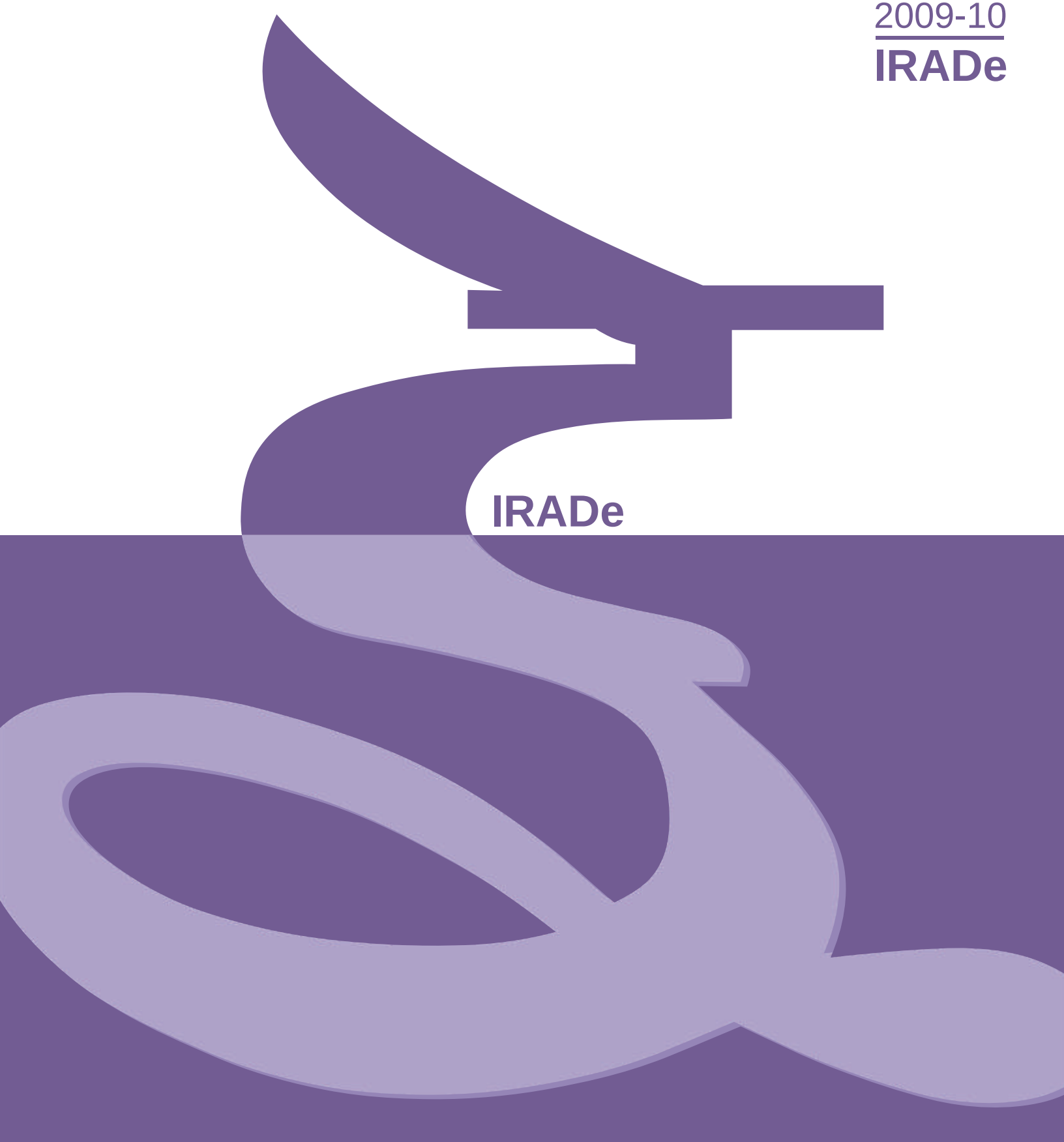
Integrated Research and Action for Development

Annual Report
2009-10

IRADe



INTEGRATED RESEARCH AND ACTION FOR DEVELOPMENT (IRADe)

BACKGROUND AND FOUNDING OF THE SOCIETY

Integrated Research and Action for Development (IRADe) is set up as a fully autonomous advanced research institute, which aims to do research and policy analysis, train people and be a hub of a network among various stakeholders. IRADe is an institute that focuses on research and effective action through:

- Multi-disciplinary and multi-stakeholder research for implementable solutions for sustainable development
- Policy research that accounts for the effectiveness governance of techno-economic and socio-cultural issues.

  It is a 'think tank' that works with 'action tanks'.

OBJECTIVES

- To develop understanding that integrates multi-stakeholder perspectives concerning issues of development.
- To promote a wider consensus through research and analysis on effective policies among stakeholders and policy makers.
- To build capacities among professionals for multi-disciplinary, multi-stakeholder policy analysis.
- To promote ideas and initiatives for inclusive developments at the local and global levels.
- To promote research supports to developing countries for development and also to negotiate international agreements better.

THE KEY PROGRAMME AREAS ARE:

- Environment and Natural Resources
- Climate Change
- Energy and Power System
- Urban and Rural Development
- Poverty alleviation and gender

Our activities in the above areas have cross-cutting themes such as technology assessment and policy reforms. The key activities are:

- Action Projects with communities
- Monitoring and Evaluation
- Training and Capacity Building
- Policy Analysis and Knowledge Dissemination

RECOGNITION AND MEMBERSHIP

- IRADe is designated as a Centre of Excellence in the area of Urban Development on "Climate Change Vulnerability and Adaptation" by the Ministry of Urban Development (MoUD), Government of India.
- IRADe is recognized as "Scientific & Industrial Research Organizations (SIRO)" by Department of Scientific and Industrial Research, Government of India on 16th September 2008.
- IRADe is registered as "Research Institution, other than a hospital, for the purpose of availing customs / central excise duty exemption" by Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology, Government of India on 1st December 2008.
- IRADe is a part of National Energia Focal Point for India for International network on Gender and Energy.
- IRADe is a member of NATCOM network established by the Ministry of Environment & Forests for Climate Change.

PARTNERSHIPS DEVELOPED

IRADe networks with the government, ministries / departments, international organizations, the public & private sectors and engaging academic experts, NGOs, and consultants to work on projects awarded by them. The ministries include Ministry of Environment and Forests, Ministry of New and Renewable Energy, Planning Commission, Ministry of Power, Ministry of External Affairs, Department of Science and Technology, Central Statistical Organization under Ministry of Statistics and Programme Implementation, TIFAC etc for many national level projects. At the international level, IRADe has worked with Stanford University, California USA; Wuppertal Institute for Climate, Environment and Energy, Germany; UNDP-GEF-SGP; ENERGIA-International network for gender and sustainable energy, Netherlands; British High Commission; WISION-Germany, GTZ, International Institute for Applied Systems Analysis (IIASA),Austria, United States Environmental Protection Agency (US,EPA) etc. IRADe has collaborated with private sector and multinational organizations and NGOs such as SEWA, Petroleum Federation of India, Pricewaterhouse Coopers, ICF International, Rockefeller Foundation, Institute for Social and Environmental Transition (ISET), Center for Clean Air Policy (CCAP) and others.

