covered under CET for Carbon points'(Ministry of Coal)

The different ministries and associated bodies have been classified based on their views on the **present CET framework** and their views on **implementation of CET**. These are separately indicated and the ministries have been classified under three heads namely Positive, Neutral and Apprehensive. This is schematically indicated below:

	POSITIVE	NEUTRAL	APPREHENSIVE
BASIC FRAMEWORK	Ministry of Power *National Productivity Council* Ministry of Steel Ministry of External Affairs Andhra Pradesh Power Generation Corporation *Maharashtra Energy Development Agency* *Maharashtra Pollution Control Board* *Orissa Pollution Control Board*	*Central Pollution Control Board* *Energy Management Centre* Ministry of Industry Ministry of Coal *Andhra Pradesh Pollution Control Board*	Planning Commission Ministry of Environment & Forests

	POSITIVE	NEUTRAL	APPREHENSIVE

IMPLEMENTATION		Ministry of Power *Energy Management Centre* Ministry of Steel *National Productivity Council* Ministry of External Affairs *State Pollution Control Boards (Andhra Pradesh, Maharashtra & Orissa)* *Maharashtra Energy Development Agency*	Ministry of Environment & Forests *Central Pollution Control Board* Ministry of Industry Ministry of Coal Planning Commission

Communication means preferred

It was seen that most of the ministries and their associated bodies preferred seminars and common forums to discuss the issues regarding CET wherein they felt that the communication would be two way and clarity would be best. Some of the associate bodies preferred printed communication material on CET as they seem to be more comfortable reading over the points many times to understand them.

The communication means preferred for additional information on CET is summarized in the following table.

PRINT	SEMINAR / FORUMS	INTERNET / AUDIO - VISUAL
Central Pollution Control Board *National Productivity Council*	Ministry of Environment & Forests Ministry of External Affairs Ministry of Industry Ministry of Power *Energy Management Centre* Ministry of Coal Ministry of Steel *State Pollution Control Boards (Andhra Pradesh, Maharashtra & Orissa)* *Andhra Pradesh Power Generation Corporation* *Maharashtra Energy Development Agency*	Planning Commission

NGOs & PRESS

BACKGROUND

In matters related to environment protection and pollution control, Non-Government Organizations (NGOs) play a very important role in dissemination of information, improving awareness, educating the masses and also as a spokesman to express the opinions of the public. Their role is that of a facilitator.

NGOs are considered to be very important and their views are taken by the Government and their ministries in the decision making process.

The following NGOs were contacted for this study

Centre for Science and Environment (CSE)
Development Alternatives (DAI)
Tata Energy Research Institute (TERI)
Indira Gandhi Institute of Development Research (IGIDR)

The press is one of the most powerful mediums for information dissemination and, like NGOs, the role of the press is that of a facilitator.

Newspapers and magazines could be classified broadly under two segments namely general purpose and business. Some of the well known general purpose newspapers in India are The Hindu, The Times of India, The Hindustan Times, The Telegraph, etc. Some of the well-known Business Newspapers are The Economic Times, The Financial Express, Business Standard, etc. General-purpose magazines in India that are widely read include India Today, Outlook, The Week, etc. Business magazines that are well known include Business India,

Business World , Business Today, etc.

During the study, it was seen that many of the newspapers and magazines do not have a separate correspondent for environment related issues.

