Integrated Research and Action for Development

IRADe

ANNUAL REPORT 2020-21

Governing Council - IRADe

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

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

Dr Suresh Prabhu
Former Union Minister of Railways

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

Ms Meera Shankar
Former Ambassador, GoI

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

Ms Renana Jhabvala
President, SEWA Bharat

Mr Hemant Sahai
Advocate, Treasurer

International Advisory Board - IRADe

Mr Nitin Desai
Former Under-Secretary-General, United Nations

Prof. Amartya Sen
Harvard University

Prof. Gustav Speth
Yale University

Lord Nicholas Stern
London School of Economics and Political Science

Prof. Joseph Stiglitz
Columbia University

Founding Members, IRADe-2002

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

Dr Manmohan Singh, PhD
Former Prime Minister, India

Ms Ela Bhatt
Founder, SEWA

Mr Adi Godrej
Industrialist

Mr Keshub Mahindra
Industrialist

Dr R.A. Mashelkar
Former Director General ,CSIR

Mr Shirish Patel
Consulting Civil Engineer

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

About IRADe

Integrated Research for Action and Development (IRADe) is an independent, non-profit advanced research institute that 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 faced by the world in the 21st century. IRADe's research covers these issues, as well as the policies that affect them. IRADe's focus is on effective action through multi-disciplinary and multi-stakeholder research to arrive at implementable solutions for sustainable development policy research and effective governance that accounts for techno-economic and socio-cultural issues. It also provides expertise to several ministries, national and international institutions, and partners with reputed organizations.

IRADe was established under the Society's Act, in 2002 in New Delhi. It is certified as a Research and Development Organization by the Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology (MoST), Government of India. It has also been selected as a Centre of Excellence by the Ministry of Housing and Urban Affairs (MoHUA), Government of India, for urban development and climate change.

Thematic areas of IRADe

- Climate Change and Environment
- Sustainable Urban Development
- Energy and Power Systems
- Poverty Alleviation and Gender
- Agriculture and Food Security
- Asia Center for Sustainable Development

Our Partners in development

Integrated Research and Action for Development (IRADe)

- Corporate Sector, Financial and Technical Institutions
- NGOs, Farmers, Gender Groups
- Policy and Administrative Bodies
- Academic Community and Think Tanks
- Multilateral, Bilateral, International and Regional Organizations

Our Vision

To be a leading global independent policy research think tank that provides and enables implementable policy solutions for sustainable and inclusive development.

Our Mission

To carry out policy analysis from multi-stakeholder and multi-disciplinary perspectives for decision-makers and vulnerable groups in the thematic areas of climate change and environment, energy and power systems, sustainable urban development, agriculture and food security, poverty alleviation and gender. This is accomplished using policy research and analysis, consensus building and dialogues, capacity building, monitoring and evaluation.

Our Objectives

- Integrate multi-disciplinary and multi-stakeholder perspectives concerning issues of development.
- Promote wider consensus through research and analysis, on effective policies.
- Engage and work at local, district, state, national, South Asian, regional and global levels.
- Provide research support to developing countries for development and the negotiation process for international agreements.
- Carry out policy research that accounts for the political economy of the society and the effectiveness of governance.

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

1. Policy Dialogues and Dissemination.
2. Training and Capacity Building.
3. Research and Analysis for Decision Support.
4. Research in Action, Monitoring and Evaluation of Projects.

Preface

Despite the hardships of the pandemic, IRADe emerged stronger and better equipped to face the 'new-normal' scenario. The IRADe team continued to engage multiple stakeholders on policy and research related aspects in the areas of energy, including green energy, climate change and environment, sustainable development, gender and agriculture. We even added new members to our team.

Our notable achievements this year in climate change research have been in adaptation, mitigation and negotiation. The Odisha State Disaster Management Authority adopted many suggestions from the Heat Stress Action Plans developed by IRADe for Bhubaneswar. IRADe established South Asia Heat Health Information Network Forum (SAHHIN) - a platform for promoting regional cooperation and collaboration for heat adaptation in South Asia in association with local bodies. IRADe also prepared Disaster Resilience Action Plans for the cities of Shillong and Gangtok. To ensure state-level climate mitigation for climate change, IRADe analyzed the power sectors of Odisha and Assam. IRADe also assessed progress in NDC in many sectors.

In South Asia, the country reports for electricity models of Bhutan, Bangladesh and Nepal were prepared. The IRADe team analyzed the impact of the COVID-19 pandemic on the South Asian power system and suggested mitigation strategies to be adopted and ways to create a resilient power system in the region through cross border interconnections and cooperation.

For the South Asian Region, the SARI/EI team at IRADe also finalized Regulatory Interventions for Grid Discipline and Grid Reliability and suggested the creation of forums of Transmission Utilities and also of System Operators, assessment of the potential of gas / LNG for Regional Energy Cooperation in the Bangladesh, Bhutan, India, Nepal and Sri Lanka (BBINS) region, for which stakeholder consultations were held.

We launched the IRADe Covid Newsletter to report on COVID-19 related research and converted it to the IRADe Newsletter (IRN), which reaches out to more than 2000 stakeholders globally across various sectors. It has helped us to keep you informed of IRADe's various endeavours.

Dr Kirit Parikh and I thank our colleagues, peers and students for hosting and celebrating our birthdays. The series of nine KP@85 Conferences brought together more than 250 experts to discuss topics ranging from power systems, health, economy and livelihood, to power, agriculture, food and nutrition, and production planning to flood management and climate change, coordinated by Dr Probal Ghosh.

JP@80 saw policymakers, scientists, and leading academicians from across the globe converge at the virtual session. A Festschrift is also in progress.

We are getting ready for IRADe's 20th anniversary year 2021-2022, beginning September.

I thank Sharmistha Ghosh, Ananya Bhatia, Reema Bardhan and Rohit Magotra for their contributions in bringing out this Annual Report.

I convey my best wishes to the readers.

Jyoti Parikh

Professor Jyoti Parikh, PhD
Executive Director, IRADe

Contents

Climate Change and Environment

1.1 Climate Adaptive Action Plans to Manage Heat Stress in Indian Cities

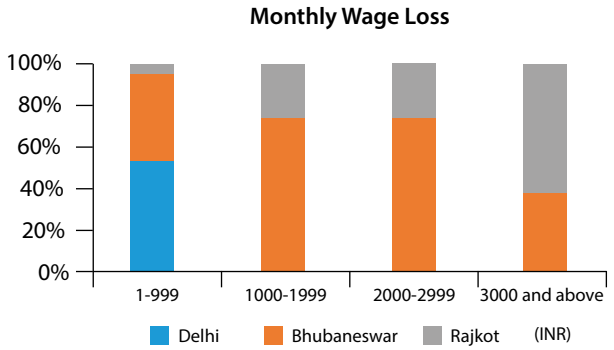
IRADe, supported by the International Development Research Centre, Canada (IDRC) and in collaboration with municipal corporations in Bhubaneswar, and Rajkot, developed Heat Stress Action Plans (HSAPs). The HSAPs include mapping vulnerable areas, early warning systems, concrete measures for gender differential needs to address risks, community awareness campaigns, and specialized training to improve the public health system's preparedness. More than 500 public health professionals and front-line health workers were trained to prepare and manage heat stress illness and associated risks. The HSAPs in these cities will support India's medium-term development planning, especially prioritizing and integrating adaptive resilience within the agenda of climate-resilient smart cities.

Some of the key highlights of the project are presented below:

1.1.1 Heat Stress Vulnerability Assessment

The cumulative ward-wise heat stress vulnerability analysis for Rajkot, Bhubaneswar and Delhi indicated low-high vulnerability of urban poor and low-income groups due to lack of minimal basic amenities to cope with heat stress. Among the outdoor workers, daily wage male labourers are most affected. High-risk symptoms of heat exhaustion are evident in the working-class age group. The analysis identified vulnerable locations and the vulnerability factors in the specific city wards. Some of the key inferences of the study follow:

- Asbestos rooftops in Rajkot, cement rooftops in Delhi and rudimentary housing types in Bhubaneswar add to the heat stress. Lack of ventilation leads to hot and humid conditions. Thermal comfort factors need to be considered for constructing low-income houses.
- Water scarcity in Rajkot and Delhi in the surveyed pockets was observed. Irregular electricity supply in 50-80% of the survey locations was reported in Delhi and Bhubaneswar. Water availability and reliable electricity supply need to be prioritized for building adaptive capacity to heat stress.
- All the three cities recorded over 25% productivity loss during the summers. The male working population recorded the highest productivity loss in Delhi (1-3 hrs.); in Bhubaneswar, male and female populations recorded nearly an entire day of productivity loss. The productivity loss among casual workers was high (30%), with Rajkot recording a higher loss (33%).



Heat Stress Action Plans (HSAPs)

Climate Adaptive HSAPs were revised for Rajkot and Bhubaneswar. The Action Plan provides a framework for implementation, coordination, and evaluation of extreme heat response activities, as well as creating awareness of heat-related illness to reduce the impact of heatwaves on health, productivity and livelihood. The HSAP of Bhubaneswar was incorporated in the Heat Wave Action Plan for Odisha, 2020 by the Odisha State Disaster Management Authority (OSDMA).

1.1.2 Heat Wave Action Plan Initiatives

Review of the Heat Action Plans (HAPs), South Asia

This report examines the HAPs that are currently available in South Asia. The review reports revealed that India is the most proactive in developing and implementing HAPs in India. About 100 cities and 23 state governments have developed HAPs. Karachi in Pakistan is the only other city in South Asia, apart from Indian cities, with a detailed HAP. This review report is important to identify gaps and to improve the existing HAPs and will also act as a manual for the preparation of future HAPs.

1.1.3 Dissemination of Heat Alerts

Heat Stress Advisory and Action Alerts for Summer 2020 were disseminated among government and urban local bodies such as the New Delhi Municipal Council (NDMC), Rajkot Municipal Corporation (RMC) and the Government of Delhi.

South Asia Heat Health Information Network Forum (SAHHIN)

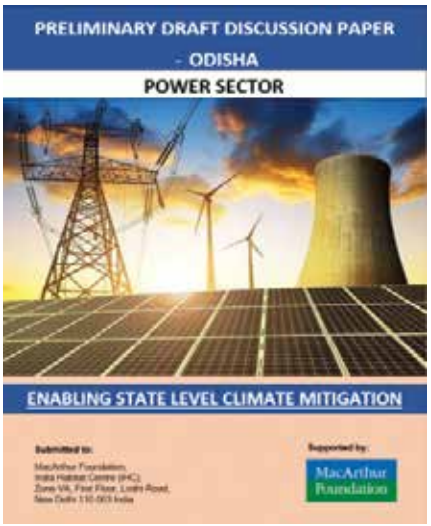
A platform for promoting regional cooperation and collaboration for heat adaptation in South Asia was established. SAHHIN will promote evidence-driven interventions, shared-learning, co-production of information, synthesis of priorities, and capacity building to empower multi-disciplinary actors to take more effective and informed action for heat stress mitigation and adaptation. SAHHIN has been recognized as a regional node for the Global Heat Health Initiative of the World Health Organization and the World Meteorological Organization.

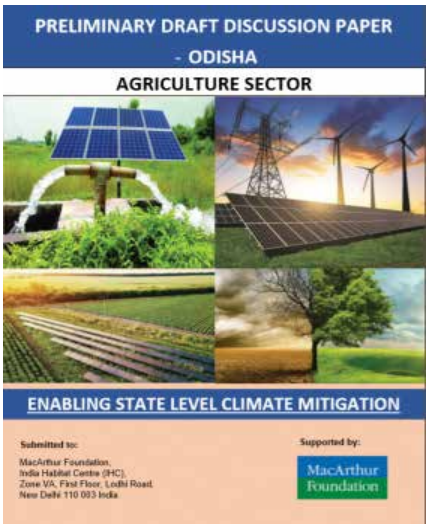
Duration: November 2017-January 2022
Supported by: International Development Research Centre (IDRC), Canada

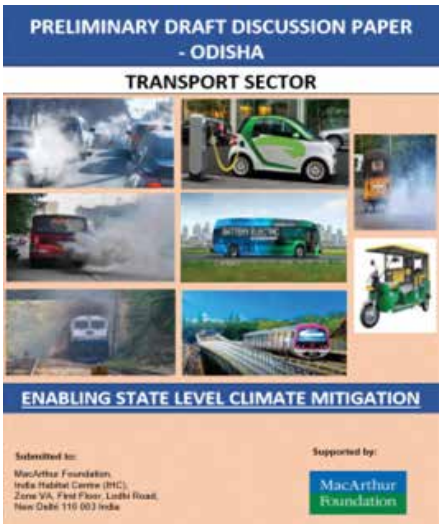
1.2 Enabling State Level Strategic Actions for Achieving NDC- Odisha

A detailed study to formulate and suggest policies to reduce carbon dioxide (CO_2) emissions and increase the share of renewables in the energy mix for Odisha has been carried out. Three draft discussion papers for Odisha for power, agriculture, and transport were prepared.

Power Sector: The power sector analysis of Odisha focused primarily on supply and demand-side interventions that are in prevalence and the additional ideas that can be implemented at policy and market level. Odisha has a significant potential to cut Greenhouse Gas (GHG) emissions by reducing the technical losses in its distribution system. As per IRADe's analysis, a 10% reduction in technical losses would have resulted in CO_2 abatement of 0.6 Million tons in FY 2017-18. Odisha has almost doubled the capacity of thermal Captive Power Plants (CPPs), as compared to grid thermal power plants. The CPPs are small and inefficient as compared to the large-scale grid plants. In IRADe's analysis, scenarios were created to analyze the effects on emissions if a sample of 7 GW of these CPPs were shifted to the grid. In a scenario where captives are shifted to the current Odisha grid, there is a reduction potential of 10 million tons of CO_2







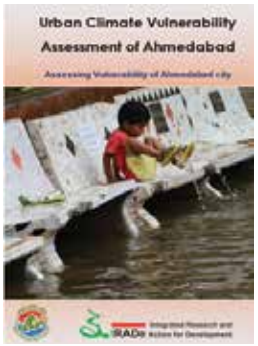
in 2018-19. However, to achieve such a transition, a 30% reduction in industrial tariffs is required.