1. IRADe was registered as society on 5th September 2002 under Registration of Societies Act- Act XXI of 1860 with Registration No. S43706

ANNUAL REPORT
2009-2010

INTEGRATED RESEARCH AND ACTION FOR DEVELOPMENT(IRADe)

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FOREWORD

This year we consolidated the Climate Change Programme by adding more dimensions so that it is quite comprehensive. It now covers climate mitigation, adaptation and negotiations. IRADe, designated as "Centre of Excellence for Urban Development on Climate Change Vulnerability and Adaptation" by the Ministry of Urban Development, New Delhi completed the rapid vulnerability assessment and two case studies. During COP 15 at Copenhagen, the work on cities and climate adaptations and role of natural gas in reducing green house gases was discussed.

The project on climate negotiations from the Ministry of External Affairs was also completed. Several seminars on Gender and Climate Change were attended. The paper written on this subject for UNDP has been posted on our website.

In terms of the action projects, we completed a solar demonstration event with Asian Games Village Society. We also prepared a plan to make Raj Bhavan of Manipur a 'Green Estate'. The work sponsored by US-EPA on land-fill was completed. In all, both consolidations as well as new initiatives were done in this year. We hope to have co-operation and suggestions of our sponsors, collaborators friends and well wishers.

Prof. Jyoti Parikh
Executive Director

1. IRADe: Centre of Excellence

IRADe is designated as a Centre of Excellence in the realm of Urban Development on "Climate Change Vulnerability and Adaptation" by the Ministry of Urban Development, Government of India. The prime objective is to assess the vulnerability of Indian cities to climate change and recommend the policy measures for adaptation and facilitate to reform the policies of urban development.

1.1 IRADe Work plan (MoUD)

Rapid Assessment

- The mandate consists of carrying out a rapid assessment of vulnerabilities of 14 Indian cities to climate change, based on climatic and socio-economic indicators and addressing climate resilience for cities of India. The rapid vulnerability assessment of cities has been done for 14 cities in the first phase. Rapid assessment of vulnerabilities of cities based on climatic and socio-economic indicators show that many of the Indian cities are highly vulnerable to climate change. A short city profile highlighting the emerging threats is prepared for each of the selected cities

Methodology Development for Case Studies

- To proceed with work plan, IRADe has developed methodology for climate vulnerability assessment and adaptation on various components of city infrastructure (www.urbanindia.nic.in/programme/lsg/C_Excellence_Minutes.pdf). IRADe has examined city development plans, local governance system, available research studies etc. for suggesting measures for adaptation to climate change and reform the current urban development plans, for various sectoral modules, examine water supply, waste water management, transportation, energy, storm water and drainage.

Case Studies: Surat and Haridwar

- Under the climate resilience report for cities of India, IRADe has studied urbanization and climate change in general and city of Surat and Haridwar in particular. The prime objective is to assess the nature of climate change induced threats to Indian cities and suggest measures for preparedness towards the same. On the basis of trends of urbanization and potential threats of climate change, the report points out that city infrastructure and development plans are inadequate to address the climate change induced vulnerabilities. The city of Surat is highly vulnerable to floods, sea level rise, water security, diseases, etc. While, the city of Haridwar appears to be prone to floods, land slides, air pollution, diseases and water scarcity.
- On the basis of research and field visits, IRADe has suggested that there is a need of base line data (climatic and socio-economic); to construct dynamic models of climate, ecosystems and socio-economic factors of urban systems; quantify the risk of climate change in Indian cities.

1.2 Asian Cities Climate Change Resilience Network

IRADe is a national partner in the global programme of "Asian Cities Climate Change Resilience Network (ACCCRN)" sponsored by the Rockefeller Foundation and implemented by ISET. IRADe has been selected as a national partner of the ISET. Three Indian cities, namely Surat, Indore and Gorakhpur are part of ACCCRN. IRADe team visited all the three cities, met the city planners and official and reviewed city development plans of the cities. IRADe examined urban development programmes and policies with respect to climate change and suggested ways to mainstream concerns for climate change and disaster risk reduction. IRADe has suggested to replicate the learning from the above cities at national level.

The main tasks of IRADe is to suggest measures to strengthen and improve case studies/prototypes; determine mechanisms to mainstream the current work in the national policy framework for the benefits of other cities in India; establish national linkages; review networking arrangements and project documents; make linkages with national policies; examine and review city development plans; and participate in important meetings such as Conference of Parties (COP) and make presentations.

2. Climate Change and Environment

2.1 Over view: Climate Change programmes at IRADe

IRADe has grown from strength to strength with its climate change programme in the last 7 years, wherein our first research project was on Clean Development Mechanism (CDM) regarding Greenhouse Gas (GHG) reduction potential for India in transport, power, cement, construction, wind power, hotel industry, co-generation and coal bed methane etc.

Climate Change research at IRADe is steadily expanding to cover many areas. IRADe has been awarded with many climate change projects based on issues of adaptation, mitigation and negotiations. As mentioned earlier, the Ministry of Urban Development has designated IRADe as a "Centre of Excellence for Urban Development on Climate Change Vulnerability and Adaptation". Urban growth, land use planning and infrastructure development have to accommodate urban development as well as climate change. The climate change work now encompasses development, gender and energy efficient technologies.

In the area of climate modeling, the focus is on long-term implications of alternative energy policies, investments and technological developments. The Climate Negotiation Project examined various variables such as carbon intensities, sectoral approaches etc. across many countries.

2.2 Climate Change Impacts and Vulnerability of Himalayan Ecosystems and Livelihoods: Case study of Uttarakhand

The Ministry of Environment and Forests (MoEF) awarded this project to evaluate and assess the impacts of climate change on Himalayan ecosystem and livelihoods of the people with a case study of Uttarakhand state. Its aim was to study the vulnerabilities of the agriculture, forests, water resources and their impact on livelihood. The present study generated the information to outline the future agenda, to

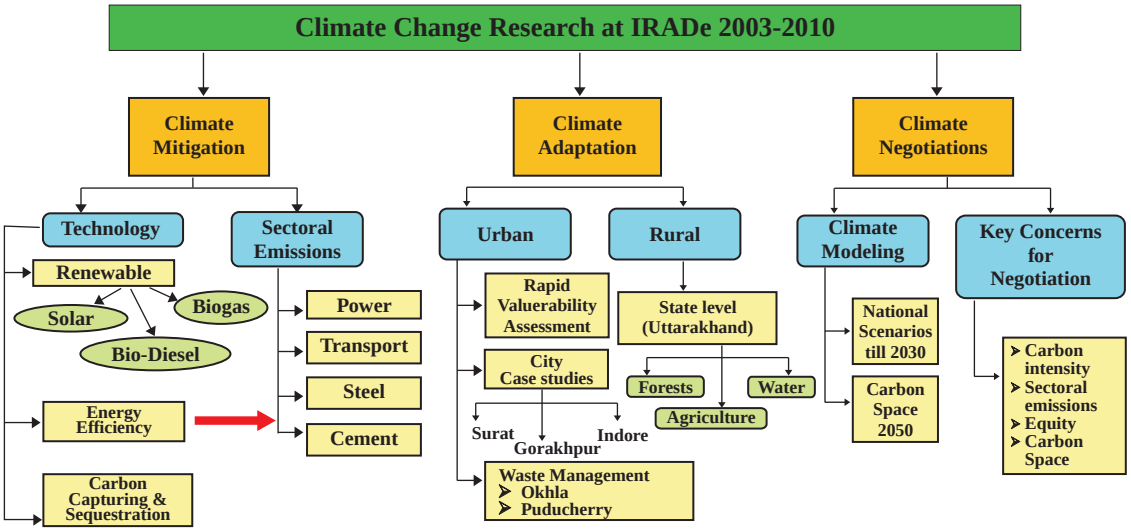


Figure 1: Climate Change Research at IRADe 2003-2010

address key demands from the community for targeted information on climate change impacts, and to fill critical knowledge gaps, which currently inhibit effective adaptation.

