



*“CEEW has successfully scaled up into a centre of research excellence; with demonstrated capacity to convene partners across government, industry, civil society and academia.”*

Suresh P. Prabhu (Chairperson)

---

*“CEEW has set a stellar example for other young and innovative organisations motivated to build a better planet.”*

Jamshyd N. Godrej (Co-Chairperson)

---

*“CEEW, in four years, has established itself as a front-ranking research organisation on the way to becoming an institution of quality. The leadership of Dr Arunabha Ghosh, CEO of CEEW, commands my respect for making this enormous achievement happen.”*

Tarun Das (Founding Trustee)

---

*“CEEW is one of the few organisations to have developed the expertise of examining the inter-linkages between some of India’s and the world’s gravest issues. I wish them success as they begin putting their research into action.”*

Gautam Thapar (Trustee)

---

*“I congratulate the entire team of CEEW for its high quality research, professional ethics and the impact on stakeholders that leads to sustained credibility. CEEW is clearly on the ascending path.”*

Anil Kakodkar (Trustee)

---

*“Within a short span of four years, CEEW has developed a reputation of consistently delivering world-class research. As India strengthens its efforts for sustainable development, CEEW is set to play a pivotal role in supporting policy interventions in the areas of energy, environment and water.”*

Deepak S. Parekh (Trustee)

---

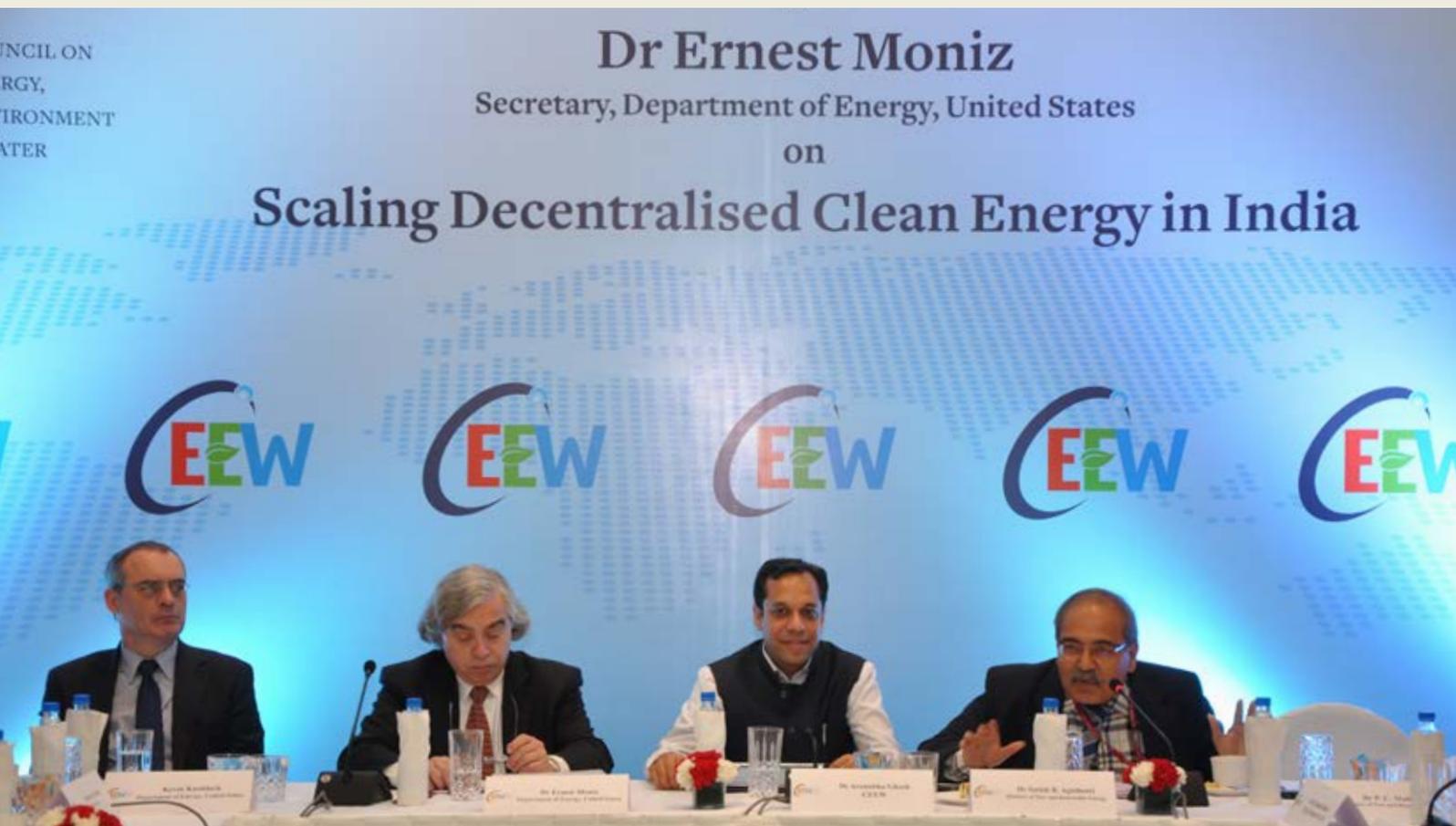
*“CEEW’s achievements have made us all very proud. It is increasingly being recognised as one of India’s topmost think-tanks. It has emerged as a reliable source that provides cohesive frameworks for policies on energy and water.”*

S. Ramadorai (Trustee)

• • • • •

*“Clean energy is an essential pillar of the U.S.-India relationship. In September 2013, we launched a new program in our clean energy partnership, PEACE, with the transformational goal of off-grid energy access to drive economic growth and improve lives across rural India.”*

Dr Ernest Moniz, U.S. Secretary of Energy  
Excerpt from his opening remarks at  
CEEW’s ‘Scaling Decentralised Clean Energy in India’ roundtable discussion



• • • • •

**IN JANUARY 2014, THE ‘2013 GLOBAL GO TO THINK TANK INDEX’ RANKED CEEW AS**  
1st in India and 14th Globally among ‘Top Think Tanks with Annual Operating Budgets of Less Than \$ 5 Million USD’  
1st in South Asia for the ‘Best Policy Study/ Report’ for its study on India’s National Water Resources Framework  
1st in India for ‘Best Institutional Collaboration’ involving two or more think tanks

**IN JUNE 2014, THE INTERNATIONAL CENTRE FOR CLIMATE GOVERNANCE RANKED CEEW AS**  
India’s number one climate-related think tank for a second year running

• • • • •

Download our report: [www.ceew.in/annualreport](http://www.ceew.in/annualreport)

# Leadership Perspectives

A message from our Chairperson and Co-Chairperson



Suresh Prabhu

India and the world stand at the cusp of an age, when sustainability can no longer just be preached. The future of life on this planet hinges on our determination and ability to mitigate and adapt to climate risks, optimise our resource use and embrace alternative sustainable lifestyles.

India's concerns are many: rising aspirations, dwindling natural resources, lopsided energy access and consumption, insufficient water availability and management, and increasing global pressure to share the responsibility and act on climate change. The lack of coordinated and synchronised efforts to tackle these concerns amplifies the problem and makes it more difficult to meet the goal of India's holistic development. This is the gap that CEEW addresses by providing integrated solutions within a "glocal" framework.

