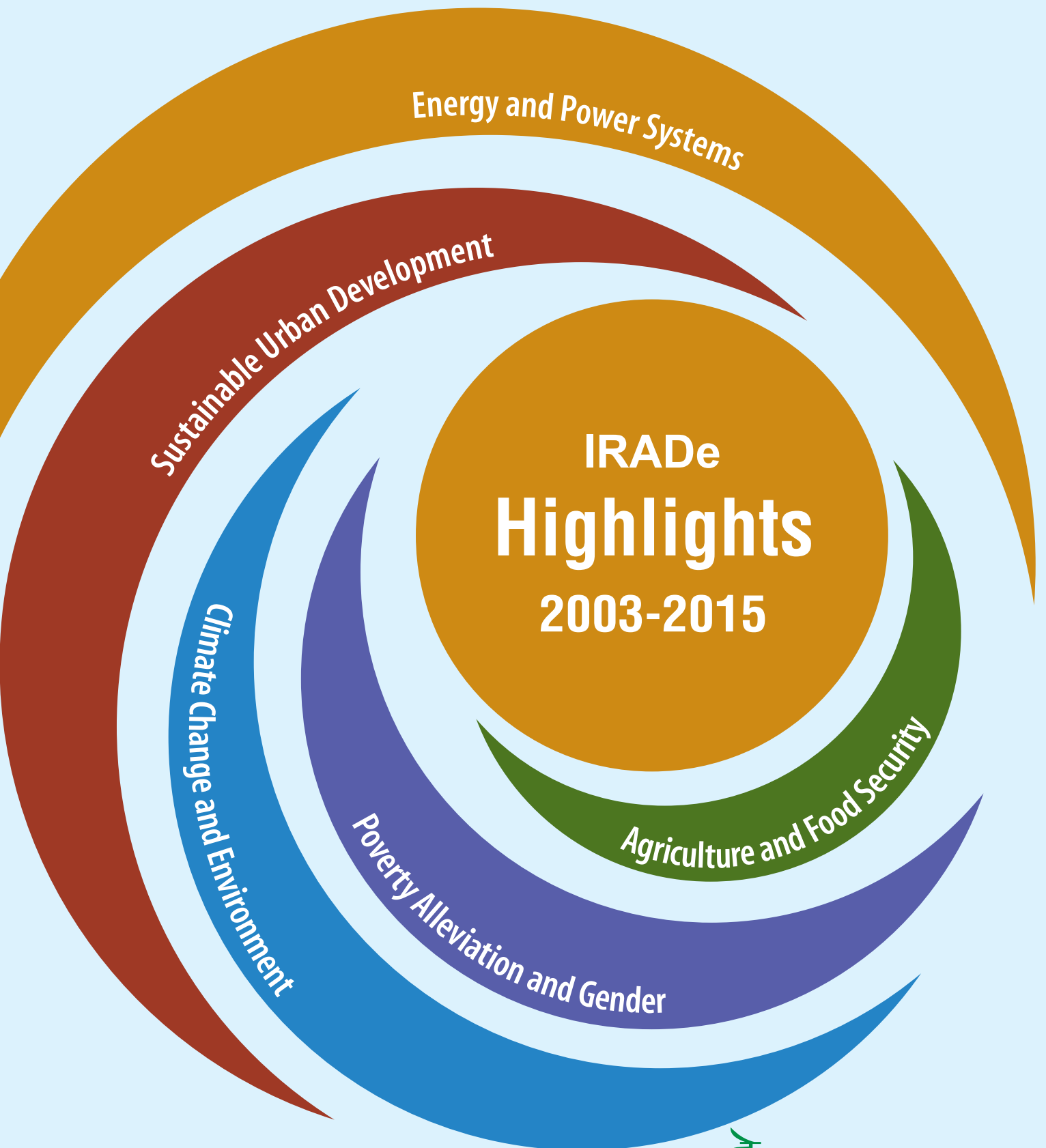


Integrated Research and Action for Development



Integrated Research and Action for Development



IRADe
Highlights
2003-2015



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| Background

IRADe is an independent advanced research institute which aims to conduct research and policy analysis to engage stakeholders such as government, non-governmental organizations, corporations, academic and financial institutions. Energy, climate change, urban development, poverty, gender equity, agriculture and food security are some of the challenges for the twenty first century. Therefore, IRADe research covers these, as well as policies that affect them. IRADe's focus is effective action through multi-disciplinary and multi-stakeholder research to arrive at implementable solutions for sustainable development and policy research that accounts for the effective governance of techno-economic and socio-cultural issues.

IRADe was established under the Society's Act, in 2002 at New Delhi. It is certified as a Research and Development Organisation by the Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology (MoST). It has also been selected as a Centre of Excellence by the Ministry of Urban Development (MoUD) for urban development. In addition, it provides expertise to other ministries, national and international institutions and partners with other reputed organisations.

| Thematic Areas

- Energy and Power System
- Sustainable Urban Development
- Climate Change and Environment
- Poverty Alleviation and Gender
- Agriculture and Food Security

| Cross Cutting Themes

- Inclusive Development
- Technology Assessment
- Modelling and Systems Analysis
- Sustainability and Resource Efficiency
- Socio-Economic Impact

| Key Activities

- Research and Analysis for Decision Support
- Action and Implementation at Local Level
- Training and Capacity Building
- Policy Advocacy and Dissemination
- Monitoring and Evaluations of Projects

IRADe's Objectives

- Integrate multidisciplinary and multistakeholder perspectives concerning issues of development.
- Promote wider consensus, through research and analysis, on effective policies.
- Engage and work at local, district, state, national, South Asia regional and global levels.
- Provide research support to developing countries for development and for negotiation process for international agreements.

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Integrated Research and Action for Development's (IRADe's) journey began with an idea of addressing real-life problems. As no real life problem can be examined with a single discipline or from one point of view, it meant using multi-disciplinary and multi-stakeholder approaches. We always had a clear vision – to develop understanding which would integrate multi-stakeholder perspectives especially for a public policy purpose. Such an approach would help build consensus among stakeholders and bring people on the same platform towards a common goal. Before starting IRADe, considerable preparatory work was done when we were in Mumbai, where we met various like-minded people and drafted its charter.



*Prof. Jyoti Parikh, PhD
Executive Director, IRADe*

Although registered in September 2002, IRADe started operating on July 2003. We began in one room with a meagre amount and now have a team of 40, with a building of our own in South Delhi. IRADe has now evolved in to a well-established, globally recognized and a sought after think tank for policy analysis. It become a Centre of Excellence for urban development in a short span.

In the thematic areas chosen by IRADe, we not only do policy analysis and research but also carry out monitoring and evaluation of policies and programmes, disseminate our findings, organize policy dialogues, carry out action projects, surveys and training. We believe we have made a difference through several influential projects such as South Asia Regional Initiative for Energy Integration (SARI), climate resilient urban development, vulnerability profiles of Indian cities, low carbon development pathways for sustainable India, climate negotiations, modelling

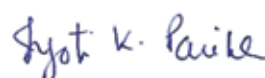
of Indian economy, techno-economic assessment of emerging technologies such as biofuels, carbon capture and storage and renewable energy, price reforms for petroleum products, etc. We also do city (30 cities) and state level analysis of climate vulnerabilities (Himachal Pradesh and Uttarakhand), environmental accounting (Goa and Andhra Pradesh), energy strategy for sustainable development (Gujarat) and livelihood and gender justice.

Over the years, we have concluded 108 projects that span work from research projects to preparation of policy briefs. However, we have always stressed quality over quantity i.e., our work is often in-depth as some projects are over 3 to 5 years duration. We disseminate work through events/workshops/conferences, training programmes and stakeholder consultations. Some notable workshops and mega conferences are well remembered for their advance preparation and effective delivery. Projects and studies done in each of the five thematic areas are presented here, where the first page introduces the theme and indicates sub-thematic areas.

The success we have achieved is due to dedicated and sincere efforts of many of the past and present staff of IRADe. Many well wishers, decision makers and other think tanks have helped us over these years. Many sponsors have generously supported us not once but several times. Over the years, the Council members have always given their whole hearted support.

We present you a compendium of these efforts made over 12 years to understand us better. We have provided glimpses of events and highlights of the research projects. We hope our work speaks louder than our words and that we have made a difference by introducing new ideas through policy analysis.

We are happy to see our vision – IRADe – growing!



Jyoti Parikh
Executive Director

GOVERNING COUNCIL, 2015

Prof. Kirit S. Parikh, PhD
Chairman, Former Member, Planning
Commission

Prof. Jyoti K. Parikh, PhD
Member Secretary, Energy,
Environment and Climate

Ms. Ela Bhatt
Founder
Self Employed Women's Association

R.A. Mashelkar, PhD
Former Director General, Council for
Scientific & Industrial Research

Ms. Meera Shankar
Former Ambassador, Gol

Prof. Deepak Nayyar
Economist, Former Vice Chancellor,
Delhi University

Mr. Suresh Prabhu
Minister of Railways

Mr. Hemant Sahai
Advocate, Treasurer

INTERNATIONAL ADVISORY BOARD

Mr. Nitin Desai
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Prof. Amartya Sen
Harvard University

Prof. Joseph Stiglitz
Columbia University

Lord Nicholas Stern
London School of Economics and
Political Science

Prof. Gustav Speth
Yale University

FOUNDING MEMBERS, 2002

Prof. Kirit S. Parikh, PhD
Chairman, Former Member,
Planning Commission

Manmohan Singh, PhD
Former Prime Minister, India

Ms. Ela Bhatt
Founder, SEWA

Mr. Adi Godrej
Industrialist

Mr. Keshub Mahindra
Industrialist

R.A. Mashelkar
Former Director General, CSIR

Mr. Shirish Patel
Consulting Civil Engineer

Prof. Jyoti K. Parikh, PhD
Member Secretary, Energy,
Environment and Climate Change



*IRADe founding members (from left to right): Kirit Parikh, Shirish Patel,
Manmohan Singh, Jyoti Parikh, RA Mashelkar and Adi Godrej*

IRADe is registered under Society's Act in 2002 at New Delhi. It is an R&D organization recognized by the Department of Scientific & Industrial Research (DSIR), Ministry of Science & Technology (MoST). IRADe is also recognized as a Centre of Excellence for Urban Development and Climate Change by the Ministry of Urban Development (MoUD).

Events, Meetings and Workshops: Some Memories



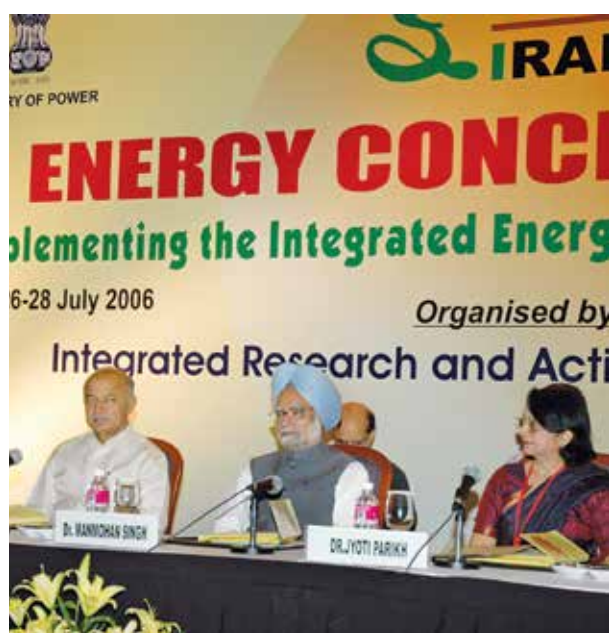
IRADe organizes events for disseminating results, policy diagnosis, multistakeholder consultations etc. IRADe plans these carefully to ensure the presence of decision makers to take the conclusions further in real life. IRADe's events are inaugurated and participated by luminaries such

as the President of India, Prime Minister, cabinet and state level ministers, secretaries and other heads of national and international organizations including private and public sectors. IRADe also has an international presence. These events are organised in various parts of India and abroad.

Energy Conclave 2006, 'Implementing the Integrated Energy Policy – The Way Forward', 26–28 July 2006

The Energy Conclave 2006 on Implementing the Integrated Energy Policy inaugurated by the Prime Minister Dr. Manmohan Singh was a mega event of three days with more than 300 participants including high-level delegates from various sectors such as coal, oil, gas, power, renewable energy, energy efficiency, finance, science and technology and sustainable development.

It was an unprecedented event during which policies for energy sectors were discussed and recommendations were presented to the Planning Commission.



The Hon'ble Prime Minister Dr. Manmohan Singh giving the inaugural speech at the Energy Conclave, 26 July 2006, New Delhi

Energy Technology Conclave, 2008



IRADe in collaboration with India Energy Forum and World Energy Council organized Energy Technology Conclave on 13–14 March 2008 at New Delhi. The highlight of the event was the talk delivered by former President of India Dr. A.P.J. Abdul Kalam.

He emphasized energy independence, clean-green-energy, provision of Urban Amenities in Rural Areas (PURA) by creating physical, electronic and knowledge connectivities leading to economic connectivity. He outlined a vision of a safe, prosperous, happy and socio-economically developed nation by 2020.



Energy and Climate Summit



Mr. Suresh Prabhu, M.P. addressing the event

IRADe organized the Energy and Climate Summit 2009 to explore interactions of climate change and energy system on 3–4 February 2009 at New Delhi. Union Minister of Power Sushil Kumar Shinde presided, while Montek Singh Ahluwalia, deputy chairman of the Planning Commission, inaugurated it. The summit was attended by energy sector professionals.

Financial Sector Reforms Conclave, 6–8 January 2005

Shri P. Chidambaram, Union Finance Minister, inaugurated the IRADe-IIEF (Invest India Economic Foundation) State Market Conclave 2005, which was aimed at examining financial policy reforms needed to support and foster 8 per cent growth.



Shri P. Chidambaram, Union Minister, Finance inaugurating the IRADe-IIEF State Market Conclave 2005, 6–8 January 2005, New Delhi

Accelerating India's Growth: A Talk by Prof. Joseph Stiglitz

Nobel Laureate Prof. Joseph Stiglitz from Columbia University was the chief guest and was invited to India for an interactive session on 'Accelerating India's Growth: What is needed?' as part of the 10th anniversary celebration of IRADe.

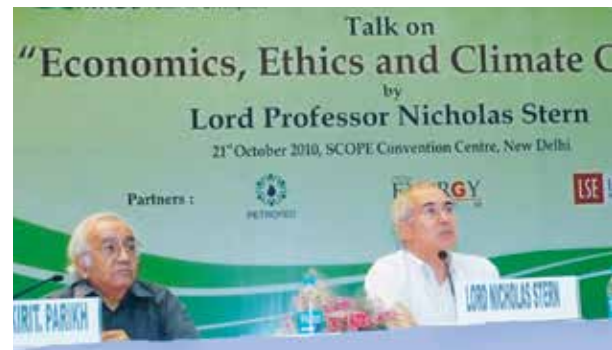


Prof. Stiglitz, one of the most influential economists in the world today, emphasized the need for accelerating India's growth and the role of reform. He, however, cautioned against blindly following IMF/World Bank prescriptions and advised keeping country's circumstances in mind.

Economics, Ethics & Climate Change – A talk by Prof. Nicholas Stern

Prof. Lord Nicholas Stern, IG Patel Professor of Economics and Governance, London school of Economics (LSE) delivered a very thought provoking lecture on 'Economics, Ethics and Climate Change' at New Delhi on October 21, 2010. It was organised by IRADe in partnership with PetroFed, World Energy Council, Indian Member Committee; India Energy Forum and LSE India Observatory.

Prof Stern, argued that both economic and ethical considerations call for strong and immediate actions to deal with climate change. While all must act, the burden must be largely borne by industrialized countries.



Alternative Roadmaps on Reforming Diesel Price in India

The workshop was organized by IRADe on 22 August 2012, at Hotel Claridges, New Delhi. Dr. Kirit Parikh, Chairman, IRADe, highlighted the background of the study and stressed the immediate need to reform diesel pricing in India, as it would benefit the economy in the long run.

The workshop brought out the impact of liberalizing diesel pricing for different stakeholders. They included truckers association, farmers, car manufacturers, consumer association, telecom tower owners etc. Many of them felt either that the diesel price rise was not bad for them in the long run and they needed to adapt or that they could



handle the impact, except the trucking association, which felt that only with fuel-efficient trucks it could handle the price rise.

Supported by Shakti Foundation

Biodiesel Summit

IRADe took the lead in 2005 to work on biodiesel sector to explore the relevance of biodiesel option for India. IRADe organized a two-day summit to discuss biodiesel policy and energy security from the perspectives of various stakeholders, viz., farmers, processing units, oil industries, users and regulatory agencies, six ministries participated in the summit.



India's Energy Transition till 2050 in the Global Context

A round table discussion was organized to release the report 'Indian Perspectives on Global Energy Scenarios till 2050'. During the event held on February 8, 2014 at India Habitat Centre, New Delhi, key findings and some of the critical messages concerning the roadmap for transition in the energy mix in India were presented.

The report is based on analysis done in collaboration with the International Institute for Applied Systems Analysis (IIASA), Austria and sponsored by Technology Information, Forecasting and Assessment Council (TIFAC), Department of Science & Technology, Government of India (GOI).

Member of the Planning Commission Dr. K. Kasturirangan was the chief guest and released the IRADe-TIFAC-IIASA report, followed by a round table discussion chaired by Dr. Pavel Kabat, CEO and Director General, IIASA.



A New Global Green Deal? – Towards Green Energy Policies for Sustainable Development

IRADe organized an international conference on 'A New Global Green Deal? – Towards Green Energy Policies for Sustainable Development' on 24–25 September 2010 in New Delhi. The conference was supported by Friedrich Ebert Stiftung.



This conference was held to discuss, debate and explore the emerging opportunities for sustainable socio-economic development in the context of energy security and economic crisis. China, Germany, USA, Korea, EU, IMF and UNCTAD shared their concepts on policy issues and strategies on nationally appropriate new green technologies, prudent and proven renewable energy technologies and impact of climate change for holistic global development. Leading experts from India discussed low-emission technologies, technology transfer, role for multilateral agencies, clean energy investment framework, policy and regulatory challenges and enabling mechanism. The participants included public and private sector

executives, officials from Ministries of Central and State governments, national financial institutions, legal and management consultants, environmental scientists, research and development institutions and non-governmental organizations (NGOs).



Sustainable and Climate-Resilient Urban Development

Urbanization and climate change are among the most challenging issues facing India and the world in the coming decades. The international workshop on sustainable and climate-resilient urban development drew a unique combination of decision makers, city mayors and local government representatives, local NGOs and international research experts.

Intensive discussions and presentations held over a two-day period generated a wide array of conceptually grounded and highly practical insights and guidance on how India can begin to address urban challenges in the context of climate change.

The two-day workshop was jointly supported by the UK Department for International Development and the Rockefeller Foundation, US. The workshop was organized by the ACCCRN India Programme partners, IRADe and Institute for Social and Environmental Transition (ISET) with active support from other ACCCRN India partner organizations.

Regional Workshops for Disaster-Resilient and Sustainable Cities

In the year 2014, IRADe, a Centre of Excellence of the Ministry of Urban Development (MoUD) worked extensively in the area of disaster resilience from the point of view of preparing cities and mainstreaming disaster resilience in urban planning. Four regional

workshops on 'Sustainable and Disaster-Resilient Urban Development' covering different cities including Shillong, Guwahati and Bhubaneswar (Eastern India); Pune, Ahmedabad and Bhopal (Western India); Vishakhapatnam, Hyderabad (South India) and Dehradun, Srinagar (Northern India) were conducted with active participation of the urban local bodies, parastatal bodies, researchers and urban planners of the respective cities. The workshops were mainly sponsored by the MoUD.