Agriculture Sector: In Odisha, farmers rely primarily on diesel engine sets for irrigation. A market model was developed for the shift from diesel irrigation to community based solar irrigation systems. The community based solar irrigation system is the cheapest irrigation ene rgy source for farmers after heavily subsidized electricity. Similar to Gujarat, IRADe analyzed the financial implications for the stakeholders for the conversion of the currently electrified irrigation pump to a grid integrated solar irrigation system. GHG emission savings due to transition from fossil fuel-based energy to solar energy irrigation system is also estimated for Odisha under different levels of conversion.

Transport Sector: IRADe is doing a similar study for Odisha and Assam in tandem with the research and analysis completed for Gujarat. In Odisha's transport network, penetration of electric vehicles (EVs), the share of public transport, and the accompanying cost of infrastructure and investment requirements were studied. Financial modalities for lowering the cost of EVs and market-based policy recommendations for the state level to benefit all stakeholders were also considered. IRADe signed an institutional agreement with CEPT Research and Development Foundation (CRDF), Ahmedabad, for transport sector research in Gujarat, Odisha and Assam. IRADe and the Ramaiah Public Policy Center (RPPC), Bengaluru, signed a Memorandum of Understanding (MoU) for a state-level transport sector research.

Duration: 1st September 2018 to 28th February 2021 (Ongoing)
Supported by: MacArthur Foundation, USA

1.3 Urban Climate Vulnerability Assessment for Ahmedabad

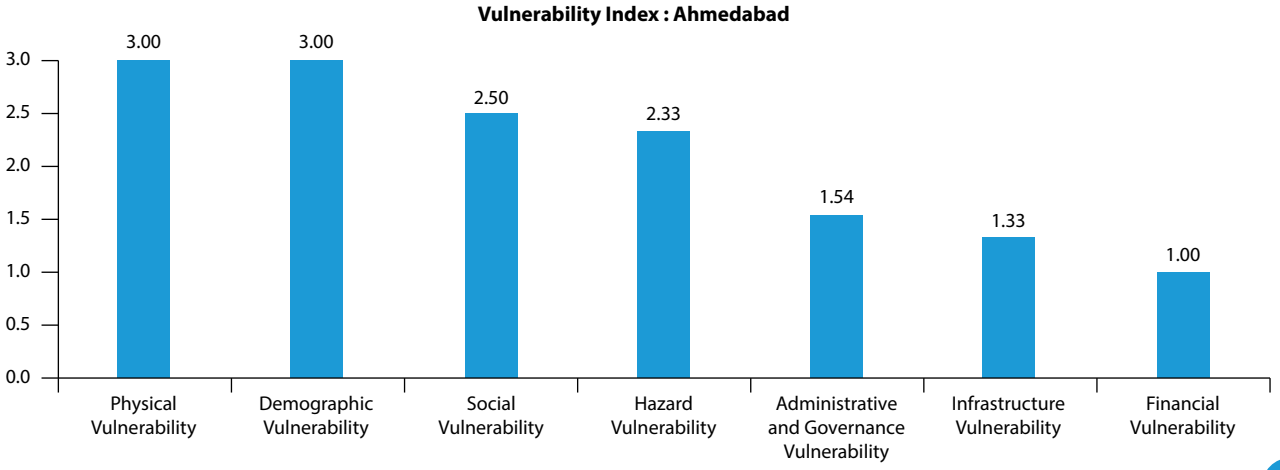


The detailed vulnerability assessment of Ahmedabad was done through the Urban Climate Vulnerability Assessment Framework developed by IRADe. The city has high exposure to climate-induced disasters like heat stress and urban floods. The city scores highest in physical and demographic vulnerability due to its high annual exposure to hazards, high population density and decadal growth. The social vulnerability stands next, as around 13% of the population resides in slums near the high-risk zone. The total climate vulnerability score for Ahmedabad city is 2.10 out of the highest score of 3.00. The city has been rated as a medium risk city and is overall ranked second in the comparative vulnerability of seven cities, which include Delhi, Mumbai, Chennai, Shillong, Bengaluru, Srinagar and Ahmedabad. The report also identified priority sectors for investments and governance strategies to strengthen the climate resilience of Ahmedabad city.

The Urban Climate Vulnerability Assessment Framework evolved by IRADe is a replicable framework that can help identify and target climate-vulnerable areas, sectors, vulnerable populations, raise awareness, and contribute to a monitoring strategy for assessing the climate vulnerability of cities.

Duration: April 2020 – December 2020
Supported by: Ministry of Environment, Forest and Climate Change (MoEFCC)

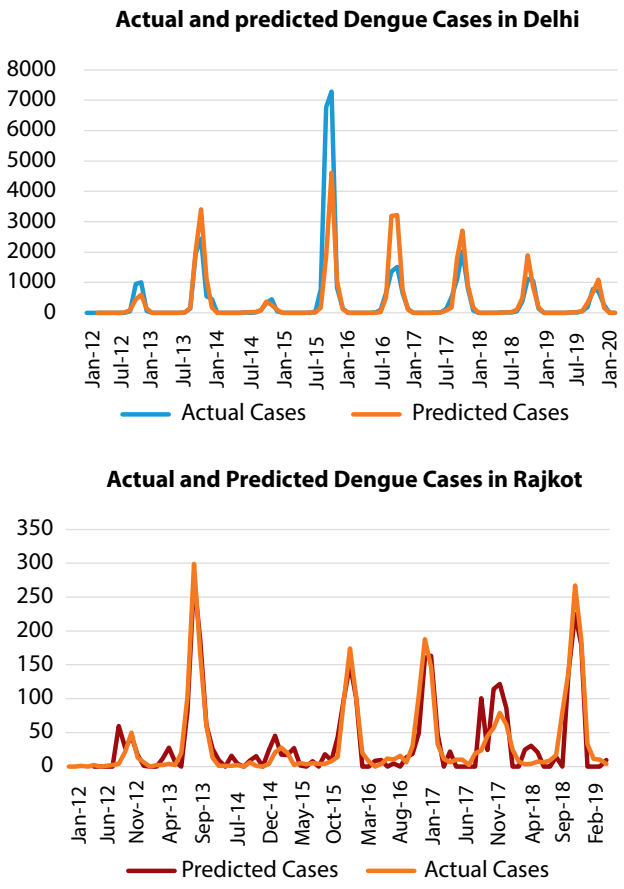
Figure: Urban Vulnerability Score of Ahmedabad



1.4 Spread of Dengue and Climate Change for Delhi and Rajkot

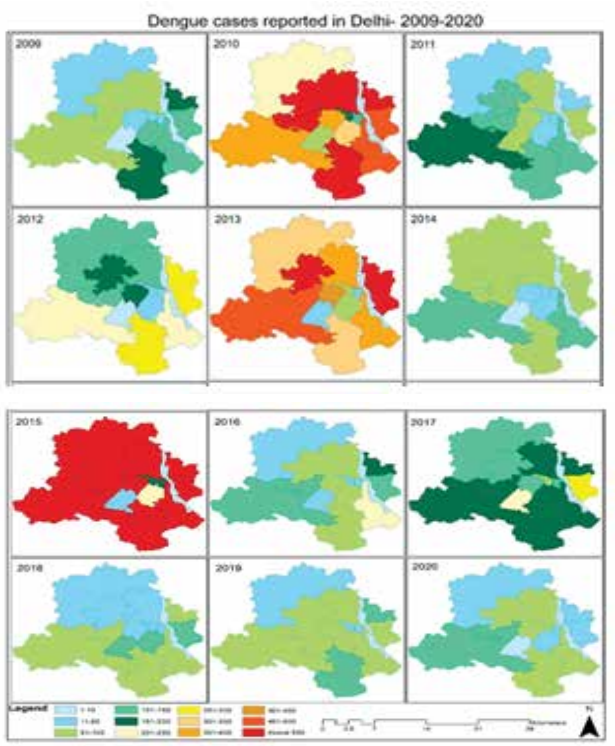
IRADe's study on the assessment of climate parameters affecting dengue incidences was completed. Statistical modelling included the establishment of a correlation between reported dengue data and climatic parameters for the project cities of Rajkot and Delhi. A regression model was developed to predict dengue cases in the future based on climatic parameters. The statistical analysis found that dengue cases were nonlinearly related to relative the humidity in the morning and evening, which, in turn, was related to climate variables of rainfall and the maximum and minimum temperatures. The prediction from the estimated statistical models of dengue cases for Delhi and Rajkot in the sample years of 2017 to 2019 closely approximated the peaks in actual dengue cases during this period.

Figure: Statistical projection of Dengue cases in Delhi and Rajkot



The study helps to understand the seasonality and identification of the hotspots in the project cities. The epidemiology of dengue in Delhi is changing over the years and is now making it an endemic disease. This indicates that Dengue is adapting to the local environment and soon will become a perennial feature in the city.

Map: Zonal level distribution of Dengue in Delhi 2014-2020 (Source: IRADe)



GIS-based Dengue Hotspot Maps were prepared to show dengue's spatial and temporal distribution over the years across the city. Delhi Cant., Rohini, Shahdara South, and Shahadara North are perennial hotspots that show consistently high dengue cases.

The ward-level analysis of dengue cases within the SDMC highlights that among its four zones, the South Zone reported the maximum number in the last three years (2017-2019). The identification of hotspots shows that the ward numbers 47s (Dwarka), 46s (Rajnagar), and 62s (Hauz Khas) are dengue hotspots and hence need targeted interventions for dengue management.

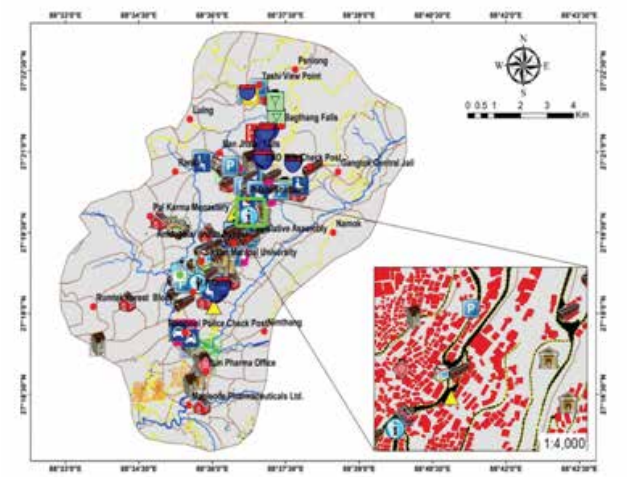
The project also evolved an action plan for dengue management in Delhi. The action plan covers preparedness, response to dengue in the pre/during/post dengue season and suggests an enabling framework for dengue management and its evaluation.

Duration: September 2017 – February 2021
Supported by: Department of Science and Technology (DST), Government of India

Sustainable Urban Development

2.1 Developing Disaster Resilience Action Plan for Shillong and Gangtok

IRADe prepared Disaster Resilience Action Plans (DRAPs) for the cities of Shillong and Gangtok. The plans review the existing urbanization scenario and the impact of natural disasters while assessing the disaster vulnerability of the project cities. Along with identifying the significant disasters, risk assessment of these disasters has also been carried out by documenting hazard inventories and mapping hazard-prone areas across the city. The plan also assesses the physical and socio-economic vulnerability and the impact associated with these disasters. The current critical and basic Urban infrastructure status is documented, and the recommendations are discussed to fill in the existing gaps.



The plan attempts to develop a comprehensive DRAP with hazard susceptibility (landslides, flash floods and earthquakes) and existing critical infrastructure maps at the scale of 1:4000 at ward level. The plan emphasizes the short-medium-long term structural and non-structural resilience action strategies/ measures to mitigate and adapt to the existing physical and socio-economic vulnerability. The plan provides a detailed implementation framework to strengthen the governance and administrative structure of the city, while procuring and strengthening the early warning systems and preparedness methodology for improved risk management in Gangtok and Shillong.

Duration: March 2017- December 2020 (Completed)
Supported by: Ministry of Environment, Forests and Climate Change (MoEFCC), Govt. of India, under the National Mission on Himalayan Studies (NMHS) program.

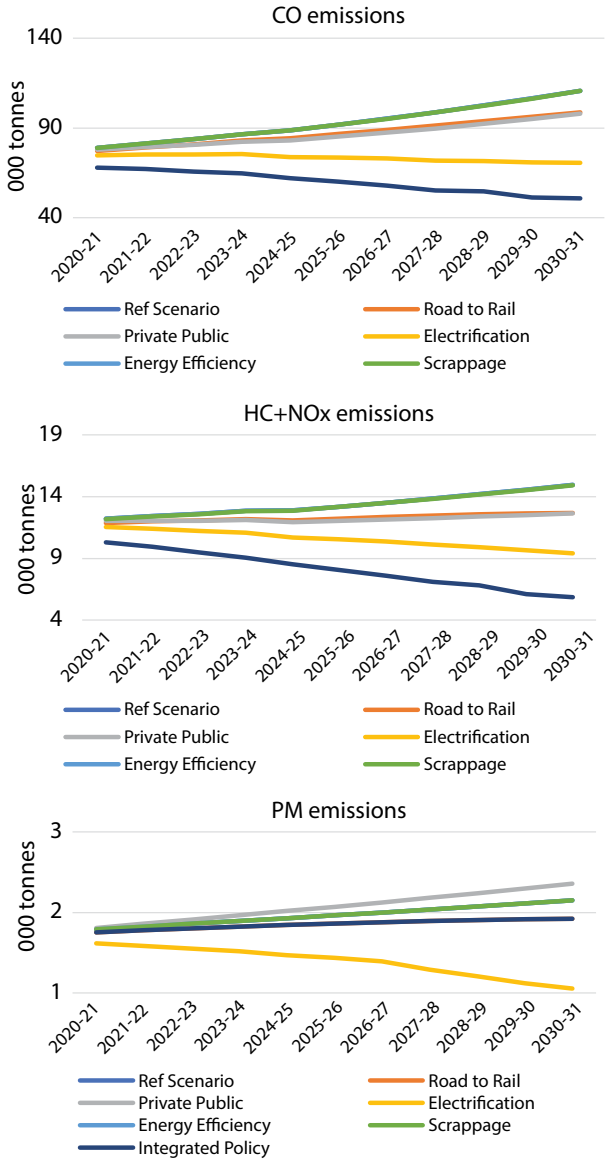
2.2 Process, Analysis, Observations and Modelling: Integrated Solutions for Cleaner Air for Delhi (PROMOTE)

IRADe has set up a detailed transport model for Delhi, covering modes like, metro rail, 2-wheelers, 3-wheelers, e-rickshaws, private cars, taxis, buses, Light Commercial Vehicles (LCV) and Medium Commercial Vehicles (MCV). Mode-wise registered data was used to estimate historic levels fuel wise on-road vehicles and sales. The total transport demand and mode-wise transport demand was estimated and projected using GDP and the population of Delhi.