Over the last four years, CEEW has successfully scaled up into a centre of research excellence; with demonstrated capacity to convene partners across government, industry, civil society and academia; and deliver robust policy insights and alternatives on energy, environment and water issues. I am enthused that along with producing high quality research, CEEW has embarked on "actioning" it through initiatives such as the Clean Energy Access Network or the Indian Alliance on Health and Pollution.

I am also confident that the action plans on energy, environment, and water incorporated in this report will serve as a handy toolkit to anyone interested in understanding and solving India's challenges of sustainable development.

Once again, I would like to congratulate the entire CEEW team for being recognised as India's number one climate think-tank for a second consecutive year, and am confident that they will keep raising the bar as always. I also express my gratitude to all the partners and other stakeholders, whose constant cooperation has played a pivotal role in CEEW's progress.

A handwritten signature in black ink, appearing to read 'Suresh Prabhu'.

Suresh Prabhu

Chairperson, CEEW; Former Union Minister of Power, Environment & Forests, Industry, Chemicals and Fertilisers, Heavy Industry & Public Enterprises



Jamshyd Godrej

The chances of India continuing to become more inclusive in the provision of basic human needs are dependent on how, as a country, we succeed in providing quality water, reliable energy or clean air. We need new and sustainable business models, innovative financing solutions, robust modes of service delivery and participation of end users have to be encouraged in order to bridge the gap between core energy and water deficits and the levels of quality of life to which Indians increasingly aspire. Herein, also lies the opportunity for Indian industry to fulfill millions of dreams, explore new markets and contribute to social wellbeing.

Today, Indian industry has an important role to play in the global fight against climate change. Industry needs to take leadership in promoting sustainable lifestyles; and in supporting clean energy, energy efficiency, and effective water management. Greater collaboration between industry, government, civil society organisations and the common public holds the key to a sustainable and prosperous India.

In four years of operation, CEEW has established itself as one of India's leading think-tanks, known for its world-class research and capacity to facilitate stimulating conversations between key stakeholders on several issues of sustainable development. Looking at some of the cutting edge research that CEEW has done over the last year – be it in off-grid financing, urban water and sanitation, phasing down hydrofluorocarbons, or resource security – I am glad that they have resolved to "action" some of their research as well. CEEW's evolution sets a stellar example for other young and innovative organisations motivated to build a better planet.

I would also like to draw the attention of the readers to the policy briefs on energy, environment, and water prepared by CEEW, which have been incorporated in this annual report. I am confident that these briefs will provoke further discussions on equity, access, security, governance, and eventually suggest pathways towards a more sustainable future.

A handwritten signature in black ink, appearing to read 'Jamshyd Godrej'.

Jamshyd N Godrej

Co-Chairperson, CEEW; Chairman, Godrej and Boyce Manufacturing Company Pvt. Ltd.

# CEEW's Plans for a Sustainable India

A message from the Chief Executive Officer



Arunabha Ghosh

As you read this report, we would have set in motion the next phase of CEEW's growth. In four years of operation we have delivered independent and internationally peer-reviewed research on national and global concerns, which has facilitated evidence-based dialogue and aided strategic policy interventions. We now aim to "action our research" and meet the growing demand to partner in on-field interventions.

Over the last four years, CEEW has established itself as one of India's leading institutions focused on solving real problems using world-class research. Since starting operations in August 2010, we have been engaged in more than 60 research projects, published more than 35 policy reports and papers, advised governments around the world over 80 times, promoted bilateral and multilateral initiatives between governments on more than 30 occasions, and organised more than 75 seminars and conferences.

Testimony to the impact of our work is the recognition and accolades received from across the globe over the last year. In January 2014, CEEW made an exciting debut on the University of Pennsylvania's 'Go To Think Tank Index', topping India across three categories. We were also ranked as India's number one climate think tank by the International Centre for Climate Governance, for a second year running in June 2014.

This annual report will give you a glimpse of some of the major research projects that we undertook last year in the areas of energy access, energy storage, resource security, renewable energy technologies, urban water and sanitation, hydropower, hydrofluorocarbons, geoengineering governance research, strategic industries, etc.

In this report, we have also gone one step further and have charted out action plans for energy, environment and water for a prosperous and sustainable India. Resource security is likely to grow in salience for the new government that has taken office in Delhi. India, whose per capita consumption of energy and many minerals remains low, has to balance resource pressures and confront three interlocking challenges of sustainable development: meeting basic needs for food, fuel, and water for a growing population; securing energy and other minerals to support economic growth while maximising

resource efficiency; and managing the environmental constraints and strategic consequences of increased resource use and competition. This triple mantra – focusing on access, efficiency and externalities – must be the guiding principle for resource security for the new government.

What would a focus on access, efficiency and externalities mean in terms of domestic and foreign policies? Our annual report offers a clear plan of action. Drawing on the extensive research conducted by the Council on Energy, Environment and Water, the report crystallises our findings and recommendations on a range of issues. CEEW strives to integrate the concerns surrounding energy, water, local environmental challenges and global climate change. Without such integration the risk of known and unknown or unintended consequences becomes higher, as other countries and regions, too, confront similar challenges.

Each policy brief in this report outlines the key challenge, the barriers (self-imposed or external) that India faces, its underlying strengths and capacities to respond and exploit new opportunities, and the recommendations that emerge from this and other CEEW research. We hope that the new government and all other key stakeholders in India's development will consider these recommendations and plan of action as our contribution to a national and global dialogue on prosperity with sustainability. This is our humble vision for India.



Arunabha Ghosh  
Chief Executive Officer

New Delhi  
August 2014

# Events & Outreach



CEEW Hosted a State Consultation for Ministry of Water Resources & ADB's National Water Mission Study on National Water Use Efficiency Improvement



Keynote Lecture by Mr Suresh P Prabhu, CEEW Chairperson and Former Union Minister, at Fourth Clean Energy Ministerial



H.E, President of Iceland, Ólafur Ragnar Grímsson, at a lecture organised by CEEW on 'The AHA Moment India and our Ice-Covered World'



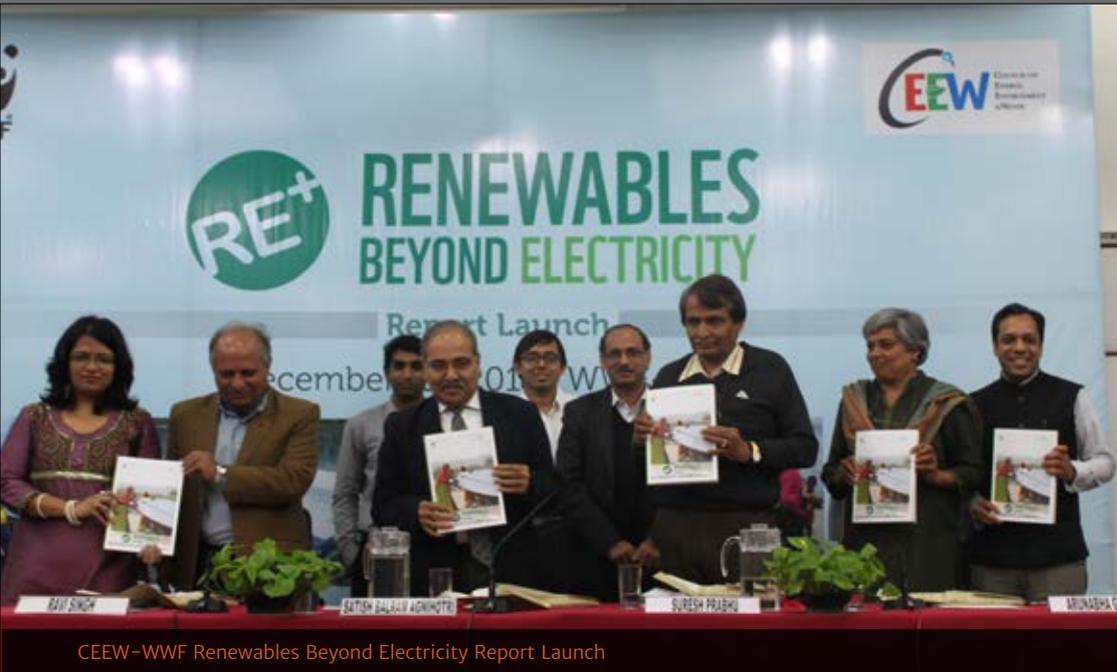
Global Green Growth Summit 2013



CEEW Hosted Dr Ernest Moniz, US Energy Secretary, for a Roundtable on Scaling Decentralised Clean Energy in India