The contacts made for this study in the Press Segment were:

Business Standard
Financial Express
India Today
The Hindu

CENTRE FOR SCIENCE & ENVIRONMENT (CSE)

Introduction

The Centre for Science and Environment (CSE) is a leading NGO in India with interest in sustainable natural resource management. CSE stresses on the importance of sustainable development. In the first citizens' report published in 1982, CSE argued that development and environment must go hand in hand. CSE's second citizens' report carried the report on how environmental destruction affects rural women and received nation-wide attention to a point that the then Prime Minister invited CSE in 1986 to address the nation's Council of Minister and the Parliament on the importance of sustainable development. The fourth report on India's traditional methods of water management has started off a nation-wide interest in community and household-based water management. CSE is today leading a campaign against the growing threat of pollution in the country. Started in 1982, CSE also publishes books and journals as well as produces videos and films. Its fortnightly magazine, 'Down to Earth' has a small subscription base but it reaches out to about 80% of the districts in the country. Apart from work on natural resource management issues, CSE has campaigns on air and water pollution and the threats posed to public health by the changing environment. CSE has also started an innovative project to bring about transparency in the industrial sector by rating the environmental performance of Indian firms.

Summary of Views & Opinions on CET

CSE is totally against CET in its present framework. CSE is very vociferous in its viewpoint that any discussions on CET should be on the basis of per capita emissions. CSE would like to discuss any issues under CET only after a worldwide uniform per capita emissions is laid down as they feel that every individual has a right to the environment and if any steps are to be taken

on a global scale, the standards set should be equal across the globe.

Awareness of GHG (especially CO_2) and its effects / CET

Being an NGO with particular interest in Science and Environment, CSE is well aware of GHGs and its effects as well as CET. CSE representatives have attended the Seventh Conference of Parties (COP) held in Costa Rica in 1999 and are very up to date on the developments regarding CET.

Views on CET.

CSE has very strong views on CET. They are strictly against the whole thing in its present form. They feel that it is anti-national. In their opinion, it is just another way of drubbing the developing countries. They feel that the growth rate of India would be stunted if they sign the protocol in its present form.

The main apprehension is based upon the fact that the emissions levels are not being divided on the per capita basis. Hence, CSE feels that India is not getting the fair share of the carbon rights, which it is entitled to. Further, the developed countries are shirking away their responsibility towards the environment. They are passing on the burden to the developing countries. The developed and industrialized nations are doing nothing to control CO_2 and GHG emissions in their areas. They are not making any investment in their countries to clean up.

CSE feels that the industry would be committing a major blunder by accepting any foreign investment under CET. There might be some very small short term benefits. However, in the long run, the whole thing would be very expensive to the industries. By taking investments under CET now, the industries would be losing their carbon share now. At a later stage, when

growth increases, the industry would have to invest in costlier technologies on their own to meet the emissions levels. Anyway, the funding right now would not be substantial. Thus, the developed countries would be exploiting India and other developing nation's interests.

Therefore, CSE is of the view that, CET should not be accepted at all in its present form. However, they can look into it and may even accept it after changes, if the emissions levels are fixed on a per capita basis.

Communication means preferred and reasons

CSE believes that the industries and the concerned ministries need to be educated about the fact that environment is a basic right for all individuals on earth and hence the per capital emissions standard should be the basis of any discussions on CET. CSE feels that industries and allied associations in India seem to blindly believe that the CET can only be a boon for them. Awareness has to be developed in both these sections. After this, other issues can be discussed on CETs through common forums. The priority should be to accept the emissions levels on per capita basis and this message has to be spread far and wide across the country.

DEVELOPMENT ALTERNATIVES, INDIA (DAI)

Introduction

Development Alternatives, India, (DAI) is a non-profit research, development and consultancy organization established in 1983. It fosters the interaction between people, technology and environment to attain the goal of sustainable development. DAI has three main branches namely the Technology Systems Branch (TSB), The Environment Systems Branch (ESB) and The Institutional Systems Branch (ISB). The ESB handles all issues related to global climatic change.

In TSB, DAI actively intervenes through its commercial partner TARA (Technology & Action for Rural Advancement) by selling appropriate technology to rural areas for income generation activities. Examples are tile making machines, mud compaction machines, etc. TSB has set up projects and had helped develop local expertise in marketing and management.