The estimated model was used to construct scenarios and analyze emissions, on-road vehicle stock, fuel wise sales and fuel consumption. Scenarios considered are: 1) Modal shift - passenger transport from road to rail, 2) Modal shift -passenger transport from private

to public, 3) Electrification, 3) Energy efficiency, 4) Scrappage, and 5) Integrated policy. The CO_2, carbon monoxide (CO), hydrocarbons (HC) + nitrogen oxides (NOx) and particulate matter (PM) emissions for Delhi are projected for each scenario from 2015-2030. Bharat Standards (BS) VI emissions standards were assumed for future projections. Corporate Average Fuel Efficiency/Economy (CAFÉ) norms effective from 2018 and 2022 onwards have been assumed. Policies such as scrapping old vehicles, shifting private to public transport, and shifting from road to rail/metro that reduces the intensity by 3% to 6% were compared to a reference scenario. Fuel/energy efficiency and electrification policies have a significant impact on the reduction (24%) and reduce (40%); integrating all policies will reduce 63% by 2030. The scenarios show a significant impact on air pollution also. Policies such as shifting private to public transport, shifting from road to rail/metro and electrification reduce CO emission by 12000 tons, 13000 tons and 40000 tons in 2030 compared to 111000 tons in the reference scenario. Similarly, HC + NOx reduces by 2000 tons in the shift from private to public transport and shift from road to rail scenario and by 6000 tons in the electrification scenario in 2030 compared to 15000 tons in the reference scenario. The electrification scenario also reduces PM emissions by over 1000 tons while modal shift scenario reduce PM by more than 200 tons in 2030 compared to 2000 tons in the reference scenario.

IRADe's report on 'Socio-Economic and Health Impacts of Air pollution on Low-Income Households in Delhi' evaluates the socio-economic impact of air pollution through qualitative and quantitative analysis of air pollution's impact on individual households. This study analyses air pollution's impact on Delhi's most vulnerable communities through a survey and post-survey analysis and also proposes mitigation measures suggested by the people. Using GIS, five hotspots (30 households in each hotspot) for the survey were identified, and 798 respondents in 150 households were surveyed. Of these, 75% reported discomfort because of air pollution, and 71% developed direct health problems. The exposure to air pollution was highest (9-12 hours) among outdoor workers at 54%, and the risk is higher between November to February, wherein about 63% of the survey respondents reported facing ailments/related illnesses. During this period,



32% of respondents sought doctor's consultation. People spend as much as 25% of their annual income to deal with direct air pollution health impacts. Low-income people lost more work-days. 93% of the population was not aware of the Air Quality Index, and 68% were unaware of the air pollution mitigation measures implemented. 26% of respondents suggested that vehicles that fail emission tests and old vehicles should be banned. Respondents believed that air pollution could be controlled through the use of electric or CNG vehicles, adopting technologies to control and monitor emissions, establishing air quality action plans and improving fuel quality.

Duration: October 2017-March 2022 (Ongoing)
Supported by: Ministry of Earth Sciences (MoES)

Asia Centre for Sustainable Development

3.1 Implications of Declining Costs of Solar, Wind and Storage Technologies on Regional Power Trade in South Asia (BBIN Countries)

Energy modelling study by IRADe assesses the long-term implications of declining costs of solar, wind and storage technologies on the volume and direction of regional power trade among Bangladesh, Bhutan, India and Nepal (BBIN). The work involves the development of the Bhutan Electricity Model, updating of IRADe's existing 'Bangladesh, India and Nepal's Electricity Model', and running the regional integrated BBIN electricity model.

IRADe updated the Bangladesh electricity model, and the results of Bhutan, Bangladesh and Nepal standalone electricity models have been reported in the country reports. Further, IRADe is updating India's electricity model and will start the integration of the BBIN electricity model in Answer TIMES. From the standalone model of Bhutan and Nepal, it is observed that trade will help these countries to utilize their hydro potential. For example, in a low-trade case, the installed capacity of Nepal will reach only 15 GW, as compared to high-trade case where it reaches 44 GW by 2045. Similarly, for Bhutan, under a low-trade case, the installed capacity reaches 5 GW, and in a high-tradecase, it reaches 16 GW. However, for Bangladesh, in a standalone case, the volume of trade will depend on the cost competition of imported electricity versus imported fuels for power generation. For instance, in a low trade case, Bangladesh's domestic generation capacity requirements will increase to 81 GW by 2045, compared to 19 GW of installed capacity in 2019.

India's standalone model (not integrated with BBN countries) showed that by just assuming renewable energy (RE) cost decline, India will not meet its ambitious RE target of 450 GW by 2030. For achieving this goal by 2030, the Government of India will require policy push and fiscal support.

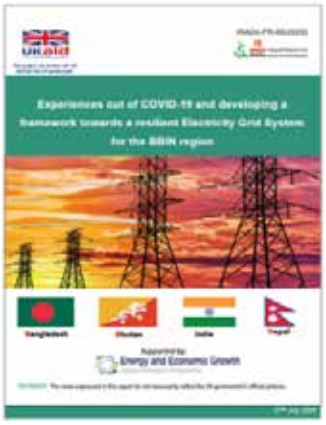
Similarly, for Bangladesh, the volume of trade will depend on the cost competition of imported electricity versus imported fuels for power generation.

Duration: March 2019 – December 2021; (Ongoing)
Supported by: UK Aid from the UK government under the Applied Research Programme on Energy and Economic Growth (EEG), managed by Oxford Policy Management (OPM)

3.2. Experiences from COVID-19 and Developing a Framework Towards a Resilient Electricity Grid System for the BBIN Region

This was a short study based on secondary research, power system data analysis, expert interaction and stakeholder engagements. The analysis focused on BBIN countries. This study involved a macro-level rapid vulnerability assessment and risks associated with the Electricity Grid System (EGS) in BBIN countries. A broad-level estimation was carried out to assess the extent of the impact of the COVID-19 pandemic on the EGS in BBIN countries, the challenges in operating the grids under these conditions, and how they were met. Specific analysis of the impact on clean energy

and assessment on system management and protection was made. In spite of the reduction in demand by a large quantum (around 25% of the peak demand and daily energy), the load-generation balance was intact. Most reduction in generation was carried out in the fossil fuel-based stations, while the generation in the case of RE sources was not curtailed, maintaining the balance in favor of clean energy. The institutional role was analyzed, along with a gap assessment. A comprehensive mitigation framework based on four key pillars has been prepared and suggested, and key actions have been scaled according to three escalating severity levels of the pandemic.



Duration: 01 May 2020 – 15 June 2020 (Completed)
Supported by: Energy and Economic Growth (EEG) research program of the UK Department for International Development (DFID)

3.3 Testing Electric Pressure Cooker Adoption in Socio-economic and Cultural Context of Nepal

As per the World Bank-Energy Sector Management Assistance Program (ESMAP) report 2019, 26.3% of households in Nepal use Liquefied Petroleum Gas (LPG) stoves and 73.5% of the households use wood for cooking. While Nepal lacks fossil fuels, it has 42 GW hydro generation potential, making it an ideal country to explore the viability of electric cooking. The study will implement a community-scale pilot study to examine the socio-economic and cultural acceptability along with the financial viability of Electric Pressure Cooker (EPC) adoption in Nepal. The study aims to accelerate the uptake of EPC in Nepal through members of women communities in rural and urban locations.

The study area is in the district Kavrepalanchok of Nepal with Sahara Nari Chetna Skill Cooperative, an urban women community in Banepa municipality and Sabal Nari Chetna Skill Cooperative, a rural women community in Temal rural municipality. From each of these two cooperatives, 120 members having grid electricity were randomly selected. A structured questionnaire was administered to capture the household level cooking practices, fuel-mix, electricity status, intra-household gender dynamics, willingness to use and ability to pay for EPC. Out of the 240 households (HHs), 40 HHs were using collected fuel, 94 HHs were using biomass along with LPG, and106 HHs were using LPG for cooking. Data analysis of the preparatory survey helped in selecting 40 members each from both the communities for EPC distribution. IRADe organized a meeting in Nepal with selected beneficiaries to sensitize them about the pilot project. In the next phase, cooking diaries will be administered among the beneficiary HHs to capture their daily cooking practice uninterruptedly for six months.

Duration: 1st July 2020 to 30th November 2021 (Ongoing)
Supported by: Loughborough University, MECS Programme, UK

Women participating in e-cooking awareness meeting organized by IRADe (Banepa, Nepal)

4.1 Electric Vehicles Charging Patterns and Impact on DISCOM

This project aims to examine existing EV user profiles in Delhi, their charging patterns and establish a methodology for distribution utilities to predict demand at the Distribution Transformer (DT) level.

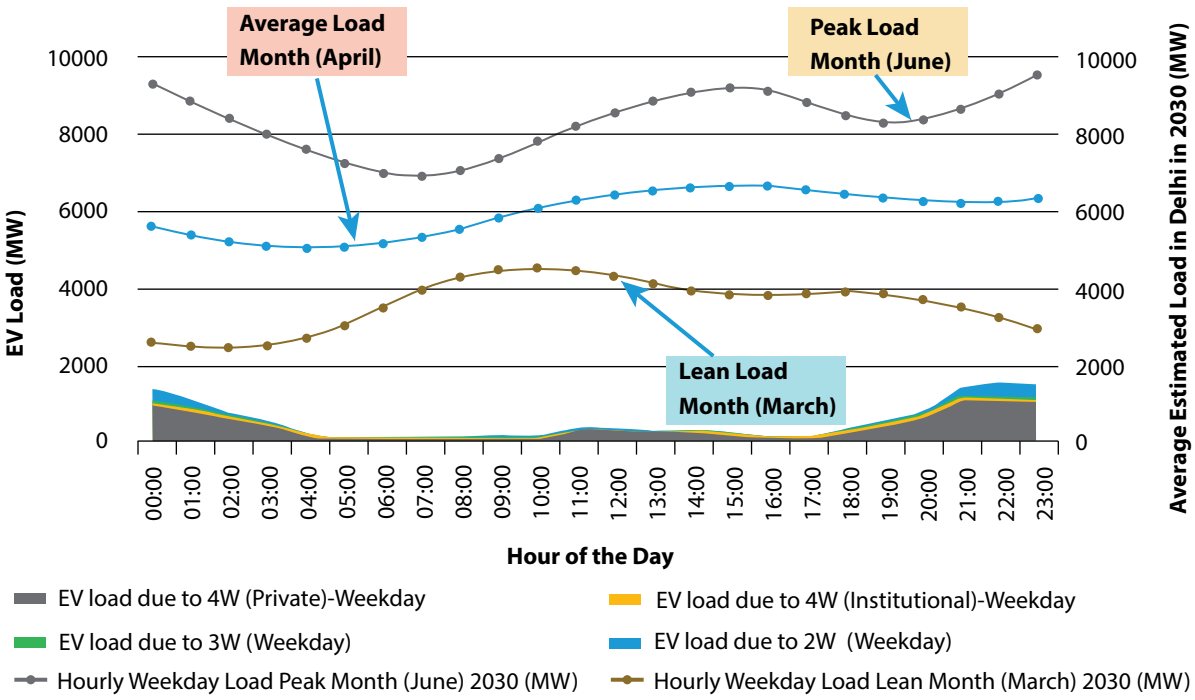
A primary survey of 502 respondents was conducted for five segments: electric-2W (e2W), electric rickshaw, Electric-Private 4W, electric-Institutional (Government, PSU and taxi fleets) 4W, and prospective EV consumers. A pilot survey was conducted by IRADe to assess the EV questionnaires that were designed to be segment-specific for understanding the usage patterns and preferences of the respondents. Among the prospective buyers, 47% did not choose an EV for their next purchase due to the absence of charging infrastructure. Other reasons were: performance issues (23%), range issues (39%), long charging time (8%), long-distance travel inefficiency (11%) and fewer mechanics (3%).

The e-rickshaw survey revealed that 44% of drivers purchased their e-rickshaw with monetary support. The survey shows that high-quality and affordable e-rickshaw batteries will reduce tolls. According to the e2W owners survey, 66 % owned only one e2W, while 34 % owned one e2W and other conventional 2W and 4W vehicles. 80 % of respondents who possess one e2W are salaried, self-employed, or students. 60 % utilize the e2W for their daily commute.

A model was developed to capture and analyze the charging habits of EV users. It was run on different data sets for weekdays and weekends to calculate the load effect of EV charging on the local grid. The impact of EVs has been estimated using the projected number of EVs for 2030 to arrive at an indicative load impact on the Delhi grid.

It can be interpreted from the figure above that substantial impact is due to the EV-4W with additional topping up impact on the grid due to EV-2W. Another important observation is that the impact of

Figure: Estimated Impact of EV on Delhi on Electricity Load in 2030 on a typical weekday



4W-(Institutional) vehicles is much subdued and the noon charging peaks which were seen based on the analysis of 2019-20 is dampened. This is due to the fact that the EV-4W (private) count is quite high in 2030 as compared to the EV-4W (Institutional). The figure highlights the impact of EV charging on the estimated hourly electricity load on peak and lean months.

EVs in 2030 have the potential to contribute 17% over and above the peak month electricity load requirement. This contribution may increase to 54% of the total electricity requirement in the lean month. Hence, it is imperative for the distribution system to plan for EVs coming into the system.