Mr. Jamshyd Godrej at Launch of CEEW's Urban Water and Sanitation Report



CEEW-WWF Renewables Beyond Electricity Report Launch



'Lecture by Ricardo Meléndez-Ortiz, Chief Executive, ICTSD



Mr Arun Maira, Member Planning Commission and Dr Isher Judge Ahluwalia, Chairperson ICRIER, at Launch of CEEW's Urban Water & Sanitation Report



NDTV's Mission Energy Launch

# Energy Updates 2013-14

## Modelling India's Energy Scenarios and Supply Risks

Current policies focusing on making energy commodities affordable do not sufficiently address availability and awareness related issues, which are crucial to ensure a transition to cleaner and efficient fuels and technologies. CEEW is modelling long-term scenarios for India's energy from the perspectives of access, supply vulnerabilities, fuel choices and investment needs.

Our results for energy access suggest that the reliance on solid fuels (traditional biomass, coal and charcoal) is set to continue until 2050. Consumption of cooking fuels like LPG shows a tremendous increase in both rural and urban areas. There is a near five-fold growth in the per capita consumption of LPG in rural areas. While electricity access and consumption in urban areas is very much on the rise, the demand from rural areas will outstrip the demand from urban areas.

## Developing Effective Networks for Energy Access

In order to understand the potential for a countrywide network to help facilitate and scale-up off-grid renewable energy and energy access solutions, CEEW conducted extensive desk research, had one-to-one interactions with over 100 individuals and held three stakeholder consultations. Extensive analysis and stakeholder consultations across the country revealed two core sets of services: technology development,

testing and certification; and skills and training. During the course of the project 250 firms working in this sector in India were also identified. CEEW "actioned" this research by spearheading the formation of the Clean Energy Access Network (See its description on page 40).

## Energy Storage for Off-Grid Renewables in India

By 2020, more than 2000MW of energy storage capacity is expected to be in the off-grid renewable energy market. Currently off-grid entrepreneurs are faced with energy storage choices that are largely driven by cost, forcing them to disregard other options that exist. In order to enhance and strengthen the energy storage sector for off-grid renewables, policy interventions can be made in three areas:

- A differentiated incentive mechanism must be promoted to broaden the market for battery based storage and shift away from the current dominance of lead acid storage
- Improve compliance among consumers in furthering environmentally sound practices when it comes to recycling
- Innovation and R&D in battery technology, specific to off-grid consumers' needs, must be promoted actively

*CEEW's Research Fellow, Dr Vaibhav Chaturvedi, Chairing a Panel Discussion on Energy Security and Power Trade*





*Building the Case for the Clean Energy Access Network (CLEAN)*

## Renewables Beyond Electricity

While the current policies and activities are focusing on power generation through renewables, there is a need to look at potential applications of renewable energy beyond electricity generation.

Research has indicated that the huge unmet needs of energy services, especially in rural India, are being partly met by offering decentralised energy solutions. Renewable energy applications and technologies, such as improved biomass cook stoves, biogas digesters, solar space heating and cooling system, solar photovoltaic water pump, solar pasteuriser, solar desalinator, wind water pumps and so forth have been successfully installed and accepted in different parts of the country.

This trend is encouraging for two reasons: first, it demonstrates that market-based solutions can be developed to fulfil the energy needs of the poor; and secondly, it empowers individual households and communities to take control of their energy destinies. The report prepared in collaboration with WWF India was launched by Mr Satish Agnihotri, then Secretary, Ministry of New and Renewable Energy.



*Energy Access Roundtable with Prof Johannes Urpelainen*

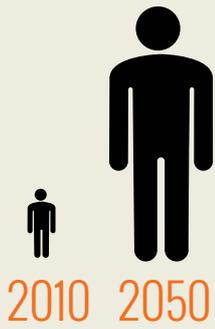
## Selected Events

### Organised

- Dialogue with U.S. Secretary of Energy, Dr Ernest Moniz, on 'Scaling Decentralised Clean Energy in India', New Delhi, 11 March 2014
- Launch of CEEW-WWF report on 'RE+ : Renewables Beyond Electricity' by Dr Satish Agnihotri (Secretary MNRE), New Delhi, 19 December 2013
- Roundtable discussion with Dr Michael Levi, Council on Foreign Relations- USA, on 'The Power Surge: Energy, Opportunity, and the Battle for America's Future', New Delhi, 3 October 2013
- Roundtable discussion with Professor Johannes Urpelainen, University Of Columbia, on 'Electricity for Rural India: Understanding Policy Preferences', New Delhi, 24 June 2013
- Consultation on 'Countrywide Alliance for Energy Access and Renewable Energy (CAEARE)', New Delhi, 10 May 2013, and Bangalore, 14 May 2013

### Participated as Key Speaker

- India-U.S. Track II Dialogue on Climate Change and Clean Energy, New Delhi, 19- 20 April 2013, and Washington D.C., February 2014
- India's Energy Scenarios - Senior Energy Advisory Council, New Delhi, 11 April 2013, and Mumbai, 16 December 2013
- 'Energy Future - Grey to Green World' panel discussion, New Delhi, 27 November 2013
- 'Energy Security and Power Trade' panel discussion at ADB-CII conference 'Promoting Mekong-India Economic Cooperation, New Delhi, 19 November 2013
- Solarcon, Bangalore, 1 August 2013



5 1/2

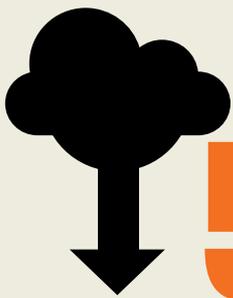
times growth estimated in India's commercial primary energy consumption between 2010 and 2050

Source: CEEW

450%

Estimated increase relative to 2010 in per capita carbon dioxide emissions due to fossil fuel dependence in 2050

Source: CEEW



50%

Decrease in India's cumulative emissions vis-à-vis Business as Usual required between 2010 and 2050 for meeting a 2° C target under a globally cooperative climate regime

Source: CEEW



400%

Increase in bio-ethanol/ bio-diesel production required by 2020 compared to 2013 to meet 20% transportation oil blending target

Source: CEEW; USDA



40%

of India's low-carbon primary energy needs to be fulfilled by nuclear energy by 2075 for meeting India's emission mitigation goals

Source: CEEW

# Energy Mix, Energy Efficiency, and Low-Carbon Pathways

**Challenge:** Leveraging energy efficiency and an optimal energy mix for India's low-carbon future while meeting development aspirations.