Agriculture

- Agriculture sector in Uttarakhand contributes 30% of the State Gross Domestic Product. About 15 thousand hectares of agriculture land in the last five years has been diverted to other usages. The cropping intensity is 160%, which is much higher than the all-India average of 129%.
- In Uttarakhand, 74% of total population relies on agriculture. The contribution of various crops was cereals Rs. 11 billion, pulses Rs.0.9 billion, miscellaneous crops Rs. 1.8 billion and livestock Rs.17 billion. Thus any loss in agriculture production adversely affects rural employment, availability of food, higher food prices and may lead to malnutrition.
- Agricultural activities are fully dependent on the weather. The available scientific evidences suggest that climate change will place significant stress on the livelihoods of the rural mountainous people of Himalayas. Livelihoods from apple growing, bee keeping and sensitive crops may be at risk.

Forestry

Majority of the people of Uttarakhand are largely dependent on forests (64.81% of total geographical area with output of Rs. 6.4 billion) for subsistence and livelihood. They are under pressure due to unregulated extraction of timber and fuel wood, diversion of forest land for non-forestry purposes, grazing, illegal non forestry wood and forest product collection, pressures on high altitude forests, forest fires and tourism.

- The depletion of the forest wealth of the Uttarakhand has disturbed the hydrological cycle and is having a huge impact on the livelihoods of the people living around the forested areas, particularly Tharus, Buxas, Bhotias, Jaunsaris and Rajis. The Rajis are comparatively more dependent on the forests than the others; they live within the forest areas.
- Climate change triggered events could increase the dependence of local people on forests for livelihood resulting in deforestation, and reduce perennial flow of water in mountain streams and increase events of flash floods, land slides and forest fires contributing to reduction in forest cover.

Water

- The problem of water scarcity in the Uttarakhand can be summarized as “Water an abundant, yet scarce resource”. Though state receives abundant rainfall and is the source of many major rivers of the Northern India, yet scarcity persists in many areas. Under such circumstances, planning and sustainable management of water resources for quantity and quality is a challenging task for the states and local levels in Himalayan regions.
- The variations in the hydrological cycles of rivers in Uttarakhand are determined mainly by the seasonality of the precipitation and the temperature, which governs the ratio between snow and rainfall. Water supplies in areas fed by glacial melt water from the Himalayas, on which millions of people in India depend, are negatively affected.

- Adaptation strategies for containing the losses from the effects of climate change on water resources in Uttarakhand involve demand management strategies like changing cropping pattern and the strategies for augmenting water supply like water harvesting.

2.3 Carbon Capture and Storage

(a) Analysis of Carbon Capture and Storage (CCS) technology in the context of power sector in India

The Department of Science and Technology, Government of India sponsored this study, which aims to analyze "Role of India and level of participation in global development of the CCS technology in context of Indian power sector."
The Carbon Capture and Storage (CCS) technology has been recognized as one of the possible scientific & technological method to address climate change mitigation by reducing CO2 emission to atmosphere, where major power generation is through burning of fossil fuels. The scope of CCS is, to capture CO2 emissions from stationary industrial source (primarily power station), and transport to a geological site, where it (captured CO2) can be safely stored, under the earth surface without being released to the atmosphere.

This study covered introduction to CCS, projection of emissions of CO2 from power plants in future, literature survey to identify development in clean coal technologies, carbon capture, transportation and storage technology, evaluation of each technology for its economic and technical viability, characteristics of sequestration sites, suggestions way forward for its development, carry out technology assessment, economics and regulatory issues, to encourage debate with policy makers.

The ideas, information and concepts gained during the process of analysis, survey and study were compiled to document the development of carbon capture and storage technology and setting up priorities of basic and applied research covering the technology development globally. The study recommends that India has to continue with the basic research on CCS with greater range of technology and applied research in selective fields. Indian entrepreneur could gain business opportunity at a later date if and when the commercialization of CCS technology appears viable.

(b) To Map Carbon Capture and Storage-CCS activity, decision makers and build political consensus in India for "CCS"

British High Commission in India awarded this study to IRADe to identify key issues regarding CCS and interact with the key stakeholders (Central Ministries, legislature, academics, the scientific community, public and private industry, and state government) to understand their appreciation and apprehension for Carbon Capture and Storage (CCS) scheme and prepare a roadmap for advancing R&D activities on CCS on a national level.

IRADe first conducted a literature review of CCS technology development. A survey on Carbon Capture and Storage technology was conducted among stakeholders within India to evaluate their perception. They were divided into five categories based on their area of work and employment in India. The viewpoint and suggestions were gathered through structured interviews, questionnaires etc. Using these results, a roadmap of CCS technology in India was then generated.

The report proposes a roadmap with the basic assumption that India conducts a CCS demonstration project after the developed countries have successfully tested and

demonstrated the technology and understood the risks and consequences. India need not re-invent the wheel but learn from the successful experiments with CCS projects abroad and develop indigenous capacity. These efforts will help in increasing thermal power plant efficiency and demonstration of clean coal technology whether coal is indigenous, imported or blended. The government has a very important role in promoting CCS technology beginning with demonstration project. It is suggested to prepare a draft regulatory framework document guiding development of CCS in the context of existing laws, policies and acts and carrying out economic analysis of the process. The participation of Indian scientists and technologists in research and development of CCS technology in developed countries will benefit implementation process for clean coal technologies or the CCS scheme when the government of India recognizes the benefits and provides in principal approval. The capacity building of the various stakeholders involved will be a key to success for the demonstration project.

2.4 Role of Sectoral Approaches in Implementing GHG Mitigation Actions in India

Centre for Clean Air Policy (CCAP), USA has sponsored the study "Analysis of GHG Emissions for Major Sectors in India: Opportunities and Strategies for Mitigation". IRADe, in partnership with ICF international completed this study. The objective was to analyze low carbon technologies for key energy intensive sectors like Power (Supply and Demand), Cement, Iron & Steel and Transport and to identify potential mitigation options.

As reported in our previous annual report, a range of potential mitigation options were identified and analyzed in the report highlighting mitigation options and related issues. This activity continued with inputs from sectoral experts and stakeholders. With gap analysis and consideration of possible options to overcome these barriers, a broad roadmap for implementation of selected options for each sector was also suggested.

Cement

The main mitigation options that have been evaluated were the expansion of ongoing industry-efforts in plant modernization, process improvements and the use of blended cements. Implementation policies include carbon market mechanisms; government's energy-related partnerships with industry and knowledge sharing programs; sectoral energy intensity targets; international financial assistance and technology transfer.

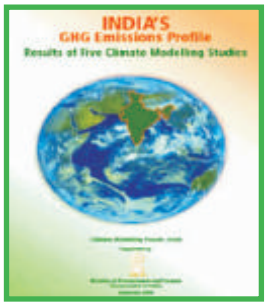
Production of blended cement with higher ratio of additives and waste heat recovery are two promising mitigation actions that have been identified. Some barriers to adoption of these options are lack of trained personnel for modern equipment, non-availability of indigenous technology, huge investment costs and negative consumer perception about blended cement. Recommended policy options to address these barriers are capital subsidies for modernisation / modification of plant and infrastructure, excise and tax concessions for related equipment and creating consumer awareness.