Duration: May 2019 – July 2021
Supported by: Shakti Sustainable Energy Foundation (SSEF)

4.2 Gulf-Undersea-India (GUI) (phase 2)

Is the undersea link between India and the Gulf viable? If so, under what circumstances? For this research study, Energy and Economic Growth (EEG) selected IRADe as an Indian partner to support the project with data, qualitative analysis, modeling validation, stakeholder consultation, strategy building, planning and roadmap. Some of the key outcomes of the study highlight that the economic viability of the GUI project will largely depend on the Indian side the market size, demand at different times-load curves, local REN and other resource availability, and the final energy price delivered. On the Gulf side, it is dependent on the supply, price of electricity and geophysical feasibility. In addition, another critical decision-making factor for GUI trade could be carbon pricing/taxing, which, at the moment, is very low in India. The future prices of the carbon tax could make the GUI potential more attractive than in the current context. Further, GUI interconnection could help India in achieving more RE as its own solar photovoltaics (PV) potential of 749 GW might get fully utilized by 2050. Under some of the carbon price scenarios, the model showed the possibility of installation of 25 GW interconnector capacity between the Gulf and India reflecting absorption of around 25 GW of solar capacities in India from the Gulf region.

Duration: 04th January 2021 to 31st March 2021 (Completed)
Supported by: Oxford Policy Management Limited (OPM), supported by FCDO

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

The SARI/EI program addresses issues of policy, regulation, legal, technical and market aspects of advancing regional energy integration and Cross Border Electricity Trade (CBET) in South Asia. In its current phase, the program is focused on moving the region to trilateral and multilateral power trade, sustainability of CBET through institutionalization, and establishing the South Asia Regional Energy Market. The SARI/EI Secretariat at IRADe executes the program in consultation with the Project Steering Committee and three Task Forces. Demand-driven studies on various studies for promoting CBET were undertaken, as proposed by IRADe and approved by the PSC. A list of studies completed/undertaken during the year is given below.

Studies Undertaken

Compendium of Electricity Regulations for South Asian Countries

This was another step in the project's endeavour toward better energy integration and cooperation within South Asian countries, under the aegis of the South Asia Forum for Infrastructure Regulation (SAFIR) working Group on "Regulatory Cooperation to Facilitate Knowledge sharing, addressing Cross-Cutting Energy/Electricity Regulatory Issues and Capacity Building in South Asia", which SARI/EI is partnering. Since the regulatory frameworks of the power sector are at various stages of evolution across South Asian countries, the compendium is intended to act as a ready reference for all the member states to study and comprehend the regulatory frameworks in the region. The compendium, with updates till December 2019, was released on 19th February 2020. The updated compendium till June 2020, was completed in February 2021. It has been uploaded on the SARI/EI and IRADe websites, and sent to important stakeholders. The next stage of updation, till December 2020, is in progress.

Impact of COVID-19 Pandemic on South Asian Power System Operation

This paper describes in detail the different challenges faced by the region's power sector due to the pandemic and the various mitigation strategies adopted. It further gives an insight into the robustness

of the systems and principles on which the electricity grid in South Asia in general, and India in particular, are operating. It also gives an opportunity to appraise how the standard systems and procedures can be refined further to meet such situations in the future. The paper also touches upon the impacts on the CBET flows and related impacts due to the reduction in demand in the neighbouring countries within South Asia, particularly Bangladesh, Bhutan, India and Nepal. The demand declined during the COVID-19 lockdown due to limited economic activities in all the countries, translating further into a decline in cross-border power trade in the region. In respect of daily energy consumption, the additional loss was around 900 GWH of energy, which constitutes around 25% of the normal consumption in the electricity grid. Due to the steep decline in demand, market-clearing volume in the day-ahead market in the Indian power exchange also dropped by 27.6%, and market clearing price declined by 16%. During the lockdown period, the Indian electricity grid played a pivotal role in maintaining load generation balance in the region. The paper highlights the absorption of the additional power by the Indian electricity grid from the grids of the neighbouring countries in South Asia, in spite of heavy load reduction in its own (Indian) grid. This is an apt example of how nations can help each other through cross border interconnections during adverse situations and calamities.

SAFIR Regulatory Newsletter (Quarterly)

SARI/EI Project Secretariat has been mandated to prepare quarterly newsletters for SAFIR. This Newsletter aims to provide a summary of the latest notifications on policies and regulations being published by the South Asian countries in the field of energy - electricity, oil, and coal and gas. The introductory edition of the SAFIR Regulator Newsletter (April-June 2020) was released at the SAFIR and SARI/EI Annual Conference (virtual) on 15th March 2021, in the presence of the Power Secretary, Government of India, and senior members of the power sector across South Asia.

Study on Regulatory Interventions for Grid Discipline and Grid Reliability in the South Asian Region

As part of the SAFIR Working Group activities, review and analysis was done for the existing relevant electricity regulations, mechanisms and technical frameworks with respect to grid discipline and grid reliability of each of the South Asian countries, both from the perspective of integration/unification of regional grids of the domestic power system of a country, as well as cross-border power grid interconnection. Regulatory measures/interventions needed for ensuring grid discipline and grid reliability in the region were suggested. The areas of intervention include – System planning, System construction and safety, Grid connection, System operation, Scheduling and dispatch, Information and Communication Technology (ICT), Monitoring and Compliance.

Some of the key regional regulatory recommendations were: 1) To develop ancillary service markets for primary, secondary and tertiary responses in the country; 2) Introduce an incentive/penalty-based imbalance settlement mechanism and the rules and procedure for implementation of the same; 3) Specify penalty for mis-declaration by the generating companies and inaccurate demand forecasting by distribution companies; 4) Specify a detailed transmission planning criteria to be followed by the Transmission Licensee to achieve economies of scale, reduction in network congestion, strategy for generation and load alternatives and renewable energy integration; 5) Lay down the procedure for operational planning, system security, demand management, outage management and partial or complete grid disturbance, define key system performance indicators, define grid incidence

and grid disturbance events; 6) Take steps for adoption of advanced technology, including ICT; 7) Specify cyber security-related aspects to identify critical information infrastructure; and 8) South Asia Forum of Electricity/ Energy Regulators (SAFER) should act as a neutral, apolitical forum/ platform for regulators and experts to assemble, brainstorm, strategize and recommend specific steps to address the multiple barriers to CBET.

Study on Building Consensus and Developing a Strategy Paper on Creating Regional Technical Institutional Mechanism in the South Asia Region for Promoting CBET

The study is being carried out by SARI/EI/IRADe, towards forming a Forum of Transmission Utilities (SAFTU) of the countries in the South Asian region, for coordinated, reliable and secure operation of the interconnected transmission network, as well as for coordinated system planning and integrated system/ network development and grid code harmonization in the region.

The study will recommend a detailed strategy, along with the function, structure, mode of operation and creation of the institution, by taking into account the aims of SAFTU.

Building Consensus and Developing a Strategy Paper for Creating the South Asia Forum for Electricity Market for Promoting CBET

The Task Force 3 (on Power Markets) of the SARI/EI program recommended the creation of the South Asia Forum for Electricity Market (SAFEM), a forum of market players of the South Asian countries. It is envisioned to be critical for the creation of power markets for CBET. The Forum would work towards various facets of the electricity market, including market structure and products, market design and rules and payment mechanism of trade.

A questionnaire for engaging with stakeholders on the development of the SAFEM was sent to various stakeholders for their responses. The draft Inception Report which covers the "as-is scenario" in South Asia and globally, in terms of power markets, and literature surveys, is currently underway. The study will recommend a detailed strategy along with the function, structure, mode of operation and creation of the SAFEM by taking into account the aims of the SAFEM.

2nd Edition of BIMSTEC Energy Outlook 2035

This is being prepared for trade within the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) region as part of a collaboration with the BIMSTEC Secretariat. The study includes analysis, updating, review of the energy sector (power, gas, oil) outlook of the seven BIMSTEC countries and preparation of the Energy Outlook till 2035. The draft report covers the past, present and future projections in the energy value chain that includes generation, transmission and the distribution sectors and is under finalization. This study would also cover the reforms and updates, as well as modelling methodology for estimating trade in energy in the BIMSTEC countries. After being reviewed internally, the draft report on the same has been finalized and shared with the BIMSTEC Secretariat for approval. The capacity of electricity generation in BIMSTEC is estimated to increase at a compounded annual growth rate of 6.7%, reaching 1220 GW by 2035. The energy transition is clearly evident, with the share of renewables increasing to 50% in 2035, from 22% in 2020. Electricity generation is expected to grow at a compound annual growth rate of 4.7%, reaching 3952 TWh in 2035. Based on the assessment, it is estimated that CBET in the BIMSTEC region has the potential to increase up to 7 times, from 15,618 MU in 2020 to 127,259 MU in 2035.

White Paper on Creating Regional Technical Institutional Mechanism, i.e. South Asian Forum of System Operators in South Asia Region

The proposed regional institutional mechanism for system operators, i.e. SAFSO, aims to be a neutral entity in the form of an institution, that will function with the spirit of cooperation and collaboration. Some of its proposed important functions include: a) Promote safe, reliable, efficient and economic system operation; b) Facilitate the work of development and implementation of common procedures/guidelines and frameworks for system operation; c) Promote technological excellence and harmonization of practices; d) Promote compliance

to reliability standards; e) Promote capacity building in power system operation; f) Promote development of a Code of Ethics for Load Dispatchers in South Asia; g) Provide technical support and assistance to Regional Regulatory Institutional mechanism and Regulators of South Asian countries (SACs) on the matters related to system and market operation; h) Promote knowledge exchange within system operators of SACs; and i) Act as a platform for cross-cutting deliberations and exchange of ideas towards promoting safe, secure, reliable and efficient power system operation in South Asia.

It has been proposed that SAFSO can be started with a simple and loose structure that can undertake activities that are mainly advisory in nature, with focus on harmonizing and sharing best practices of power system operation across the region. It can gradually evolve into a more formal and legally incorporated entity over time. The study will be further fine-tuned after stakeholder consultation with the different countries in South Asia.

Analytical Study to Assess the Potential of Gas for Regional Energy Cooperation

The study is focused on assessing the potential for exploration, production and trade of gas, in the region as well as globally, with the ultimate objective of promoting energy cooperation in the BBINS region. The Report takes into account the evaluation of potential energy resources and demand across the countries, as well as its economics till 2040. It will assess the potential for trade in gas, including the assessment of the benefits of multilateral trade over bilateral trade. Stakeholder consultations were held with Indian stakeholders in December 2020 and with all other stakeholders in January and February 2021. The report has identified benefits for all SACs, from optimal utilization of domestic gas resources as well as imported LNG in the region, use of natural gas a substitute fuel for oil in transport and industries, as well as benefits from creating a South Asia Gas Exchange for trade of gas for one day for further optimal utilization of natural gas. The report estimates the potential benefits from intra-regional trade in gas in the BBINS to be about USD 1.2 billion/annum in 2025, which can go up to USD 1.9 billion/annum in 2030, and approx. USD 3.6 billion/annum by 2040.

Report on Risk Mapping and Impact Assessment of COVID-19 on South Asian Power Sector

A comprehensive study deals with issues related to the impact of COVID-19 on the entire power sector in South Asia, analysis of the issues and proposed policy measures to deal with the situations arising due to the pandemic. The study analyses the risks and impact on power demand, power generation, supply chain, projects under construction, system operation and finances of the power utilities and climate investments. It proposes policy recommendations to the South Asian governments to deal with such situations in the future. This study comprises data from 15th March to 30th May 2020, on a daily basis. It also compares data from January – December 2020, on a monthly basis, as compared to the same period last year. The draft report has been submitted to USAID for approval. It proposes a resilience framework for reducing the above-mentioned risks. The findings pertain to policy recommendations on restructuring of retail tariff, replacement of cross-subsidy by direct subsidy, incorporating the pandemics under the disaster management plans and workers' safety.

Creating Country Folders on Energy Metrics

The SARI/EI team is preparing country folders of all different South Asian countries, serving as a ready reference with details/data on energy, such as cross border energy trade (current condition and plans for future expansion), power supply and demand, with plans for future expansion, and installed generation capacity, peak demand for each of the SACs, along with their institutional setup. All the completed country folders are available on the SARI/EI website through pre-approved access.

Development of South Asia Energy Database (SAED) for South Asian Countries

The Portal is being developed as a part of the mandate of the SAFIR Working Group. SAED will be a web-based application on the official SARI/EI and SAFIR websites, and shall include the whole database in an electronic format. The database shall have search filters and graphical data representation for the benefit of policymakers, regulators, energy utilities, and researchers. The database will allow users to

investigate and develop several standard and custom-made reports, including on groupings of various energy parameters such as the installed capacity of different sources of generation, country-wise and for the region, energy reserves, energy consumption and supply, and sector-wise consumption for the countries and the region.

Assessing the Potential Benefits of Cross Border Electricity Trade (CBET) for Affordable Supply of Electricity, Facilitating Grid Balancing of Renewable Energy Integration, and Suggesting a Framework for Ancillary Service Market in the South Asia Region

This study aims at assessing the potential reduction in the average cost of supply of electricity in South Asian countries with an increase in CBET, for optimal utilization of generation assets in South Asia, analysis of various market mechanisms internationally for grid balancing and ancillary services and to propose a transparent market structure and a broad framework for ancillary services in the region. This study is also being conducted for the SAFIR Working Group. Based on the comments and suggestions received from USAID, the draft Terms of Reference (ToR) was modified, and the finalized draft has been shared with the SAFIR Secretariat for approval.

Developing a White Paper on "Regional Parliamentary Forum on Energy Cooperation and Energy Trade in South Asia."

The objective of the Regional Parliamentary Forum is to be a high-level policy-level forum of Parliamentarians of South Asian Countries (focusing on BBINS) to discuss, deliberate, and share knowledge for advancing Energy cooperation and Energy Trade in South Asia. It is envisioned to enable regional energy cooperation for a connected, inclusive, resilient and sustainable South Asia. It aims to facilitate dialogue and knowledge-sharing on avenues and framework of cooperation between BBINS countries on issues related to energy trade; provide collective assistance for taking forward discussions on energy cooperation in member countries; propagate the need for energy trade and cooperation through outreach, dissemination and engagements with relevant stakeholders; enable smooth sharing of relevant datasets from member countries for informing the discussions of the Forum, and promote sustainable development of energy resources in the BBINS region with a focus on the integration of renewable energy, energy efficiency and innovative technologies.

Assessment of the Cross Border Natural Gas Trading (CBNGT) Potential in the South Asian Countries

The study will critically review and analyze the existing literature and work done so far by SARI/EI in CBNGT in the South Asian region. It will develop a Regional Natural Gas Trade Model (RNGTM) for the region and undertake a comprehensive modelling exercise to identify the CBNGT potential in Afghanistan, Bangladesh, Bhutan, India, Pakistan, Nepal, Sri Lanka and the Maldives - over the next 20 years. The study will also suggest a regional roadmap and an action plan for initiating/accelerating the CBNGT in the region and a strategy for importing gas from outside the region to meet the demand, as well as starting a gas hub in the region.