The ESB designs environment and development management strategies at various geographic scales and levels of detail. Experimental cum demonstration projects are also undertaken in the field. The range of field studies and projects include Environmental Impact Assessment and Analysis, Environmental Management Plans, Environmental and Social Policies and Procedures for Corporate organizations, Community Development, Food Security in Tribal areas, Rehabilitation and Resettlement, Pollution Prevention, Cleaner Production, Waste Management, Natural Resources Management using GIS & Remote Sensing, Income Generation through Micro-enterprises, and Bio-diversity Conservation.

DAI has about 160 professional and support staff in diverse fields ranging from Anthropology,

Sociology, Economics, Forestry, Ecology, Geology, Engineering and Analytical Chemistry to contribute to the assignments undertaken. The Environmental Monitoring Facility can undertake soil, water and air analyses. DAI has regional offices in Bangalore and Jhansi apart from a technology centre being established in Orchha in MP. A field station has been set up in Tumkur, Karnataka.

Summary of Views & Opinions on CET

DAI has a positive view towards CET. DAI feels that industry stands a lot to gain in terms of technology and funding of the same. Many issues still have to be sorted out regarding CET and its implementation but DAI feels that this can easily done with the number of knowledgeable experts in different fields available in the country.

Awareness of GHG (especially CO_2) and its effects / CET

Very well aware of GHGs and their effects as well as CET.

Views on CET.

DAI view CET as a positive thing to happen for India. It would help in increasing foreign investment especially in the big projects. DAI feel that the industries should not miss the bus as they did at the time of AIJ and eventually many of the plum projects went to the Latin American (especially Costa Rica) and East European countries. The industries should look at CET positively and in a way that can be helpful for them.

In spite of the optimism in their views, DAI had a few concerns and apprehensions regarding CET.

- It would be very difficult to put down a baseline. Further, no static baseline is possible. The baseline has to be constantly reviewed and monitored.
- The whole issue has to be agreed upon by the project developers (the investors and the company implementing the project) and certified by the governing agency. Then only the CET executive board can think of awarding the CERs to the investors.
- The goals of CET have to be quantified.
- Government of India should appoint entities for monitoring, reviewing, certification, etc. Only the government can take an initiative in this regard.
- Substantial carbon points cannot be accumulated from small projects. Therefore, these small-scale industries would not get the benefit.
- There are many "any case" projects which would have taken place any way – CET or no CET. Majorities of these are in the renewable energy sector. Present indications are that they will not be credited under the CET. These "any case" should also be the beneficiaries of CET and they should be allowed to accumulate CERs.
- The U.S. Senate is yet to ratify the Kyoto Protocol. However, DAI feels that this is not a major concern as the Senate would definitely ratify it after the Presidential Elections in U.S. are over and a new government is formed (and especially if Al Gore wins).

On the whole, DAI feels that these mechanisms are not developed everyday. The industry should take advantage of whatever is there. This is a mechanism that will not only safeguard our interests but also lead to sustainable development.

Communication means preferred and reasons

A proper ground work is required before information dissemination takes place. A lot of people who deal in environment and climate change should be met. Different views should be put down and discussed. The industry, government and the environment experts should thrash

out issues. Then a common forum for discussion should be formed. The forum should discuss the hard facts and figures.

DAI feels they can organize the following programs for this purpose.

- Training programs for the government and industries
- Interactive workshops for creating an awareness and interest
- Seminars to work out means of implementing CET

TATA ENERGY RESEARCH INSTITUTE (TERI)

Introduction

TERI is an autonomous, non-profit research institute established in 1974. Conducting both scientific and policy research, its activities are in the fields of energy, environment, biotechnology, forestry and whole range of sustainable development issues. The Institute is committed to reducing all forms of waste, promoting efficient use of raw materials and depletable resources, protecting the environment, conserving natural resources and wide-scale dissemination. TERI also takes a comprehensive view of development, wherein efficient use of natural resources and protection of the environment are seen as essential pre-requisites for economic welfare.