Iron and Steel

The introduction of advanced production technologies in the context of the Indian iron & steel industry was evaluated. Implementation policies include carbon market mechanisms; government energy-related partnerships with industry and knowledge sharing programs; subsidies and financial incentives for research and development; sectoral energy-intensity targets; international financial assistance and technology transfer.

The mitigation options considered for India focuses on the use of more energy efficient production technologies and the use of appropriate control processes for iron and steel. In order to overcome the high cost of new technologies (identified as a key barrier), several policies could be put in place including: R&D focusing on improving the quality of steel, training to facilitate resolution of pending technical issues, developing adequate financing mechanisms such as domestic cap-and-trade mechanisms etc.

2.5 Activity Analysis Model for Climate Policies for India



The Ministry of Environment and Forests funded project, through which the IRADe model was developed and concluded during 2008-2009.

The IRADe model was used to generate a base run and many other scenarios. This was brought out by the MOEF prior to the Copenhagen climate conference showing projections of India's emissions up to 2030 along with studies by TERI and NCAER. The IRADe model was set up in a macro economic framework with disaggregated production sectors and consumer groups. The model is a self consistent model, which has the macro economic details as well as the details of energy sector, so as to get the feedback from alternative climate change scenarios to economy and poverty. This helps in providing more reasonable projections for India's GHG emissions that is consistent with long term total and sectoral growth prospects as well as technological and balance of payment constraints.

The IRADe model has also been further used to generate scenarios with the same specifications as Integrated Energy Policy Report- 2006 (IEP, Planning Commission) scenarios. The IEP model is a resource and technology driven model wherein the demand for energy from the economy is specified from outside by assuming specific growth rates for total GDP. The IRADe model on the other hand has the economy disaggregated into 34 production sectors and allows for inter sectoral interactions through the Social Accounting Matrix. Thus the energy demand is internally determined as within the model as opposed to the IEP model. The IRADe model results were to IEP similar energy demand requirements for aggregate as well as for each energy source i.e. Coal, Oil, Gas, Power (thermal, hydro, gas, clean coal technology, wind, solar thermal, solar photo voltaic, wood, nuclear and diesel) ,for total GDP growth rate of approximately 8%. IRADe model provided insights into the macro economic consequences of the implementation of IEP scenarios. For example, it gave the welfare and poverty implications for implementing CO2 emissions mitigating scenarios and also the need for hydro, nuclear or gas and demand side management. These scenarios generated showed that higher level of investment is needed to take measures for reducing energy demand side management measures. The exercise showed that GDP was affected by the choice of technology. These scenarios though climate friendly, were not costless. The results of this exercise were used in a paper published in the International Journal of Energy Sector Management.

2.6 Ecosystem Management of Marine National Park (MNP) in harmony with the Industrial development, Jamnagar, Gujarat

Ministry of Environment and Forests (MoEF) funded this project on Ecosystem

Management of Marine National Park, Jamnagar, Gujarat. The project aims to study the overall potential threats and formulate an action plan to protect the Marine life, unique corals and Mangrove ecosystem. The coastline of the Gulf of Kuchchh is going through unprecedented industrialization, port & shipping, mangroves destruction, oil spills, toxic waste and reclamation. The main objective of the study is to identify appropriate conservation and management plan for the entire region that is possible with stakeholder's joint effort in this direction. IRADe research team made regular visits and surveys to identify the desired parameters for the targeted goal.

IRADe organized well participated "Review Workshop on Conservation of Marine National Park Activities" in the month of November 7th, 2009 at Jamnagar, Gujarat:

- To review and revise preliminary assessment results with the stakeholders.
- Provide the basis of developing a more coherent programme in the MNP Based on the assessment results on industrialization and ports / shipping activities.
- Disseminate information related to the conservation of the Marine National Park, the mangroves and the coral reefs.
- To develop a consensus for issues like ecotourism in MNP and the nearby Khijedia Bird Sanctuary.

Apart from this workshop, the steering committee meeting was held and various assessment papers presented on role of different departments and their contribution in the conservation of Marine National Park. The steering committee consists of various eminent people from government sectors, Corporate, NGOs and environmentalists etc. who are involved in the conservation of marine ecosystem.

3. Energy Systems and Technology Assessment

3.1 Overview and Assessment of Indian Renewable Energy and Rural Electrification Programme in the Context of Rural Development

GTZ (German Technical Corporation), sponsored this inception study on Renewable Energy Component of the Indo-German Energy Programme.

Background

IRADe prepared an inception study providing an overview and assessment of the National and State policies to promote renewable energies, rural electrification and relevant issues in rural development along with the relevant institutions and stakeholders of the programmes and to guide energy investment in this sector.

As the part of the study, currently or potentially relevant institutions, government schemes, non-governmental programmes and stakeholders are assessed, both at central, state and sub-state/ district level. Their major roles and responsibilities in the relevant areas of renewable energies and rural electrification were summarised. Their capacities and capabilities are also analysed as far as possible. This study reports on selected successful and failure examples of rural electrification schemes based on renewable energies, both ongoing and past examples. The role of potential private sector stakeholders (such as private project developers, investors, operators, suppliers etc.) for the proposed project was also identified.

IRADe suggested that the renewable projects should be associated with other livelihood projects of the government, so that sustainability can be ensured. Creation of livelihood opportunities has to be linked with adequate capacity building and providing finances for income generation opportunities. Identification of suitable livelihood activities at the inception stage is very essential for achieving financial sustainability. Moreover, considerable opportunities are coming through newly launched climate mission viz. solar mission. Various domestic, bi-lateral and multi-lateral financing opportunities, carbon financing, can be tapped to meet the huge financing requirements. This will not only bring about transformational change in the energy sector and spur growth in the country, but will also help to alleviate poverty and realize the development goals, while addressing environmental concerns in a sustainable manner.

3.2 Techno-Economic and Socio-Agronomic Analysis of Biodiesel System

The Ministry of the New & Renewable energy (MNRE) funded this study to capture the status, barriers and success of Jatropha based bio-diesel production and consumption in the states of Orissa and Rajasthan.

This study attempted to identify and fill critical knowledge gaps, which currently inhibit effective policy on Bio-diesel in India to delineate the key challenges in the Jatropha cultivation and to find ways to scale up the outreach of services to the poor and vulnerable. The study analyzes various socio economic parameters, agro climatic conditions for oilseeds cultivators. The project identifies the primary barriers of Jatropha plantation for socio-economic feasibility of a multi-stakeholder system with a focus on rural population. Biofuel

promotion is a very complex issue dependent on knowledge, infrastructure support, pricing policy, political environment, inter-sectoral cooperation and linkages for the cooperation and technology promotion and transfer. Feedstock supply and management chain considering site-specific climatic, agronomic, economic, and social conditions emerge as the most important issue for the promotion of Bio-diesel from Jatropha.