Transition of Bilateral Power Trade to Trilateral and Multilateral Power Trade in South Asia"

The proposed study aims to document and analyze the international best practices in trilateral and multilateral power trade across the globe. Further, it will identify learning and inferences for South Asia, with the aim of developing a regional framework for South Asia. Through this exercise, it is intended to learn from the evolution of bilateral to trilateral and multilateral forms of cross border power trade in the different regional grids across the globe, as well as the best practices for such trade prevailing in these regions. Based on this learning, as well as taking into account the conditions prevailing in different countries in South Asia, a Regional Framework for Trilateral and Multilateral Power Trade (RFTMPT) will be developed. The interim report has analyzed various international experiences. Some of the key lessons/inferences were drawn for south Asia such as – forming of South Asian regional bodies, harmonised grid code and regional planning documents.

Common Minimum Grid Code (CMGC)

Developed for South Asia, the CMGC lays down the rules, guidelines, and standards to be followed by

various South Asian participants in the system for cross border trade of electricity and to operate the power system in the most secure, reliable, economical and efficient manner. The objective of the CMGC is to: a) facilitate cross border trading of power, while ensuring secure, reliable, economical, and efficient operation of the grid, and b) facilitate the coordinated optimal operation of the South Asian grid and facilitate the coordinated and optimal maintenance planning of generation and transmission facilities in the grid. The CMGC for South Asia is divided into four chapters, i.e. Connection Code, Operating Code, Scheduling and Dispatch Code and Administration of the Grid Code.

Duration: October 2018 – September 2022
Supported by: USAID India

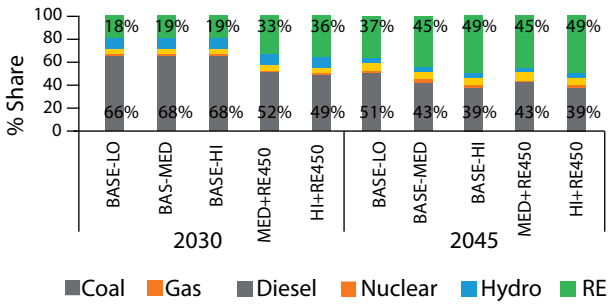
4.4 Low Carbon Economy Modelling Component of the Strategic Partnerships for Implementation of the Paris Agreement

Strategic partnerships for the implementation of the Paris Agreement (SPIPA) is a European Commission-funded project managed by GIZ in India. IRADe is one of the four modeling groups in India to build the capacity of Indian modelling groups for low-carbon modelling.

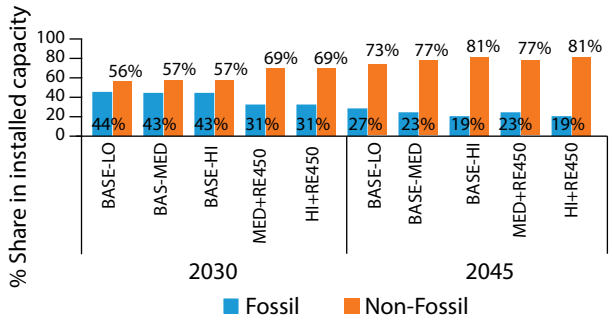
IRADe has undertaken research to analyze and evaluate the existing data and methodological gaps in various models in India to address the future climate change challenges. IRADe worked on its macroeconomic model and ANSWER-TIMES based power sector model in the model capabilities comparison template shared by the International Institute for Applied Systems Analysis (IIASA); coordinated with the Institute of Economic Growth (IEG) and the National Council of Applied Economic Research (NCAER) and provided inputs for the modeling comparison template; IRADe also contributed to the report, "Assessing the gaps in current research" prepared by the consortium.

Under the deliverables, IRADe worked on shifting the power systems model from ANSWER-TIMES platform to MESSAGE platform; extending it from a power systems model to a full energy systems model; upgrading the IRADe macroeconomic model from an Activity Analysis model to a Computable General Equilibrium

Generation Mix- RE versus Coal



Fossil vs Non-Fossil Capacity (% share)



(CGE) model; and improving the representation of energy commodity and sectors in the latest Social Accounting Matrix/Input-Output Table.

The base year data of the power systems model from 2011 to 2015 was updated. The transfer of the TIMES-based India Electricity model to the MESSAGE ix Model is ongoing. The work on India's electricity model began with the assessment of power sector fuel consumption. The team used the 2015 data on power sectors to expand the number of electricity-generating activities in the 2015-16 input-output matrix. The modification of the IRADe Macroeconomic model to a CGE model is ongoing. The generation mix for RE versus coal has been analyzed for 2030 and 2045 for various low-carbon scenarios.

To reinforce the modeling capacity at national and sub-national levels, the research team has completed training on the MESSAGE ix platform through multiple workshops by IIASA. The project trained young researchers from partner institutes like IIT Delhi and IIT Mumbai on the MESSAGE ix platform.

Duration: 1st April 2020 – 31st March 2022 (Ongoing)
Supported by: Ministry of Environment, Forest and Climate Change (MoEFCC), GIZ, IIASA and Joint Research Centre, European Commission

Poverty and Gender

5.1 Impact Assessment of Electricity Access on Health and Education

IRADe's study assesses the impact of quality of electricity access on health and education delivery in Bihar and Jharkhand. The study captures the status of electricity supply to primary health centres (PHCs)/ community health centres (CHCs) and schools in rural and peri-urban areas of Jharkhand and Bihar, by tracking metrics such as access, reliability, quality, convenience, and usage. The districts covered under this study in Jharkhand are Ranchi, East Singhbhum and Deoghar. Patna, Lakhisarai and Gaya were covered in Bihar. A list of 'tracer indicators' was used to gauge the presence or absence of key infrastructure and instruments at the PHCs/CHCs and schools.

In each state, the study team conducted surveys of fifteen health centres (CHCs/PHCs) and fifteen Government-run schools. Service satisfaction surveys of 150 patients/non-patients and 150 students were also carried out in each state. Apart from surveys, group discussions were also organized at health centres and schools to understand the staff's perspectives and concerns.

The Multi-Tier Framework (MTF) analysis identifies electricity supply issues that can affect the delivery of services offered by health and education facilities. Although multiple factors, such as medical staff, equipment and medicines, are necessary for adequate delivery of health services, energy plays a critical role in strengthening healthcare service delivery and improving health outcomes. PHCs/CHCs, having an emergency service facility, view access to uninterrupted 24x7 electricity as a critical component for handling emergency cases.

MTF findings for PHCs/CHCs and Schools from Jharkhand

The tier-wise disaggregated analysis revealed that 100% of the surveyed PHCs/CHCs fall in tier-5 for power capacity, followed by 93.3% for health and safety attributes, 73.3% for affordability, 66.7% for power supply from main/backup sourcesand46.7% for energy reliability. In terms of quality attributes of energy access, 86.7% of the surveyed PHC/CHCs fell under tier-4, and 13.3% under tier 0. MTF analysis of the non-residential schools revealed that 50% of the surveyed schools achieved tier-4 or higher for energy quality, legality, budget for operation and maintenance, affordability, and power supply from main/backup sources. 100% of the residential schools had reached tier-5 levels for power supply reliability, power supply from main/backup sources, legality, affordability, and power capacity. The installation of rooftop solar systems is credited for this improvement in residential schools.

MTF Findings for PHCs/CHCs and Schools from Bihar

In Bihar, 100% of the surveyed PHCs/CHCs fell under tier-5 for power capacity; more than 50% of the surveyed health facilities had reached tier-5 specifications for reliability, health/safety, and power supply from main/backup sources.

MTF analysis of surveyed schools in Bihar reveals that 80% of the schools in Bihar met the tier-4 conditions for affordability, followed by 73% for operation and maintenance budget, 47% for the legality, 27% for reliability, and 20% for power quality. However, 80% of the surveyed schools are still in tier-1 for the quality attribute of energy access; 40% are in tier-1 for reliability attribute.

In the absence of a secondary source of electric power in day schools, students complained that it becomes unbearable for them to sit in the class during power cuts in the summer season. During group discussions, teachers pointed out that students find it challenging to focus on study during power cuts on days when natural light is inadequate or the day temperature is high.

The availability of a secondary source of electricity improves the reliability of the power supply at the PHCs/ CHCs and schools. However, electricity in some of the surveyed residential schools is supplied by diesel-powered generators, which cannot be operated throughout the power cut duration, due to limited budget and expensive fuel. Some of the surveyed school authorities also reported worn-out batteries due to excess usage of inverters. Generators, without self-starter, at health centres impede the services as it does not provide instant electricity needed during an emergency.

In Jharkhand, the Jharkhand Renewable Energy Development Agency's initiative of solarizing CHCs and residential schools with battery back-up has improved access to reliable electricity. Electricity peak load analysis of health centres and schools will further help in installing solar rooftop solutions of suitable size. The study finds that it is important to raise awareness regarding energy efficiency aspects in the health and education departments. In consultation with the departments of energy, health, and education, there must be guidelines prescribing energy efficiency standards for future purchases of electricity-driven equipment and electric appliances.

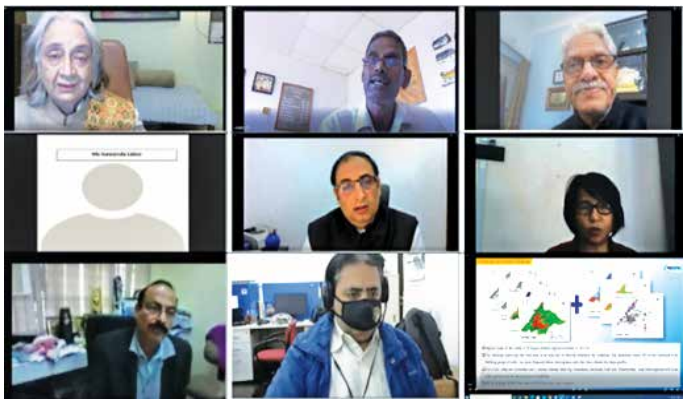
Duration: 1st September 2019 to 30th June 2021 (Ongoing)
Supported by: SHAKTI Sustainable Energy Foundation

Kasturba Gandhi Balika Vidyalay - Bero, Jharkhand

Conferences, Workshops and Meetings

Climate Change and Environment Workshops

"Stakeholders' Workshop on Developing Disaster Resilience Action Plan- Shillong", 15 December 2020



IRADe, in collaboration with the Meghalaya State Disaster Management Authority, organized a Stakeholders workshop to share the results and findings of the project on Developing Disaster Resilience Action Plan (DRAP) for Shillong. Discussions were made on the DRAP features and recommendations for improving the disaster resilience of Shillong.

"Stakeholders' Workshop on "Developing Disaster Resilience Action Plan, Gangtok", 30 September 2020

IRADe, in collaboration with the Sikkim State Disaster Management Authority (SSDMA), organized a workshop that deliberated on DRAP for Gangtok. Prof. Vinod Sharma, Vice-Chairman, SSDMA, was the Chief Guest and Shri P.N. Sherpa, Relief Commissioner-cum-Secretary Land Revenue and Disaster Management Department, Government of Sikkim, the Guest of Honor. An elaborate panel discussion followed presentations on "Disaster Resilience Action Plan," "Hazard and Risk mapping of Gangtok" and "Impact of urbanization on Gangtok city". The consultation was attended by more than 75 participants. Some of the key points of discussion were: relevance of ward-level resilience plans, the importance of GIS and remote sensing, the need for multi-departmental stakeholder collaborations, capacity building, issues of data interoperability and the need for a data repository.

National Workshop on "Climate Change and Cities: Urban Climate Vulnerability Assessment Framework", 29 September 2020

IRADe organized a national workshop inaugurated by Shri Durga Shanker Mishra, IAS, Secretary, MoHUA. It was attended by more than 200 officials. The national workshop deliberated on the key learning on Urban Climate Vulnerability Assessment Framework(UVAF) developed by IRADe. The UVAF implementation will meet the Government of India's dual objectives of Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR).

International

IRADe's Session on 'Climate Adaptive Heat Stress Management in South Asia at the Gobeshona 7th International Conference, 23 January 2021

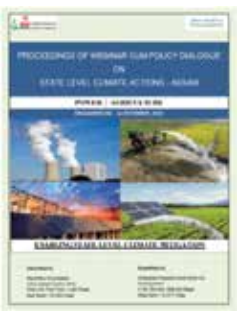
IRADe, supported by the IDRC, organized a session in association with the Global Heat Health Information Network (GHHIN), attended by more than 50 participants. The session deliberated on the research findings, policy gaps, and successful interventions for managing heat stress in South Asia and the need for research and participation of stakeholders to expedite Heat stress action in South Asia. Mr Rohit Magotra, Deputy Director, IRADe, announced the South Asian Heat Health Information Network (SAHHIN), an independent, voluntary, and member-driven forum of scientists, practitioners, and policymakers focused on improving the capacity building to protect populations from heat stress.

Energy Events

Webinar cum Policy Dialogue on 'State Level Climate Actions for Odisha's Power, Agriculture and Transport Sector, 2-3 September 2020.'

The key delegates at the workshop were Dr Saurabh Garg, IAS, Principal Secretary, Department of Agriculture, Govt. of Odisha and Shri Nikunja Bihari Dhal, IAS, Principal Secretary, Department of Energy, Govt. of Odisha, Chairman, Odisha Power Generation Corporation and Ms. Moutushi Sengupta, Director, India Office, MacArthur Foundation.

Webinar cum Policy Dialogue on Energy and Climate Change - Assam: 'State Level Climate Actions for Assam's Power and Agriculture', 14 December 2020



The welcome address was delivered by Dr Jyoti K Parikh, the special remarks were delivered by Ms Moutushi Sengupta, Director, India Office, MacArthur Foundation, the special address was delivered by Shri S. N. Kalita, Member (Technical), Assam Electricity Regulatory Commission (AERC) and the inaugural note was delivered by Shri. Niraj Verma, IAS, Principal Secretary, Power Department, Principal Secretary, Urban Development Department, Personnel and A.R. Training Department, Government of Assam. Dr Kirit Parikh chaired the power sector panel discussion, and Dr Tushaar Shah, Senior Fellow, International Institute of Water Management India, chaired the agriculture sector panel discussion along with eminent panelists. Context setting presentations based on Sectoral Discussion Papers for Assam prepared by IRADe researchers were presented at the webinar. The workshop was attended by 100 plus stakeholders from the power and agriculture sector.