TERI had been active in energy & environmental fields. The early achievements in this field is in conserving resources in the village / community level. Joint Forestry Management and Forest produce collection is an example of this. Sustainable water programs are another success. In all these programs, the success was largely dependent on an integrated approach. TERI has been playing the role of knowledge builder in these areas. The success of these programs is attributable to the participatory / ownership role of the stakeholders. The cost / benefit of the programs had been very well demonstrated.

There are about 500 professionals are with TERI which is headquartered in Delhi and has branch offices in other cites as well as overseas.

Summary of Views & Opinions on CET

TERI seems to have a neutral view on CET.

Awareness of GHG (especially CO_2) and its effects / CET

Well aware of GHGs and their effects as well as CET.

Views on CET.

TERI's views on CET were seen in the FICCI-TERI Conference held in February, 2000 , the central theme of which was 'Climate change: sharing experiences and business opportunities'.

At the conference TERI opined that the focus would have to be on the energy sector as far as CET was concerned. TERI feels that it would be very important for industry to protect the local environment, which would also have global benefits although the results may not show in the current balance sheets of business concerns.

Communication means preferred and reasons

TERI feels that the Government of India's views towards abatement of GHGs is indifferent. TERI feels that awareness of the problems related to increase in GHGs should first be addressed before spreading awareness on CET.

TERI feel they can organize workshops and training programs for industry on how CET projects would need to be structured, evaluated, implemented, and monitored.

INDIRA GANDHI INSTITUTE OF DEVELOPMENT RESEARCH (IGIDR)

Introduction

The Indira Gandhi Institute of Development Research (IGIDR) is an advanced research institute which researches on problems and policy options for development from a broad multi-disciplinary prospective. IGIDR have carried out environment related research on various policies.

Summary of Views & Opinions on CET

IGIDR is skeptical about CET in its present form. They also are worried about the baseline fixation. However, IGIDR feel that the if the Government of India is careful, India can get a good deal from CET in terms of good technology.

Awareness of GHG (especially CO_2) and its effects / CET

IGIDR is aware of the effects of CO_2 on the environment. They are also well aware of CET.

Views on CET.

IGIDR is of the view that there are chances of getting good technology under CET. However, they feel that there is no clear definition of the baseline and without a proper baseline there is a possibility that all kinds of fake carbon saving will take place and the developing nations will get peanuts for this saved carbon. The developed nations will not save any carbon in their countries but they will say that the target has been achieved but actually carbon emissions would not be reduced. IGIDR feels that the Government of India has a very critical role to play in seeing that in the name of Carbon, the future of the country should not be compromised and India should not incur long term liability later on.

BUSINESS STANDARD (BS)

Introduction

Business Standard (BS) is a very well accepted and respected business newspaper. They generally look into the business issues. However, Business Standard is the only newspaper in India to have an Environment Editor who covers environment issues. Generally, the environment editor writes on matters covering diverse areas of environment, viz., Wildlife, Air and Water Pollution, Topsoil depletion, etc.. The environment editor has been writing on the issues regarding GHG and CO_2 emissions from time to time.

Summary of Views & Opinions on CET

BS has a neutral view overall towards CET. BS feels that the developed nations should do their bit in their own countries to reduce emissions but also feel that this is a good opportunity for developing countries to improve their technologies at a lower price.

Awareness of GHG (especially CO_2) and its effects / CET

BS is well aware of the UNFCCC and the Carbon Emissions Trading mechanism. Though the environment editor is yet to write on these issues, he has a good knowledge of them.

Views on CET.

BS feels that the CET in its present form is vague. The mechanism of implementation of CET is not mentioned anywhere. Will the developing countries agree to the whole thing and if they do, to what extent would they agree is also not known. CET is a concept – a vague idea that needs to be defined properly. BS see certain advantages and disadvantages in CET.

Advantages of CET:

- This would help the developing nations get more funds from the economically developed nations for improvement in their technology.
- The new technology thus obtained would help in increasing productivity of the Indian industries.