1. North India workshop: 30 December 2014 at New Delhi

The workshop was inaugurated by **Mr. Shankar Aggarwal, Secretary, Ministry of Urban Development, Government of India.**



2. East India workshop: 17 October 2014 at Guwahati, Assam

The workshop was inaugurated by **Mr. Daya Ram Rajbangshi, Additional Commissioner, Guwahati Municipal Corporation, Government of Assam.**



3. South India workshop: 09 October 2014 at Vishakhapatnam, Andhra Pradesh

The workshop was inaugurated by **G.C. Kishore Kumar, Secretary, Visakhapatnam Urban Development Authority (VUDA), Andhra Pradesh.**



4. West India workshop: 09 September 2014 at Ahmedabad

The workshop was inaugurated by Mr. G. S. Aloria, Additional Chief Secretary, Urban Development and Urban Housing Department, Government of Gujarat.



The purpose of the workshops was to build awareness on city disaster-resilience mechanism, dissemination of knowledge and to suggest strategies for disaster-resilient cities. The workshops aimed at building the capacity of city stakeholders (policy makers, urban planners, city administrators, experts, academicians and aid agencies from different regions of India) to

strengthen the disaster resilience mechanism and help them deal with related issues and formulate adaptation strategies.

Considerable time was spent in preparing reports of the 10 cities containing hazard analysis, spatial planning as well as levels of benchmarks of urban services.



We acknowledge the support of our Asian Cities Climate Change Resilience Network (ACCCRN) partners.

South Asia Regional Initiative for Energy Integration: Cross Border Electricity Trade



SARI/EI

IRAdE is the implementing partner for USAID's South Asia Regional Initiative for Energy Integration (SARI/EI) for advancing regional energy integration and Cross Border Energy Trade (CBET) among eight South Asian countries (Afghanistan, Bangladesh, Bhutan, India, Pakistan, Nepal, Sri Lanka and the Maldives).



South Asia Regional Conference of SARI/EI on Cross Border Electricity Trade, 4-5 Oct 2013, New Delhi





SARI/EI South Asia Investor Workshop was held on 24-25 Sept 2014, New Delhi

The SARI/EI inaugural conference on Cross Border Electricity Trade was held in Oct 2013 and was inaugurated by the then deputy chairman of the Planning Commission, Montek Singh Ahluwalia. The conference had a large turnout including high level delegates from both public and private sectors from all the eight participating nations.

IRADe in association with the Confederation of Indian Industry (CII) organized the South Asia Investor workshop in September 2014, an important platform for investors, developers, financial institutions, Multilateral Development Banks and high-level officials from the region to explore challenges and investment opportunities to enhance CBET among the South Asian nations. As cross-border generation and transmission interconnection projects are capital intensive,



IRADe in association with the Indian Energy Exchange Limited (IEX) organized a visit to Amsterdam and Paris for understanding the legal and regulatory issues, governance, operational and other aspects of European Regional Power Market, 13-19 July 2014

various aspects require, transparency, reliability and harmonization of policies and regulations to attract investment.

Other Meetings and Conferences

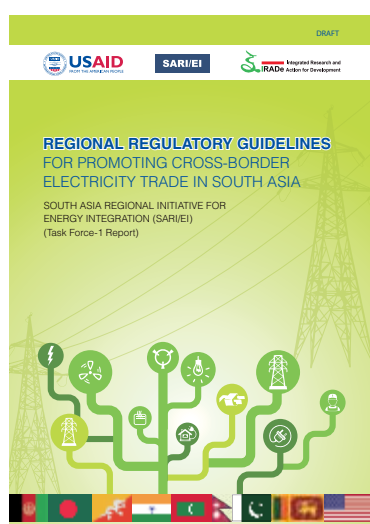
- The SARI/EI team visited Colombo, Sri Lanka from 18-20 December 2012 to meet stakeholders to apprise them of SARI/EI roadmap.
- A workshop on Issues before Regulators in South Asia Region was held on 19-20 February 2013 in Kathmandu, Nepal.
- The first meeting of Task Force-I was held on 24-25 July 2013, in Dhaka, Bangladesh for planning its core activities towards coordination



SARI/EI Project Steering Committee consists of senior Government representatives and think-tanks of SA countries, ex-diplomats and specialists. The first meeting of the PSC was held on 12 March 2013 at New Delhi. The Committee met again in January 2014 at New Delhi and in December 2014, at Dhaka to review the progress of SARI/EI annual activities.

of policies, legal and regulatory frameworks for CBET. Members met again to evaluate the progress in February 2014 in Sri Lanka, in June 2014 at Bhutan and in December 2014 at Bangladesh Dhaka. The Task Force recently brought out the following reports (draft final): (i) “*Recommendations on Regulatory Guidelines for CBET in South Asia*” and (ii) “*Required Changes in Electricity Laws, Policies and Regulations of South Asian Countries for promoting CBET*”.

- The first meeting of Task Force-2 was held on 21-22 August 2013, at Thimpu, Bhutan. The team met again in April 2014 at Kathmandu, and in February 2015 at Colombo, to drive the objectives for advancement of transmission system interconnections, both technical and operational aspects of them.



- The first meeting of Task Force-3 was held in Mumbai in April 2014, for creating an enabling environment to establish an electricity market in the South Asia region.
- During 5-6 August 2015 SARI/IRADe released Regional Regulatory Guidelines for CBET.

International Training Programmes 2004, 2005, 2006 and 2007

IRADe organized International Training Programmes (ITP) for four years, every year since 2004, on Renewable Energy Technology (RET) for participants from Asia and Africa. The various topics covered under RET were as follows:

1. ‘Renewable Energy in Local, National and Global Context from Socio-economic Perspectives’, March 2004.

2. ‘Renewable Energy: Techno-Economic, Finance and Socio-Environment Issues’, 7–17 December 2004.
3. ‘Alternative Fuels: Energy Security, Techno-Economic and Environmental Issues’ 23–30 March 2006.
4. ‘Role of Renewable Energy in Energy Planning and Expanding Livelihood Options’, 14–22 March 2007.



Training-of-Trainers on Economic Instruments for Environmental Management in Asia, 27-29 April 2005

IRADe is a member institution for Network of Institutes for Sustainable Development (NISD) set up under UNEP

The 3-day Training-of-Trainers Workshop on the Use of Economic Instruments (EI) for Environmental Management in Asia was organized by IRADe and was supported financially and technically by UNEP’s Economic and Trade Branch. Participants were from China, Indonesia, Vietnam and Nepal. UNEP’s Division of Environmental Policy Implementation and the Indian Ministry of Environment and Forests provided additional support.

IRADe-UNEP “Training Session on Capacity Building–Environment, Trade and Sustainable Development”

IRADe organized a Training Session on Capacity Building–Environment, Trade and Sustainable Development” on November 24, 2004 in New Delhi in view of the need to build the capacity of planners, industrial organizations, environmentalists, business community, trade associations and decision makers. The United Nation Environment Program (UNEP) financed the workshop. It was based on the Training Module: Introduction into Capacity

Building for Environment, Trade and Sustainable Development, developed by the UNEP-UNCTAD Capacity Building Task Force (CBTF). Participants came from Research and Information System of Non Aligned and other Developing Countries (RIS), United Nations Conference on Trade and Development (UNCTAD), different ministries, the Planning Commission and several universities.



Workshop on Food Security: Present and Future, 16th September 2008, New Delhi

IRADe celebrated its 6th Foundation day with a panel discussion, organized on “Food Security: Present and Future” at India International Center on 16th September, 2008. The workshop was attended by renowned academicians and NGOs. Dr. Kirit Parikh chaired the panel, and Dr. Abhijit Sen, Member Planning Commission was the chief guest of the event. The eminent panelists were Dr. S. Mahendra Dev, Chairman of CACP, Dr. Ashok Gulati of IFPRI and Dr. Suman Bery, Director General, NCAER.

The workshop highlighted some key aspects necessary to address the issues of food security like maintaining a buffer stock for food grains, use arable land to the maximum, use improved irrigation practices, water management techniques and application of technology (for Fertilizer, Seeds, farm practices and Pesticides etc.). Reduce soil degradation, food wastages needs to be reduced at source upto end user (including Logistics and PDS). Reduce the subsidy burden on the Government in Agriculture sector. Improving credit facilities and co-operative farming practices need to evolve. The food security can be ensured effectively by integrating food grain production, allied agro-products, access to the market, production of value added items, technology enhancement etc. Food security is important mission of Government of India. The effective cooperation of Private and Public sector is essential to make the mission of the Government a success.

International workshop on Carbon Capture and Storage (CCS) in power sector in India 22-23 January 2008 at New Delhi

IRADe conducted a workshop on CCS for reducing Green House Gas (GHG) and CO₂ emission which are important from the point of climate and reducing pollution from fossil fuel based power plant. The workshop was inaugurated by Shri. Kapil Sibal, who was the Minister of Science and Technology and Earth Science. The sponsors were Department of Environment, Food and Rural Affairs (DEFRA), UK, the British High Commission of India, Department of Science and Technology (DST) and Planning Commission.

The workshop highlighted that Carbon Capture and Sequestration (CCS) technology is one of the emerging technologies to restrict CO₂ emission to atmosphere from industrial processes. In the context of Thermal Power plant (TPP), it is a bundle of technologies; preventing the release of carbon dioxide emission with flue gases to the atmosphere.

CCS process chain consists of, (a) capturing the carbon dioxide in flue gases emitted in TPP and then separating it (b) transporting the separated carbon dioxide to the sequestration site (CO₂ as supercritical fluid) and finally (c) securely storing the carbon dioxide at the identified sequestration sites in liquid state. The potential underground sequestration sites are depleted oil and gas fields, deep saline aquifer formations, deep ocean bed, sedimentary rocks, basalt rock formation etc., are being studied for efficacy, stability; these sites are located few kilometer below earth having protective rock covering to prevent CO₂ leakages and (d) Monitoring and Verification of sequestration sites for establishing compliance of Government Regulation is also important.

Workshop stressed that developed countries should lead by example by establishing successful demonstration CCS in their own country. Ongoing R&D works to make CCS technologies, techno-economic viable. Develop and enable legal and regulatory frameworks for CCS at the national and international levels, including long-term liability regimes. Incorporate CCS into emission trading schemes and post-Kyoto instruments. New thermal power plants to include capture/storage readiness (facilities) [Capture ready thermal power plant] considerations within plant design to be commissioned by 2015.

→ South Asia Cross Border Electricity Trade

- South Asia Regional Initiative for Energy Integration (SARI/EI)

→ State Level Energy Analysis

- Sustainable and Integrated Energy Strategy for Gujarat

→ Energy Price Reforms

- Assessment of Alternative Road Maps on Reforming Diesel Prices
- Analysis of Kerosene-free Delhi Scheme
- Assessing the Impact of Diesel Subsidy Reform since January 2013
- The Impact of India's Diesel Price Reforms on Trucking Industry

→ Energy Technology Assessment

- Energy Transitions Needed Till 2050
- Techno-Economic Assessment for Bioenergy in India
- Global Technology Watch Group on Advanced Coal Technologies for Power Generation
- Analysis of Carbon Capture and Storage Technology in Power Sector, India

→ Rural and Renewable Energy

- Evaluation of Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY)
- Overview and Assessment of Indian Renewable Energy and Rural Electrification Programme in the Context of Rural Development

→ Monitoring and Evaluation

- Monitoring and Evaluation of Off-Grid Solar Photovoltaic Systems Installed in Punjab and Himachal Pradesh in the Years 2008, 2009 and 2010
- Evaluation of Franchise System in Assam, West Bengal, Nagaland and Rajasthan

- Evaluation of Solar Thermal Demonstration Projects in Four States of India
- Evaluation of Solar Photovoltaic Programme in Six States of India
- Survey and Evaluation of Remote Village Area Electrification Project through Solar Photovoltaic System in Rajasthan and Haryana
- Village Energy Security Programme in Vavdi and Vaddithar Hamlets in Patan District of Gujarat

→ Biodiesel Analysis and Implementation

- Integrated Analysis of Diesel Substitutes from Oilseeds for India
- Rural Microenterprise Model for Biofuel Extraction in India

→ Fuelling India's Growth

- Natural Gas Demand by Indian Fertilizer Sector
- Fuelling India's Growth: Past Trends and Scenarios 2004–05 to 2011–12
- Fuelling India's Growth: Vision 2030
- Impact of Fuel Scarcity and Pollution on Rural Poor, 2004 Himachal Pradesh
- IRADe Modeling Activities

Introduction

IRADe has a strong presence in energy policy studies in India. These include energy needs of India in the context of global energy scenarios, pricing policy and reforms, technology assessment, energy access, programme evaluation, role of renewable energy trade and long-term (2050) perspectives on energy.

The analytical research included understanding the changes in trends of energy production, consumption, imports and exports of petroleum fuels and their contribution to the overall energy mix in India.

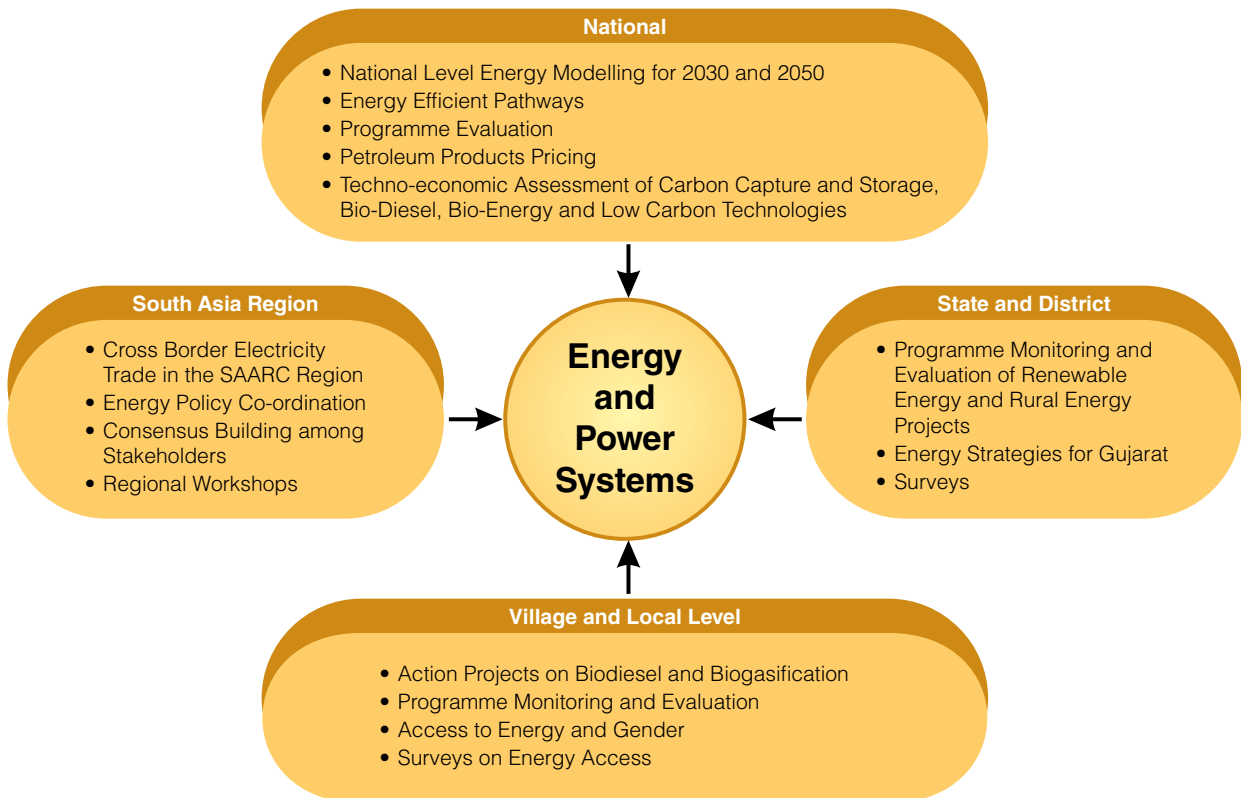
Technology assessment exercises carried out include carbon capture and storage, biodiesel, renewable technologies and star-rated appliances.

Fuel demand and specific sectors that impact energy consumption and energy transition till 2030 and 2050 are studied.

South Asia Regional Power trade is now a major project with a duration of five years supported by SARI/USAID.

Access to modern energy for poor, especially for women, is a major concern always reflected in IRADe research and have undertaken several projects involving surveys and analysis.

Our policy analysis cover areas related to pricing of and access to energy and also technology perspective for long term. These also explore issues linked with poverty and gender as well as climate change.



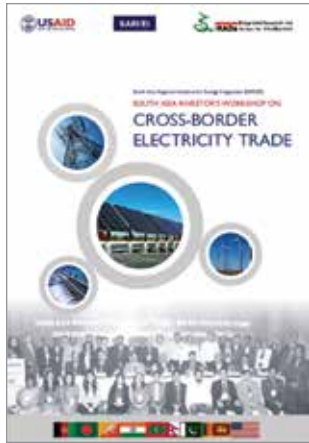
South Asia Cross Border Electricity Trade

South Asia Regional Initiative for Energy Integration (SARI/EI)

The SARI/EI program promotes regional energy integration and Cross Border Electricity Trade (CBET) in eight South Asian countries (Afghanistan, Bangladesh, Bhutan, India, Pakistan, Nepal, Sri Lanka & the Maldives). At present all of these countries face energy shortage. The region has



Dasho Sonam Tshering, Hon. Secretary, Ministry of Economic Affairs, Royal Government of Bhutan addressing SARI/EI Task Force Members, July 2013



the highest untapped hydro potential in the world and is also the least interconnected. Thus regional integration can enhance energy security for all. IRADe was selected by USAID for promoting CBET for the years 2012–17 to address policy, legal, and regulatory issues related to energy in the region; promote transmission interconnections; and works toward establishing a regional market exchange for electricity. SARI/EI activities are driven by Task Forces and guided by a Project Steering Committee.

Studies initiated/proposed under SARI/EI

Task Force 1

- a. Review of Electricity Laws, Regulations, Policies and Legal Structure for SA.
- b. Investor friendly Policies/guidelines for SA power sector (proposed).

Task Force 2

- a. Electricity Trading Potential Assessment in SA.
- b. Harmonization of Grid Codes, Operating procedures and standards for CBET.

Task Force 3

- a. Assessment of commercial terms and conditions for CBET and model of Power Exchange in SA.
- b. Market Rules and Pilot Market design (proposed).

Research and Analytical Studies

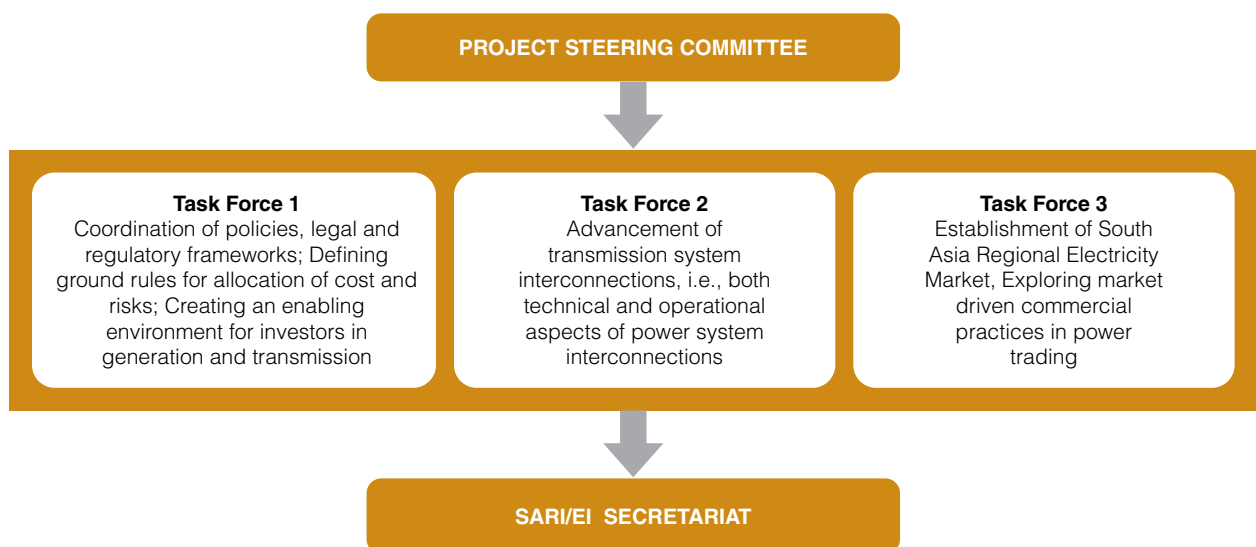
IRADe’s in-house research work resulted in a background paper on CBET potentials and a concept paper on investment requirements for CBET. IRADe is working towards developing internationally acceptable energy models for econometric analysis of CBET benefits for participating South Asian countries

Publications

The Task Force-1 completed an elaborate study on “**Coordination of Policy, Legal and Regulatory framework**” which brought out (i) “Recommendations on Regulatory Guidelines for CBET in South Asia” and (ii) “Required Changes in Electricity Laws, Policies and Regulations of South Asian Countries for promoting CBET”. These regulatory guidelines and amendments recommended will provide the initial framework towards enabling participating countries to recognise cross border power trading.