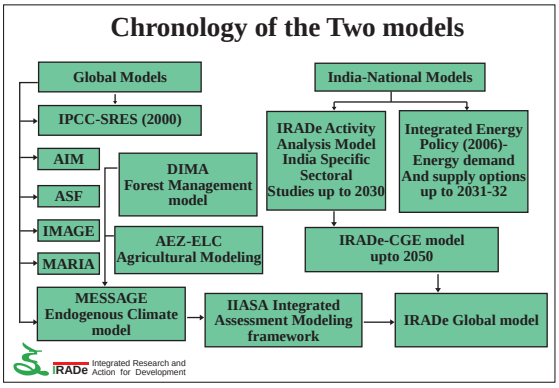
The important observations of this study are,

- Although Jatropha plants can survive in wastelands/degraded lands, the fruiting and seed yield of the plant is highly dependent on availability of water (rain or irrigation) during critical stages. Soil characteristics also play important role in the growth. Therefore, the growth performance in Orissa is better than in Rajasthan.
- Jatropha plantations are in its early stage of development in both the states and would take some more time to reach to critical levels of production. It may be difficult at this stage to assess the economic viability, but many farmers are considering the possibilities of using their unproductive waste and fallow lands. At times, overselling the idea has led to sense of betrayals. Risk sharing schemes are needed.
- Support system for the timely supply of quality planting material , R & D inputs to improve yields and adaptability in the varying agro climatic conditions is very much needed. Similarly, support system for the training, resource mobilization (both inputs & financial) and information exchange with farmers need considerable strengthening and necessitates building of suitable institutional support mechanism with the support of NGOs and private institutions. Formation of Jatropha SHGs and tie-ups with the financial institutions will create positive impact in promotion of this activity.
- Even though the area under Jatropha plantation has increased, critical production levels have not been achieved to establish large processing units. Timely interventions for establishment of necessary infrastructure at all levels are needed. The “oil expeller Self Help Groups (SHG)” could be formed at village or cluster level for value addition at grass root level.
- Proper marketing linkages are needed at village level for procurement of the produce at the rate fixed by the government.
- Environmental impacts of change in land use, especially, transfer of common and grazing lands, which provide fodder to livestock in the local economy need special attention. In addition, monoculture of the Jatropha may affect the ecological diversity and stability in long run. Therefore, detailed impact assessment study of the Jatropha plantation activity to assess the long-term impact on agro-ecological balance is necessary.

3.3 Indian Perspectives on Global Energy Scenarios till 2050

Technology Information, Forecasting and Assessment Council (TIFAC), New Delhi has sponsored the project "Indian Perspectives on Global Energy Scenarios till 2050" and International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria has participated as a collaborator with IRADe in this project. The project aims to understand energy transitions needed in the future that is

consistent with global perceptions and R&D. It would also include studying existing IIASA global regional energy scenarios from India's perspectives and suggest new scenarios suitable for India and reflect India's viewpoints.



India, being an energy scarce country is especially vulnerable to uncertainty in energy supply. Poverty alleviation will require energy access for nearly six million poor people who do not have access to it. It is therefore necessary to effectively map energy futures along with old and new technologies, the shares of various energy resources e.g. coal, oil, gas, nuclear and so on, which are expected to change over time potential by Asia and South Asia up to 2010 and include global perceptions of new energy technologies. All countries-develop or developing try to meet the increasing energy need from energy resources available globally. However the resources are limited and depleting at a fast rate. How much increase can be expected of India's future shares in global energy? What are the implications for energy security? Up till now, due to the lack of indigenous models that link India and the global energy scenarios, one has to rely on the models developed by other countries to understand the potential role of India at international negotiations. The project will help in providing a future global energy vision for India. Therefore, work with IIASA can help to see the technology transitions needed for sustainable development including addressing climate change. India can present its perspective and improve global energy scenarios that reflect India's viewpoints.

4. Action Projects

4.1 Renewable Facility Development at Raj Bhavan Complex, Imphal

Ministry of New and Renewable Energy, Government of India sponsored preparation of Detailed Project Report (DPR) under Special Area Demonstration Scheme. IRADe has undertaken the project for preparation of (DPR) of Raj Bhavan complex at Imphal, Manipur. The scheme aims to demonstrate use of renewable energy options in lighting and supplementing the energy requirements with renewable energy at places of national pride and of international importance thereby create awareness towards renewable among the masses.

The present study has been carried out with the above objectives in focus. Special attention has been given to the best utilization of renewable energy at the same time keeping publicity and awareness aspects of these systems.

Suggested Action projects and Recommendation

Based on the discussions with all stakeholders and analysis of the various requirements which can be met from the renewable systems, are two solar power plants , stand alone street lights, solar water heaters, solar road studs, one solar flasher and biogas plant .

View of the Raj Bhavan Imphal.

Visiting IRADe team and local officers at Raj Bhavan complex Imphal

It is recommended that the above mentioned systems should be installed at Raj Bhavan Campus and two persons from Raj Bhavan and one person from MANIREDA should be thoroughly trained on the operation and maintenance of these systems. A five year Annual maintenance contract should form part of the order. We recommend ban on filament bulb and recommend use of T-5 Tube light, CFL and LED light for all lighting applications.

A booklet for public awareness describing these systems will be an added advantage.

4.2 Methane Emission and Pump Test study from Landfill

United States Environmental Protection Agency (US-EPA), as a part of their "Landfill Methane Outreach" Program, awarded the task of "Assessment of landfill gas and pre feasibility study of the landfill gas utilization at Okhla, New Delhi and Puducherry." IRADe has undertaken the project to study the land-fill gases emitted from these sites and whether the gases can

be captured commercially or not as land fill sites emit methane, which is a greenhouse gas. This emission should be abated by capturing the gases at the source and using them for useful purposes. The project envisaged to study the amount. Studies were carried out in Puducherry and Okhla, New Delhi landfill sites to assess the potential for a landfill gas (LFG) generation and its use.

(a). Okhla, New Delhi Landfill

The assessment done was based on the information provided by the Officials at Central Pollution Control Board, Delhi Pollution Control Committee, Municipal Corporation of Delhi at Okhla Landfill Site supplemented by observations made during site visits. Feasibility of the land fill gas LFG supply as domestic fuel to the surrounding areas was carried out for the existing network in Okhla Sewage Treatment Plant as this network is likely to be disconnected as DJB plans to use the biogas for captive power generation for running their sewage treatment plant. An LFG recovery model was used based on waste disposal, waste composition, and climate data. The outcome of model indicated that LFG recovery is projected to reach a maximum of approximately 1,522 cubic meters per hour (m3/hour) in 2011 and decline after site closure.

Okhla, New Delhi Land fill site

Active disposal area located at Karuvadikuppa village, Puducherry

b). Puducherry

An assessment of the potential for a landfill gas (LFG) utilization project was performed for the Puducherry landfill in Puducherry, based on information provided by the Puducherry Pollution Control Committee and Puducherry Municipality and observations made during a site visit. The LFG recovery model of US-EPA was applied on present Karuvadikuppam landfill site based on waste disposal, waste composition, and climate data. The model results indicated that the combination of the relatively small amount of waste in place; the dispersed nature of the waste mass; the significant amount of inert material, aerobic degradation, and waste combustion will likely limit future LFG recovery to a maximum of 22.8 cubic meters per hour.

This report has been prepared for the U.S. Environmental Protection Agency and is for public information.

5. Events/ Seminars/ Workshops

5.1 COP15 at Copenhagen

Fifteenth Conference of the Parties COP15 was held under the United Nations Framework Convention on Climate Change, popularly known as COP15 at Copenhagen. The event was held with an objective to respond to one of the greatest challenges facing humanity: climate change. COP 15 offered potential opportunity to tackle the climate crisis while also catalyzing the low-carbon, green growth that is the foundation of long-term economic prosperity.

Dr Jyoti Parikh participated in the following programmes at COP15

- Participated as a panel speaker in Panel II: "The Evolving Role of Natural Gas, a Policy Perspective" on invitation from Worldwatch Institute.
- India results at "Policy Implementation Strategies for GHG Mitigation in developing Countries" invitation from CCAP.
- ACCCRN event at ICLEI Climate Change, regarding climate resilient cities.
- Roundtable on Strengthening India-EU-US Collaboration to support India's Low Carbon Energy Leadership.
- IIASA-UN event.