Disadvantages

- The theory of transferring credit points to the developed nation does not seem to be good.
- This would slow down the economic growth of the country
- This would also slow down the usage of fossil fuels (India has abundant resources of fossil fuels)
- The money that would be invested is only the incremental cost.
- The quality of technology that would be transferred would also be questionable.

On the face of it looks like the developed countries are shirking away their responsibility to the developing nations. They are not doing anything about their emissions but asking the developing countries to reduce their emissions. " *The developed countries should help the developing countries in reducing their emissions in addition to reducing the emission levels in their countries, not in lieu of that*."

The giant emitters should control and maintain whatever levels they have been asked to maintain. They increase their emissions to fuel their economic growth and in return they are asking the developing nations to reduce their emissions levels and in a way, reduce or slow down their economic growth.

Communication means preferred and reasons

BS suggests that a common forum involving media, government, NGOs and industry should be formed. This forum can then suggest to the nodal ministry of the government to lay down the policies in this regard. Then seminars, press briefings, etc., should be done to create an awareness and acceptance.

FINANCIAL EXPRESS (FE)

Introduction

The financial express (FE) is the daily business newspaper of the Express Group, which is one of the large newspaper groups in the country. The group has a general purpose daily newspaper called the Indian Express which is also very popular.

Summary of Views & Opinions on CET

The FE feels that the CET will not be beneficial for India. The FE views CET as something put forward by the US to serve their own interests

Awareness of GHG (especially CO_2) and its effects / CET

The FE has been following environment issues like Global Warming, Climate Change and GHG & CO_2 emissions. FE has also been keeping track on UNFCCC and CET quite closely.

Views on CET

The UNFCCC is the only international convention held on climate change. Everyone had agreed upon it. Even India was a party to the convention. However, the U.S. Senate is yet to ratify the subsequent Kyoto Protocol. FE feels that CET is a system evolved by the US only. US sponsors the system because they do not want to clean up the act in their region. They are trying to push the mechanism down the throat of developing countries. CET has only short-term benefits for India, but has long term benefits for the US. It is beneficial only for the developed nations like US and not beneficial for developing countries like India.

On the face of it, it is very clear that CET is a mechanism developed by U.S., where they transfer the technology and get credits. The question that arises now is why they should get the credits. Why shouldn't the country reducing the emissions get the credits.

Further, U.S. senate has not yet ratified Kyoto Protocol. Until that happens, it would be useless for anyone to discuss anything. In case the Senate refuses to ratify the Protocol, then the whole effort would go waste. Therefore, we have to wait until the U.S. Senate ratifies the Protocol and then only we can discuss the subsidiary issues.
Therefore, we should not accept it. The whole mechanism is wrong. The US is trying to push CET forcefully.

Communication means preferred and reasons

FE suggests that first the U.S. Senate should ratify the Kyoto Protocol, then only a common forum involving media, government, NGOs and industry should be formed to discuss the subsidiary issues. Even the people from developed countries should be involved. Then seminars, press briefings, etc., should be done to create an awareness and acceptance. However, these are only the steps two and three. The first step towards the issue should be that the U.S. Senate should ratify the Kyoto Protocol. No discussion is possible before that happens.

INDIA TODAY (IT)

Introduction

India Today is a very popular weekly general-purpose magazine. Started as an English magazine, many vernacular issues of IT are today available. The English version of IT is the oldest and has the largest circulation among English weekly magazines in the country.

Summary of Views & Opinions on CET

The awareness of all environment related matters are at a basic level. As can generally be seen in the press, when certain issues become current and require immediate attention only then is knowledge increased on that particular topic. As of now, the views and opinions of IT on CET are neutral.

Awareness of GHG (especially CO_2) and its effects / CET

IT is well aware of GHG emissions and its effects. However, do not have much knowledge of CET. No one in IT seems to be an expert in it.

Views on CET.