The Background Paper highlights the current status of and the overall benefits of CBET to South Asian economy, challenges and opportunities.

- The current status of regional energy integration including the past energy trade, projects in pipeline and those that are in various stages of planning;
- Review of the existing literature including the academic literature covering developments



in other parts of the world (such as Greater Mekong, European, North American and African CBET experiences), as well as South Asian studies (by ADB, SEC, World Bank and USAID).

- Issues in development of a regional power market.

The concept paper on “CBET in South Asia: Challenges and Investment Opportunities” analyses the investment requirements for cross-border electricity trade in the region and challenges for each South Asian country including the way forward. IRADe’s in-house concept paper brought out the critical analysis of investment requirements, challenges and opportunities in CBET in SA region. Key highlights of the concept paper are:

- Power sector overview of SA countries and CBET
- Key drivers for investment in CBET
- South Asia investment climate
- Key investment challenges in CBET
- Key opportunities and investment requirements in each SA countries.

Working Paper on Bhutan

A working paper on Bhutan was prepared to assess the impact of CBET on the economy of Bhutan. It highlights the positive impact of power exports on Bhutanese economy and provides revised projected electricity demand till 2050 (using ARIMA Model), and electricity supply projections based on the upcoming power plants considering slippages review.

IRADe’s India Activity Model

The results were updated using the revised trading potential of Bhutan and the earlier estimated potential of Nepal (based on NEA’s demand estimates). The model provides India’s projections with CBET and without CBET on key indicators such as energy mix, electricity generation mix, CO₂ reduction, reduction in total investments and energy sector investment requirements, reduction in import dependence of coal and fossil fuels etc.

Analytical Study

Under SARI/IE program IRADe is carrying out an Analytical Study with the primary purpose to build the consensus for cross border electricity trade. It will involve multi-country analysis (currently Nepal) and bringing out the economic (macro and micro) importance of power trade besides

other country benefits. In addition, it will carry out a set of activities to build consensus through various channels and create political climate for co-operation. The Consensus building activities will bring together stakeholders from power sector, financial and diplomatic communities and other energy experts.

The objective of the study is to critically assess the need for CBET among the nations of the South Asia region through comprehensive analytical studies that quantify the technical, economic, environmental and energy market benefits of cross border interconnection in the region.

The outcome of the studies will rigorously form estimates of benefits to inform the discussion by all three Task Forces of the SARI/IE and pave the path to prepare and develop regional energy markets and make them sustainable in order to foster economic growth of this region.

State Level Energy Analysis

Sustainable and Integrated Energy Strategy for Gujarat

IRADe is requested to prepare a policy document on “Environmentally Sustainable and Integrated Energy Strategy for Gujarat” by the state government. Under the project, socio-economic status and energy and environment profile of the state are studied to predict energy demand for the next two decades.

Based on current energy scene, energy requirements are worked out for a number of scenarios of economic growth and structure of the economy. While exploring supply strategies the factors that are taken into account, among others, for policy formulation are energy imports, conservation, access to consumers at affordable cost and infrastructure needed.



Stakeholder meeting in progress at GPCL, Gandhi Nagar



IRADe research team on visit to 1 MW solar power plant on Ash Dyke of the 850 MW Gandhi Nagar thermal power station, Gandhi Nagar

1 MWp CANAL-TOP SOLAR POWER PLANT	
Location : Village Chandrasan, Taluka Kadi, District Mehsana, Gujarat	
Installed Capacity : 1 MWp	Owner : Gujarat State Electricity Corporation Ltd
Technology : Polycrystalline Solar Modules, 280Wp	Canal Property : Sardar Sarovar Narmada Nigam
No. of Modules : 3616	Financial Assistance by : NABARD
Canal Length used : 750 mtr	Power Off-taker : Uttar Gujarat Vij Company Ltd
No. of Blocks : 8 Blocks each of 125 KWp	EPC Contractor : SunEdison Energy India Pvt. L
No. of Inverters : 4 Nos.	Module Manufacturer : MEMC, USA
Power Evacuation System : 11 KV	Inverter Supplier : Power Doe, Italy
	Compact Sub-station Supplier : ABB Ltd.

Energy-mix needed for the energy demand is discussed along with energy supply strategies.



Supported by Gujarat Energy & Petrochemicals Department & Gujarat Power Corporation Limited (GPCL)

Energy Price Reforms

Assessment of Alternative Road Maps on Reforming Diesel Prices

Government has been keeping consumer price of diesel below cost of supply and was reluctant to raise diesel price mainly due to fear that it might lead to inflation, even though administered price of petroleum products leads to large under-recoveries of costs due to the difference between cost of supply and sale receipts.

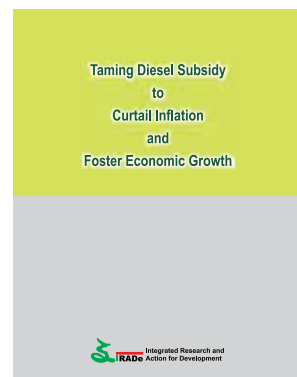
Partial financing of under-recoveries by the government is done by direct budgetary support and indirectly by the public sector, oil marketing companies (OMCs) and upstream oil companies (ONGC and OIL). The high level of under-recoveries raises fiscal deficit, which in turn leads to higher money supply resulting in higher inflation, prompting the Reserve Bank to raise interest rate

that lowers investment and economic growth rate over time.

To explore this trade-off between short-term impact and medium-term outcomes in terms of economic growth and inflation, IRADe conducted a study titled 'Taming Diesel Subsidy to Curtail Inflation and Foster Economic Growth'. The aim of the study was to assess alternative roadmaps to reform diesel prices in India.

An econometric model using quarterly data was estimated and alternative policies were simulated. While raising diesel price will increase inflation in the short run, over time the GDP will be higher and inflation substantially lower than when diesel price is not raised. Also the impact of a 10 per cent increase in diesel price on the poorest 10 per cent of consumers will be an increase of less than 0.6 per cent of their consumption expenditure.

IMPACT: IRADe organized a stakeholder consultation meeting and a meeting at the Finance Ministry. Subsequently, the government raised diesel price and announced a policy of monthly increase in diesel price eventually freeing it.



Supported by Ministry of Finance and Shakti Sustainable Energy Foundation

Analysis of Kerosene-free Delhi Scheme

'Kerosene-free Delhi' (KFD) scheme was launched by the Delhi Government in 2012. It gave a free LPG cylinder, a two-burner gas stove, regulator and gas pipe to ration card holders using kerosene. IRADe found the scheme to be reasonably successful as it reduced indoor air pollution but, at the same time, it failed to include the poor as it focused only on the holders of ration cards, thus excluding the others, i.e. the homeless with no identity card or address.

It was also found that some kerosene use continued to bridge days between the order and delivery of a gas cylinder. IRADe recommended supply of 5 kg cylinders. The government has recently announced that supply of 5 kg cylinders will be increased.



The LPG kit distributed under KFD scheme

Assessing the Impact of Diesel Subsidy Reform since January 2013

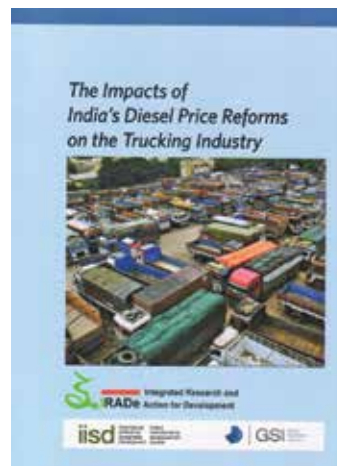
The diesel subsidy was gradually reduced beginning January since 2013. Macroeconomic impact was examined on how diesel price increase has impacted diesel consumption pattern, its consuming sectors, car sales and how diesel price increase has allowed OMCs to recover losses.

The study concludes that reforms helped the OMCs to recover a major part (more than half) of the under-recoveries. The pattern of diesel and petrol car sale had reversed and consumption of diesel has come down. The reduction in fiscal subsidy could soon ease monetary situation.

The Impact of India's Diesel Price Reforms on Trucking Industry

The trucking industry is vulnerable to high diesel costs due to the inherent structural and regulatory issues of the industry. The study team consulted various stakeholders in the business in and around Delhi, Jodhpur and Guwahati to assess how

diesel price reforms have affected them. It found that waiting time at toll gates, road conditions, uncertainty of getting return freight, mileage of trucks and regulatory issues are some of the other reasons that raise trucking costs. IRADe suggested an SMS/web-based clearing mechanism for return journey freight.



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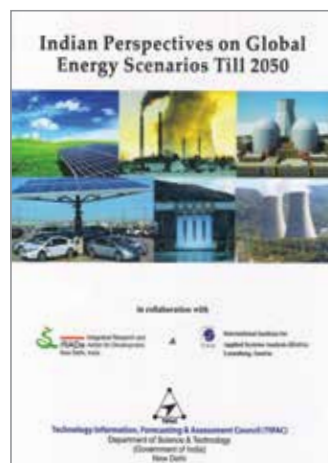
Supported by
International Institute for Sustainable Development

Energy Technology Assessment

Energy Transitions Needed till 2050

Indian Perspectives on Global Energy Scenarios till 2050

TIFAC supported a collaborative project with International Institute for Applied Systems Analysis (IIASA), Austria. The objective was to understand energy transition needed in India that is consistent with global perceptions and to identify research and development required for the transition. IRADe studied IIASA's energy scenarios for global regions from India's perspectives. The



project provided a global energy vision for India till 2050.

In IASA's scenario, carbon capture and storage (CCS) played an important role. IRADe scenario without CCS pushed more nuclear and gas plants along with renewables. IRADe's work with IASA helped identify technologies for the energy transition needed for sustainable development including for combating climate change. It also helped India to present its perspective in the development of global energy scenarios that reflects India's concerns.

Techno-Economic Assessment for Bioenergy in India

India needs to develop all forms of energy resources as it is short of conventional fossil fuel. The study reflects various issues of bioenergy in India.



The paper prioritized investment opportunities for technology development and its market adaptation under appropriate policies. It found that among various bioenergy options in India, biodiesel, bioethanol and biomass gasification are the most relevant, where investments for technology and market development could be made.

Wastelands could be used for growing oilseed plants for producing biodiesel, irrigated land for sugarcane-based ethanol production and small plots in village location can be used for producing fuel wood for gasification: thus land requirements can remain complementary to agriculture.

Supported by
Technology Information, Forecasting and
Assessment Council (TIFAC)



Global Technology Watch Group on Advanced Coal Technologies for Power Generation

The main objective of the project is to establish a Global Technology Watch Group (GTWG) for monitoring and keeping a close watch on the status of coal technologies in India and abroad, to evaluate them for use in India and to facilitate the development of a viable roadmap of Advanced Coal Technologies (ACT) for sustainable power generation.

IRADe in consortium with three IITs (Madras, Bombay and Delhi) will carry out the sustainability analysis of the selected technologies for the country. Sustainability analysis will take into account, environment, socio-economics and technology aspects while suggesting the appropriate options. The present coal technologies are low in efficiency and have high emission of pollutants. Highly efficient, friendly and economically viable ACT need to be developed and deployed at the earliest. The existing non-technological barriers like isolated and fragmented research and development, lack of effective collaborative research and focused team work can be overcome by establishing a national ACT network which will bring together stakeholders from industry, academia, government and society to encourage, facilitate, catalyse and actuate purposeful sharing of knowledge and resources at national and international levels. This will help create a coal database, facilitate the development of a coal roadmap and culminate in the creation of a global ACT network for the benefit of coal power generation in the country.

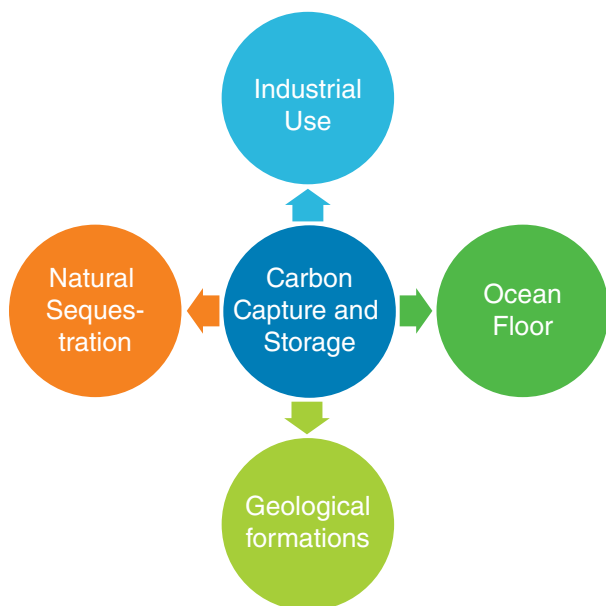
Supported by
Ministry of Science & Technology, Department of Science & Technology, Government of India

Analysis of Carbon Capture and Storage Technology in Power Sector, India

IRADe projected emissions of carbon dioxide from power plants in future, carried out a literature survey to identify developments in carbon capture technology and evaluated economic and technical viability of each aspect. Specification of sequestration sites, identification of the way forward for development, evaluation of monitoring options of CCS and regulatory issues were discussed.

The study provided an opportunity for policy makers to identify critical issues. It also recommended that

the impact of CCS on the cost of power generation should be assessed with various options to define appropriate technology and costs under Indian conditions.



Supported by
Department of Science and Technology,
Government of India

Rural and Renewable Energy

Evaluation of Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY)

Under the project, IRADe was to study in five states – Assam, Gujarat, Himachal Pradesh, Rajasthan and Uttar Pradesh – the progress of village electrification in terms of coverage and quality of coverage (such as infrastructure, electrification of Below Poverty Line (BPL) households, etc.).

IRADe studied 25 districts and 125 villages i.e. five districts in each state and five villages in each district. Implementation issues for RGGVY were discussed with various government agencies, Discoms, district officials, village panchayats and households. We found that good quality rural electricity distribution infrastructure was built and positive socio-economic impact was observed. Also, while BPL consumers benefited, there was a need for wider acceptance by Above Poverty Line (APL) households to receive and pay for electricity for better utilization of the distribution network and its economic viability. In this scheme, 'electrified'

villages as per definition, hamlets and sub-villages were left out. Also the focus was on meeting household needs and electricity for productive purposes received less attention. The next phase of the programme should address these issues.



The project assessed benefit of the programme to families, especially women and children.



Supported by
Rural Electrification Corporation

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

The project gives an overview and assessment of the national and state policies to promote renewable energies, rural electrification and relevant issues in rural development. It also looks at institutions and various stakeholders of the GOI programmes, who need to be guided for investment in this sector. This thematic paper was commissioned by the World Renewable Energy Conference (WREC 2009) in Delhi and was widely distributed to the participants at WREC and beyond.



SPV Panel for rural lighting in village



Supported by
Deutsche Gesellschaft für Internationale
Zusammenarbeit (GIZ)

Monitoring and Evaluation

Monitoring and Evaluation of Off-Grid Solar Photovoltaic Systems Installed in Punjab and Himachal Pradesh in the Years 2008, 2009 and 2010

The Ministry of New and Renewable Energy (MNRE) is implementing a country-wide Solar Photovoltaic programme (SPV) of demonstration and promotion of solar photovoltaic lighting systems, stand-alone power plants and other new and specialized systems in the country. The evaluation was conducted through surveys of beneficiaries and discussions with the officials of MNRE and state nodal agencies (PEDA of Punjab and Himurja of Himachal Pradesh).



It was found that a large percentage of systems installed were working.

Supported by
the Ministry of New and Renewable Energy, Government of
India

Evaluation of Franchise System in Assam, West Bengal, Nagaland and Rajasthan

The Ministry of Power (MoP) had awarded a study to IRADe to assess franchise systems in Assam, Nagaland and West Bengal. Rural Electricity Corporation (REC) awarded further studies to IRADe for evaluating the franchise systems operating in different district distribution circles in Assam, West Bengal, Nagaland and Rajasthan through sample villages in these states. This project covered villages in Bankura and Dibrugarh districts in West Bengal & Assam and the REC project survey included villages in Purulia, Jodhpur and New Bongaingaon districts.

Conclusions were drawn from the studies that franchises require adequate supply of good-quality power maintained by utilities to work effectively. Also capacity building of franchises should be done at the beginning.

Supported by
the Ministry of Power, Government of India

Evaluation of Solar Thermal Demonstration Projects in Four States of India

The MNRE had provided solar cookers and solar water heaters to the residents of villages in four states namely Rajasthan, Haryana, Uttarakhand and Gujarat. Overall, the users of solar thermal products were satisfied. 90 per cent of the users felt that food cooked with solar cookers tasted better and was healthier. They were happy that the solar cooker does not require fuel and needed little maintenance. They were aware that these products had a long operational life, but could only be used during the day, and their effectiveness depended on the season.

Supported by
the Ministry of New and Renewable Energy, Government of
India

Evaluation of Solar Photovoltaic Programme in Six States of India

The MNRE had provided village residents in six states, namely Rajasthan, Haryana, Uttarakhand, Gujarat, Manipur and Karnataka, with solar technologies such as home lighting systems, water pumps, lanterns and street light systems. Evaluation done by IRADe for MNRE through the field visits focused on verification and collection of beneficiary level information regarding

functioning and maintenance of the solar systems and satisfaction level of beneficiaries. Their lifestyles have changed gradually following work done under the scheme. The benefits accrued were increased working hours for useful tasks, increased study hours of children, decline in consumption of kerosene and decline in environmental accidents such as snake and insect bites. Beneficiaries have started using mobile phones, radios, telephones etc.

*Supported by
the Ministry of New and Renewable Energy, Government of India*

Survey and Evaluation of Remote Village Area Electrification Project through Solar Photovoltaic System in Rajasthan and Haryana

The MNRE had provided subsidy for solar home-lighting and street-light systems to residents in the remote villages of India, which could not be covered by the national power grid. In the survey done by IRADe for MNRE, it was observed that a target-oriented approach was followed during its implementation. The implementing agencies did not fully adhere to the guidelines stipulated by MNRE.

Approximately 15 per cent of the systems were found to be non-functional. Improvements in maintenance and service support from equipment suppliers are needed.

*Supported by
the Ministry of New and Renewable Energy,
Government of India*

Village Energy Security Programme in Vavdi and Vaddithar Hamlets in Patan District of Gujarat

Village Energy Security programme in Vavdi and Vaddithar in Patan District of Gujarat is a part of the Village Energy Security Programme under Remote Village Electrification programme of the MNRE. IRADe installed biogas plants, improved stoves, wood gasifier based electricity generator and jatropha plantation for biodiesel in two villages, Vavdi and Vaddithar of Santalpur Taluka of Patan district of Gujarat. IRADe in close cooperation with the Self-Employed Women's Association (SEWA), Gujarat Energy Development Agency (GEDA), the village Panchayat and village population implemented the programme that aimed to provide

access to electricity through biomass resources to households in remote villages which are not likely to be covered through grid extension.