Inception and Bangladesh Electricity Model Result Discussion Workshop, IRADe, 8 December 2020

IRADe organized an inception meeting and a webinar to discuss the Bangladesh Electricity Model Result updated under the project to assess the implication of declining cost of RE

and storage technology on cross border electricity trade among BBIN countries. The discussion happened on the Bangladesh Electricity Model, along with the key assumptions and results from assumed scenarios. The workshop had a participation of 50 plus stakeholders from Bangladesh, Bhutan and Nepal.

SPIPA Project MESSAGEix Training Workshop Organized by International Institute for Applied Systems Analysis (08-10 June 2020)

The workshop provided an introduction to MESSAGEix modelling framework, building a simple MESSAGEix model, energy system modelling with MESSAGEix, post-processing and model software development.

SARI/EI Events

Webinar on Energy Storage in South Asia: Regulatory, Technical, and Economic Considerations, 25 August 2020

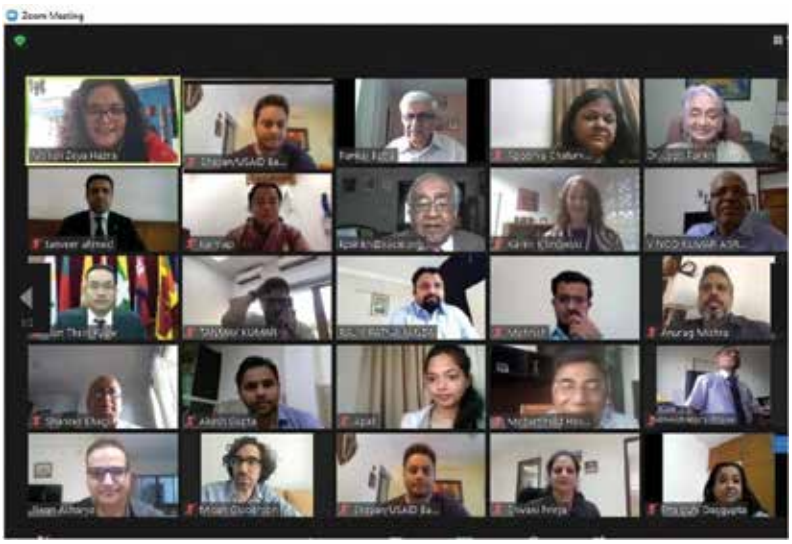
SARI/EI collaborated with the National Renewable Energy Laboratory (NREL), wherein their experts shared their study on "Energy Storage in South Asia: Regulatory, Technical, and Economic Considerations". NREL shared the philosophy underlying the study, the modeling methods used in determining the potential benefits of energy storage for the region, the state-of-the-art methods used to determine how much and where storage might be built given various potential areas, and the regulatory considerations necessary for storage success. More than 190 energy sector experts and enthusiasts attended the webinar.

26th SAFIR Steering Committee Meeting and 16th SAFIR Executive Committee Meeting, 28 August 2020

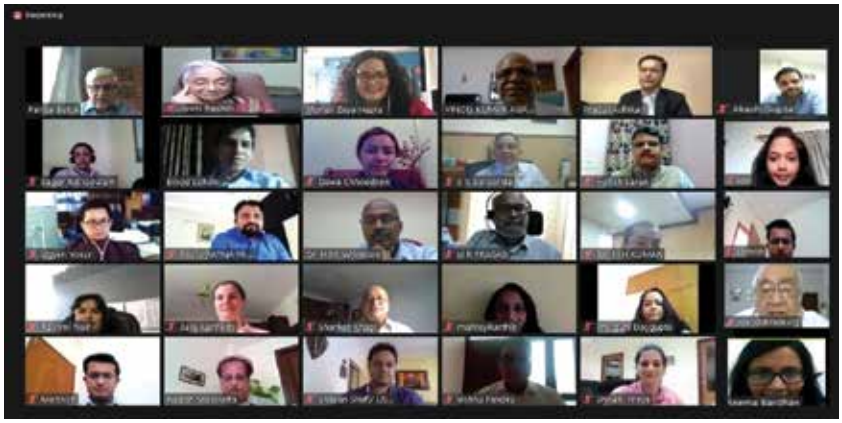
Mr. Pankaj Batra, Project Director, and Rajiv Ratna Panda, Technical Head, SARI/EI/IRADe, participated as special invitees at the 26th SAFIR Steering Committee and the 16th SAFIR Executive Committee Meeting. They updated on the various activities of the SAFIR Working Group and proposals for the current and the next year. The SARI/EI/IRADe officials had made a Common Minimum Grid Code for South Asia at the behest of CERC, and the progress status of the same was presented. Mr. Batra stated that comprehensive consultations with the expert committee of each country comprising all stakeholder constituted by the country regulators would be conducted, and feasible suggestions incorporated.

Eighth SARI/EI Project Steering Committee (PSC) Meeting, 28-29 September 2020

The two-day 8th PSC virtual meeting witnessed participation from senior officials of the governments of Bangladesh, Bhutan, India, Nepal, and Sri Lanka, Director of SAARC Secretariat and Director of BIMSTEC Secretariat. The meeting focused on SARI/EI efforts to work with stakeholders in the region for increasing cross border energy trade and regional power market formation. The studies done/in process, as well as the proposed studies pertaining to cross border trade in energy were presented to the PSC members. Their guidance and suggestions were sought on these activities. The engagement with various regional institutions, i.e. SAARC, SAFIR and BIMSTEC, were also presented.



SARI/EI Combined Task Force Meeting, 30 September 2020



The combined meeting of Task Forces 1, 2 and 3 saw virtual representation from key stakeholders in the power sector from across South Asia. The meeting deliberated on SARI/EI's efforts on the institutionalization of bodies and mechanisms to boost cross border energy trade through trilateral and multilateral trade, such as "Forum of Transmission Utilities" or "Forum of System Operators", or "Forum of Energy Regulators". Suggestions were also sought from all the stakeholders on new studies required for promoting CBET.

2nd meeting of SAFIR Joint Working Group "To Study, Formulate and Recommend for Facilitating Power Trade Development in South Asia", 28 September 2020

Mr Pankaj Batra, Project Director and Mr Rajiv Ratna Panda, Technical Head, SARI/EI, participated as special invitees. The meeting concluded that IRADe would provide technical assistance to support the Working Group on the Common Minimum Grid Code. IRADe will present the harmonization of rules and the Common Minimum Grid Code in the next meeting. The World Bank would synthesize various studies conducted by SARI/EI/IRADe and identify the need for suitable refinements to align analysis and recommendations to the scope of study on a market design agreed in the meeting. After the meeting, SARI/EI/IRADe shared the details of the various work being undertaken by the Project Secretariat.

Webinar on "Tackling the Covid-19 Crisis – Experience Sharing by South Asian Power Distribution Companies", 25 November 2020

The joint webinar was organized with USAID's South Asia Regional Energy Hub (SAREH) as part of the South Asia Knowledge Series. The webinar brought together senior leadership of power distribution companies from across South Asia. The leaders shared their experiences and challenges faced due to COVID-19, the mitigation strategies adopted for risk aversion, and the way forward to build crisis-preparedness and make the region's power distribution sector more resilient to future contingencies.

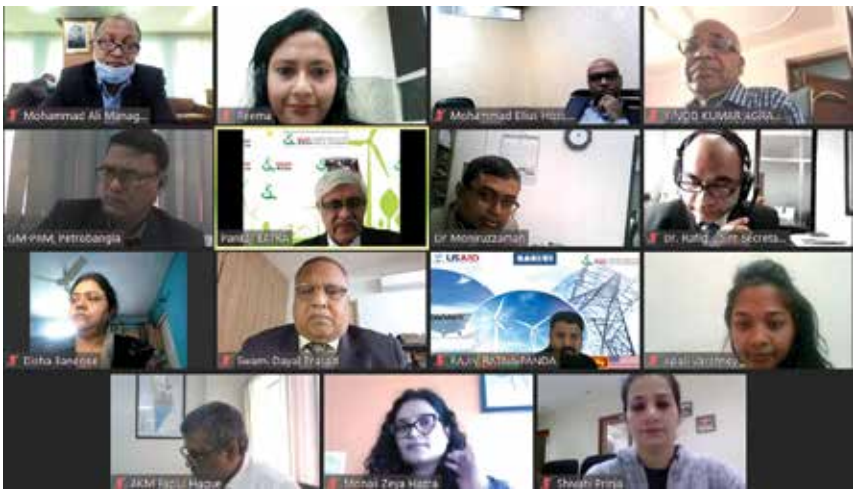
Stakeholder Consultation on SARI/EI Report on "Potential of Gas/LNG for Regional Energy Cooperation in BBINS Region", 21 January 2021

The consultation was held with stakeholders from the BBINS countries to disseminate the findings of the SARI/EI Gas Market Study and to seek feedback and inputs from decision-makers, influencers and experts across these countries on the draft report. This would help make the report relevant and useful to all stakeholders in the region.

3rd Meeting of the Joint Working Group of SAFIR " To Study, Formulate and Recommend for Facilitating Power Trade Development in South Asia", 28 January 2021

Mr Pankaj Batra, Project Director, and Mr Rajiv Ratna Panda, Technical Head, SARI/EI, participated as special invitees. IRADe made a detailed presentation on the harmonization and Common Minimum Grid Code (CMGC). After the meeting, and in line with the suggestions received, a note on the "Jurisdiction over Grid Code by the Regulators of South Asian Countries" was prepared by SARI/EI/IRADe and sent to the SAFIR Secretariat, which will be added as an annexure to the CMGC.

Consultation Meeting with Bangladesh Stakeholders on SARI/EI Report on "Potential of Gas/LNG for Regional Energy Cooperation in BBINS Region", 18 February 2021



The draft SARI/EI report was presented to senior delegates from Bangladesh's energy sector, including A K M Fazlul Haque, Additional Secretary (Development); SK Aktar Hossain, Joint Secretary (Development); Dr. Md. Rafiqul Islam, Joint Secretary (Planning), from the Energy and Mineral Resources Division, Ministry of Power, Energy and Mineral Resources, Government of Bangladesh; Engr. Ali Mohd. Al-Mamun, Director (Operation and Mines), Petrobangla, Bangladesh; and Mohammad Ali, Managing Director, Bangladesh Petroleum Exploration and Production Company Ltd. The Bangladeshi stakeholders gave valuable suggestions, which were noted for consideration.

Webinar on Importance of Creating Regional Technical Institutional Mechanism for Harmonising Power System Operation Practices and Norms in South Asia', and Key Considerations Towards its Formulation, 23 March 2021

SARI/EI has been advocating the need for a regional institutional mechanism in South Asia to enhance cooperation in power system operation and the long-term sustainability of CBET. To deliberate on this point further, a high-level panel discussion was held on this subject. The webinar was attended by subject experts from different parts of the region, including the system operators from Bangladesh/Bhutan/India/Nepal, thought leaders from the energy sector/educational institutions, experts from consulting firms/industries, and representatives from multilateral agencies/development financial institutions.

Poverty and Gender

Webinar on the Role of Energy Access in Community Health and Education, 3 September 2020

The webinar focused on energy access in rural areas, especially in the education and the health sectors. This webinar provided a platform for people from health, and the energy sector to discuss the issue of energy access. The key delegates at the webinar were Mr Ajay Shankar, former Secretary, Department for Promotion of Industry and Internal Trade, Government of India and Dr Nitin Madan Kulkarni, Secretary, Department of Health and Family Welfare, Government of Jharkhand.

KP@85– Festschrift Conference

Towards the celebrations of the 85th birthday of Dr Kirit Parikh, Chairman, IRADe, on August 1st, 2020, IRADe organized and hosted a series of Festschrift Conferences. A mark of tribute for his lifelong achievements, these were a series of staggering events, held till early 2021. These momentous occasions were attended by more than 40 experts from various fields and over 250 enthusiastic participants including his students, ex-colleagues, colleagues and friends from all across the world. The inaugural session in the first week of September 2020 had presentations on renewables and electricity trade and India's Electricity Policy. Dr Jyoti Parikh made an inaugural speech where she narrated interesting facts about her academic partnership with Dr Kirit Parikh.

- The second session provided a broad discussion on the four interconnected issues of Economy, Energy, Climate change, and Agriculture. Dr Ashima Goyal and her student, Mr Abhishek Kumar, dwelled on whether supply or demand determines inflation in India. Dr Probal Ghosh, IRADe, presented the impact of diesel price and subsidy reforms on the Indian economy and factors that hindered the economy from benefiting from it. Dr Ram Ramanathan from the University of Bedfordshire made a presentation on addressing climate change by reducing food waste using digital technologies, while Dr Ashutosh Sharma, IRADe, presented on climate change and Agriculture.

- The third session covered issues on energy and agriculture. Dr Ganesh Kumar and Dr Nitin Harak from IGIDR, Mumbai looked into the natural gas pricing policy and its distortionary impacts on the natural gas market. Dr Badri Narayanan, from the University of Washington-Seattle, presented the issue of distortion due to power subsidies given to farmers that lead not only to excessive use of electricity but also deplete groundwater for irrigation to burdening the exchequer. Dr Haripriya Gundimeda, IIT Mumbai, illustrated through the case study of Punjab how an exclusive focus on yields to achieve self-sufficiency and maintain a surplus, and misaligned policies of rampant subsidies, free power, use of intense inputs, and little emphasis on crop diversification, created a scenario of groundwater depletion, a decline in soil quality and productivity, loss of biodiversity and severe environmental pollution, culminating in adverse impacts on human health.

- The fourth session of the Festschrift conference focused on flood management. Prof. A. K. Gosain, Emeritus Professor, IIT Delhi and Director, INRM Consultants Pvt Ltd., shared a presentation on how modeling could predict floods in Indian rivers. Dr G.N. Qasba, Former Commissioner, Srinagar Municipal Corporation, Senior Advisor, IRADe, shared a presentation on the experience of waste water management post the Srinagar floods.