IT feels that CET is more of a political issue and less of an environment issue. Climate change is a very broad issue having a large canvas. We are yet to have our concepts in place. Therefore, India should tread its steps very carefully.

CET looks good on the face value. However, there is an anxiety that outdated technology would be dumped on us. A lot of primary investigations would be required in this regard.

Further, studies should be carried out to ascertain whether the emissions are really that high that an immediate attention is required. If not, then this should not be our priority issue as we have other problems to solve. As it happened five years ago, when the developed countries said that the methane emissions by India are very high and we should take some measures to control it. Later the Indian scientists proved that actual emissions are much less as compared to the specified norms. The U.S. has brought up the issue of climate change, as they cannot afford to reduce their own emissions.

Role of Media

Many issues have brought up by the media. These include Project Tiger, RainWater Harvesting, Narmada, Tehri Dam, etc. The media needs to introspect and continue writing on them even if fatigue sets in. On CET and the related issues, the media can show the way to the industry, ministry and other stakeholders. They can create a view and initiate discussions on the whole issue. India is constantly badgered in these international conventions. Now, they have to take very cautious steps as industry is also involved. Media can help the stakeholders by guiding them to the right steps. For this, a lot of brainstorming sessions would be required. A lot of education would also be required.

THE HINDU

Introduction

The Hindu is one of India's well-known English dailies. While it is known to be a conservative newspaper, it was the Hindu that rocked the country with its now famous exposes on the Bofors Gun Scam.

Summary of Views & Opinions on CET

The Hindu, has not formed any strong viewpoints on the CET per se. Like many of the other respondents in the press, they look at environment from a larger perspective and concentrate more on the day to day environment concerns.

Awareness of GHG (especially CO_2) and its effects / CET

Have some basic awareness but do not seem to be fully aware of all the concerns.

Views on CET.

Do not have any strong views on CET as they are not aware of all the details. However, they view CET as something that should be studied closely before making any commitments.

Role of Media

Like others in the press, the Hindu also feels that the press is the best means of communicating information about CET to the public. The press also has a social responsibility and hence information given by the press will be in the best interest of the public and the country.

SUMMARY OF FINDINGS

Introduction

From the study so far, it is clear that the NGOs and the press will play a significant role in the decisions made by the Government with regarding to the CET. The NGOs have very strong opinions and usually they do not hold back in voicing their opinions through various mediums. The press is always ready to voice their opinion as well as of those who have a viewpoint on any issues especially something as important as CET.

Summary of Views & Opinions on CET

Some of the major points raised by the different NGOs and the press are quoted below:

Apprehensions

The most common apprehension in the framework for CET seems to be the lack of initiatives that will be taken by developed nations to curb their own emissions. The other common apprehension seems to that a common per capita emission basis is not being used as a starting point for CET.

In implementation of CET, the common apprehensions are:

'It would be very difficult to put down a baseline. Further, no static baseline is possible. The baseline has to be constantly reviewed and monitored.' (DAI)

'By accepting certain emissions levels now, at a later stage, when growth increases, the industry would have to invest in costlier technologies on their own to meet the emissions levels.

Anyway, the funding right now under CET would not be substantial' (CSE)

'Substantial carbon points cannot be accumulated from small projects. Therefore, small-scale industries would not get the benefit.' (DAI)

'There are many "any case" projects which would have taken place any way – CET or no CET. Majorities of these are in the renewable energy sector. Present indications are that they will not be credited under the CET. These "any case" should also be the beneficiaries of CET and they should be allowed to accumulate CERs.' (DAI)

'Base line fixation will be a problem and hence all kinds of fake carbon savings will be shown. The developing countries will get pittance for this saved carbon while the developed nations will show high carbon savings without doing anything about carbon in their own country while in reality the carbon emissions will continue to increase worldwide' (IGIDR)

" The developed countries should help the developing countries in reducing their emissions in addition to reducing the emissions levels in their countries, not in lieu of that." (Business Standard)