5.2 Workshop on Conservation of Marine National Park (MNP), Jamnagar, Gujarat, 7th November 2009

Left to Right: Holmes Hummel, Ian Smale, Dr. J.K. (Jorg) Gigler, Dr. Jyoti Parikh, Maggie Fox

The inception workshop of IRADe was held on 3rd March 2009 at Gandhinagar, where the main issues of discussion were; partnerships from all concerned sectors in the preservation of Marine National Park, sharing the studies and works that had come up on the subject and ways to go ahead in minimizing impacts on the marine ecosystem.

The second workshop in this line was organized by IRADe on 7th November 2009 at Hotel Vishal in Jamnagar in collaboration with Forest Department of Gujarat supported by Ministry of Environment and Forests, Government of India. It was aimed at collaborative action in the management of MNP. Broadly the following were the objectives:

- Review and revise preliminary assessment results with the stakeholders;
- Provide the basis of developing a more coherent programme for the MNP based on the assessment results on industrialization and ports / shipping activities;

- Disseminate information related to the conservation of the Marine National Park, the mangroves and the coral reefs; and
- Develop a consensus for issues like ecotourism in MNP and the nearby Khijedia Bird Sanctuary.

Recommendations
On Government Policy

- Jamnagar, besides being an industrial city also houses the biodiversity rich Marine National Park, mangroves and the Khijedia Bird Sanctuary. Therefore it is imperative to strike a balance between industrial growth and the fragile ecosystem.
- A MNP management institute (which researches on various aspects of preservations) is necessary to be established in Jamnagar. Along with other aspects, climate change impacts on marine life and the coastal area should be important area of research for this institute.

For Industries

- The shipping sector and industries should plan themselves to contain their effluent discharge and Government should formulate strategies to assist the industry.
- The underwater oil pipelines must be inspected periodically to detect any leakage and must be subjected to independent evaluation by experts.

For government bodies like GPCB and JMC:

- Biological parameters should be monitored through research to facilitate natural regeneration and further growth of mangroves. The reasons for the degradation of mangroves should be analyzed and addressed.
- There is an urgent need to ascertain if effluents of JMC's STP will meet the prescribed limits of the statutes. Otherwise the marine ecology at MNP will have perpetual problems and algal bloom will be one of the outcomes.

Industry and Coast guard

- Oil spill contingency plan must be up to date to manage any unforeseen disaster at sea.
- There should be strict vigilance to keep an eye on the coastal and shoreline activities of the industries and regular monitoring should be carried out by GPCB and other

MNP Workshop in Gujarat

experts from this field, for the waters in the Gulf of Kuchchh.

For Forest Department and Tourism Sector

- Economic evaluation of MNP should be conducted by the forest department periodically so as to have an ample database on the forest based products for research in this direction. Training programs for capacity building should be initiated by the government.
- Re-design the existing tourism policy to produce alternative coastal- specific tourism models focusing on environmental sustainability. The existing scope of tourism can be remodeled in the way of Goa and Andaman.

Others:

Ecosystem assessment of MNP are conducted by many organizations like CEE, GEER foundation etc. These should be made available in the public domain for further research in this area.

5.3 Solar Energy Fair, 23rd Oct, 2009

A Solar Energy Fair was organized at Asiad Village Society on Sunday, the 25th October, 2009 by World Energy Council-Indian Member committee (WEC-IMC) in association with All India Women's Conference (AIWC) with support of Asiad Village Society and IRADe. This was an initiative promoted by the Ministry of New and Renewable Energy to create awareness of Solar Energy Programme in Urban Areas. WEC-IMC in association with AIWC is organizing such Solar Energy Fairs in Delhi and neighboring areas with support of RWA / Community Centre.

Dr. Kirit Parikh addressing at the fair

Demonstration Counter in the fair

The Chief Guest, Dr. Kirit Parikh, Former Member, Planning Commission inaugurated the fair. He appreciated the keen participation of the children as they would be the ones who would be facing the challenges of sustainable energy tomorrow. He called for the organizations who own the flats in the Complex to support this initiative by adopting solar energy for meeting their lighting and heating requirements. Dr. Bandopadhyay, Director, Solar Energy Centre, MNRE highlighted the Government's initiatives in taking the Solar Mission forward and its focus on R&D to bring down the costs of solar devices and equipments. Other distinguished invitees and visitors included Dr. Sant Ram, Mrs. Gomati Nair, President, AIWC and Mr. S. K. Bhatia, Sr. Manager, Syndicate Bank.

5.4 Workshop on Role of Sectoral Approaches in Implementing GHG Mitigation Actions in India, 27th Oct, 2009

The Integrated Research and Action for Development (IRADe), ICFI, Centre for

European Policy Studies (CEPS), Brussels and Center for Clean Air Policy (CCAP), USA organized this workshop to understand as well as strategize the way forward for the sectoral approach in mitigation of GHG emission from the Indian Industry. The workshop was graced by the eminent panelists Dr. K. Kasturirangan, Member, Planning Commission; Shri. Shyam Saran, Prime Minister's Envoy; Dr. T. Ramasami, Secretary, Department of Science & Technology; Mr. R Donkers, Commissioner, EU Commission, and Dr. William Whitesell, Director, CCAP, USA.

The workshop deliberations were aimed at the followings:

a) Analysis of sectoral approach for mitigation of GHG emission with emphasis on the sectors namely (i) Electricity demand (ii) Electricity supply (iii) Cement (iv) Iron & Steel and (v) Transportation.

b) The policy implementation analysis in these sectors for GHG emission mitigation.

c) Assessment of the Implication of Domestic Policy options for international negotiations.

d) Analysis of Implementation of Post – Kyoto 2012 climate change mitigation action in India.

The sectoral approach is a broad based concept. The panelists also highlighted that the setting of benchmarks is essential for performance evaluation of the industry. The formulation of performance indicators and benchmarks is complex, as it depends on diverse parameters such as profitability, human resource, safety indicators, energy and resource efficiency etc. The panel discussion had general agreement on the need of (1) national level benchmarks on energy efficiency (2) uniform standards and acceptable energy standards of energy efficiency (3) policies on how to enhance energy efficiency.

Sessions at "Role of Sectoral Approaches in Implementing GHG Mitigation Actions in India" at IHC, New Delhi

6. Professional Activities of Members

Dr. Kirit Parikh, Chairman, IRADe and Member, Planning Commission, Govt. of India, New Delhi was involved in number of high level policy committees of the Government. He was also member of governing bodies of many academic institutions and chaired some of them.

Awards / Honours

He was awarded "Padma Bhushan" by the president of India in March 2009.