## Background and Barriers

- Rising population and projected economic growth impose a mitigation challenge with a fossil fuel-dominated energy sector
- Subsidised or ambiguous energy pricing regime impedes moving towards a more energy efficient and renewables-rich economy
- Higher comparative cost of low-carbon technology compared to fossils on the energy supply side
- Lack of comparable technological options on the end-use side for switching from fossil fuels to alternative energy sources, e.g. moving from oil to electricity or hydrogen in the transportation sector
- Incremental progress in electricity and fuel market liberalisation

## Strengths and Opportunities

- Policy push towards solar and nuclear energy for de-carbonising electricity generation
- Perform, Achieve and Trade (PAT) scheme for reducing industrial sector emissions and improving industrial energy efficiency
- Thrust on more efficient public transportation with many cities opting for metro rails and modern bus fleet
- Bureau of Energy Efficiency's appliance rating programme, propelling higher penetration of energy efficient appliances through increased awareness about efficiency gains and financial savings

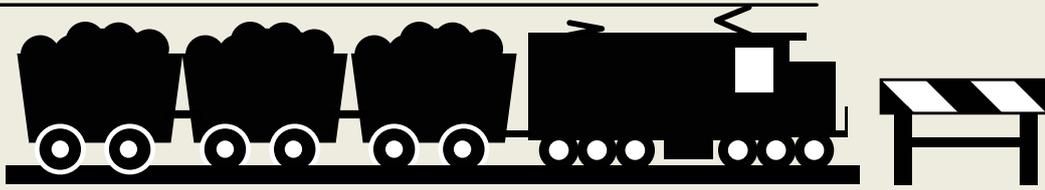
## Consequences of Inaction

- Two-fold increase in dependence on (mainly imported) fossil fuels, and increased rate of emissions of global and local pollutants
- Long-term fixities in fossil fuel-backed supply sector: power plant lifetime spans 40-50 years, and the more fossil fuel plants we build, higher the chances of investment lock-in with limited flexibility

- Uncontrolled growth of private vehicles, energy consumption and emissions from transportation sector: more congestion, adverse health impacts, and loss of economic value
- Inefficient electricity usage and wastage in the buildings sector; higher electricity bills

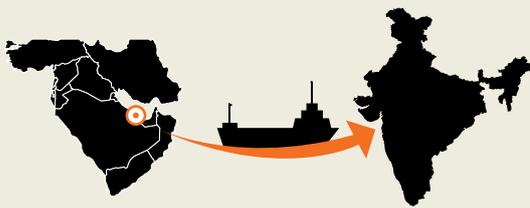
## Recommendations

- Establish a Green Growth Unit within the Prime Minister's Office (PMO) to periodically assess the alignment of policies to maximise co-benefits of mitigating emissions and meeting developmental needs
- Establish a single Energy Ministry, failing which an Energy Board within the PMO to integrate policy across all energy sectors
- Ministry of Environment, Forest and Climate Change (MoEF & CC) should mandate that all new fossil fuel power plants built after 2020 be carbon capture ready; although more expensive, it would be a risk cover and offer flexibility in moving towards Carbon Capture and Storage (CCS) under a climate-constrained world
- An independent body should undertake regular and credible risk assessments to address the divergent risk perceptions around nuclear energy
- Ministry of Power should enable market based ratings of utility performance and permit buyouts of poorer performing utilities
- Incentivise alternative fuels for the transportation sector through tax exemptions contingent on emissions and efficiency performance rather than for specific technologies
- Revisit regulations on waste-to-energy to encourage waste reuse in industry



**300** million tonnes of annual coal production remains untapped for want of 300 km of railway tracks

Source: CEEW



**75% - 80%**

India's dependency on a single country Qatar for natural gas imports

Source: CEEW



**90%**



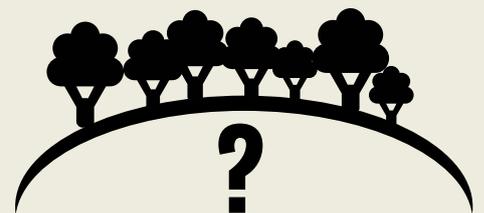
of India's imported coal demand is met by 3 countries i.e. Indonesia, Australia and South Africa

Source: CEEW

**48%**

of sedimentary basin area is yet to be evaluated for gas reserve potential in India

Source: MoPNG



# Coal and Natural Gas

**Challenge:** Catering to the rising demand of coal while increasing the share of natural gas in a bid to keep end user prices at affordable levels and minimise the pollutant load and GHG emissions.

## Background and Barriers

- Coal currently contributes around 45% to the primary energy mix compared to the 8% contributed by natural gas
- Production from existing coal fields has stagnated and natural gas production has not lived up to expectations, leading to high import dependence from a handful of suppliers
- Lack of co-ordination and implementation capacity on part of States, (MoEF & CC), Ministry of Coal, and Indian Railways have led to new coal mines with large production capacity not exploited for want of rail connectivity
- Underutilised and concentrated pipeline network prevents expansion of gas supply to demand centres
- Regulated pricing and allocation policy (both coal and natural gas) distorts end user consumption choices and production decisions

## Strengths and Opportunities

- High willingness to pay for energy services from many consumer sectors, which can drive new supply sources
- Large resource bearing areas of natural gas are yet to be explored (~50%). In addition, initial estimates indicate significant potential of unconventional gas sources (shale/ gas-hydrates) and technologies to explore these are becoming more widespread
- Supply from new mines with a production capacity of 300 MTPA (50% more than present production capacity) could be achieved through expansion of rail network to these areas
- A fully integrated national grid with open access gives developers the freedom to develop thermal power plants across the country based on the availability of resources

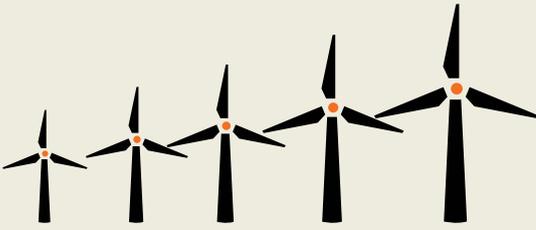
## Consequences of Inaction

- Dwindling GDP growth rates as a result of energy deficit
- In a regulated price environment, exploitation of higher cost reserves (deep sea gas / unconventional gas) may not materialise and will perpetuate the energy deficit
- Stagnant domestic production will lead to import of costlier coal and LNG, increase the current account deficit and have a cascading impact on prices across the economy
- Increase in pollutant concentration from the use of inefficient plants and the need to handle large quantities of ash from unwashed coal

## Recommendations

- Domestic resources need to be ascertained before signing on to expensive long-term contracts
- Clarity and consistency in policy to ensure time-bound statutory clearances for exploration projects and creating a level playing field for private sector willing to invest in exploration and production
- Maintain continuing focus on expanding the rail network to transport more coal from existing and new mines
- Institute a reporting authority to ensure inter-ministerial coordination on issues of national security (such as coal transportation, cleaner coal technology, gas terminals)
- Diversification of gas imports across multiple suppliers (including pipeline based imports from Iran and Turkmenistan) with a focus on obtaining long-term concessional rates, or at the very least a good hedging strategy to safeguard against price swings
- Increased capitalisation of entities like ONGC Videsh Limited, Coal Videsh Limited in order to compete with other state owned companies in emerging economies to secure overseas production assets or to enable bidding as part of joint consortia

# 100 GW



Five-fold increase in wind installation to be completed under the proposed National Wind Mission by 2022

Source: MNRE

## Over 90%

of the wind and solar installations are spread across seven states i.e. Tamil Nadu, Gujarat, Rajasthan, Maharashtra, Karnataka, Madhya Pradesh and Andhra Pradesh



Source: CEEW



## 58%

Area categorised as a solar hotspot in India

Source: IISc

Ambitious target of RE's contribution to overall electricity mix by the year 2020

Source: NAPCC

## 15%



# Grid-connected Renewable Energy

**Challenge:** Increasing the share of renewable energy in India's electricity mix while ensuring the stability of an increasingly integrated national grid.