- In the fifth session of the Festschrift Conference, Dr Samar Singh gave a presentation on the mathematics of the Social Accounting Matrix rigorously and its generalizations. Mr T R Sankar analyzed the present situation and future possibilities for the Indian Information Technology Sector within a SWOT (Strengths, Weaknesses, Opportunities, Threats) analytical framework, emphasising COVID-19. Dr Suresh Velagapudi developed newer algorithms for two convex optimization models arising in production planning in a multi-plant firm.

- Session six of the conference dealt with COVID-19 and its impact on health, economy, and livelihood. Renowned economist Dr Surjit Bhalla showed how epidemiological performance against COVID-19 can be measured and what explains the differential pattern of such performance (flattening the curve) across different states of India. His presentation analysed two strategies: lockdown and the 3-T policy of Tests, Tracing and Treatment. In their presentation, Mr Litul Barua and Mr Sudershan Singh analyzed the first round of Covid-19 related shocks survey in rural India, including impact on agriculture, livelihoods, and migrant labour. Finally, Mr Rohit Magotra, IRADe, talked about the health policy and measures required to increase our preparedness for COVID-19-like health disasters and formulate a robust response mechanism to deal with such emergencies.

- The seventh session had three presentations addressing various issues and policies arising out of the need to increase renewable integration in India's grid. Mr Vinay Saini from IRADe projected the scenarios of renewable penetration into the Indian grid, under various assumptions of cost reductions in renewable and storage technologies. Dr Deb Chattopadhyay from the World Bank dwelt on how CBET can deliver significant benefits-from cost and emissions reduction to increased access to electricity and climate resilience based on a summary of benefits from seven regional analyses. Mr V. K. Agrawal from IRADe talked about the nature, structure, and role of required regional institutions in South Asia, which provide support to the rest of the regional stakeholders with the objective of promoting CBET in South Asia. This was followed by a panel discussion on "Challenges and barriers to cross border trade in South Asia".

- Session eight was on the topic of Agriculture, Food and Nutrition. The presentations in the session looked at policy instruments to improve agricultural income and the nutritional intake of households. Through their study, Prof. Mahendra Dev and his colleagues from IGIDR aimed to understand the impact of production diversity on household dietary diversity in the rural areas of Bihar and Odisha. The second presentation by Prof. Manoj Panda and his colleagues from IEG was on economic growth as a driver of nutritional indicators, including child malnutrition using four waves of the National Family Health Survey data on child undernutrition. The third presentation by Dr Prakash Chander examined the welfare implications of the MSP policy instrument, noting that the current formula for fixing the MSP for food grains is problematic as it completely ignores the market forces, i.e. demand and supply for food grains.

- Session nine covered two different sectors-health and power that are connected through a common theme of application of optimization tools. This was an apt contribution to a Festschrift for Dr Kirit Parikh, an expert and a lifelong user of optimization tools to address practical issues. The presentation by Dr Lakshmi Raut (Visiting Professor, University of Chicago) was on the uses of the multinomial logit model and the neural network model for identification of important determining factors and prediction of the risks of various diseases that individuals experience in their middle age. Mr Rajbans Talwar, Optimization Consultant, STEAG, New Delhi, presented Flexibilization of the operations of fossil fuel burning power stations to enable individual units to achieve higher ramping rates by means of better means designed components.

JP @ 80

IRADe celebrated the landmark 80th birthday of Dr Jyoti Parikh, Executive Director, on March 20, 2021. This virtual event was attended by many of her ex-students from IGIDR, ex-colleagues, several senior management team of IRADe and many influential people of society from across the world.

Welcoming the participants, Dr Kirit Parikh expressed his sincere thanks and appreciation. He was impressed by Dr Jyoti Parikh's comprehensive understanding of many things whereas he would consider things from a technical aspect, she looked at issues from a larger perspective. IRADe has grown as a leading think tank under her able leadership since 2003, raising substantial project funding.

Mr Piyush Tiwari, the Convener of the Festschrift and one of Dr Jyoti Parikh's oldest students from IGIDR, said that she had always been accessible to students with her valuable advice and support despite her towering personality in the academic world. "Working under her guidance on many projects such as High Tension Industry studies, energy-efficient building materials, and sustainable consumption patterns not only showed me how to conduct research, but also enabled me to develop skills for policy-relevant research," he said. "She taught that a policy had to be well supported and well researched as well as practical. Her remarkable supervision style with attention to detail, patience, reading multiple draft papers several times over and pointing out wherever there was scope for improvement, and cutting-edge work resulted in a thesis leading to eight publications in leading journals. This initial training gave me the grounding for the rest of my career." All students owed their successes to Dr Jyoti Parikh's mentoring. As a tribute, many of her students and colleagues have put together a Festschrift with 15 chapters and 26 authors. The volume is organized in sections that cover areas where Dr Parikh has worked for more than 50 years, such as energy policy, energy access, energy transition, women empowerment, sustainable urban development, climate change, environmental economics and development issues. The manuscript will be published in her honour.

Dr Suresh Prabhu, IRADe Council member and former Minister, mentioned that he was very happy that both Dr Kirit Parikh and Dr Jyoti Parikh have contributed a great deal to public policy and social good and that informally he has learnt from the different facets of their policy analysis.

Dr Mohan Munasinghe, a former IPCC Vice-Chair from Sri Lanka said that Dr Jyoti Parikh has carried off her remarkable work with grace, and her elegance is matched with a superlative intellectual and professional contribution. "She is truly the Grande dame of energy, development, climate change and many other areas," he said. For more than four decades, he, along with the Parikhs and a select group of international colleagues, had "fought the good fight together" for the rights of developing countries, poverty eradication, social justice and equity.

Mr Nitin Desai, former UN Under-Secretary-General, said Dr Jyoti Parikh has built IRADe in a relatively short period of time and it has become one of the leading research institutions in India, particularly in the field of energy. Her work is based on solid evidence-based research and well-articulated ideas.

Dr Debrabrata Chattopadhyay said that it is remarkable that Dr Parikh's vision was far ahead of the times. What they worked on in the nineties are still relevant issues, and that he has continued to work on grid interconnection and carbon reduction from the Indian power sector demand-side management. IRADe is still actively working in these areas.

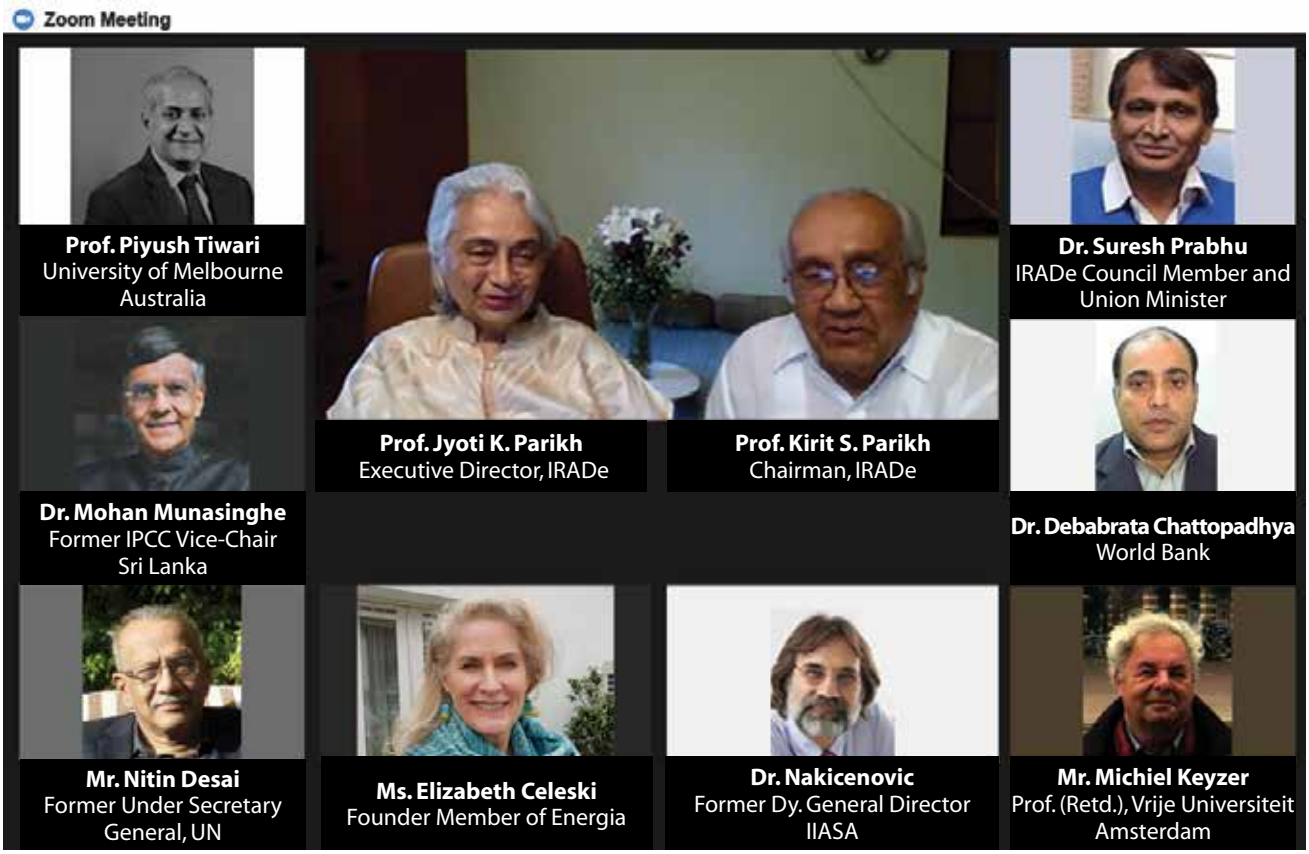
Topics like climate change, energy access DSM, grid integration and clean transport, and gender in energy in the developing world were practically introduced by Dr Parikh 30 years ago. The depth of her work in each of those areas has also been phenomenal.

Dr Mikhiel Keyzer said: "I have known Kirit and Jyoti for nearly 45 years. 1980s in the Bangladesh energy

sector, Jyoti helped to introduce informal sectors within Bangladesh's five-year plan.

Ms Elizabeth Celeski, Founding President of Energia said: that "Jyoti has been a quiet influencer and supporter for Energia and a role model for me which she may not know. In 2019 she was named as one of the world's 100 most influential persons in climate policy. She has always used her status as an international and national authority on energy policy to elevate the visibility of women's needs and gender equality. She is an eminent academic researcher who has advocated policies that make people see a different future. Whenever I see this small, quiet woman come up to the podium and start speaking very quietly, I listen very carefully to every word as each of her word is very valuable. 21 years ago Jyoti was advocating for gender equity in petroleum subsidies to be targeted at the household level. Instead, she argued that subsidy on diesel shows gender bias."

Dr Nakicenovic: "Jyoti and I worked together in the energy program at IIASA, which was established in 1973. It was the first-ever global energy study that involved scientists from the East and West and also developing countries. Our joint work and that of other colleagues resulted in a very comprehensive and truly global publication called "Energy in a finite world."



Media Coverage

- A strategic testing regime: How-to step-up tests to ensure effective containment of corona- Kirit S Parikh | The Times of India | April 10, 2020
- Rohit Magotra and Nimisha Jha (2020) 'Policy Response to COVID-19 Needs to be Gender Sensitive. Here's Why' | The Tilak Chronicle, April 27, 2020
- Rohit Magotra and Vijay Raj (2020) 'Improving the Response to COVID-19 Crisis Demand an Innovative Policy Approach and Implementation' The Tilak Chronicle, April 27, 2020
- New Normal Cooking Solutions under Social Distancing- Dr Ashutosh Sharma and Saumya Vaish | India CSR | April 29, 2020
- Smooth Operations - Power system overcomes Covid-19 challenges to ensure seamless supply- Dr Jyoti Parikh, V.K. Agrawal and Rajiv Ratna Panda | Powerline | April 2020
- Coping with the Crisis- Pankaj Batra | Powerline | April 2020
- What the lockdown has accomplished- Kirit S Parikh | Business Standard | May 10, 2020
- Display of Outstanding Regional Cooperation in Electricity Grid Management during 9 pm, 9 Minute Event- V K Agrawal and Rajiv Ratna Panda | Infraline | June 2020
- India needs to ensure multi-level participation from countries for its ambitious global solar grid plan- Dr.Jyoti Parikh | ET Energy World | June 24, 2020
- OPINION: Proposed power distribution reforms to empower Make in India- Pankaj Batra | ET Energy World | June 26, 2020
- Cross border Electricity Trade brought to the Forefront in the Amendment to the Electricity Act 2003- Pankaj Batra | Infraline | August 2020
- Increasing Connectivity – Decoding the Common Minimum Grid Code for South Asia- Pankaj Batra | Powerline, South Asia | August 2020
- "Strengthening Public Health Systems for COVID-19 Response" | IRADe's Policy brief in Greater Kashmir, August 10, 2020
- Demand Slide - Views of sector experts | Mr Pankaj Batra, Powerline, September 2020
- Climate Change and Cities: IRADe develops critical assessment framework, Delhi Post, September 30, 2020
- 'IRADe: Partnerships for building Climate-smart Cities in India', by India CSR Network | October 10, 2020
- Politics of stubble burning: Solving the problem requires us to rethink paddy farming and irrational subsidies | Dr Jyoti Parikh, The Times of India, November 24, 2020
- For a digital stimulus: Budget for growth and empowerment through digital access and connectivity | Dr Jyoti Parikh, The Times of India, January 27, 2021
- For India to meet its nationally determined contributions on climate change, states must be involved | Dr Jyoti Parikh, The Times of India, December 15, 2020

Publications

Proceedings

- Session on "Climate Adaptive Heat Stress Management in South Asia" at the Gobeshona 7th International Conference, 23rd January 2021
- National workshop on "Climate Change and Cities: Urban Climate Vulnerability Assessment Framework", 29th September 2020
- Stakeholders' workshop on "Developing Disaster Resilience Action Plan, Gangtok city, Sikkim", 30th September 2020
- Stakeholders' workshop on "Developing Disaster Resilience Action Plan, Shillong city, Sikkim", 15th December 2020

Journal Articles

- Magotra, R.; Pandey, P; Kumar, M; Gupta, MK; Kaushik, A; Parikh, J (2020) *"Role of Marine National Park for sustainable livelihoods of artisan fisherfolk – A case study of MNP, Jamnagar"* Ecology, Economy and Society–the INSEE Journal3(2): 59–82, July 2020