Biodigesters were set up in both the villages to provide lighting to 50 homes. Secretary, MNRE Mr. V. Subramaniam dedicated it to Vavdi village. 100 improved cook stoves were also distributed in each village at subsidized rates. Self-help groups were formed and were given electric flour mills, soap making units, etc., for income generation.

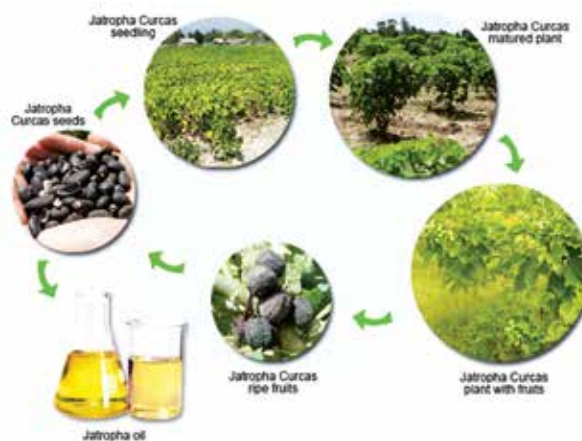


*Supported by
The Ministry of New and Renewable Energy, Government of India*

Biodiesel Analysis and Implementation

Integrated Analysis of Diesel Substitutes from Oilseeds for India

This study reviewed the entire chain of stakeholders in biodiesel production sale and consumption. It suggested a policy framework for land availability for oil seeds plantation, minimum support price for oilseeds, farm subsidies for cultivating plantations for oilseeds, tax exemption for entrepreneurs and sale of biodiesel. Financial incentives may be provided to oil companies as they ensure quality





oil and take various types of risks. An action plan to reduce cost of production, increase financial viability and market linkages was also discussed for biodiesel production and sale. It was followed by a multi-stakeholder conference.



Rural Microenterprise Model for Biofuel Extraction in India

IRADe formulated a microenterprise model for biomass-based energy system at the village level. The objective was to extract oil that provides an alternative source of fuel in rural areas. IRADe set up a biodiesel extrusion unit in Bawal, Rewari district of Haryana.

The villagers were explained how to use the extraction machine and get biodiesel.



Dr. A. R. Kidwai, Hon'ble Governor of Haryana, observing the oil extraction unit at Bawal, Haryana

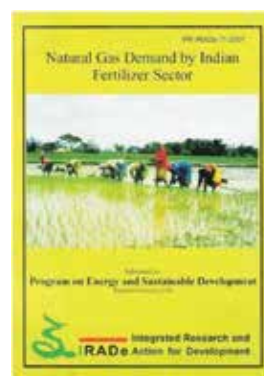


Supported by Sustainable Energy Project Support (SEPS) of WISIONS, Germany

Fuelling India's Growth

Natural Gas Demand by Indian Fertilizer Sector

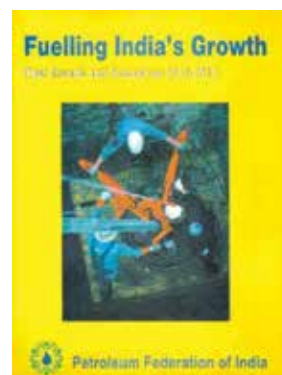
Natural gas is the preferred feedstock for urea manufacture. The demand for natural gas for the next two decades was projected for the fertilizer sector. These projections were made in the context of changing government policies regarding the fertilizer industry, such as farm gate price regulation and self-sufficiency level of indigenous urea production. The current growth plan of natural gas supply and evolving supply scenario in the future were also considered in the study. Depending on the price of urea the need for natural gas was projected to be between 27 BCM and 34 BCM for 2025–26.



Supported by Programme on Energy & Sustainable Development (PESD) of Stanford University, USA

Fuelling India's Growth: Past Trends and Scenarios 2004–05 to 2011–12

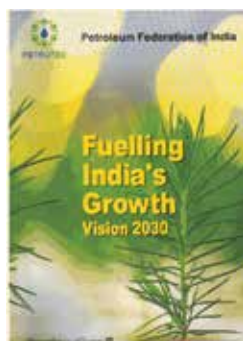
IRADe did a study on 'Fuelling India's Growth: Past Trends and Scenarios 2011–12' focusing on the drivers of oil and gas demand. It analyses the broad trends observed in commercial energy mix, growth rates of each of the refined petroleum fuels, crude oil and natural gas during 1998–99 to



2003–04. The analysis was enriched and validated through direct interaction with the member companies of PetroFed.

Fuelling India's Growth: Vision 2030

The drivers of demand for each of the fuels were identified through econometric models using data till 2011–12. Econometric models establish relationships of demand for commodities with other variables. Using these relationships, the demand scenarios for the milestone years 2016–17, 2020 and 2030, with special focus on hydrocarbons, were developed. Based on these projections, the broad commercial energy mix has been indicated for 2020 and 2030.



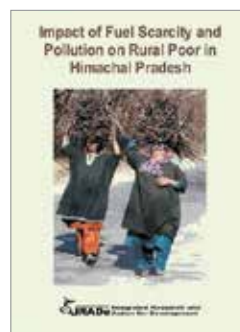
Supported by
Pricewaterhouse Coopers Pvt. Ltd. (PwC)



Impact of Fuel Scarcity and Pollution on Rural Poor, 2004 Himachal Pradesh

The research project assessed the impact of scarcity of clean and traditional fuels on health and time spent in gathering traditional fuels. We studied pollution in economic terms by observing how traditional biofuels are used by vulnerable groups comprising the rural poor in Himachal Pradesh. Observations were also made on socio-economic circumstances, access to fuel and need and willingness to pay for cleaner fuels.

The key findings showed that about 21 per cent of rural adults might be having some symptoms of respiratory diseases.



Supported by
Global Development Network (GDN)
through SANEI, New Delhi



IRADe Modeling Activities

The IRADe 'activity' model was first developed under the project "Developing a CGE model with Activity Analysis for climate policies in India up to 2030" funded by the Ministry of Environment and Forests, Government of India during 2006-2009. The model since then has evolved and has answered many concerns through various versions (see table below) such as implications for GHGs emissions, need for energy transitions, food security, strategies low carbon pathways for the country among others. It has endogenous income distribution and demand determination with specific technological alternatives, it is basically period and multi-sector models that cover the whole economy in an activity analysis framework. This permits alternative technologies in different sectors to provide a comprehensive profile of GHG emissions and possible policies to reduce them and calculates emission intensity in keeping with the voluntary pledges of India. Thus in principle different versions of the model can be used to construct scenarios to achieve desired emission targets and sectoral productivity as well as social indicator targets.

S. No.	IRADe Model Reference	Funded by	Theme addressed	Year
1	IRADe-AA30	Ministry of Environment and Forest	India's GHG Emissions Profile: Results of Five Climate Modeling Studies	2006-09
2	IRADe-ET50	Technology Information, Forecasting and Assessment Council, Department of Science and Technology	India's Energy Transition till 2050 in the Global Context	2010-13
3	IRADe-AG40	Centennial Group, USA	Study on Indian Agriculture, 2040	2009-11
4	IRADe-EQ30	South South North Trust, South Asia	Impact of Mitigation and Poverty Alleviation	2012
5	IRADe-LCSD	World Wildlife Fund	Low Carbon Pathway for Sustainable Development	2012-14
6	IRADe-LCSIG	Planning Commission, India	Study on Economy-wide Model for Low Carbon Strategy for inclusive Growth	2013-14
7	IRADe-NEG50	MoEF&CC, New Delhi	Modelling Studies on Greenhouse Gas Emissions and Emission Intensity of Indian Economy	2014-15
8	IRADe-SARI35	USAID	South Asian Regional Initiative for Energy Integration	2012-17

→ Climate Change and Cities

- Climate Vulnerability Profiles of 20 Indian Cities
- Policy Brief on Emerging Mechanisms and Responses of Cities to Climate – ACCCRN
- Working Paper on HIGS Framework for Climate-Resilient Urban Development
- Mainstreaming Climate Resilience in Urban Development: Policy Landscape for Urban Climate Resilience

→ Disaster Resilience

- Sustainable and Disaster-Resilient Cities: Case Studies and Capacity Building of 10 JnNURM Cities
- The Time is Now: Sustainable and Climate-Resilient Urban Development (2010)
- Vulnerability of Coastal Cities on Rivers to Climate Change: Case Study of Surat
- Policy Level Engagement for Developing Climate Resilient Smart Cities
- City Disaster Management Plans of Six Cities – Bhubaneswar, Gangtok, Shimla, Vijayawada, Madurai and Thiruvanthapuram

→ Solar Cities

- Preparation of Master Plan with Detailed Action Plan for Jodhpur under Solar Cities Development Programme

→ Urban Waste Management

- Landfill Waste Management in Okhla, New Delhi

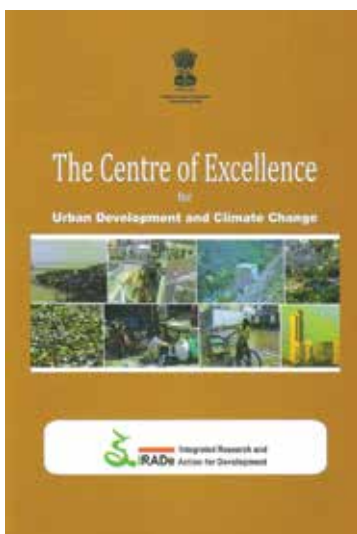


Introduction

In 2008, IRADe was designated as Centre of Excellence (CoE) in the area of urban development and climate change by Ministry of Urban Development, (MoUD) GOI. IRADe collaborates with national institutions, state urban departments, municipal corporations, urban local bodies, NGOs and academia for capacity building, promoting awareness, research and training on specific topics in the areas of urban development and climate change in more than 29 cities across 19 states.

As the CoE, IRADe is furthering the agenda of integrating various urban development efforts and documenting best practices and policy level prescriptions that could be understood and adopted by the state and national level decision makers and local administrations to help them link climate issues with the existing programmes in urban development. Presentations were made on project objectives, results, methodology and future strategy for climate resilience of India's cities to various forums such as organized by IPCC-SREX, European Union, UNESCAP and others.

We are grateful to MoUD, Ministry of Earth Sciences (MoES), US Environmental Protection Agency (USEPA), Asian Cities Climate Change Resilience Network (ACCCRN), Department of International Development (DFID) and United Nations Development Programme (UNDP) for supporting various initiatives under this thematic area.



Centre of Excellence Projects – 29 Cities and 19 States



Geographical Coverage

Project Cities

- | | |
|--------------|------------------------|
| 1. Srinagar | 16. Kolkata |
| 2. Shimla | 17. Bhubaneswar |
| 3. Haridwar | 18. Puri |
| 4. Dehradun | 19. Pune |
| 5. Delhi | 20. Mumbai |
| 6. Allahabad | 21. Hyderabad |
| 7. Gorakhpur | 22. Visakhapatnam |
| 8. Jodhpur | 23. Vijaywada |
| 9. Ahmedabad | 24. Chennai |
| 10. Surat | 25. Madurai |
| 11. Indore | 26. Bengaluru |
| 12. Bhopal | 27. Kochi |
| 13. Gangtok | 28. Thiruvananthapuram |
| 14. Shillong | 29. Puducherry |
| 15. Guwahati | |

Project States

- | | |
|---------------------|--------------------|
| 1. Jammu & Kashmir | 11. Meghalaya |
| 2. Himachal Pradesh | 12. Assam |
| 3. Uttarakhand | 13. Odisha |
| 4. Delhi | 14. Maharashtra |
| 5. Uttar Pradesh | 15. Telangana |
| 6. Rajasthan | 16. Andhra Pradesh |
| 7. Gujarat | 17. Karnataka |
| 8. Madhya Pradesh | 18. Tamil Nadu |
| 9. West Bengal | 19. Kerala |
| 10. Sikkim | |

Centre of Excellence Projects in Urban Development and Climate Change

The work involved three components:

1. Rapid assessment of vulnerabilities to climate change of Indian cities. It was done for 14 key cities in India based on indicators of vulnerability to climate change. IRADe's approach and methodological framework include developing an index to assess the vulnerability to climate change, generating baseline data pertaining to urban development in terms of socio-economic and infrastructure characteristics. This can help in formulating efficient urban policies and programmes.

2. Augmenting city development plans for Surat and Haridwar to address climate change impact:

The study analyses the potential threats of climate change and adaptation options in urban planning. Based on this analysis, some policy actions for resilience and climate change adaptation were suggested that could be implemented by the local urban/municipal bodies. Two city level analyses were carried out.

IRADe's study recommended engagement of various decision makers like householders, government, ULBs and major corporations in identifying options and creating awareness.

Supported by
Ministry of Urban Development,
Government of India



Climate Change and Cities

Climate Vulnerability Profiles of 20 Indian Cities

The study developed climate vulnerability profiles for 20 cities (Ahmedabad, Allahabad, Bengaluru, Bhubaneswar, Chennai, Dehradun, Delhi, Haridwar, Hyderabad, Indore, Jodhpur, Kochi, Kolkata, Mumbai, Puri, Shillong, Srinagar, Surat, Thiruvananthapuram and Visakhapatnam), which were getting funds under the Jawaharlal Nehru National Urban Renewal Mission. It assessed climate-induced risks from various hazards such as cyclones, storms, floods and droughts. It also highlighted the infrastructure needed for resilience and the importance of governance and institutional framework at city level. It helped to better understand city-level vulnerability by exploring

various aspects that influence the vulnerability of the cities and the nature of action needed to reduce it.

IRADe conducted primary surveys, secondary surveys, assessment studies and provided analytical support.

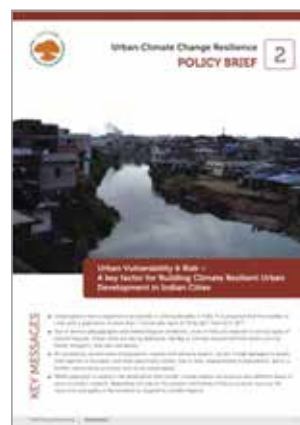


Supported by
Rockefeller Foundation under ACCCRN Project

Policy Brief on Emerging Mechanisms and Responses of Cities to Climate – ACCCRN

IRADe prepared a policy brief to explore various aspects influencing the vulnerability of the cities. It highlights IRADe's approach that similar climate events can produce very different levels of socio-economic impact, depending not only on the location and timing of the occurrence, but also on the resources and agility of the societies to respond to climate impact.

The working paper was presented at the National Conference on Emerging Mechanisms and Responses of Cities to Climate Change held in New Delhi on 10 December 2013.

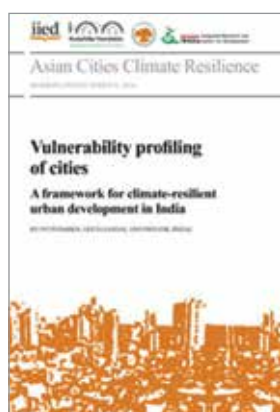


Supported by
TARU Leading Edge Pvt. Ltd.



Working Paper on HIGS Framework for Climate-Resilient Urban Development

In order to put the methodology in the public domain IRADe prepared a working paper describing it to address hazards (H) through infrastructure-governance-socio-economic (HIGS) framework for Rapid Vulnerability Analysis (RVA) of cities. The working paper helps policy makers, urban planners, city administrators, experts, academicians, students and aid agencies to appreciate issues regarding urban climate vulnerability and helps them deal with climate-related impact and formulate adaptation strategies.



Supported by
International Institute for
Environment and Development (IIED), UK



Mainstreaming Climate Resilience in Urban Development: Policy Landscape for Urban Climate Resilience

IRADe reviewed the approach and work related to ACCCRN, supported by the Rockefeller Foundation, from policy perspective and supported assessment of vulnerabilities due to disasters such as floods and droughts and developed climate resilience strategies for three cities, namely Gorakhpur, Surat and Indore.



IRADe identified the opportunities to orient urban development programmes in order to promote city-level climate resilience.

The lessons from these are brought to national level and the city governments are also apprised of the relevant opportunities offered by the central government. IRADe suggested that an integrated policy framework and co-ordinated decision making are needed at the national, state and city levels.

Disaster Resilience

Sustainable and Disaster-Resilient Cities: Case Studies and Capacity Building of 10 JnNURM Cities

The objective of the study was to assess the state of disaster resilience of 10 selected cities, namely Dehradun, Srinagar (North India), Shillong, Guwahati, Bhubaneswar (East India), Pune, Ahmedabad, Bhopal (West India) and Vishakhapatnam, Hyderabad (South India). Four regional workshops were also organized to get feedback from the city officials and stakeholders covering the different regions with active participation of the Urban Local Bodies (ULBs), parastatal bodies, researchers and urban planners of the respective cities.

The study revealed that the ULBs face a big challenge to keep pace with the need to increase infrastructure and service provision for citizens





and simultaneously ensure inclusive growth for the urban poor. Through this study, IRADe has recommended an integrated approach for sustainable and disaster-resilient development in these cities. This will help the local governments as generally they have limited resources available to address development issues ranging from health, education, infrastructure and services, and often disaster risks do not emerge as clear priorities.



Ministry of Urban Development
Government of India

*Supported by
Ministry of Urban Development, Government of India*

The Time is Now: Sustainable and Climate-Resilient Urban Development (2010)

This report relates the direct impacts of climate change such as extreme temperatures and floods as well as the indirect impacts of climate change

such as changes in global grain markets that lead to spikes in food prices. With a rapidly growing urban population, the future challenges for urban administrations will be huge.



*Supported by
Department for International Development and
The Rockefeller Foundation. Co-organized with the
Institute for Social and Environmental Transition*

Vulnerability of Coastal Cities on Rivers to Climate Change: Case Study of Surat

The main objective was to develop an integrated analytical framework for floods and disaster management strategy for urban areas in the background of a specific case study of the city of Surat. This is to assess the vulnerability of the city and its people to floods and to develop a procedure to incorporate climate change concern in the existing framework with a decision support system. It suggested adaptation actions that can make a city resilient to climate change induced vulnerability.

The objective of this study is to also assess the hydrological vulnerability of the people and the public infrastructure of Surat. The elements of infrastructure under consideration include buildings (schools, hospitals, slums, and industries) within and adjacent to the floodplains, roads, bridges, etc. An original systems approach is used in the study to gather and examine available data in order to develop an understanding of the relevant climatic effects and their interactions with infrastructure. For this, a hydrological model of the river is developed to assess the extent of inundation and water depths under various scenarios, which may arise due to climate change. An integrated hydraulic modelling system and spatial analysis software have been used in the study.