## Background and Barriers

- National Missions for Solar and Wind (proposed) have targets to install 20 GW of grid-connected solar energy and 100 GW of grid-connected wind energy by 2022
- Despite huge potential of biomass, small hydro and other alternative resources, the focus has been limited to wind and solar
- Renewable energy is not yet cost competitive (for a variety of reasons) and deployment is driven by targeted policies, which require budgetary support from the government
- Lack of adequate evacuation infrastructure and variable nature of renewable sources hinder uptake and integration of renewable energy into the grid
- Poor enforcement of Renewable Purchase Obligations has undermined growth in the Renewable Energy Certificate market

## Strengths and Opportunities

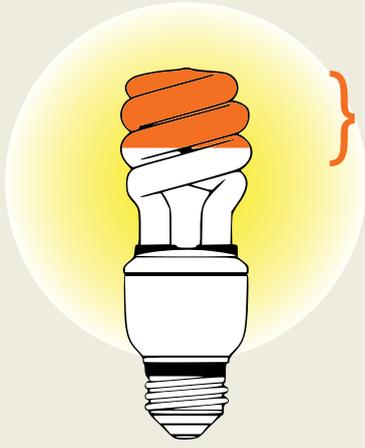
- Despite challenges, installation of solar power exceeded phase 1 targets while prices dropped by half
- With experience of over 20 GW of wind power installations, Indian wind turbine manufacturing industry has shown signs of being globally competitive
- A National Clean Energy Fund (NCEF) has been created by the government to increase research and deployment of clean energy

## Consequences of Inaction

- Investors and developers may hesitate to invest due to medium-term uncertainties about RPO enforcement
- Poor evacuation infrastructure for dispersed renewable energy projects will undermine confidence in expected returns
- Without a quantum jump in domestic installations, domestic manufacturing of renewable energy components is unlikely to take off.

## Recommendations

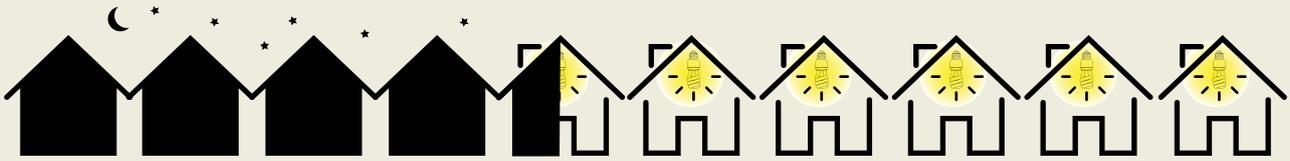
- Strengthen the finance ecosystem for utility scale renewable energy, with focus on long-term debt, interest rate subsidies, loan guarantees, and risk insurance
- Use generation based incentives and penalties in combination with any form of viability gap or tax related capital subsidies
- Pilot green bonds and a green bank via leading municipalities or state governments
- Enforce RPOs and impose penalties on utilities failing to comply
- Outline a clear roadmap of projects with evacuation infrastructure to gain financier and developer confidence
- Ensure transparent and timely information dissemination (e.g. policy updates, plant performance) to build awareness and confidence amongst financiers
- Use NCEF to promote R&D in renewable energy technologies suitable to domestic conditions, such as hybrid cooling for power plants
- Invest in energy storage technologies and infrastructure for grid stability in the long-term
- Support opportunities to create value at home by being part of a global supply chain of renewable energy products and services



**30%**

Premium paid by the poor for every unit of useful energy consumed

Source: CEEW: NSSO



**45%**

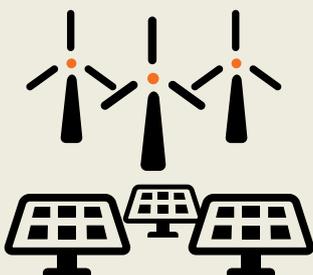
of rural households in India are non-electrified

Source: Census 2011

**85%**

of rural households devoid of clean cooking fuel

Source: CEEW: NSSO



**250**

Approximate number of decentralised renewable energy firms in India

Source: CEEW

# Decentralised and Distributed Renewable Energy

**Challenge:** Reduce operating costs and financial risks to stimulate the decentralised clean energy market and promote sustainable business models.

## Background and Barriers

- Around 80 million households in India remain without access to electricity
- Nearly 45% of rural households struggle with electricity supply
- Less than a third of rural households have access to clean cooking fuels; despite rising incomes, the consumption of traditional biomass keeps rising in rural India, due to inadequate supply of modern fuels
- There are approximately 250 decentralised renewable energy firms offering a range of business models across several technologies, but many still operate on a small scale
- Growth of the decentralised clean energy market is hindered by: limited access to investment and working capital; lack of skilled human resources; experiences with poor quality products eroding consumer trust; insufficient anchor loads; and lack of awareness regarding potential end use applications powered by decentralised renewable energy (water pumping; purification/desalination; cold storage, etc.)

## Strengths and Opportunities

- Large number of firms and varied business models offer a laboratory for India and other developing countries
- Outreach to financiers and creating portfolios of investable projects backed by loan/risk guarantee funds could unleash investment in this sector
- Focusing on livelihood-linked end-use applications, which could be powered using decentralised energy, enhances consumers' willingness to pay
- Engaging grassroots organisations could increase awareness and mobilise community-based entrepreneurs for maintenance of decentralised energy installation

## Consequences of Inaction

- Deficit in energy access to persist for longer with consequences for governance and politics
- Low-income households would struggle with health hazards in absence of clean cooking fuels and safe drinking water; both needs can be met with decentralised clean energy
- Lack of investments and supportive policies/programmes would hinder commercialisation of successful pilots

## Recommendations

- Support asset financing models, which enable consumers to pay for services as opposed to bearing upfront costs
- Use NCEF to capitalise a Decentralised Energy Risk Guarantee Facility
- Create a single window to channel institutional investment into portfolios of decentralised energy projects
- Build synergies between ministries (water, health, agriculture, etc.) to leverage potential of decentralised energy; for example, integrating clean energy into national clean drinking water programmes
- Introduce government accredited standardised curricula for decentralised energy skills development in training institutes
- Facilitate R&D institute-industry-investor collaboration
- Create a network of regional technology testing centres by upgrading laboratories in engineering and R&D institutions
- Establish an online “go-to” information portal for decentralised energy stakeholders

# Water Updates 2013-14

## Urban Water and Sanitation in India

Between December 2012 and July 2013, CEEW went beyond the usual “public versus private” discourse and convened five roundtable discussions to deliberate on the challenges facing the urban water and sanitation sector. The dialogues were informed by issue briefs prepared by CEEW covering an array of issues: challenges of water utility management; roles of the private sector and civil society; role of the regulator; challenges with water measurement and data; and ongoing efforts and difficulties with building capacity in the UWSS sector. Participants included water utility managers, government representatives, private water companies, financing institutions, credit rating institutions, civil society organisations, think-tanks, senior academics, architects, planners, lawyers and multilateral agencies.