'CET has only short term benefits for India, but has long term benefits for developing countries like the US.' (Financial Express)

Positive

Respondents also felt there are benefits from CET. Some of the prominent points made are as follows:

'There will be inflow of technology and funds under CET which will be good for industry especially for large projects'(DAI)

'CET is a mechanism which will not only safeguard the interests of a country like India(by reducing emissions) but also lead to overall development in the long run (in terms of technology, funds, employment, etc.)' (DAI)

The NGOs and the press have been classified based on their views on the present CET framework and their views on implementation of CET and this is schematically indicated below:

The press have been classified by their views on the CET framework only as their awareness of the basic framework itself is sketchy and none of them had anything to say about implementation.

	POSITIVE	NEUTRAL	APPREHENSIVE
BASIC FRAMEWORK	Development Alternatives	Tata Energy Research Institute India Today The Hindu	Centre for Science & Environment Indira Gandhi Institute of Development Research Business Standard Financial Express

	POSITIVE	NEUTRAL	APPREHENSIVE
IMPLEMENTATION		Development Alternatives Tata Energy Research Institute	Centre for Science & Environment Indira Gandhi Institute of Development Research

Communication means preferred

NGOs generally seemed to prefer forums and seminars to disseminate information on CET as their feeling is that a lot of discussions and exchange of views and opinions are necessary before any concrete action can be taken on CET.

The press would also prefer a briefing from the Government, NGOs and Industry on the issues related to CET and the different views and opinions . The press, more than wanting communication, would like to play the role of disseminator of information on CET.

CONCLUSIONS & RECOMMENDATIONS

Communicating to industry stakeholders

The industry stakeholders contacted are positively oriented to Carbon Emissions Trading mechanisms. The major motivators for their inclination include technology transfer, funding for the projects and the enhancement of corporate image among the public.

More efficient industrial units are interested in using CET to enhance their competitiveness in the global market place. While units that are not so efficient have greater need to utilize CET, they may follow once the more efficient units starts using them.

Awareness of GHG emission mitigation efforts through Carbon Emissions Trading is minimal and it is essential to develop a basic communication package with information regarding the convention which constituted the basis for development of the CET mechanism, along with appropriate case studies, where available.

The specific information sought by the industry in order to obtain more knowledge about options available to them include:

- Carbon Emissions Trading mechanism - details and implications, including case studies
- Funding mechanism and options
- Technology options
- Baseline, additionality and monitoring issues

These information need to be effectively packaged with suitable cost benefit analysis and operational details to enable better understanding of the various aspects involved.

The method through which the above information could reach the industries are:

- Brochures and print material sent through mailers (in some cases through e-mail) to the top management (CEOs, Presidents etc.) on CET mechanism and funding options and to operational / functional heads (General Managers) on technological aspects specific to the particular industry.
- Workshop / training programs to operational / functional personnel, preferably at the plant location (or in near by regional area), focused on the industry or similar type of industries.

In the case of government companies, there is also need to address the CO_2 emissions reduction issues raised above with the respective ministries (Ministry of Power for power plants, Ministry of Steel for steel companies and Ministry of Industries for other industries).

It may be concluded that, the large industries are more amenable to the concept of Carbon Emissions Trading, as the direct benefits accruing are obvious to them. However, they feel the need for the active cooperation by the Indian government as a facilitator.

Communicating to Government stakeholders

Within the government, the key protagonist in the acceptance of the CET mechanism will be the Ministry of Environment & Forest. It is apparently against the CET mechanism mainly due to the following two factors:

- It is not emphasizing on the developed countries to work towards reducing the cause of their own CO_2 emissions levels and instead shifting the focus on developing countries.
- It will ultimately impose caps on emissions in developing countries like India, which can not afford them keeping in view of the developmental needs.