With information on the likely depth of flooding in different parts of the city, citizens and local

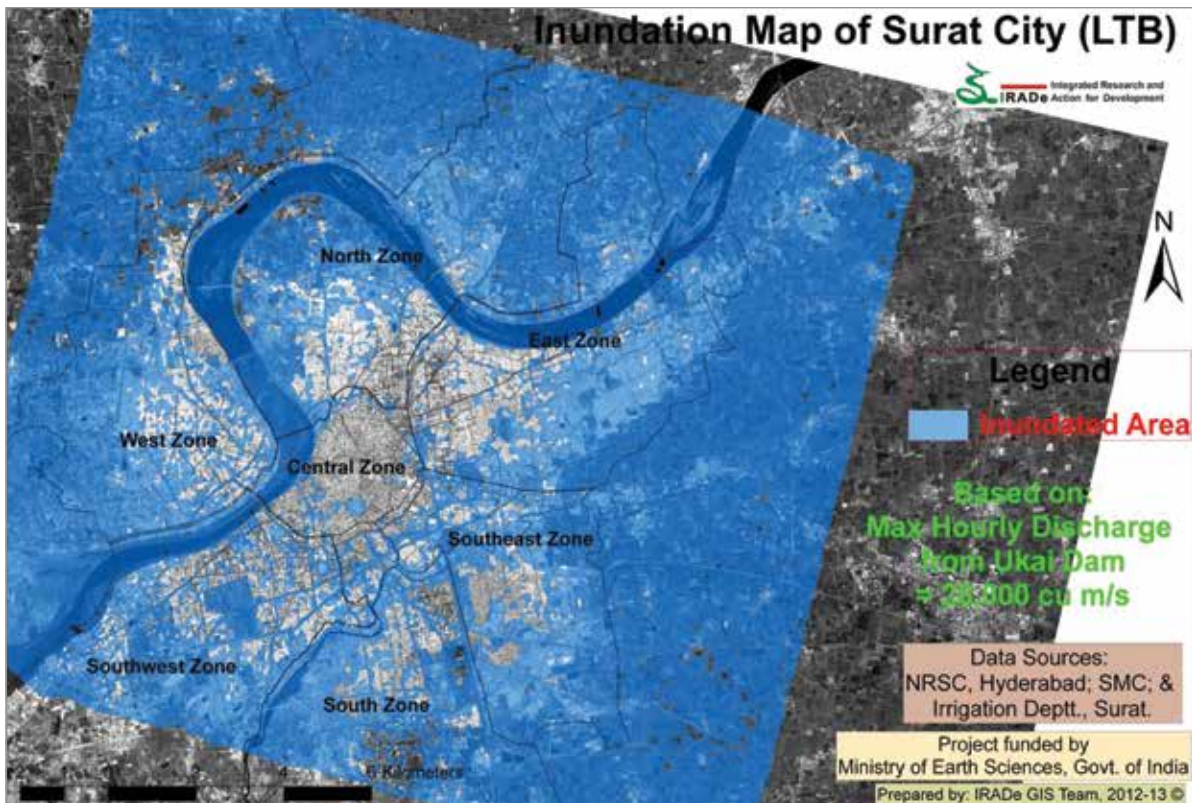


Figure: 28,000 cu m/s water discharge from Ukai dam (Year 2006 level)

administrators can take effective measures such as avoiding certain areas, building on stilts, providing shelters etc.

City Disaster Management Plans of Six Cities – Bhubaneswar, Gangtok, Shimla, Vijayawada, Madurai and Thiruvanthapuram

United Nations Development Programme (UNDP) selected IRADe to review the City Disaster Management Plans (CDMP) of six cities with a view to assess the clarity, comprehensiveness, efficiency, appropriateness and dissemination of disaster management measures as part of city disaster management plan.

This also includes the integration of climate risk management measures in the CDMP planning process and plan document. IRADe has made specific recommendations and presented



Supported by
Ministry of Earth Sciences, Government of India

Policy Level Engagement for Developing Climate Resilient Smart Cities

IRADe, supported by the Rockefeller Foundation, has strived to position urban challenges in the larger policy framework provided by state and national institutions. IRADe engages decision makers for informing them on urban climate change resilience and integrating the concepts into wider planning discourses.

IRADe proposed inclusion of climate resilience in smart city plans through engagement at various levels in Ministry of Urban Development, state and city level urban bodies for climate resilient smart city framework. IRADe is engaged with two cities viz. Ahmedabad and Guwahati for integrating climate resilience in the smart city plans.

Supported by
Rockefeller Foundation under ACCCRN Project

strategies to each city administration on addressing the gaps established during the review process to update the existing CDMPs. These six cities have made progress in disaster risk management while making efforts to prepare city disaster management plan.



*Supported by
United Nations Development Program*

| Solar Cities

Preparation of Master Plan with Detailed Action Plan for Jodhpur under Solar Cities Development Programme

The significance of this assignment was to 'prepare a master plan' with detailed action plan for various activities for the years 2009–10, 2010–11 and 2011–12 during the 11th plan period for development of Jodhpur as solar city as per the specifications, guidelines and terms and conditions of MNRE.

The objective of the master plan was to set a goal of minimum 10 per cent reduction in projected total demand of conventional energy at the end of five years to be achieved through energy saving from energy efficiency measures and generation from renewable energy installations.

The proposed master plan was accepted by Jodhpur Municipal Corporation.



*Supported by
Jodhpur Municipal Corporation and
Ministry of New & Renewable Energy*

| Urban Waste Management

Landfill Waste Management in Okhla, New Delhi

IRADe studied the gases emitted from the landfill site of Okhla, New Delhi and analysed whether the gases can be captured commercially as the landfill site emits methane. The assessment was done based on the information provided by the officials at Central Pollution Control Board, Delhi Pollution Control Committee, Municipal Corporation of Delhi and Okhla landfill site and observations made during site visits. Feasibility of the land fill gas (LFG) supply as domestic fuel to the surrounding areas by using the existing network of the Okhla Sewage Treatment Plant was assessed. It was not found suitable in current conditions.

*Supported by
United States Environmental Protection Agency,
Washington DC*





IRADe and COP 21, Paris 2015

Intended Nationally Determined Contributions

IRADe was one of the two institutes who did the modeling work for India's Intended Nationally Determined Contributions (INDC) for the COP 21, Paris at the request of the Ministry of Environment, Forest & Climate Change (MoEFCC). IRADe developed a special version of the model for climate change negotiations **IRADe-CC-Neg**. (See modeling activities at IRADe). By projecting Indian economy with **38 sectors till 2050 with 4 fossil fuel sectors and 10 power generation options**. It examined implications of INDC's through various scenarios. IRADe showed that it is **possible to promise 40% electricity generation capacity from non-fossil sources**, i.e. solar, wind, nuclear and hydro power. It showed the economic impacts of alternative INDC targets mandated and on poverty-keeping in view India's energy resources, economic growth and ensuring inclusive development. It also showed that **India can reduce 35% carbon intensity**. IRADe continues to explore this further. The model provided scenarios for total, sectoral, cumulated (cumulative) and per capita emissions and CO₂ intensities for all years till 2050 under normal and ambitious actions.

COP 21, Paris Dialogues

As events leading up to Paris, IRADe and The French Embassy held two dialogues to address significant issues in the context of COP 21. A seminar was organised on **Long-term Sustained Climate Finance for structured mitigation and adaptation** on June 29th, 2015. The recommendations largely focused on the importance of mitigation technologies and adaptation which were raised during the Paris negotiations.

The **Cities Resilience to Climate Change** dialogue held on October 30th, 2015 where IRADe presented extensive work it has carried out on climate resilience in 20 cities. We also engaged with prominent experts including Ms. Thara, Municipal Commissioner of Ahmedabad and Dr. Sudhir Krishna, Former Secretary, MoUD to share and direct discussions in the context of India's expectation aligned to the Paris text. These discussions were largely attributed to sustainable planning for climate resilient infrastructure.

National Energy Policy

Niti Aayog requested IRADe to contribute recommendations towards **India's National Energy Policy** in the context of **Climate Change and Environment**. A stakeholder consultation was held on November 6, 2015 which served as a platform to gather and discuss their policy positions on various sectors including that of Energy and Climate Change, Transport and Air-Pollution and CAMPA. Following India's INDC submission to the UNFCCC for the Paris Climate Agreement 2015, this platform served as a **discussion forum to plan further actions to achieve India's established INDC targets for 2030**. The findings of the workshop are disseminated across decision making bodies leading to wide-ranging energy policy implications.

→ Climate Mitigation

- Greenhouse Gas Reduction Potential, Sectoral Base Lines and Opportunities for Clean Development Mechanism
- Mapping of Carbon Capture and Storage Activities in India to Promote Research and Development Initiatives
- Low Carbon Technologies Implementation and Policy Issues

→ Climate Adaptation

- Climate Change and Himalayan Ecosystem – Uttarakhand
- Methodology Development for Climate Change Adaptation
- Socio-economic Vulnerability of Himachal Pradesh to Climate Change

→ Climate Negotiations

- Developing Economy-wide Model for Low Carbon Strategies for Inclusive Growth (LCSIG)
- Climate Negotiations from Indian Perspective
- Critical Evaluation of the 12th Five Year Plan from a Climatic Perspective
- First Biennial Update Report to UNFCCC: Updation of Information on Mitigation Actions for National Circumstances

→ Environment: Natural Resource Accounting (NRA)

- Natural Resource Accounting in Goa, Phase II, under SEEA Framework
- Measuring Ecosystem Services for Green India Mission: A Case Study of Paderu Project in Andhra Pradesh
- Ecosystem Management of Marine National Park, Jamnagar, Gujarat
- Review of Status of Jamnagar Marine National Park and Evolving Vision Statement for Its Management
- Pre-feasibility Study of Integrated Waste Management and Landfill Gas Recovery and Utilization at Puducherry
- ENVISION – Information System Reforms at the Ministry of Environment and Forests, 2006–07
- Supporting National Study on the Economics of Ecosystems and Biodiversity (TEEB – India Initiative)

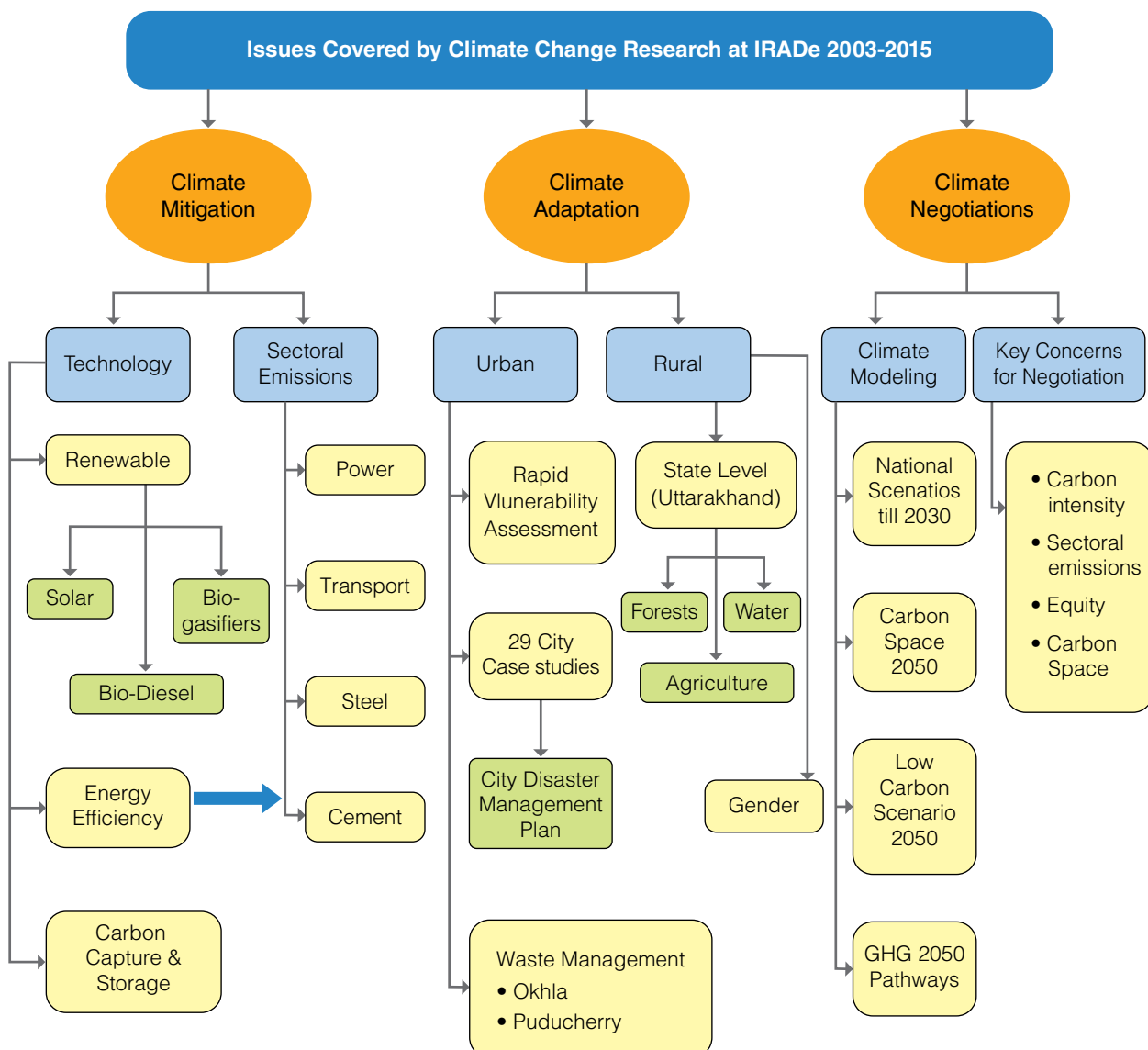
Introduction

Local and global environmental issues, especially climate change, loom large with increasing risks. As the way forward, IRADe has adopted a multi-disciplinary approach and carries out national projects for both climate mitigation and adaptation in the country.

In climate change, IRADe intensively covers climate mitigation, adaptation and negotiations. Further, IRADe provides inputs using the activity analysis model in the area of low carbon pathways

until 2030 and 2050 for Climate Policies in India. As a member of NATCOM institutions and Indian Network on Climate Change Assessment (INCCA), IRADe assists in country reports and provides inputs on negotiating positions, arguments and policy suggestions to ensure equity principles.

IRADe's environment project portfolios include environmental accounting and valuation for Goa and Andhra Pradesh with a focus on tourism, waste management and water pollution. Biodiversity and Ecosystem management for Marine national Parks are also addressed.



| Climate Mitigation

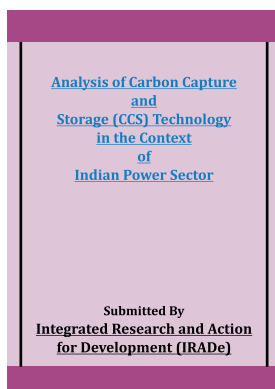
Greenhouse Gas Reduction Potential, Sectoral Base Lines and Opportunities for Clean Development Mechanism

IRADe examined the methodology of 'Baselines for Renewable Energy Projects under Clean Development Mechanism (CDM)' in the power sector for India. The study found that India's power sector has considerable scope for improvement in transmission and distribution (T&D) losses. The suggested short-term and long-term measures to reduce these include installation of appropriate conductors, capacitors, reconfiguration of the network, upgradation to high-voltage transmission, etc. The project also analysed opportunities in the cement sector, co-generation schemes, wind power and hotel industry and other sectors for defining baselines. It studied the approaches to greenhouse gas (GHG) reduction and policies towards CDM followed by these industries.

*Supported by
Ministry of Environment, Forests and Climate Change,
Government of India*

Mapping of Carbon Capture and Storage Activities in India to Promote Research and Development Initiatives

IRADe conducted a review of technological status of CCS globally and surveyed perceptions of the scientific and technical manpower employed in India. The various elements of costs of CCS, carbon capture, transport of carbon dioxide and storage were examined. It was felt that till the economics of CCS is demonstrated by plants in industrialized countries, India should not adopt CCS. However, there may be scope for designing plants to be CCS ready and to pursue research and development in CCS. Perhaps an international research and development centre may be established in India.



The outcome of the project is that India has to continue with basic research on CCS with a larger range of technology options and progress to applied research in selected fields. Indian entrepreneurs should be able to gain business opportunities at a later date when commercialization of CCS technology becomes viable.



*Supported by
British High Commission and Government of UK*

Low Carbon Technologies Implementation and Policy Issues

This study analyses low carbon technologies (LCT) in power, steel, cement and transportation sectors. The analysis for cement and steel sectors identified a range of potential mitigation options. A comprehensive roadmap for implementing each policy option was provided including identification of the key factors involved, the key barriers to policy implementation and associated major benefits. International policies that supplement the suggested domestic policy options had also been described, along with implications for the structure of international climate policies. This was done jointly by ICF International, India and IRADe.



*Supported by
Centre for Clean Air Policy (CCAP), USA*

| Climate Adaptation

Climate Change and Himalayan Ecosystem – Uttarakhand

IRADe examined how agriculture, water and forests will be affected by climate change, which could lead to loss of livelihoods of the poor in the Himalayan ecosystem of Uttarakhand. A variety of data and methodologies are used in the study, which include vulnerability assessment by observing indicators, sustainable livelihood approaches, IPCC projections of climate (4th Assessment Report); Participatory Rapid Appraisal (PRA) Approach and public consultation with multi-stakeholders.



Changes in water regime due to climate change will increase floods and droughts, reduce water availability in hilly regions requiring women to walk more for water, lead to change in cropping patterns, lower agricultural productivity and increased deforestation and soil erosion. The impact can be reduced by water harvesting, groundwater recharge, conservation, reintroduction of native crops, grasses and trees and protection of forests through joint forest management.



Supported by
Ministry of Environment and Forests, Government of India

Methodology Development for Climate Change Adaptation

IRADe has developed a methodology for climate vulnerability assessment and adaptation on various components of city infrastructure. It involves city infrastructure assessment and adaptation strategy that includes sustainable management of water, adequate storm water drainage capacity, effective solid waste disposal and public health measures. Climate resilience requires sound urban design.

Supported by
the Ministry of Urban Development,
Government of India

Socio-economic Vulnerability of Himachal Pradesh to Climate Change

The state of Himachal Pradesh is vulnerable to climate change due to its geo-ecological location. The study develops methods to determine impact of climate variability. It assesses the impact of climate change and variability on agriculture and forests. Vulnerability assessment was done of agriculture and forest resources at different time scales, taking into account economic activities in



future. It shows socio-economic vulnerability of livelihood because of impact of climate change on natural resources, like shift of apple belt, increased forest fires, changes in non-timber forest products, rice-growing areas, etc.



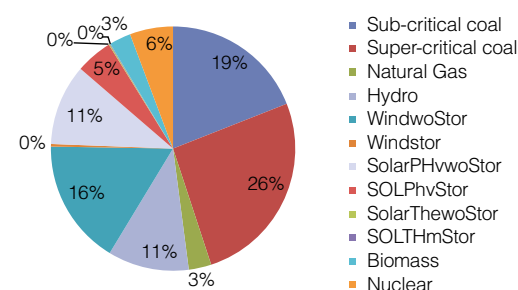
Supported by
Ministry of Science and Technology, Government of India

Climate Negotiations

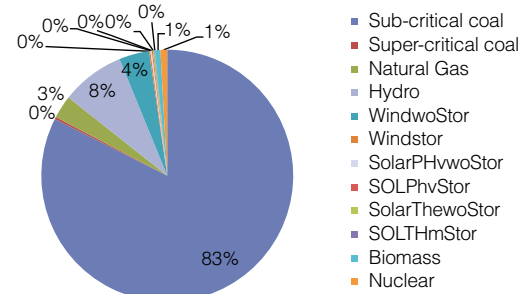
Developing Economy-wide Model for Low Carbon Strategies for Inclusive Growth (LCSIG)

The Expert Group on Low Carbon Strategies for Inclusive Growth (LCSIG) appointed by the Planning Commission had submitted its interim

Power Generation Capacity in GW in 2030 in LCIG



Power Generation Capacity in GW in 2030 in BIG



report in 2011. It provided low carbon technology alternatives for key energy-intensive sectors in India. But the assessment of these technologies at macro-economic level was not done. IRADe developed IRADe-LCSIG model to assess the impacts on growth rate, carbon emissions and energy and emission intensities of various low carbon measures.

The results were reflected in the final report of the Expert Group. It was found that India can reduce emission intensity by 25 per cent by 2022, but it would involve some loss of GDP.