After the dialogues, a report was compiled which summarised the existing literature on urban water management issues, offered cases of successful and not so successful practices, captured the essence of a series of dialogues, showcased the individual opinions of experts who participated, and underlined key recommendations for policymakers. The report was released by Mr Arun Maira, Member Planning Commission, and Dr Isher Judge Ahluwalia, Former Chairperson of the High Powered Expert Committee on Urban Infrastructure and Services.

## A Strategic Roadmap for the 2030 WRG India Water Platform

As part of its efforts to strengthen the water ecosystem in India, CEEW in collaboration with the 2030 Water Resources Group created a strategic roadmap for setting up an India Water Platform. In comparison to existing water networks, it was proposed that the India Water Platform (IWP) would stand out as an action-focused multi-stakeholder platform using innovative technologies and building collective action with communities. CEEW recommended that the platform should focus on:

- Collective action on enhancing industrial water use efficiency from extraction to disposal
- Enhance agriculture water efficiency within a river basin
- Engage with Urban Local Bodies in the neighbouring areas of the selected industrial clusters on possibilities for different institutional, technological and contractual arrangements to increase reliability of urban water supply
- Create a knowledge management group that could commission studies on hydro-economic modelling and to trace the different technological and institutional options available and their cost-water saving potential for various sectors

*CEEW's Associate Fellow Dr Nirmalya Choudhury at a workshop for DFID's South Asia Water Governance Programme*





*Fifth CEEW-Veolia Urban Water Roundtable*

## Responsible Hydropower Development in India: Challenges for the Future

By the end of the fourth year of the Eleventh Five Year Plan (March 2011), hydropower contributed around 22% of the total power generation in India. In India, which is struggling to meet the power demand, it becomes further important to focus on hydropower development given that only around 16% of the hydro potential in the country has been used. Also, hydropower is less carbon intensive than coal-based thermal power plants, which dominate our electricity portfolio.

However, unplanned hydropower development may result in a situation of “rapid” hydropower development rather than social and environmentally “responsible” hydropower development. To pursue responsible hydropower development, two key priorities would include: Environment Impact Assessment (EIA) follow up, and gaining public support through greater public involvement during the planning process. The voluntary environmental, social and governance standards drafted by the Ministry of Corporate Affairs, the mandatory Business Responsibility Reports to be filed with the Securities and Exchange Board of India (SEBI) and new legal statutes like the Right to Fair Compensation and Transparency in Land Acquisition and Rehabilitation and Resettlement Act, 2013, could open up new arenas through which socially and environmentally responsible hydropower development could be considered.

## Selected Events

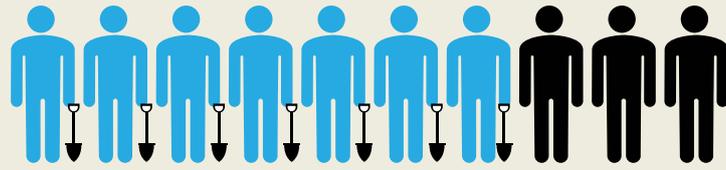
### Organised

- Roundtable on ‘Sustainability Assessment for Integrated River Basin Management: Yellow River and Upper Ganga’, New Delhi, September 2013
- 2030 Water Resources Group meeting on ‘Sustainable Water Resources Management in the Industrial Sector of Karnataka’, Bangalore, July 2013
- Fifth and final CEEW-Veolia roundtable on ‘Building Capacity in the Urban Water Sector’, New Delhi, July 2013
- State consultation for the National Water Mission, Hyderabad, June 2013
- Public event with H.E, President of Iceland, Ólafur Ragnar Grímsson, on ‘The AHA Moment: India and our Ice-Covered World’, New Delhi, April 2013

### Participated as Key Speaker

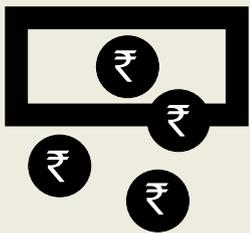
- Lecture at Occidental College on ‘Reimagining Water Security: India’s Quest for Systemic Solutions’, Los Angeles, March 2014
- Promoting Hydro Power: A Counter Strategy against Rising Fossil Fuel Prices, New Delhi, December 2013
- Northern Region Water Conclave, Chandigarh, December 2013
- The Himalayan Arctic Council, Reykjavik, October 2013
- Participatory Watershed Governance Toolbox Development, New Delhi, July 2013

# 70%



of rural working population in India depends on agriculture and allied activities for livelihood

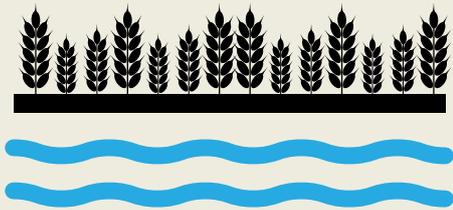
Source: Ministry of Agriculture



# ₹240 bn

Annual agricultural power consumption subsidy amounting to 25% of India's fiscal deficit

Source: World Bank



# >60%

of the irrigated area depends on groundwater irrigation

Source: CEEW; MoWR



# 12

Indian states where diesel is the major source of energy for irrigation, 11 of which are in eastern and northeastern India

Source: CEEW; MoWR

# Water Governance for Agricultural Use

**Challenge:** Produce more food with less water.

## Background and Barriers

- Agriculture and allied activities continue to support more than 70% of the rural working population
- Agriculture accounts for 70%–80% of total water use
- More than 60% of the irrigated area depends on groundwater irrigation
- Groundwater depletion has resulted in a decline in dug wells and increase in deep tube wells
- Electricity is used for irrigation in western and southern India, while diesel is a dominant source for eastern, and northeastern regions
- Irrigation service delivery is poor in canal systems across the country
- Poor rural electrification in eastern and northeastern India
- Electricity pricing for groundwater extraction is highly politicised
- Smallholder agriculture increases transaction cost for water management

## Strengths and Opportunities

- Policy focus shifting to water governance and management through 12th Five Year Plan and National Water Policy
- National Water Mission gives impetus to increasing water use efficiency by 20%
- Structurally groundwater distribution, the major driver of irrigation in the country, is more pro-poor compared to the landholding status because of greater access to pumps than canal water for small and marginal farmers
- Separation of feeders may make a dent into the energy-irrigation nexus but more analysis needed on its impact on water use

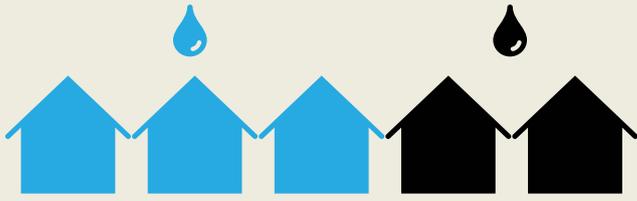
## Consequences of Inaction

- Groundwater overdraft will make several key agricultural states water stressed, increase irrigation costs and affect food security
- Water wastage from surface irrigation will continue, with no resultant increase in agriculture or water productivity