Conference Papers

- Magotra, R; Tyagi, A; Kumar, M; Shaw, M; Bhatia, A; Sharma, Y (2020) *"Climate Adaptive Heat Action Plans for Vulnerable Poor: A case study of Bhubaneswar city, Odisha" (International Conference on Sustainable Development (ICSD 2020)*
- Magotra, R; Kumar, M; Shaw, M; Bhatia, A; Sharma, Y (2020) *"Analysis of Health Geography of Dengue in Urban Areas- A case study of Rajkot City, India". (ICSD2020)*
- Magotra, R; Sharma, Y; Raj, V (2020) *"Nature Based Solutions for Heat Wave Management in Cities" (ICSD 2020)*

Published Articles

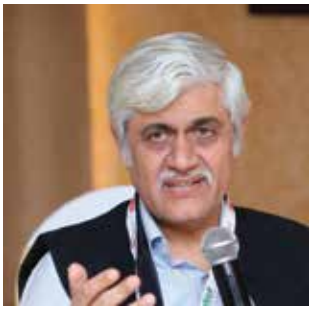
- Bhatia, A; Kumar, M; Magotra, R (2020) *"Role of GIS in managing COVID-19"* (Published in Science Reporter)

Professional Activities

Dr Jyoti Parikh

- July 2, 2020: Speaker at a two-part virtual workshop on "The Political Economy of Renewables Development in Sub-Saharan Africa and South Asia".
- July 18, 2020: Panelist at webinar: "Road to Sustainable Growth in a Post-Pandemic World How green can India's economic recovery be?" Organized by Chennai International Centre (CIC).
- August 12, 2020: Keynote Guest Lecturer at the webinar on "Environmental Governance in Contemporary Times." Organized by Mumbai School of Economics on the occasion of its centenary celebrations.
- August 20, 2020: Guest of Honor and Keynote Speaker: "Natural Disaster Resilience, Response and Recovery" -by Trends and Recent Advances in Civil Engineering." Organized by TRACE 2020 - Amity University, New Delhi.
- November 10, 2020: Speaker at the International Forum for Energy Transition, along with an exclusive group of global energy leaders, to discuss how to accelerate a clean energy transition through sustainable development, benefiting the economy, society and the global energy system.
- November 27, 2020: Panelist at the 3rd Global Renewable Energy Investors Meet and Expo in the session: 'Women in Renewable Energy.' Organized by The Ministry of New and Renewable Energy, Government of India.
- December 21, 2020: Panelist in the Panel Discussion for the session: "Cities as Stakeholders in the Climate and Sustainability" at the Webinar on "One Planet City Challenge 2020 Felicitation and Climate Proofing Smart Cities." Organized by WWF-India in partnership with NIUA Climate Centre for Cities (C-Cube).
- January 23, 2021: Panelist for the session on "Climate Adaptive Heat Stress Management in South Asia: 7th International Conference organized by Gobeshona, Bangladesh.
- February 4, 2021: Panelist at the "Intergenerational action on climate change: Taking action to save ourselves, our grandchildren and our planet." Organized by ADB, UNEP, IGES, ESCAP and Helpage International.
- February 12, 2021: Speaker at the session "Science related issues and GIS-based analysis" at the webinar, "Jagrukta Abhiyan for COVID-19 Pandemic" organized by the National Academy of Sciences, India HQ and National Academy of Sciences, Kerala Chapter.
- February 18, 2021: Speaker and Chief Guest at CASCADE 2020-2021 on "Addressing the Alliance: CSR X Climate Change." Organized by the Department of Commerce, Gargi College, New Delhi.
- March 5, 2021: Speaker' at the 5th Annual NGV India Summit 2021, Organized by Messe Frankfurt India at Le Meridien, New Delhi.
- March 5, 2021: Special Invitee to the Friends of COP Small Group Meeting: "Gender and Inclusion," to discuss several COP 26 key issues.
- March 8, 2021: Speaker at the 7th Asia-Pacific Adaptation Forum (APAN) titled "Enabling Resilience for All: The Critical Decade to Scale-Up Action" UNEP, APAN.
- March 24, 2021: Panelist at Climate Resilient Engineering Design organized by IIT, Mumbai.

Mr Pankaj Batra



- June 19, 2020: Chaired the online session on "Scope of Electricity Amendment Bill 2020 in the New Normal," organized by the Bengal Chamber of Commerce and Industry.
- June 17, 2020: Panelist in the Spotlight Session on India's Energy Trilemma at the Asia Clean Energy Forum, ACEF 2020: Online Panel Discussion. Organized by ADB.
- November 2nd to 6th, 2020: Moderated the session on "Brainstorming Session on the Role of Energy Storage for moving towards 24×7 Renewables", at the 7th International Conference and Expo on Energy Storage, EV and Microgrids, India Energy Storage Week (IESW).
- November 25, 2020: Moderated the SARI/EI Webinar on "Tackling the Covid-19 Crisis – Experience sharing by South Asian power distribution companies".
- December 1, 2020: Panelist at the Discussion on Energy Vision 2035, organized by Niti Aayog.
- December 2, 2020: Chaired the 16th LITD 10 Sectional Committee on Power System Control and Associated Communications of Bureau of Indian Standards.
- December 16, 2020: Moderated the India Energy Storage Roundtable, organized by BIS, SECI and Underwriters Laboratories.
- December 17, 2020: Delivered the opening remarks in the RE Battery Show India organized by the First View Group.
- December 18, 2020: Chaired the Plenary Session on "Better and Cleaner Utilization of the Carbon" in the 9th Green Energy Summit.
- January 6th and 9th 2021: Convener of the Working Group to develop draft document on Strategic Roadmap of Electro-Technical Division Council of BIS.
- January 18 – 22, 2021: Gave the opening remarks in the five-day-long online training course on "Energy Storage and its Importance With Renewable Integration, Grid Stability and Electric Vehicles," jointly conducted by ASCI and IESA.
- February 11, 2021: Chaired the 17th Meeting of the LITD 10 Sectional Committee on Power System Control and Associated Communications of Bureau of Indian Standards.
- March 2, 2021: Presented the Theme Presentation on Roundtable 1: "Interconnection of Regional Grids in Asia," in the India Smart Utility Week 2021.

Mr V.K. Agrawal

- July 2, 2020: Speaker at the webinar on "Wind Integration in India - Past Experiences, Challenges and Way Forward, organized by WWEA (World Wind Energy Association)".
- August 8, 2020: Chaired the Session on "Real Time Market" at "New Power Dynamics – Greening the Grid and Real-Time Market," organized by the Bengal Chamber of Commerce and Industry.
- August 14, 2020: Speaker at the "Role of Facilitating Renewable Energy Trade between India and Nepal," organized by CEED and The Asia Foundation.

Mr Rohit Magotra

- Speaker at 8th ICSD (International Conference on Sustainable Development) 2020 on "Climate Adaptive Heat Action Plans for Vulnerable Poor: A case study of Bhubaneswar city, Odisha'; 'Nature based Solutions for Heat Stress Management; and 'Analysis of Health Geography of Dengue in urban areas'.

- November 3, 2020: Speaker at the 4th National Monitoring and evaluation Workshop of the National Mission on Himalayan Studies.
- January 23, 2021: Speaker at The Gobeshona 7th International Conference hosted by International Centre for Climate Change and Development (ICCCAD) on "Climate Adaptive Heat Stress Management in South Asia".
- January 29, 2021: Speaker at the webinar "Making Cities Resilient to Heat Stress", organized by CDKN, ICLEI and TARU on "How Climate Resilient Initiatives can help cities in reducing heat stress".
- February 12, 2021: Speaker at "Jagrukta Abhiyan for COVID-19 Pandemic", organized by NASI HQ and NASI Kerala Chapter.
- February 24, 2021: Speaker at the South Asia Regional Workshop on Heatwave Risk and Impacts Agenda, organized by Red Crescent Climate Centre on "Review of Heat Action Plans in South Asia and Adaptation Strategies".

Dr Probal Ghosh

- August 25, 2020: Speaker at Electric Mobility Initiative (EMI) Strategy Refresh Workshop, hosted by Shakti Sustainable Energy Foundation (SSEF).
- September 24, 2021: Speaker at the webinar on "Ushering in A New Era: South Asia Regional Development Via Green Power Co-operation," organized by The Asia Foundation and Supported by Australian Aid.
- December 9, 2020: Speaker at Atmospheric Pollution and Human Health (APHH) PROMOTE on 'Analysis of mitigation scenarios of the road transport sector in Delhi'.
- February 23, 2021: Speaker at "Decarbonizing Transport in India": TEE +NDC-TIA on "Projections and scenarios on the evolution of transport in India from the research community-focus on energy and emissions".

Mr Rajiv Ratna Panda

- June 16, 2020: Speaker in the ACEF 2020 Event on Cross Border Power Trade and Future Energy Markets "Cross Border Electricity Trade in South Asia: Transitioning from bilateral to trilateral/multilateral trade (including power markets)" - Organized by USAID.
- August 11, 2020: Speaker in the webinar on Cross Border Electricity Trade in SAARC Countries on "Current Status and Future Outlook" organized by SAARC Energy Centre.

Dr Ashutosh Sharma

- July 31, 2020: Speaker at the webinar on "RE-Powering India-Nepal Energy Trade; Low Carbon Development Pathway through Trans Boundary-Renewable Energy Trade", organized by "CEED", Patna, Bihar.

Mr Vinay Saini

- July 15, 2020: Presented virtual poster session on "The Political Economy of the Power Trade in South Asia" at the event "2nd EEG Virtual Poster Session on the Political Economy of Renewables Development in sub-Saharan Africa and South Asia", organized by The Policy Practice, United Kingdom.

Project Reports

S. No.	Project Report No. and Year	Title of Project	Funding Agency
1.	IRADe-PR-82(2021)	Impact of Quality of Electricity Access on Health and Education Delivery - Jharkhand.	Shakti Foundation
2.	IRADe-PR-81(2021)	Discussion Paper, Odisha Agriculture Sector- Enabling State Level Strategic Actions for Achieving NDC.	MacArthur Foundation
3.	IRADe-PR-80(2021)	Discussion Paper, Gujarat Agriculture Sector- Enabling State Level Strategic Actions for Achieving NDC.	MacArthur Foundation
4.	IRADe-PR-79(2021)	Impact of Urbanization on Natural Disasters.	NMHS
5.	IRADe-PR-78(2021)	Urban Climate Vulnerability Assessment - Ahmedabad city.	MoEFCC
6.	IRADe-PR-77(2021)	Discussion Paper, Odisha Power Sector- Enabling State Level Strategic Actions for Achieving NDC.	MacArthur Foundation
7.	IRADe-PR-76(2021)	Discussion Paper, Gujarat Power Sector- Enabling State Level Strategic Actions for Achieving NDC.	MacArthur Foundation
8.	IRADe-PR-75(2020)	Prediction of Dengue with Climate Change over Delhi. A statistical analysis and development of warning system.	DST
9.	IRADe-PR-74(2020)	Disaster Resilience Action Plan of Gangtok, Sikkim.	NMHS
10.	IRADe-PR-73(2020)	Disaster Resilience Action Plan of Shillong, Meghalaya.	NMHS
11.	IRADe-PR-72(2020)	Country Report Series: Bhutan- "Implications of Declining Costs of Solar, Wind and Storage Technologies on Regional Power Trade in South Asia (BBIN Countries)".	EEG
12.	IRADe-PR-71(2020)	Review of Heat Action Plan of South Asia.	IDRC
13.	IRADe-PR-70(2020)	State Background Report- Enabling State Level Strategic Actions for Achieving NDC.	MacArthur Foundation
14.	IRADe-PR-69(2020)	State Selection Report- Enabling State Level Strategic Actions for Achieving NDC.	MacArthur Foundation
15.	IRADe-PR-68(2020)	Experiences out of the COVID-19 and developing a framework towards a resilient Electricity Grid System for the BBIN Region in South Asia.	EEG

List of Projects - 2020-21

S. No.	Title	Funding Agency	Status
	Climate Change and Environment		
1.	Climate Adaptive Action Plans to Manage Heat Stress in Indian Cities	IDRC	Ongoing
2.	Enabling State Level Strategic Actions for Achieving NDC	MacArthur	Ongoing
3.	Developing the Urban Climate Vulnerability Index for 7 Cities	MoEFCC	Completed
4.	Spread of Dengue and Climate Change for Delhi and Rajkot	DST	Completed
	Sustainable Urban Development		
5.	Developing Disaster Resilience Action Plan for Shillong and Gangtok	MoEFCC/NMHS	Completed
6.	Process Analysis, observations and modeling – Integrated solutions for cleaner air for Delhi (PROMOTE)	MoES-NERC	Ongoing
	Asia Centre for Sustainable Development		
7.	Implications of Declining Costs of Solar, Wind and Storage Technologies on Regional Power Trade in South Asia (BBIN Countries)	EEG	Ongoing
8.	Experiences out of the COVID -19 and developing a framework towards a resilient Electricity Grid System for the BBIN Region in South Asia	EEG	Completed
9.	Testing Electricity Pressure Cooker adoption in Socio-economic and cultural context of Nepal	Loughborough University, MECS, UK	Ongoing
	Energy and Power Systems		
10.	EV Charging Patterns and Impact on Discoms	Shakti Foundation	Ongoing
11.	Gulf-Undersea-India (GUI) (phase 2)	EEG	Completed
12.	South Asian Regional Initiative for Energy Integration (SARI/EI)	USAID	Ongoing
13.	Low Carbon Economy Modelling Component of the Strategic partnerships for the implementation of the Paris Agreement (SPIPA)	GIZ	Ongoing
	Poverty Alleviation and Gender		
14.	Impact Assessment of Electricity Access on Health and Education	Shakti Foundation	Ongoing

SPONSORS

Integrated Research and Action for Development (IRADe)
C-80 Shivalik, Malviya Nagar, New Delhi - 110017
Tel.: 91 (11) 2667 6180, 2667 6181, 2668 2226

Our Websites and Social Media Handles:

Web: www.irade.org
SARI website: www.sari-energy.org

@IRADe_Delhi IradeDelhiIndia irade-new-delhi-280019169