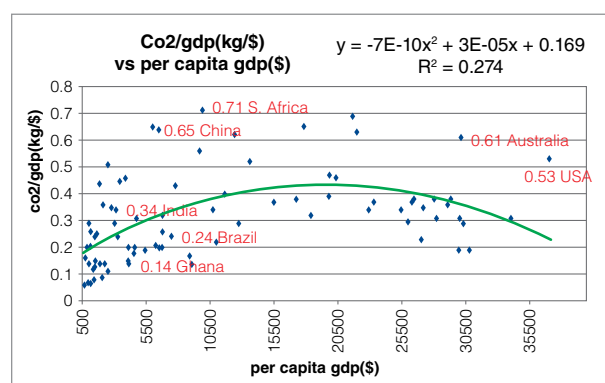
Supported by
Planning Commission, Government of India

Climate Negotiations from Indian Perspective

An international agreement will have to decide on principles of deciding which country should do what. The UNFCCC division of countries as annex I countries and non-annex I countries is no longer viable as many non-annex I countries have developed and have high levels of GHG emissions.

International comparisons of emissions, mitigation efforts, energy efficiency and emission quotas were done to outline a number of alternative paradigms. Four approaches were proposed in this report:

1. A three-tier approach, differentiating higher and lower emitters among the non-Annexure I parties
2. Sectoral approach where emission targets are set for sectors
3. Carbon dioxide intensity (of GDP) approach to differentiate countries as shown in the figure.
4. Focus on adaptation.



Data Source: EIA (2002)

Fig shows the relationship between carbon intensity and per capita GDP. It first increases with per capita GDP and then decreases.

Supported by
the Ministry of External Affairs,
Government of India

Critical Evaluation of the 12th Five Year Plan from a Climatic Perspective

IRADe carried out critical evaluation of the Twelfth Five Year Plan (GOI 2012) which focuses on faster, more inclusive and sustainable growth from a climatic perspective. The plan states that 'No development process can afford to neglect the environmental consequences of economic activity, or allow unsustainable depletion and deterioration of natural resources'.

Climate change has been explicitly addressed in India's 12th Five Year Plan. The plan document incorporates a chapter on sustainable development which outlines the required policy measures for LCSIG and focuses on a number of mitigation measures.

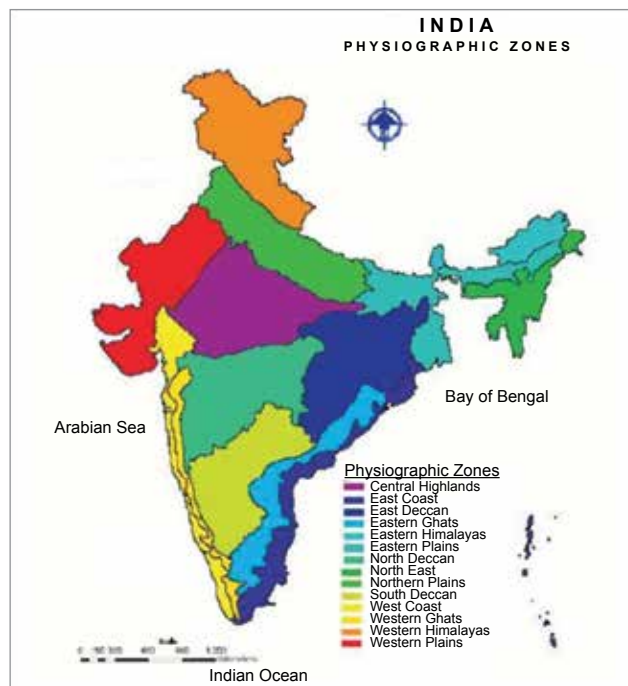
Specific measures are proposed for transport sector, energy efficiency in industries and commercial buildings, and water use efficiency in agriculture. A green technology firm is also proposed to promote green products, waste management and recycling.

Supported by
ICRIER 'The New Climate Economy Project'.

First Biennial Update Report to UNFCCC: Updation of Information on Mitigation Actions for National Circumstances

The study provides an update on national circumstances explained in the second national communication in the Biennial Update Report (BUR).

The broad scope of the study was to compile information on national circumstances, including climate, natural resources, agriculture and livestock, natural disaster, demographic profile, households, governance profile, economic profile, energy profile, power sector, transport, reforms and greenhouse gas emissions, low carbon strategy and India's commitment to climate change and sustainable development.



The report pointed out that India enacted the Energy Conservation Act, 2010 for efficient use of energy and its conservation. To improve energy efficiency of the coal-based power plants and reduce the GHG emissions, it was decided that new thermal power plants should be based on super critical technology. India has also levied cesses on coal, petrol and diesel to fund green technology.

*Supported by
Inspire Network for Environment, NATCOM*

framework. Physical and monetary accounts for these sectors were prepared.

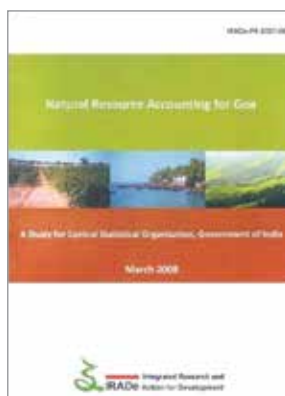
When the value of environmental degradation due to tourism and municipal waste is taken into account Goa's net state domestic product (SNDP) goes down by 6 per cent but due to afforestation the gain is also 6 per cent and so overall Goa's SNDP remains nearly unaffected.

*Supported by
Central Statistical Organization, Government of India*

Environment: Natural Resource Accounting (NRA)

Natural Resource Accounting in Goa, Phase II, under SEEA Framework

IRADe did the Natural Resource Accounting for three sectors: (1) Tourism; (2) Solid waste generation from municipal waste; and (3) Water pollution by industries, using the United Nation's System of Economic and Environmental Accounting (SEEA)



Measuring Ecosystem Services for Green India Mission: A Case Study of Paderu Project in Andhra Pradesh

Green India Mission (GIM) is one of the eight missions of the climate action plan. IRADe conducted primary field survey with the forest department of Paderu Division in Visakhapatnam District to highlight the dependence of local communities on ecosystem services and how they currently benefit from them.

Non-timber forest products (NTFPs) are critically important to local forest users as a primary, supplementary or emergency source of income and were found to contribute an estimated average of 19 per cent of a household's cash annual income.

While Tendu leaves generated income for many more people, honey gave higher total income to only a select few. Furthermore, 27 per cent households of the study area were found to receive at least some income from the collection,

processing and selling of NTFPs, majority of whom were poor to extremely poor.



Supported by
Deutsche Gesellschaft für Internationale
Zusammenarbeit (GIZ)

Ecosystem Management of Marine National Park, Jamnagar, Gujarat

Rapid industrial development in Jamnagar had its impact on the marine national park. The project studied the overall potential threats, formulated a conservation and management plan consistent with stakeholders' plans and suggested an implementation plan through a blend of economic instruments and control measures in order to protect the marine life, unique corals and mangrove ecosystem. Assessments were carried out for various potential impacts from different sources in the park areas on marine ecosystem and critical pollution sources such as industries, ports and shipping activities on the marine national park. Simultaneously, the prospect of developing an ecotourism corridor in the marine national park and the nearby Khijadia Bird Sanctuary was investigated.

The project brought together the stakeholders ranging from government officials, representatives of industries, officers of the municipality, NGOs, academics and the private sector.



Supported by
Ministry of Environment and Forests,
Government of India

Review of Status of Jamnagar Marine National Park and Evolving Vision Statement for Its Management

IRADe is conducting a study for GIZ and the MoEF to review the status of the marine national park in Jamnagar district of Gujarat since its creation in 1982. The project will undertake macro-assessment of the ecological status of the marine national park and the impact on its stakeholders. Preparation of a vision statement for sustainable and workable management for healthy coexistence

of the marine national park and economic hotspots is proposed as well.

Pre-feasibility Study of Integrated Waste Management and Landfill Gas Recovery and Utilization at Puducherry

An assessment of the potential for LFG utilization was carried out for a Puducherry landfill.

The study was based on information provided by the Puducherry Pollution Control Committee and Puducherry Municipality and observations made during the site visit. The model results indicated that various constraints are likely to limit future LFG recovery to a maximum of 22.8 cubic meters per hour.



Supported by
United States Environmental Protection Agency (USEPA)

ENVISION – Information System Reforms at the Ministry of Environment and Forests, 2006–07

The key objective of 'ENVISION' was to use information technology to transform the functioning of the MoEF and the various constituent organizations under its purview with a business process perspective and also to transform the means of rendering services to its various stakeholders. IRADe was hired as the domain expert in the team of Price waterhouse Coopers (PwC). IRADe suggested steps for faster delivery, which the MoEF has already implemented.



Supported by
Price waterhouse Coopers (PwC);
Ministry of Environment & Forests

Supporting National Study on the Economics of Ecosystems and Biodiversity (TEEB – India Initiative)

'Economic value of ecosystem services and biodiversity are used to enhance effectiveness of conservation and management of three priority ecosystems, namely forests, inland wetlands and coastal and marine ecosystems.

GIZ in partnership with the Ministry of Environment and Forests (MoEF) is implementing a technical cooperation project 'Incentives for sustainable management of biodiversity and ecosystem services'. Under this initiative, about 12 field-based primary case studies on valuation of ecosystem

services in forests, inland wetlands and coastal and marine ecosystems had been undertaken.

To support a national study on The Economics of Ecosystem and Biodiversity (TEEB-India), IRADe is doing extensive literature survey to assess the existing knowledge and studies on valuation of biodiversity and ecosystem services.

IRADe is also providing support to the Scientific and Technical Advisory Group (STAG) for preparing an overall structure/wireframe of TEEB-India report in addition to providing support to review and short-list case study concept notes to present to the project's scientific and technical advisory group (STAG).

→ Energy, Poverty and Gender Nexus

- The Impact of Clean Fuel Access Policy on Women's Empowerment in Himachal Pradesh
- Gender Audit of National Energy Policies of India
- Mainstreaming Gender in Energy Policy 2006 for Planning Commission
- Reducing Drudgery of Women Carrying Biofuels, 2007–08: E-discussion and Field Surveys
- The Third ENERGIA National Focal Points Meeting
- National Stakeholder Consultation on Gender Issues, Millennium Development Goals and Poverty Alleviation

→ Gender – Climate Change

- Gender and Climate Change – Event Organised at COP-Delhi
- MAPS India Study on Poverty and Low Carbon Development Strategies
- Assessing Socio-economic Vulnerability to Climate Change: A Case Study of Assam



Introduction

In order to address poverty issues in all the other 4 thematic areas, to enhance capabilities of women and to ensure increased participation of women in decision making, IRADe focuses on the poor, especially women, while discussing energy, environment, climate change, cities or agriculture. In the energy sector, IRADe is advocating that more attention should be given to the non-commercial energy sector (fuel-wood) managed by women, providing 27 per cent of national energy. Currently, sustainable energy for all (SE 4 all) are some of the high profile initiatives of the UN and others. In the last few years, IRADe has undertaken various

research studies in this sector to address this burning issue and organised or participated in conferences.



Energy, Poverty and Gender Nexus

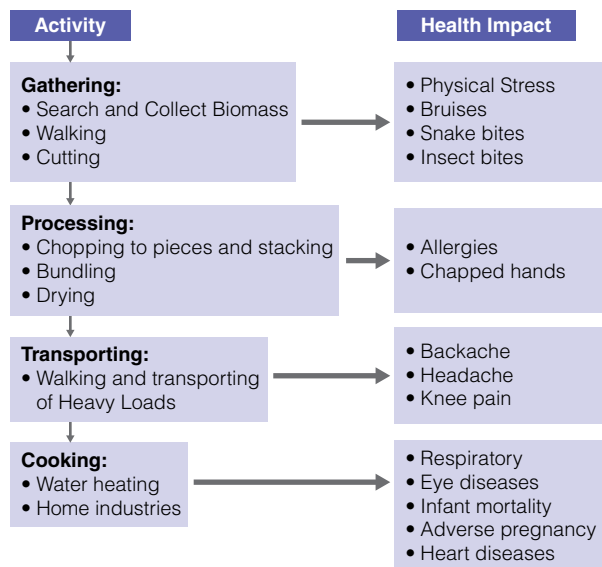
The Impact of Clean Fuel Access Policy on Women's Empowerment in Himachal Pradesh

This study focused on poverty, gender and environment and health issues in Himachal Pradesh and involved a gender-specific survey to address this issue. The study found that women walk approximately 30 km on hilly terrains in a month to collect fuel-wood.

Primary survey estimated accessibility and use of clean fuel by households for 30 villages in two districts and a survey on the kerosene depots was also conducted to get the seller's perspective of the supply situation under Public Distribution System (PDS). It was found that the people in HP are willing to pay for kerosene, the fuel next on the energy ladder to biofuels, but due to increased availability of LPG, the demand for kerosene has been on the decline.



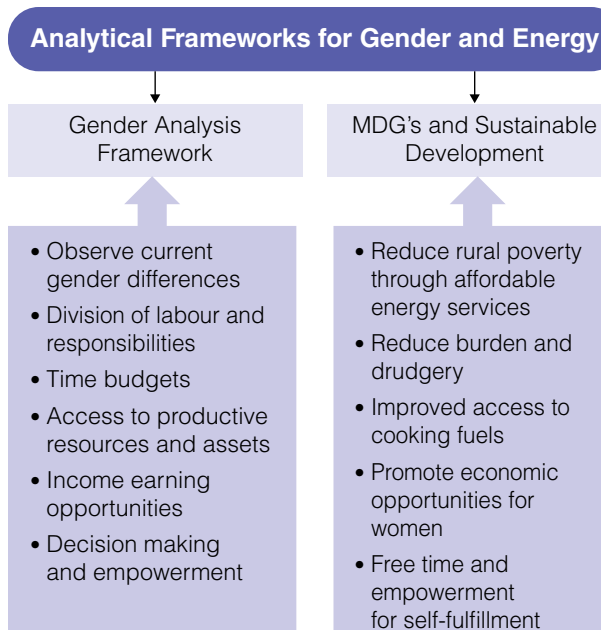
Bio-fuel chain and health impacts



Supported by DFID/KAR through ENERGIA of ETC Foundation

Gender Audit of National Energy Policies of India

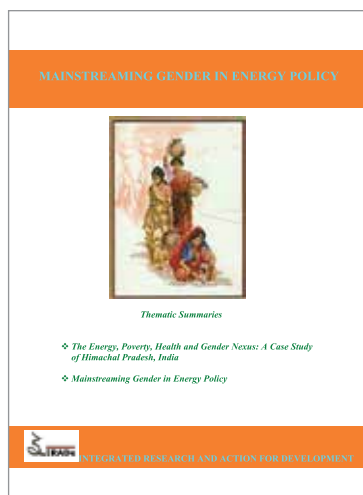
This is a collaborative exercise to draw attention to the lack of gender concerns in National Energy Policies (NEP) in India. The gender audit exercise was carried out to define an approach in making NEP more gender responsive in terms of their content and process. The key recommendations consisted of (a) reorienting monitoring and evaluation mechanisms to reflect gender concerns in energy programmes; (b) linking women's empowerment with energy development; (c) inter-ministerial coordination in addressing energy security; and (d) operationalizing the goal of 'Making cooking fuels available within 1 km of habitations'.



Supported by
ENERGIA of ETC Foundation

Mainstreaming Gender in Energy Policy 2006 for Planning Commission

The project highlighted gender-related concerns that included capacity building and special training to women in various institutions/universities to create a cadre of energy professionals. Policy needs to go beyond cooking energy, and emphasis should be on providing energy for other needs of livelihood and security. Research should be pursued for development of various biofuel species, cultivation practices and appliances (stoves). Health issues included how to minimize respiratory diseases from indoor air pollution and how to reduce the daily drudgery of women so that they can spend more time on generating income. A more participatory approach to energy policy decisions will allow both men and women to engage in defining energy problems and in



implementing solutions appropriate to geographic locations in India.



Background paper and presentation prepared for Expert Committee to formulate Energy Policy, Planning Commission

Reducing Drudgery of Women Carrying Biofuels, 2007–08: E-discussion and Field Surveys

In 2010, IRADe was chosen as the National Focal Point (NFP) of ENERGIA-International Network for Gender and Sustainable Energy. As a part of network activities, IRADe organized an e-debate with professionals from gender studies, energy and poverty on a common platform on certain identified issues to share best practices and develop ideas for gender-energy-poverty related research activities. The second level of the exercise was field survey on the suggestions received from focused group exercise done in one village each in North India (Rajasthan) and South India (Karnataka) respectively by partners, Social Policy Research Institute, Jaipur in Rajasthan and TIDE, Bangalore in Karnataka. The results of the surveys highlighted the difference in opinions and willingness to adopt new ideas in two different geographical locations in India.

For example, Rajasthan preferred LPG kitchen and local varieties as fuel sources whereas Karnataka was exploring options based on coconut waste.



The Third ENERGIA National Focal Points Meeting

ENERGIA Asia Network in collaboration with IRADe organized the third ENERGIA National Focal Point (NFP) meeting during November 1-3, 2006. IRADe is active in advocating more attention to the non-commercial energy sector (fuel-wood) managed

by women, which is the second largest energy source after coal. IRADe also advocated bringing energy within 1 km of rural habitats and organized and participated in events related to United Nations Commission on Sustainable Development (CSD). The group engaged in discussing and developing a set of monitoring criteria and National plans for each National Focal Point.

*Supported by
ENERGIA - the International Network on Gender and Sustainable Energy*

National Stakeholder Consultation on Gender Issues, Millennium Development Goals and Poverty Alleviation

A half-day consultation was organized by IRADe in collaboration with the All India Women's Conference funded by ENERGIA – the International Network on Gender and Sustainable Energy. Key issues were energy, millennium development goals (MDGs), poverty alleviation and implementation of official National Energy Policies.

The participants supported recommendations drafted by IRADe in the national paper and suggested that poverty alleviation is about increasing people's productivity, for which all issues of health, education, electricity and fuel need to be addressed.

*Supported by
ENERGIA - the International Network on Gender and Sustainable Energy*

Gender – Climate Change

Gender and Climate Change – Event Organised at COP-Delhi

One of the first side events on Gender and Climate change was organized at COP 8, 2002, New Delhi. An issue paper prepared for this is referred often.

1. Later in 2008, another issue paper was written on 'Mainstreaming Gender in Climate Change: Policies, Programmes', which was circulated widely.
2. A 3-day training programme was facilitated by IRADe for the Asia-Pacific office of UNDP on mainstreaming gender in climate change at Sri Lanka.

*Supported by
United Nations Development Programme (UNDP)*



MAPS India Study on Poverty and Low Carbon Development Strategies

With support of Mitigation Action Plans and Scenarios (MAPS), an initiative of developing countries, IRADe did pioneering work using a macroeconomic model to link poverty, income inequality and rural–urban disparity in the context of climate change up to 2030.



It showed that development initiatives like cash transfers or reducing inequality may not have a large impact on carbon dioxide emissions. Similarly, mitigation actions like improving energy efficiency will not affect development efforts and poverty levels negatively. The study showed that co-benefits approach can be useful in this context.

*Supported by
South South North Trust, Cape Town, South Africa*

Assessing Socio-economic Vulnerability to Climate Change: A Case Study of Assam

This study was aimed at assessing vulnerability of Assam to climate change and its socio-economic implications on sectors such as agriculture, water and forestry in the state. The implications of climate change are complex and multi-dimensional. Thus, vulnerable groups such as farmers, forest dwellers and other multiple stakeholders, especially women, were surveyed to assess vulnerability of livelihoods in climate-sensitive sectors such as agriculture and forestry. Loss of livelihoods and hardships were documented through primary survey.

Water logging due to floods for weeks caused problems in walking to the market or schools and also for defecation.