- Pressure on water use in agriculture will increase competition with other sectors and impact economic security
- Climate change will further complicate water management and agricultural growth strategies in several states

## Recommendations

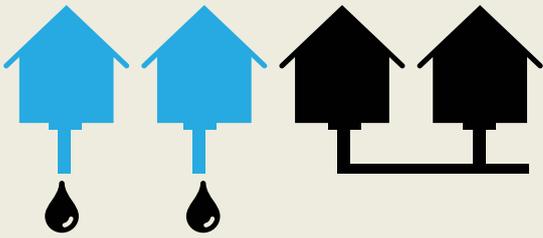
- Establish a National Water Commission (with statutory authority) to function as guardian and overseer of the National Water Strategy, provide technical advice to national and state water administrations and act as a watchdog of the rights of all water stakeholders
- Establish a Bureau of Water Efficiency to implement and enforce water efficiency targets under the National Water Mission and encourage adoption of water-saving technologies
- Apply a four-pronged strategy to break the irrigation energy nexus
  - Rural electrification in eastern India
  - Volumetric tariffs in north-western, western and southern states
  - Extensive use of solar pumps especially for small and marginal farmers
  - Improved reliability of water supply
- A “paradigm shift” in irrigation management is required
  - Give state financial support to water user associations to facilitate participatory farmer-led water measurement and management
  - Explore possibilities of including private service providers accountable for irrigation service delivery through service contracts
  - Strengthen agriculture supply chains by linking water user associations to Farmer Producer Companies
  - Establish a dedicated position within WUAs with the responsibility of connecting farmers to extension services
- Increase R&D on saline-water-resistant and drought-resistant seeds



**38%**

Nearly 38% of India's urban households do not receive treated water

Source: Census 2011



**55%**

of urban households have no wastewater outlets to closed drainage systems

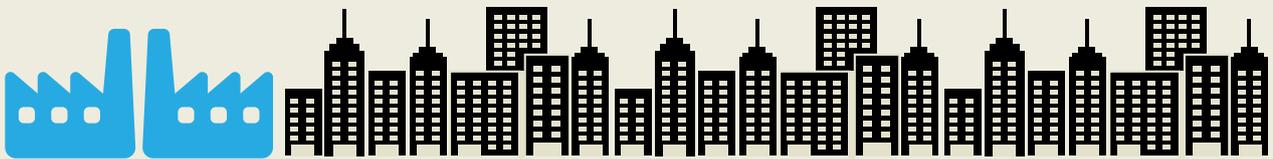
Source: Census 2011



**40%**

Average amount of non-revenue water in Indian cities

Source: MoUD



**18%**

of India's total water demand in 2050 would be in the industrial sector

Source: IWMI

# Urban and Industrial Water Management

**Challenge:** Supplying reliable and safe water in a financially efficient and socially equitable manner to cater to a burgeoning urban population; minimising shared water risks faced by industry through collaborative multi-stakeholder action and through increase in water use efficiency within industrial processes.

## Background and Barriers

- India's urban population (370 million) grew by 32% as against rural growth of 12% in the last decade
- Nearly 30% of India's urban households do not have access to tap water and 28% do not have access to water within their premises
- Nearly 38% of India's urban households do not receive treated water and 18.6% do not have access to any form of sanitation facilities at home
- Non-revenue water (NRW) averages 40% in cities, with utilities suffering from old infrastructure and poor operation and maintenance
- Water demand for industrial use is increasing with economic growth and expected increase in share of manufacturing from 15% to 25% of GDP under the National Manufacturing Policy
- Poor accountability for services delivered and absence of an independent regulator
- Deteriorating financial health of utilities
- Focus continues on new infrastructure development while O&M is neglected
- Water treatment facilities are insufficient and where present are not working at full capacity
- Industries tend to act "within the fence" with limited collective action to combat shared water risk

## Strengths and Opportunities

- Dying wisdom is still alive: traditional methods of water management still exist in parts of the country
- Municipalities have selectively outsourced water service tasks through management contracts
- Corporate social responsibility, under the Companies Act 2013, could open a new window for collaborative action across different stakeholders
- Realisation among some companies that water is a shared risk and actions need to be "outside the fence"

## Consequences of Inaction

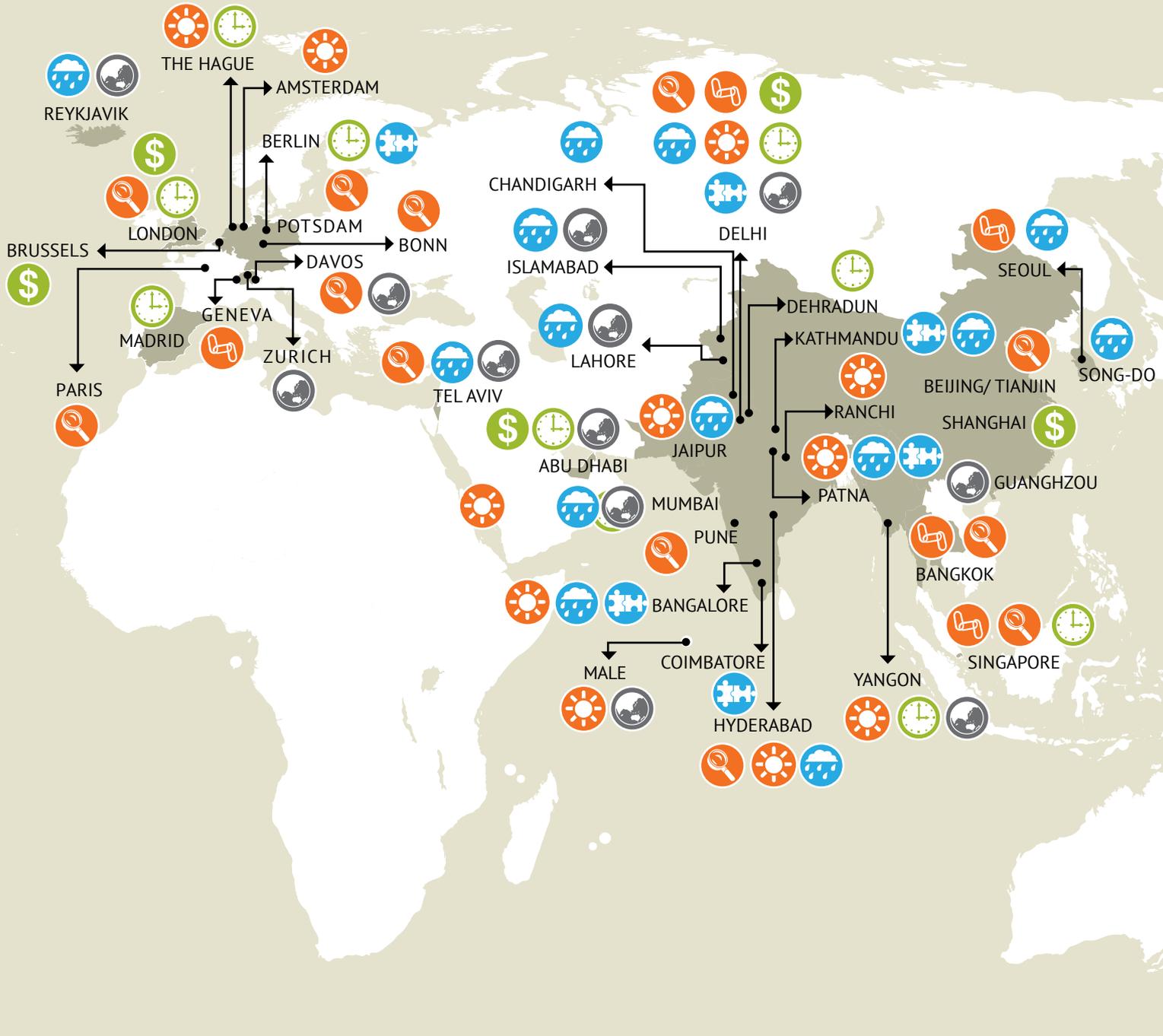
- Further decline of water quantity and quality and sanitation services will exacerbate adverse health impacts
- Poorer households will increase their dependence on informal tanker supplies
- Pollution of rivers and aquifers would continue
- Cities would be less prepared to cope with climate change-induced water stress and risks
- Industries, including power plants, may have to relocate or shut down due to lack of water supply
- Water conflicts would increase and industry may face the brunt