The planning and strategy development body (Planning Commission) is also against the present global policy in this regard. It avers that the emissions have to be viewed on per capita basis

and the overall developmental prerogative of the vast populace in developing countries have to be considered before imposing emissions restrictions.

The various other ministries and departments tacitly accept the supremacy of Ministry of Environment and Forest in deciding environmental policy related issues. They could play only an advisory or suggestive role.

The key ministries that are responsible for the various industrial stakeholders (Power, Steel and industry) appear to be more positive and hence are more amenable to work for increasing awareness of the CET mechanism. Their main motivation is fund flow, technology transfer and reduction in emissions levels. Though they have apprehensions which center around mainly the two points raised by the Ministry of Environment & Forest, they take more pragmatic view on these.

At an indirect level, the industries can exert pressure on the respective ministries to facilitate open discussion of pros and cons involved. One hopes that this will happen once the industries are made aware of the options available to them through the communication exercise.

Communicating to NGOs and Media stakeholders

NGOs can be an effective medium through whom information on the CET mechanism could flow. While the NGOs positive to CET are willing to carry the message to industries concerned regarding the advantages, the ones that are against them are interested in highlighting the dangers of accepting CET especially for a developing country like India.

Possible Messages for Certain Stakeholders

GreenCOM believes that the following messages emanate from the research. GreenCOM suggests that for the industrial sectors, two segments should be addressed. One is made up of industries that are less energy efficient but which ready to make investments in energy efficiency if they had access to capital and technology. The second one is made up more energy efficient industries that show reservations about the mid and long term implications for them of CO_2 mitigation goals and carbon emissions trading. Furthermore, because of several misconceptions detected, some of the messages below are considered to be clarification messages for all industrial sectors.

These messages presented here would need to be further refined through pretesting before generating materials covering them.

Industry

Potential messages for less efficient firms may include the following:

- You can SAVE MONEY (reduce operating costs) by being more energy efficient.
- You can consequently increase profits and competitiveness.
- There are highly energy efficient firms in India. Examples from all sectors.
- India must take control of its regional climate regardless of developed nations perceptions, intentions and actions.

Potential messages for energy efficient firms may include the following:

- Besides saving money by being energy efficient, you can MAKE MONEY by selling carbon emissions reduction credits. This is the frosting on the cake.
- Case Study: One Indian firm is already involved in negotiating CET with Japanese counterpart.
- Examples of CET benefits in other countries.
- Ways to prepare for CET and be ready when it the ball gets rolling: monitor and establish your baseline now, etc.
- Carbon emissions trading is coming: Here is HOW to do it.
- International buyers provide both funds and technology.
- Boost to industrial sectors via CET will make India more competitive in world market.
- EE firms are environmentally friendly and this improves their public image.
- Technology and capital infusion via CET will help Indian economy providing capital and jobs to mitigate social and environmental concerns.

Potential clarification messages for all firms, particularly in the cement and sugar sectors, could

include the following.

- CO_2 is one of the Green House Gases that contributes to global warming.
- Since low-grade coal, which is a big CO_2emitter, is used in India for power, EE firms can do a lot to reduce the emissions of CO_2.
- Reducing CO_2 emissions slows global warming.
- India has signed the Climate Change Convention calling for efforts to slow Green House Gas Emissions.
- India's current energy efficiency goals and standards are . . .
- Regardless of the international agreement made by governments on the Kyoto Protocol, there will probably be some form of carbon emissions trading.

Government

Possible messages targeting the government sector include the following.

- India must take control of its regional climate regardless of developed nations' perceptions, intentions and actions.
- Help shape CET policy. Express your perspective on CET to the Ministry of the Environment now.
- CET programs will enhance India's image in environmental concerns in South East Asia
- Boost to industrial sectors via CET will make India more competitive in the world market
- CET will bring funds and technology to help mitigate social and environmental concerns in India
- CO_2 emissions mitigation will help reduce global climate problems such as melting of glaciers in Himalayas and flooding in countries like Bangladesh