*Supported by
Indian Council of Social Science Research, New Delhi*

→ Food Security

- Food Security Bill: Issues, Impact, Effectiveness and Alternatives
- Extension of Minimum Support Price: Fiscal and Welfare Implications 2007–08

→ Agricultural Development, Economic Growth and Livelihood

- Demand, Supply and Subsidy Analysis for Indian Fertilizer Sector
- Indian Agriculture 2040
- Structural Transformation of the Indian Economy and its Agriculture
- India 1960–2010: Structural Change, Rural Non-Farm Sector and the Prospects for Agriculture

→ Regional Development

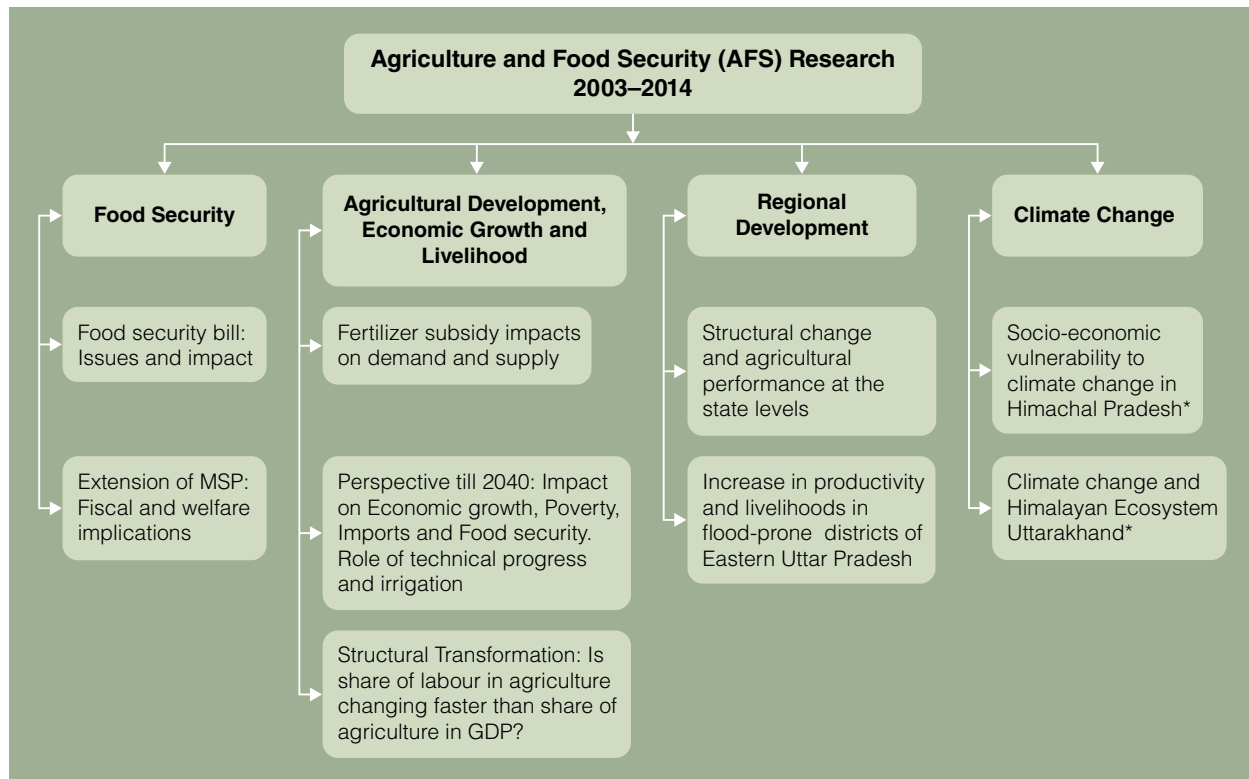
- India 1980–2008: Structural Change and Agricultural Performance at the State Levels
- Factors Affecting Productivity of Northern Flood Plains of Eastern Uttar Pradesh



Introduction

Food security issues now should also include climate change. To enhance food security, IRADe focuses on yield growth in agriculture, a rational development strategy for handling the issues of excess labour in agriculture sector,

management of arable land in India, institutional approach for collective action and rational use of irrigation water etc. The domestic self-sufficiency ratio for food security needs to be optimized. IRADe has worked on the following projects related to the field of agriculture and food security:



**Described under sectors on climate change*

Food Security

Food Security Bill: Issues, Impact, Effectiveness and Alternatives

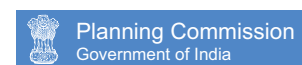
The impact of the Food Security Bill on nutrition, costs and foodgrain production is explored. Considering the difficulties of identifying the poor it argues for direct benefit transfer after excluding the clearly identifiable rich.

Extension of Minimum Support Price: Fiscal and Welfare Implications 2007–08

The Planning Commission, GOI, awarded IRADe the research project to study the implications of extending the minimum support price (MSP) to more states. After an analysis of implications for the welfare of producers and consumers in Madhya Pradesh and Uttar Pradesh, it was recommended that MSP could be extended in many states, because more states are growing rice and wheat than earlier.



There are national gains in reduction in transport of grains and benefits of government policies reach farmers in more states.

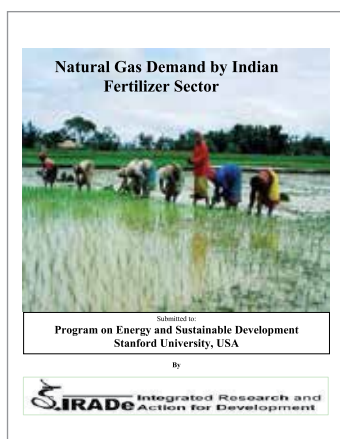


Supported by
Planning Commission, Government of India

Agricultural Development, Economic Growth and Livelihood

Demand, Supply and Subsidy Analysis for Indian Fertilizer Sector

IRADe carried out this study to analyse the fertilizer demand, assess the impact of various feedstock prices, estimate the total subsidy for the fertilizer sector, suggest a range of policy alternatives, recommend viable policy and reform options for policymakers for India and carry out a comparative study of domestic policy and global fertilizer policies. Fertilizer consumption increases with increase in irrigated area. It is sensitive to price and relative price affects nutrient balance. A 30 per cent increase in net irrigated area can increase fertilizer subsidy by 60 per cent. The need to moderate subsidy through gradual increase in price and/or effective targeting of the small farmer are suggested.



Supported by
Department of Chemicals and Fertilizers, Government of India

Indian Agriculture 2040

Rapidly growing Indian economy will call for a transformation of Indian agriculture over the next 30 years with profound implications for diversification of production, rural-urban migration, agricultural profitability and food security.

To explore these issues, IRADe has developed a macro-economic model with endogenous income distribution. A unique demand system was estimated based on Indian data. The study showed that if India is to maintain a reasonable level of self-sufficiency in foodgrains, an agricultural growth rate of at least 4 per cent is needed to support a GDP growth rate of 8 per cent, requiring expansion of irrigated area and increased agricultural productivity.



Supported by
Centennial Group, USA

Structural Transformation of the Indian Economy and its Agriculture

With economic growth, labour is expected to move out of agriculture. The turning point of structural transformation is when the share of labour in agriculture declines faster than the share of agricultural GDP in total GDP.



Despite accelerating economic growth, the structural transformation of the Indian economy has been slow.

Labour absorption in the urban economy, and especially in the manufacturing sector has been low, formal sector jobs are few and declining as a share of employment and labour contracts are increasingly informal. As a consequence, and combined with rapid population growth, the labour force in the rural areas is still growing fast. Agricultural growth has not responded to the accelerating income growth and agricultural employment is growing slowly.

India 1960–2010: Structural Change, Rural Non-Farm Sector and the Prospects for Agriculture

The agriculture sector now generates the largest number of jobs in India. Rural non-farm self-employment has become especially dynamic with farm households rapidly diversifying to increase income.

The growth of the rural non-farm sector is a structural transformation of the Indian economy, but it is a stunted one. It generates few jobs at high wages with job security and benefits. It is the failure of the urban economy to create enough jobs, especially in labour-intensive manufacturing, that prevents a more favourable structural transformation of the classic kind. The bottling up of labour in rural areas, however, means that farm sizes will continue to decline, agriculture will continue its trend to feminization and part-time farming will become the dominant farm model.



| Regional Development

India 1980–2008: Structural Change and Agricultural Performance at the State Levels

Out of 15 states, six are now experiencing convergence of the share of the agricultural labour force with the share of agricultural output – Kerala, Punjab, Haryana, Maharashtra, West Bengal and Tamil Nadu – with convergence still very slow in the last two states. The factors behind the convergence differ among the states. It is clear that structural transformation has started in India, but is not yet generalized.



*Supported by
Integrated Research for Action and Development (IRADe)*

Factors Affecting Productivity of Northern Flood Plains of Eastern Uttar Pradesh

IRADe carried out in-depth research to understand the drivers of growth and livelihoods and obstacles in the selected districts and clusters where Sir Dorabji Tata Trust (SDTT) supported projects are undertaken by NGOs. IRADe assessed the production and resource potential and devised strategies in consultation with stakeholders and participating NGOs to overcome various challenges encountered by the region, strengthen the clusters and generate synergy using data and analysis for Bahraich, Kushinagar and Shravasti, three of the poorest districts in Uttar Pradesh. A vision document is prepared that identifies options to increase livelihood.

In these districts electricity supply is poor and inadequate.

There exist large gaps between potential and actual productivity of major crops. Lack of proper

marketing channels both for purchasing farm inputs and selling produce hampers diversification.



Supported by
Sir Dorabji Tata Trust (SDTT)



Agri-extension services are inadequate and certified seeds are not available in time. The irrigation potential of canals in Bahraich and Kushinagar is not fully realized due to siltation and poor maintenance of canals. Private diesel-operated tube wells are expensive. IRADe suggested strengthening of extension services with agri-clinics providing credit to agriculturists, improving canal management and diversification of agriculture to cash-rich crops and measures to fully exploit the value chain of crops by utilizing by-products in productive activities.

Heading For Grain Drain

As it stands, the food security plan is flawed and can have a negative impact

Assuming that at 200 million priority farmers belonging to 48% of rural and 28% of urban households get 7 kg per month, around 40 million tonnes of foodgrains would be required...

Even when FCI operations were to cover the whole country, the task would be daunting. Currently 75% of rice and 65% of wheat are produced in the top 10 states...

It is not as if FCI can effectively procure foodgrains at the MSP from all over the country, farmers would have the incentive to sell elsewhere...

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Swachh Bharat should include Swachh air

A roadmap for cleaner urban centres can be merged into the smart cities framework



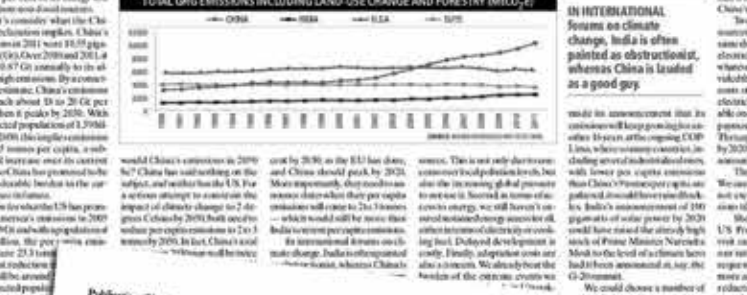
DEATH BY AIRPOLLUTION SERIES PART 1

Approximately 2 million deaths are attributed to air pollution each year. In India, the number is estimated to be around 1.5 million. The main contributors are particulate matter (PM2.5 and PM10) and nitrogen dioxide (NO2).



Be ambitious at Lima

Larger promises of emissions reduction would benefit India. But any agreement must also be fair



TOTAL GHG EMISSIONS INCLUDING LAND-USE CHANGE AND FORESTRY (MtCO2e)

China's emissions in 2009 were 13.1 billion tonnes, up from 10.1 billion in 2005. India's emissions in 2009 were 2.1 billion tonnes, up from 1.5 billion in 2005.

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साझा चुनौती का सामना

भारत के विकास के लिए हमें साझा चुनौतियों का सामना करना पड़ेगा। हमें एक-दूसरे को मदद करनी होगी और एक-साथ काम करना होगा।

Disaster-resilient cities

Lessons from Srinagar and Guwahati on how to protect our cities from natural disasters



Devastation due to extreme rainfall over three days in Jammu and Kashmir and Assam...

India has 900 cities and 4,000 urban agglomerations. The cities are growth engines for the India's GDP...

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Turning the lights on across South Asia

Why cooperation across the Indian subcontinent to ensure energy security is an idea whose time has come

Despite its huge hydropower potential, the South Asia region is the least interconnected in the world. And it can be topped only through cooperation

The South Asia Region (SAR), one of the poorest in the world, has long faced an energy crunch. Nearly 6 million people are without access to electricity...

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Decision Support Provided to Various Ministries by IRADe



S.No.	Ministry	Projects
1.	Ministry of Urban Development (MoUD)	<ul style="list-style-type: none"> Centre of Excellence for Urban Development and Climate Change Sustainable and Disaster Resilient Urban Development
2.	Ministry of Environment and Forests (MoEF)	<ul style="list-style-type: none"> GHG Reduction Potential, Sectoral Baselines and Opportunities for CDM Projects First National Communication (FNC) for India's national circumstances for addressing climate change to the UNFCCC (NATCOM) National Framework for Risks, Impact and Vulnerability Assessment for Mountain Ecosystems, Uttarakhand Ecosystem Management of Marine National Park, Jamnagar, Gujarat Activity Analysis Model for Climate Policies for India Third National Communication (TNC) for India's national circumstances for climate change for NATCOM for UNFCCC Modelling Studies on Greenhouse Gas Emission and Emission Intensity of Indian economy
3.	Ministry of New and Renewable Energy (MNRE)	<ul style="list-style-type: none"> Village Energy Security Programme (VESP) in Vavdi and Vaddithar villages in Gujarat International Training Programmes on various themes of renewable energy conducted for four years for senior officers from Africa and Asia on techno-economic, financial and socio-environmental issues Evaluation Surveys of Remote Village Electrification (RVE) Programme Solar Photovoltaic and Solar Thermal Applications in six states Techno-economic and Socio-agronomic Analysis of Biodiesel System Monitoring and Evaluation of Solar Photovoltaic System Programme in Himachal Pradesh and Punjab (2012) Monitoring and Evaluation of RVE Programme in two states (Rajasthan and Haryana) (2009) Jodhpur Solar City Master Plan Evaluation of Solar Photovoltaic System Programme in six states (Rajasthan, Haryana, Uttarakhand, Manipur, Karnataka and Gujarat) Evaluation of Solar Thermal Demonstration Project in four states (Rajasthan, Haryana, Uttarakhand and Gujarat)

Contd...

S.No.	Ministry	Projects
4.	Department of Science and Technology (Ministry of Science and Technology)	<ul style="list-style-type: none"> • International Workshop on Carbon Capture and Storage (CCS) in Power Sector in India. • Analysis for Carbon Capture and Storage (CCS) Technology in Power Sector in India • Vulnerability Analysis of Himachal Pradesh to Climate Change • Global Technology Watch Group (GTWG) on Advanced Coal Technologies (ACT) for Power Generation
5.	Technology Information, Forecasting and Assessment Council (TIFAC)	<ul style="list-style-type: none"> • Techno-economic Analysis for Bioenergy options • Indian Perspectives on Global Energies Scenarios till 2050
6.	Ministry of External Affairs	<ul style="list-style-type: none"> • Analysis of Alternative Approaches of Climate Negotiations
7.	Central Statistical Office (CSO)	<ul style="list-style-type: none"> • Natural Resource Accounting (NRA), Goa
8.	Ministry of Power	<ul style="list-style-type: none"> • Evaluation of Franchise System in West Bengal, Assam and Nagaland
9.	Rural Electrification Corporation (REC)	<ul style="list-style-type: none"> • Evaluation of Franchise System in Assam, Rajasthan and West Bengal • Evaluation of Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) in the states of Gujarat, Assam, Rajasthan, Uttar Pradesh and Himachal Pradesh
10.	Planning Commission/Niti Ayog	<ul style="list-style-type: none"> • Conducting a research study on extension of Minimum Support Price (MSP), Fiscal and Welfare Implications • Modelling for low carbon strategy for inclusive growth • National Energy Policy
11.	Ministry of Chemicals & Fertilizers (Department of Fertilizers)	<ul style="list-style-type: none"> • Demand, Supply and Subsidy Analysis for Indian Fertilizer Sector
12.	Ministry of Earth Sciences (MoES)	<ul style="list-style-type: none"> • Vulnerability of Coastal Cities on Rivers to Climate Change – Case Study of Surat
13.	Ministry of Finance	<ul style="list-style-type: none"> • Assessment of Alternative Roadmaps on Reforming Diesel Prices in India
14.	Government of Manipur	<ul style="list-style-type: none"> • Renewable Facility Development at Raj Bhavan, Manipur
15.	Delhi State Government	<ul style="list-style-type: none"> • CDM Training Programme for Delhi State Government Agencies

IRADe's Collaboration with International, Multilateral and Non-Government Organizations/Institutions



S.No.	Organization	Projects
1.	Gujarat Power Corporation Ltd. (GPCL)	<ul style="list-style-type: none"> Environmentally Sustainable and Integrated Energy Strategy for Gujarat State
2.	U.S. Agency for International Development (USAID)	<ul style="list-style-type: none"> South Asia Regional Initiative for Energy Integration (SARI/ EI)
3.	Sir Dorabji Tata Trust (SDTT)	<ul style="list-style-type: none"> Analysis of Factors affecting productivity of Northern Flood Plains of Eastern Uttar Pradesh with a view to synergize SDTT efforts in the region
4.	South South North Trust (SSN)	<ul style="list-style-type: none"> MAPS India Study on Poverty and Low Carbon Development Strategies
5.	International Institute for Sustainable Development (IISD)	<ul style="list-style-type: none"> The Impact of India's Diesel Price Reforms on the Trucking Industry Assessing the Impact of Diesel Subsidy Reform since January 2013 Analysis of Kerosene Free Delhi
6.	GIZ - Deutsche Gesellschaft für Internationale Zusammenarbeit	<ul style="list-style-type: none"> Preparation of report on status of renewable energy in India Renewable Energy Component of the Indo-German Energy Programme Green Accounting Study for the State of Andhra Pradesh Green Accounting for PADERU project, Andhra Pradesh Indian Renewable Energy Status Report - Background Report for DIREC 2010 Translation of National Action Plan on Climate Change for the urban sector. Supporting National study on the Economics of Ecosystems and Biodiversity (TEEB-India) Review of status of Marine National Park, Jamnagar and evolving vision statement for its management of MNP
7.	The World Bank	<ul style="list-style-type: none"> IRADe-IIEF State of Market Conclave 2005: Second Generation Financial Sector Reforms in India National Environmental Institutional Assessment

Contd...

S.No.	Organization	Projects
8.	Rockefeller Foundation, US/ ACCCRN	<ul style="list-style-type: none"> • International Workshop on 'Sustainable and Climate Resilient Urban Development' • Climate Vulnerability of Cities • Urban Climate Resiliency Policy Support; Vulnerability profile of India's urban centres in context of climate change • Climate Resilient Urban Development: Vulnerability Profiles of 20 Indian Cities • High level engagement at state and national level in India to integrate urban climate resilience in various policies and programmes
9.	Institute for Social and Environmental Transition (ISET) through ACCCRN	<ul style="list-style-type: none"> • Asian City Climate Change Resilience Transition (ISET) through ACCCRN Network (ACCCRN) • Climate Policy environment in India
10.	TARU Leading Edge Pvt. Ltd.	<ul style="list-style-type: none"> • A Policy Brief on Emerging Mechanisms and Responses of Cities to Climate-ACCCRN
11.	British High Commission	<ul style="list-style-type: none"> • Mapping of Carbon Capture and Storage (CCS) activities in India to promote R&D initiatives
12.	World Energy Council-Indian Member Committee (WEC-IMC)	<ul style="list-style-type: none"> • A public lecture by Lord Professor Nicholas Stern on 'Economics, Ethics and Climate Change'
13.	United States Environmental Protection Agency (USEPA)	<ul style="list-style-type: none"> • Pre-feasibility study of integrated waste management, landfill gas recovery and utilization at Puducherry, India
14.	CCAP-Centre for Clean Air Policy, USA	<ul style="list-style-type: none"> • Analysis of GHG Emissions for Major Sectors in India: Opportunities and Strategies for Mitigation
15.	ENERGIA, ETC Foundation, Netherlands/DFID-Department for International Development, New Delhi	<ul style="list-style-type: none"> • The Energy, Poverty and Gender Nexus in Himachal Pradesh, India: The Impact of Clean Fuel Access Policy on Women's Empowerment • Gender Audit of National Energy Policy in India • National Stakeholder Consultation: Gender issues, MDG and Poverty alleviation for Commission for Sustainable Development held at UN, New York • Energy Sector Reforms along with IISD consortium • Establishing inter-ministerial linkages to address energy accessibility to poor women in rural and urban areas (ENERGIA)
16.	Petroleum Federation of India, New Delhi	<ul style="list-style-type: none"> • Integrated Study of Diesel Substitutes from Oilseeds in India
17.	Stanford University, USA	<ul style="list-style-type: none"> • A Political Economy Analysis of Demand for Natural Gas in the Indian Fertilizer Sector • National Consequences of Electricity Pricing Reforms on Agriculture Using General Equilibrium Approach

Contd...