Selected list of seminars, conferences, workshops and meetings attended by Dr. K. Parikh

- Chaired session on " Special Session on Capacity Building for fuel sources" at 4th International Exhibition cum conference in Pragti Maidan, New Delhi (10th Sept, 2009).
- Speaker on "Energy security- Strategic options for India" on invitation from National Defense College, Ministry of Defense New Delhi (6th Oct, 2009).
- Chaired session on " Solar Energy- Way forward" at 9th Green Energy Summit on invitation from India Energy Forum in New Delhi (29th Oct, 2009).
- Chaired session on "India Energy Challenges: Navigating an Era of volatile oil prices and a turbulent financial environment" at the 3rd Indian Energy Summit in New Delhi on invitation from Indian Chamber of Commerce (30th Oct, 2009).
- Attended discussion as Panelist at the 3rd IHD foundation lecture by Prof. Lord Nicholas Stern at New Delhi organized by Indian Observatory & Institute of Human Development (6th Nov,2009).
- Keynote speaker in 1 day conference on "Clean Coal Technology" in Ahmedabad (10th Nov, 2009).
- Attended session as speaker on "Climate Change" at 18th Meeting of the Indo-German Consultative Group in New Delhi (15th Nov, 2009).
- Delivered a talk on "Electricity & Power as key drivers for India to reach sustained 10% GDP growth" at New Delhi on invitation from Areva T & D India (3rd December, 2009).
- Attended conference at the University of Oxford on "Effective Multilateralisms: - Cross Regional Perspectives at Center for International Studies at the University of Oxford (17-19 Dec, 2009).
- Chaired the session Policy Discussions and gave valedictory address at "3rd Japan SAARC Energy Symposium on promoting Energy Cooperation in South Asia" at New Delhi on invitation from University of Sikkim (8th Jan, 2010).
- Delivered Key Note address in the inaugural session in Mumbai organized by IIPS, IIASA & TIFAC (12th Feb, 2010).
- Chaired session on "Interaction on Power & Infrastructure sectors" in Vigyan Bhawan at Public Sector Day organized by Standing Conference of Public Enterprises (SCOPE) with Department of Public Enterprises (DPE) (10th Apr, 2010)

- Delivered a Key Note address on "Land use Planning for Sustainable Agriculture in the age of Climate Change" in "TIFAC-IIASA-MSE Modeling Workshop" at Modern School of Economics, Chennai (15th Apr, 2010).

Dr. Jyoti Parikh, Executive Director IRADe; selected list of seminars, workshops and meetings attended

- Speaker at "Copenhagen Conference and the Emerging Economics in Climate Change Negotiations" on Invitation from SIIS (Shanghai Institute for International Studies, china) (20th May, 2009).
- Chaired session in National Agriculture Science Complex on "Opportunities & Challenges in Algae Bio fuel sector" (9th Sept, 2009).
- Speaker on session "The adoptive Response to Climate Change" on invitation from Observer Research Foundation (ORF) at Taj Mahal Hotel, New Delhi (25th Sept, 2009).
- Panelist at IGES-TERI on "Asia Pacific dialogue to discuss about Climate Change" organized by British Council (22nd Oct, 2009).
- Delivered Presentation on "Gender dimensions of Climate Change" on Invitation from ADB (22nd Oct, 2009).
- Delivered Presentation on "Adaptation work (Initiatives incc.): Climate Roadmap of South Asian Cities" on invitation from ICLEI at New Delhi (5th Nov, 2009).
- Attended the Expert Group Meeting (EGM) as an expert on " The impact of the implementation of the Beijing Platform for action on the achievement of the Millennium Development Goals" at United Nations office, Geneva (Switzerland) (12th Nov,2009).
- Participated as Panel Speaker in Panel-II: "The Evolving role of Natural Gas, a Policy Perspective" on invitation from Worldwatch Institute (10-17 Dec, 2009).
- Chaired session on "Solar Power: Future Growth Strategy" at workshop on "Renewable Energy in India: 2030 & Beyond" at Observer Research Foundation, New Delhi (14th Jan, 2010).
- Attended session as Panelist on "Reflection followed by Round Table discussion of areas for further Analysis/ collaboration" in workshop on" Potential India-UK Cooperation on Energy Efficiency & Trading" at New Delhi (18th Feb, 2010).
- Chaired session on "Carbon Dioxide Capture & Sequestration (CCS) Status and Prospects" at New Delhi (25th Feb, 2010).
- Participated as Jury Member in "Indian Express Award Committee" and in "Jury Meeting for EMPI-Indian Express-Indian Innovation Award" at IIC, Annexe at New Delhi (16th March, 2010).
- Delivered Key note address at "International Conference cum Exhibition" organized by World Re-Energy Tech-2010 with MNRE New Delhi (18-20 March, 2010).

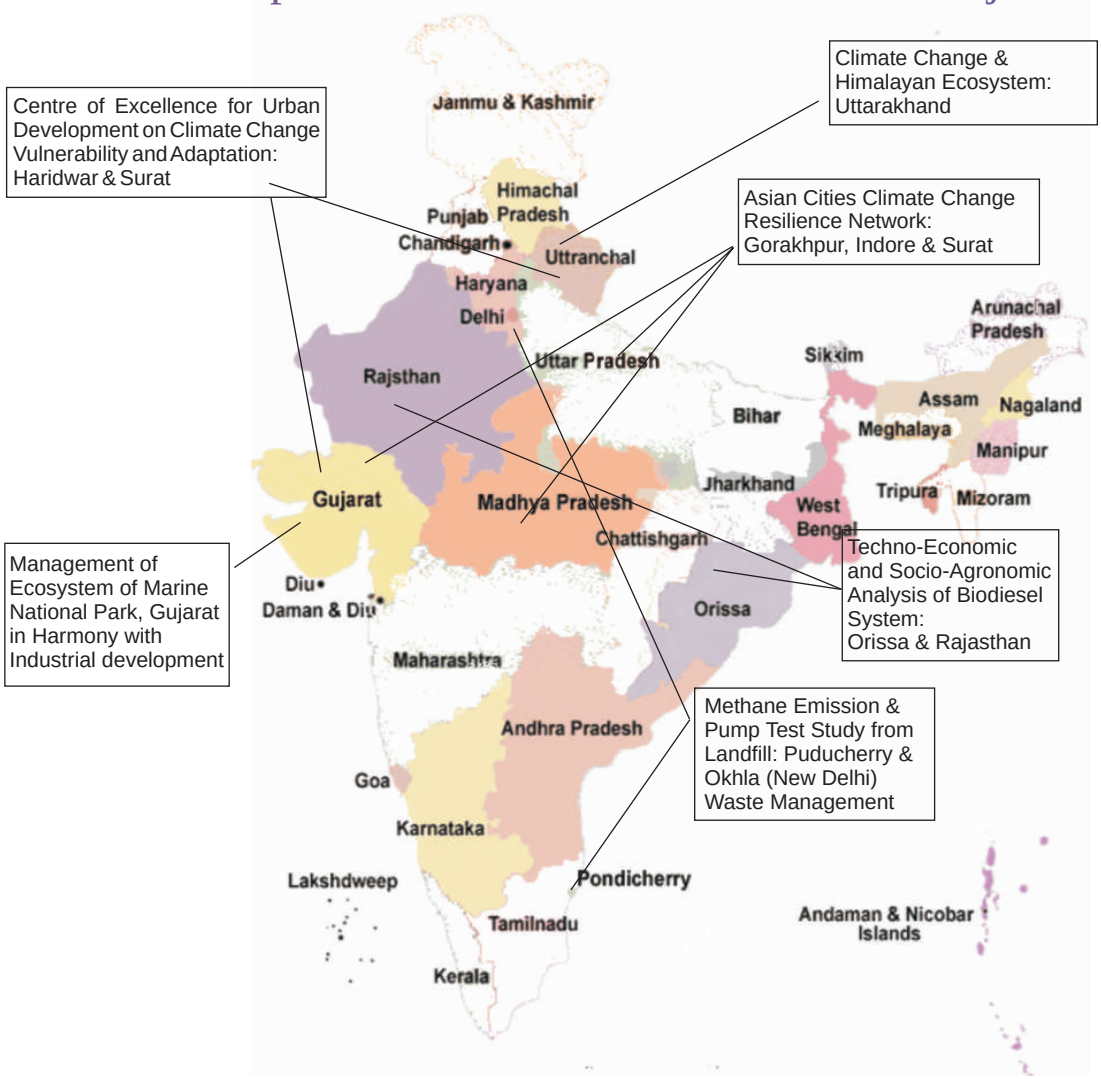
Mr. C.R.D. Biswas

- Attended workshop on Climate Change & Water Resources in South Asia at DTU on 8th Aug, 2009.
- Attended ACCCRN Review

Meeting at Indore on 25th Nov, 2009.