S.No.	Organization	Projects
18.	Pricewaterhouse Coopers	<ul style="list-style-type: none"> • Projection for Petroleum Products, Natural Gas and Substitutes up to 2030 • ENVISION – Information Systems Reforms at the Ministry of Environment and Forests
19.	Wuppertal Institute for Climate, Environment and Energy (WISIONS), German	<ul style="list-style-type: none"> • Rural Micro-Enterprise Model for Biofuel Extraction in India at Bawal, Haryana
20.	Self-employed Women Association (SEWA), Gujarat	<ul style="list-style-type: none"> • Preparation of energy activities and Pilot Demonstration Project on renewable energy
21.	United Nations Environmental Programme	<ul style="list-style-type: none"> • Training Session on Capacity Building, Environment, Trade and Sustainable Development
22.	Institute of Global Environmental Strategies, Japan	<ul style="list-style-type: none"> • Opportunities for Energy Efficiency and Clean Development Mechanism (CDM) in Cement and Building Materials
23.	Centennial Group, USA	<ul style="list-style-type: none"> • Study on Agriculture 2040
24.	GTZ-ASEM Project	<ul style="list-style-type: none"> • Study on Agriculture 2040 Transition of NAPCC for the Urban Sector
25.	United Nations Development Programme	<ul style="list-style-type: none"> • Climate Change and Gender • International Training Workshop at Colombo, Sri Lanka
26.	Shakti Foundation	<ul style="list-style-type: none"> • Assessment of Alternative Roadmaps on Reforming Petroleum Prices
27.	Brot für die Welt ('Bread for the World')	<ul style="list-style-type: none"> • Consultancy service for support in investigating and planning the strengthening of the municipal solid waste management system in Industrial Park, Cherlapalli, Andhra Pradesh
28.	DFID, UK partnership, AEA Technology & Emergent ventures	<ul style="list-style-type: none"> • Identifying Specific Policy Options with the Aim of Reducing Carbon Intensity in India
29.	Indian Council for Research on International Economic Relations	<ul style="list-style-type: none"> • Critical Evaluation of the 12th Five Year Plan from a Climatic Perspective

PR: List of IRADe Project Reports

Project Report No. & Year	Title of Project	Funding Agency
IRADe-PR-52 (2015)	Supporting National study on the Economics of Ecosystems and Biodiversity (TEEB-India)	<ul style="list-style-type: none"> Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
IRADe-PR-51 (2015)	Environmentally Sustainable and Integrated Energy Strategy for Gujarat	<ul style="list-style-type: none"> Gujarat Power Corporation Ltd. (GPCL)
IRADe-PR-50 (2015)	Preparation of Third National Communication (TNC) and other new information to the UNFCCC project, India's First Biennial Update Report-National Circumstances	<ul style="list-style-type: none"> InsPIRE Network for Environment, NATCOM
IRADe-PR-49 (2015)	Socio Economic Vulnerability of Himachal Pradesh to Climate Change	<ul style="list-style-type: none"> Department of Science and Technology (DST)
IRADe-PR-47 (2015)	Analysis of factors Affecting the agricultural productivity in the Flood Plains of Eastern Uttar Pradesh to Synergise Investments by the Trusts	<ul style="list-style-type: none"> Sir Dorabji Tata Trust (SDTT)
IRADe-PR-48 (2014)	Sustainable and Disaster Resilient Urban Development	<ul style="list-style-type: none"> Ministry of Urban Development (MoUD)
IRADe-PR-46 (2014)	Critical Evaluation of the 12 th Five-Year Plan from a Climatic Perspective	<ul style="list-style-type: none"> Indian Council for Research on International Economic Relations (ICRIER)
IRADe-PR-45 (2014)	Assessing the Impacts of Diesel Subsidy Reform Since Jan 2013	<ul style="list-style-type: none"> International Institute for Sustainable Development (IISD)
IRADe-PR-44 (2014)	Analysis of Kerosene Free Delhi Scheme	<ul style="list-style-type: none"> International Institute for Sustainable Development (IISD)
IRADe-PR-43 (2014)	Prospects for Regional Cooperation on Cross-Border Electricity Trade in South Asia	<ul style="list-style-type: none"> US Agency for International Development (USAID)
IRADe-PR-42 (2014)	Economy wide Model for Low Carbon Strategy	<ul style="list-style-type: none"> Planning Commission
IRADe-PR-41 (2014)	Research Study on Low Carbon Development Pathways for an Inclusive India	<ul style="list-style-type: none"> World Wildlife Fund, Germany and World Wildlife Fund, India

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Project Report No. & Year	Title of Project	Funding Agency
IRADe-PR-40 (2013)	CDMP Review of Six cities	<ul style="list-style-type: none"> United Nations Development Programme
IRADe-PR-39 (2013)	The Impacts of India's Diesel Price Reforms on the Trucking Industry	<ul style="list-style-type: none"> International Institute for Sustainable Development
IRADe-PR-38 (2013)	Identifying specific policy options with the aim of reducing carbon intensity in India	<ul style="list-style-type: none"> Department for International Development and AEA
IRADe-PR-37 (2013)	Climate Resilient Urban Development: Vulnerability Profiles of 20 Indian Cities	<ul style="list-style-type: none"> Rockefeller Foundation
IRADe-PR-36 (2012)	Assessing Socio-Economic Vulnerability to Climate Change: A case study of Assam	<ul style="list-style-type: none"> Indian Council of Social Science Research
IRADe-PR-35 (2012)	Maps India Study on Poverty and Low Carbon Development Strategies	<ul style="list-style-type: none"> South South North Trust
IRADe-PR-34 (2012)	Monitoring & Evaluation of Off Grid Solar Photovoltaic Systems installed in Punjab and HP in 07-08, 08-09 and 09-10	<ul style="list-style-type: none"> Ministry of New and Renewable Energy
IRADe-PR-33 (2012)	Taming Diesel Subsidy to Curtail Inflation and Foster Economic Growth	<ul style="list-style-type: none"> Shakti Foundation, Ministry of Finance
IRADe-PR-32 (2012)	Measuring Ecosystem Services for Green India Mission-Case study of Paderu project I Andhra Pradesh	<ul style="list-style-type: none"> Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
IRADe-PR-31 (2011)	Investigating and planning the strengthening of the municipal solid waste management system in the Industrial Park Cherlapalli/Andhra Pradesh	<ul style="list-style-type: none"> Bread for the World
IRADe-PR-30 (2011)	Evaluation of the Rajiv Gandhi Grameen Vidyutikaran Yojana in the states of Assam, Gujarat, HP, Rajasthan, U.P.	<ul style="list-style-type: none"> Rural Electrification Corporation
IRADe-PR-29 (2011)	Techno-economic and Socio-agronomic Analysis of Bio-diesel System	<ul style="list-style-type: none"> Ministry of New and Renewable Energy
IRADe-PR-28 (2010)	Management of Ecosystem of Marine National Park, Gujarat in Harmony with Industrial Development	<ul style="list-style-type: none"> Ministry of Environment and Forests
IRADe-PR-27 (2010)	Indian Renewable Energy Status Report, Background Report for DIREC 2010	<ul style="list-style-type: none"> German Technical Cooperation (GTZ) and National Renewable Energy Laboratory
IRADe-PR-26 (2010)	Indian Perspectives on Global Energies Scenarios till 2050	<ul style="list-style-type: none"> Technology Information, Forecasting and Assessment Council and International Institute for Applied Systems Analysis

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Project Report No. & Year	Title of Project	Funding Agency
IRADe-PR-25 (2010)	Study of Indian agriculture till 2040	• Centennial Group Holdings LLC
IRADe-PR-24 (2010)	Modeling for the Indian Agriculture Study	• Centennial Group
IRADe-PR-23 (2009)	Activity Analysis Model for Climate Policies for India	• Ministry of Environment and Forests
IRADe-PR-22 (2009)	Green Accounting for the State of Andhra Pradesh	• Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
IRADe-PR-21 (2009)	Three-tier Systems for Climate Negotiations	• Ministry of External Affairs
IRADe-PR-20 (2009)	Climate Change and Himalayan Ecosystem	• Ministry of Environment and Forests
IRADe-PR-19 (2009)	Methane Emission and Pump Test Study from Landfill - Puducherry and Okhla, New Delhi Waste Management	• United States Environmental Protection Agency
IRADe-PR-18 (2009)	Study for Evaluation of Solar Thermal Energy Demonstration Programme During 10th Plan	• Ministry of New and Renewable Energy
IRADe-PR-17 (2009)	Evaluation of Solar Photovoltaic Programme	• Ministry of New and Renewable Energy
IRADe-PR-16 (2009)	Analysis of GHG Emissions for Major Sectors in India: Opportunities and Strategies for Mitigation	• Centre for Clean Air Policy, USA
IRADe-PR-15 (2009)	Analysis for CCS Technology in Indian Power Sector	• Department of Science and Technology (DST)
IRADe-PR-14 (2009)	Demand, Supply and Subsidy Analysis for Indian Fertilizer Sector	• Department of Fertilizer
IRADe-PR-13 (2008)	Extension of Minimum Support Price (MSP): Fiscal and Welfare Implications	• Planning Commission
IRADe-PR-12 (2009)	Gender Analysis of Renewable Energy in India: Present Status, Issues, Approaches and New Initiatives	• ENERGIA
IRADe-PR-11 (2007)	Demand for Natural Gas in the Indian Fertilizer Sector	• Stanford University, USA
IRADe-PR-10 (2007)	Evaluation of Franchises System in Assam	• Rural Electrification Corporation
IRADe-PR-09 (2007)	Evaluation of Franchises System in West Bengal	• Ministry of Power

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Project Report No. & Year	Title of Project	Funding Agency
IRADe-PR-08 (2007)	Natural Resource Accounting (NRA) Goa Phase-II	<ul style="list-style-type: none"> Central Statistical Office
IRADe-PR-07 (2006)	Gender Oriented Energy Policy	<ul style="list-style-type: none"> ENERGIA
IRADe-PR-06 (2006)	GHG Reduction Potential, Sectoral Baselines and Opportunities for CDM Projects	<ul style="list-style-type: none"> Ministry of Environment and Forests
IRADe-PR-05 (2005)	The Energy Poverty and Gender Nexus in Himachal Pradesh, India: The Impact of Clean Fuel Access Policy on Women's Empowerment	<ul style="list-style-type: none"> ENERGIA and Department for International Development
IRADe-PR-04 (2004)	Consequences of Electricity Pricing Reforms on Agriculture	<ul style="list-style-type: none"> Stanford University
IRADe-PR-03 (2003)	Impact of Fuel Scarcity and Pollution on Rural Poor, a comparative analysis of vulnerable groups in HP	<ul style="list-style-type: none"> SANEI, Global Development Network
IRADe-PR-02 (2003)	India's National Circumstances for Addressing Climate Change (NATCOM)	<ul style="list-style-type: none"> Ministry of Environment and Forests
IRADe-PR-01 (2003)	Gender & Climate Change (COP 8)	<ul style="list-style-type: none"> United Nations Development Programme

About IRADe

IRADe networks with the government, ministries/departments, international organizations, public and private sectors, academic experts, NGOs, and consultants to work on projects awarded by them. IRADe provides decision support to eleven ministries that include Ministry of Environment and Forests and Climate Change, Ministry of New and Renewable Energy, Niti Aayog (formerly Planning Commission), Ministry of Power, Ministry of External Affairs, Ministry of Earth Sciences, Ministry of Urban Development, Department of Science and Technology, Central Statistical Organization under Ministry of Statistics and Programme Implementation, Technology Information, Forecasting and Assessment Council (TIFAC), etc. for many national level projects.

At the international level, IRADe has worked with bilateral and multilateral organization like the World Bank, Asian Development Bank (ADB), U.S. Agency for International Development (USAID); United Nations Development Programme (UNDP); United States Environmental Protection Agency (USEPA), Wuppertal Institute for Climate, Environment and Energy, (WISION) Germany; Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Germany; Rockefeller Foundation; International Institute for Applied Systems Analysis (IIASA), Austria; British High Commission (BHC), Centre for Clean Air Policy (CCAP), USA; International Institute for Sustainable Development (IISD), South South North Trust (SSNT) etc.

IRADe has partnered with academic, private sectors, multinational organizations, think tanks and NGOs. These include Shakti Foundation, Indian Council of Social Science Research (ICSSR), SEWA, Petroleum Federation of India, Pricewater House Coopers, ICF International, Rockefeller Foundation, Institute for Social and Environmental Transition (ISET), Center for Clean Air Policy (CCAP), Indian Council for Research on International Economic Relations (ICRIER), InsPIRE Network for Environment, Stanford University and Sir Dorabji Tata Trust (SDTT) among others.

IRADe has also developed strategic partnerships and is part of global networks like the USAID's Low Emissions Asian Development (LEAD) program – ASIA-LEDS, ENERGIA-International Network for Gender and Sustainable Energy, Netherlands; Global Clean Cook Stoves Forum, UN Foundation; Asian Cities Climate Change Resilience Network (ACCCRN), Global Technology Watch Group (GTWG-DST), Climate Action Network South Asia (CANSA).

IRADe has carried out some pioneering work in the field of state level energy planning, city level climate resilience planning, other climate change studies and livelihood studies.

Jyoti Parikh, Executive Director, IRADe

Professor Jyoti K Parikh, Executive Director of (IRADe) was a Member of the Prime Minister's Council on Climate Change – India and is a recipient of Nobel Peace Prize awarded to IPCC authors in 2007. She served as the senior professor and Acting Director of Indira Gandhi Institute of Development Research (IGIDR), Mumbai 1986-2003, International Institute for Applied Systems Analysis (IIASA), Austria for 8 years (1980-86, 76-78) and Planning Commission, as senior energy consultant at New Delhi (1978-80).

She has served as energy consultant to the World Bank, the U.S. Department of Energy, EEC, Brussels and UN agencies such as UNIDO, FAO, UNU, and UNESCO, Environment Consultant to UNDP, World Bank and so on. She worked as an advisor to various ministries for Gov. of India.

She obtained her M.Sc. from University of California, Berkeley, in 1964 and Ph.D. in Theoretical Physics from University of Maryland, College Park in 1967. She has guided 12 Ph.D. theses in energy, environment and climate change and given lectures in more than 40 countries around the world.

Her publications include nearly 200 project research papers and 25 books and monographs and span many areas ranging from policy analysis of energy and environment, climate change policies, modeling, technology assessment, power sector, natural resource management, agriculture, health, poverty and gender.

She has held national and international appointments, which includes the Technical Advisory Committee (TAG) for Energy Trust Funds Programmes of the World Bank; the advisory Board of Tyndall Center for Climate Change, University of East Anglia, Norwich, UK, 2001-2004; Scientific and Technical Advisory Panel (STAP) to Global Environment Facility (GEF) – 1995-1998.

She was on the Board of directors of Indian Renewable Energy Development Agency Ltd (IREDA) 2001-2004 and also National Institute of Urban affairs (NIUA), MoUD, Gol.

She has served on editorial boards of several Internationals Journal e.g. Utilities Policy and Energy and as a reviewer for many other journals.

Kirit S Parikh, Chairman, IRADe

Professor Kirit Parikh, Chairman of IRADe was a former Member of India's Planning Commission (2004-2009) with the status of Minister of State. He has been a member of the Economic Advisory Councils (EAC) of five Prime Ministers of India, Rajiv Gandhi, V.P. Singh, Chandra Shekhar, P.V. Narasimha Rao and Atal Bihari Vajpayee.

He was awarded "*Padma Bhushan*" by the president of India, the third highest civilian award in India. He was also a recipient of Nobel Peace Prize awarded to IPCC authors in 2007.

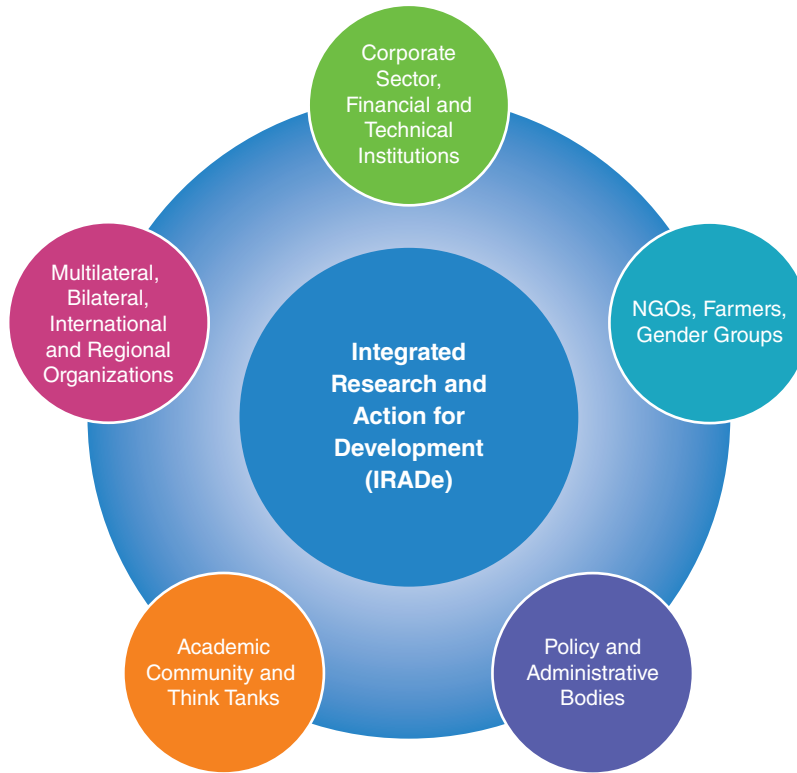
He was the Founder Director (Vice Chancellor) of the Indira Gandhi Institute of Development Research (IGIDR), Mumbai. He is a Fellow of the National Academy of Sciences, India. He has a Doctor of Science in Civil Engineering and a Master's Degree in Economics from Massachusetts Institute of Technology (MIT), USA and M. Tech from IIT (Kharagpur). He has been a Professor of Economics since 1967. From 1997 to 1998, he was Special Economic Adviser to the Administrator, United Nations Development Programme (UNDP), New York.

He has been a member of many high level advisory committees spanning diverse areas such as the Indian National Committee for Environmental Planning & Coordination (1971-74), the National Committee on Science and Technology (1974-76) and the Fuel Policy Committee (1970-74).

He chaired the Expert Committee on "Integrated Energy Policy" and also the Expert Group on "Low Carbon Strategy for Inclusive Growth" set up by the Planning Commission. He is widely recognized as the architect of India's integrated energy policy. He also played an important role in energy policy reforms in the country.

He has authored, co-authored and edited 29 books in the areas of planning, water resource management, appropriate technology for housing, optimum requirement for fertilizers, energy systems, national and international food policies, trade policies, general equilibrium modeling, natural resources accounting, inclusive growth and strategies for low carbon development.

Our Partners in Progress





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