- Attended seminar on Carbon Capture Sequestration on 25th Feb, 2010.
- Attended ACCCRN Workshop on Urban Resilience on Feb, 2010.

7. Map of India with Sites of Irade Projects



1. Centre of Excellence for Urban Development on 'Climate change Vulnerability and Adaptation'
2. Asian Cities Climate Change Resilience Network
3. Indian Perspectives on global Energies Scenarios till 2050
4. Management of Ecosystem of Marine National park, Gujarat in harmony with industrial development
5. Climate Change and Himalayan Ecosystem
6. Developing CGE Model with Activity Analysis for Climate Policies for India
7. Renewable Energy Component of the Indo-German Energy Programme
8. Analytical Approaches for Climate Negotiations
9. Methane Emission and Pump Test study from Landfill- Puducherry and Okhla, New Delhi Waste Management
10. Techno-Economic and Socio-Agronomic Analysis of Biodiesel System

Colored areas show the states, where IRADe did projects in the past and the boxes shows, where we worked in 2009-10

8. List of Recent Projects of IRADe

Projects Undertaken (2009-2010)

S. No.	Title of the Project	Funding Agency	Type	Status
1.	Centre of Excellence for Urban Development on 'Climate change Vulnerability and Adaptation'	Ministry of Urban Development	PR	O
2.	Asian Cities Climate Change Resilience Network	ISET-ACCRN	PR	O
3.	Indian Perspectives on global Energies Scenarios till 2050	TIFAC/IIASA	PR	O
4.	Management of Ecosystem of Marine National park, Gujarat in harmony with industrial development	Ministry of Environment and Forests	PR	O
5.	Climate Change and Himalayan Ecosystem	Ministry of Environment and Forests	R	O
6.	Developing CGE Model with Activity Analysis for Climate Policies for India	Ministry of Environment and Forests	R	C
7.	Renewable Energy Component of the Indo-German Energy Programme	GTZ-German Society for Technical Cooperation	PR	C
8.	Analytical Approaches for Climate Negotiations	Ministry of External Affairs	PR	C
9.	Methane Emission and Pump Test study from Landfill- Puducherry and Okhla, New Delhi Waste Management	United States Environmental Protection Agency -(USEPA)	R&D	C
10.	Techno-Economic and Socio-Agronomic Analysis of Biodiesel System	Ministry of New and Renewable Energy	R	C
IRADe Policy Events				
1.	Workshop on Conservation of Marine National Park, Jamnagar, Gujarat,7th November, 2009	Ministry of Environment and Forest	P&D	C
2.	Solar Energy Fair, 23rd Oct, 2009, Asiad Village Society, New Delhi	WEC-IMC, AIWC & IRADe	P&D	C
3.	Workshop on Role of Sectoral Approaches in Implementing GHG Mitigation Actions in India, 27th Oct, 2009	CCAP & CEPS	P&D	C

R-Research Project
D-Dissemination
AR- Action Research Project
PR- Policy Research Analysis
O-Ongoing
C-Completed

Founding Members

Name	Professional / Designations+
Dr. Kirit S. Parikh (Chairman)	Economist and Engineer
Dr. Jyoti K. Parikh (Executive Director)	Scientist: Energy & Environment
Ms Ela Bhatt	Founder, SEWA
Mr. Adi Godrej*	Industrialist
Mr. Keshub Mahindra	Industrialist
Mr. R.A. Mashelkar	Former Director General, CSIR
Mr. Shirish Patel	Consulting Engineer
Dr. Manmohan Singh	Member, Rajya Sabha

+ At the time of IRADe registration in 2002
*Resigned after the first term. Currently in his place, IRADe council has appointed Mr. Rakesh Mohan, Former Deputy Governor, RBI

* *Mr. Hemant Sahai, Sahai Law Consultants, was appointed in 2005 as Honorary Treasurer.

International Advisory Board

Name	Position
Mr. Nitin Desai	Currently at TERI*
Prof. Amartya Sen	Harvard University
Prof. Gustav Speth	Yale University
Sir Nicholas Stern	UK Treasury
Prof. Joseph Stiglitz	Colombia University

* Formerly Under Secretary General, United Nations

DECISION SUPPORT PROVIDED TO VARIOUS MINISTRIES (2003-10) BY INTEGRATED RESEARCH AND ACTION FOR DEVELOPMENT (IRADe)

No.	Name of the Ministry	Projects
1	Delhi State Government	• CDM Training Program for Delhi State Government Agencies
2	Ministry of Urban Development	• Centre of Excellence for Climate Change and Adaptation-Assessing.
3	Ministry of Environment and Forests (MoEF)	• GHG Reduction Potential, Sectoral Baselines and Opportunities for CDM Projects. • India's National Circumstances for Addressing Climate Change, National Communication to the UNFCCC (NATCOM). • National Framework for Risks, Impact and Vulnerability Assessment for Mountain Ecosystems Uttarakhand. • Eco system Management of Marine National Park Gujarat. • Activity Analysis Model for Climate policies for India
4	Ministry of New and Renewable Energy (MNRE)	• Village Energy Security Programme (VESP) in Vavdi and Vaddithar, villages in Gujarat. • International Training Programmes on Various Themes of Renewable Energy done for 4 years for senior officers from Africa and Asia on Techno-economic, Financial and Socio Environmental Issues. • Evaluation Surveys of RVE-Remote Village Electrification Programme, Solar PV & Solar Thermal Applications in 6 states. • Techno-economic and Socio-agronomic Analysis of Bio-diesel System.
5	Department of Science and Technology, (Ministry of Science and Technology)	• International Workshop on Carbon Capture and Storage (CCS) in Power Sector in India. • Analysis for Carbon Capture and Storage (CCS) Technology in Indian Power Sector.
6	Technology Information, Forecasting and Assessment Council (TIFAC)	• Techno-Economic Analysis for Bio-energy Options.
7	Ministry of External Affairs	• Analysis of Alternative Approaches of Climate Negotiations.

No.	Name of the Ministry	Projects
8	Central Statistical Office (CSO)	• Natural Resource Accounting (NRA) Goa.
9	Ministry of Power	• Evaluation of Franchisee system in the selected Districts: Assam, West Bengal, Nagaland and Rajasthan.
10	Rural Electrification Corporation	• Evaluation of Franchisee system in II. Additionally Selected Districts: Assam, West Bengal and Rajasthan.
11	Planning Commission	• Grant-in-aid for conducting a research study on Extension of Minimum Support Price (MSP), Fiscal and Welfare Implications.
12	Government of Manipur	• Renewable Facility Development at Raj Bhavan, Manipur
13	Ministry of Chemicals & Fertilizers (Department of fertilizers)	• Demand, supply and subsidy Analysis for Indian Fertilizer Sector

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