## Recommendations

- Establish progressive water pricing for households and industry to encourage efficiency but demonstrate improved service delivery before raising tariffs
- Map water utility assets, traditional water bodies, quantity and quality of various water sources, network status, consumers and relevant stakeholders before negotiating PPP contracts to reduce perceptions of risk
- Water PPP contracts should strictly mention that the level/quality of services should be the same for all, even if a dual tariff system or a subsidised service delivery system for urban poor is offered
- Use civil society organisations to build community capacity (through self-help groups) and develop alternative models of service delivery
- Modify training curricula to build capacity for a new cadre of water managers rather than civil engineers
- Develop a National Water Platform to systemise "beyond the fence" collective action by industry in partnership with other stakeholders

# INTEGRATED | INTERNATIONAL | INDEPENDENT

The world map showcases places where CEEW has engaged in projects or presented its work. The icons represent thematic areas of CEEW's work, each of which is studied in depth while also focusing on its linkages with other development concerns.



Resource efficiency & security  
[ceew.in/resources](http://ceew.in/resources)



Renewables  
[ceew.in/renewables](http://ceew.in/renewables)  
[ceew.in/solar](http://ceew.in/solar)  
[ceew.in/energyaccess](http://ceew.in/energyaccess)



Water  
[ceew.in/water](http://ceew.in/water)



Integrated energy, environment and water plans  
[ceew.in/eeplans](http://ceew.in/eeplans)



Energy-trade-climate linkages  
[ceew.in/etclinkages](http://ceew.in/etclinkages)



Sustainability finance  
[ceew.in/susfinance](http://ceew.in/susfinance)



Technology horizons  
[ceew.in/technology](http://ceew.in/technology)  
[ceew.in/geoengineering](http://ceew.in/geoengineering)  
[ceew.in/JCERDC](http://ceew.in/JCERDC)



International co-operation

# Environment Updates 2013-14

## India's Energy, Food and Water Security: International Cooperation for Domestic Capacity

India's rapid growth trajectory and development imperatives pose a great challenge to its resource security as it is already struggling to meet domestic demand for energy, food and water, and has 14 percent of the global population living without electricity and nearly a third of the global population cooking with traditional biofuels. It has little spare land or water and is one of the world's most vulnerable countries to the impacts of climate change. Over the coming decades, these challenges will intensify.

Both India, and its global allies have an incentive to look for opportunities for international cooperation on resource, and environment issues that will strengthen global regimes, while making India's search for domestic solutions more fruitful. Greater international engagement can help improve understanding of the risks that India faces, provide India with a platform to share potential solutions with partners, provide a basis for Indian leadership in the G-20, and help India to influence the post-2015 development agenda. Also, more decisive international engagement on resource issues will only be possible if the Indian government is prepared to enhance significantly its capacity to engage internationally.

## The Business Case for Phasing Down HFCs in Room and Vehicle Air Conditioners

As living standards rise for tens of millions of Indian people, the enormous expansion in room and vehicle air conditioning could strain the country's electric grid, require increased fuel import, and magnify the impacts of global warming as a consequence of emissions of carbon dioxide (CO<sub>2</sub>) and hydrofluorocarbons (HFCs)—manufactured chemicals currently used in large quantities in air conditioners and various other products. HFC use in India will expand dramatically unless businesses, consumers, and government work together to develop and adopt energy efficient and climate friendly alternatives. Policies and measures to help leapfrog to alternative refrigerants are the need of the hour. An issue paper prepared by CEEW in collaboration with IGSD, NRDC and TERI outlined some preliminary actions that could encourage companies to leapfrog to lower-GWP alternatives. These include:

- The Indian Ministry of Environment and Forests and National Ozone Unit could officially endorse the EC flammable safety standard as an interim measure while facilitating rapid development of Indian safety standards
- Leadership companies in India could commit to produce room air conditioners with low-global warming potential (GWP) refrigerants and better life-cycle climate performance for green buildings, including

*Presentation on HFCs at Montreal Protocol Meetings, Bangkok*



apartments and condominiums. The Government of India could signal endorsement of Life Cycle Climate Performance (LCCP) for appropriate applications



*India-France Technology Summit*

- Rapid transition to low-GWP refrigerants in European, Japanese, and North American markets would send a strong signal that HFC-134a is obsolete for mobile air conditioners and that HFC-410a is obsolete for room air conditioners

programme means that the interested parties would have to account for variance in research capacity, develop flexible funding mechanisms, outline clear liability rules, and decide on ownership of and ease of access to intellectual property.

## Ethics, Politics and Governance of Geoengineering Research

The existing landscape of multilateral environmental agreements varies in terms of their relevance to governing (largely, prohibiting) the deployment of geoengineering technologies. There is, however, a governance gap regarding R&D activities on geoengineering. No existing institution appears to have the mandate or capacity to govern the upstream process of laying down proactive research and governance mechanisms. Meanwhile, research activities are gaining momentum, even though the vast majority of researchers might currently be concentrated in a few developed countries, thus raising questions about the legitimacy of the research and exposing governance deficits.

What lessons can be drawn from other international research endeavours to design coordinated scientific research in solar geoengineering? There are some basic principles that are key to successful endeavours: inclusiveness, transparency and review, public engagement, and applying the precautionary principle. Further, operationalising an international research

## Selected Events

### Organised

- Seminar on 'Energy Emissions Scenario' by Dr Kishore Dhavala (Post-Doctoral Researcher at the Basque Centre On Climate Change), New Delhi, 27 February 2014
- Singapore Sustainability Symposium, Singapore, 8-10 January 2014
- Seminar on 'Opportunities for Integrated Policy Design – Application of GAINS India Tool' by Pallav Purohit, International Institute for Applied Systems Analysis (IIASA), New Delhi, 18 December 2013
- Training on Climate Change for IndiGo Airlines, Gurgaon, 6 August 2013
- HFC Presentation On 'Advancing Ozone And Climate Protection Technologies', Montreal Protocol meetings, Bangkok, 26 June 2013

### Participated as Key Speaker

- Lecture on 'Globalization, Climate Change and India's Quest For Resources: Three Mantras For Resource Security' at Occidental College, Los Angeles, 25 March 2014
- 'Climate Change and Sustainability Agenda' at World Economic Forum 2014, Davos, 23-24 January 2014
- 'Powering the Next Century: Cross-Cutting Challenges in the Governance of Strategic Resources', Abu Dhabi, 17-18 November 2013
- Global Green Growth Summit 2013, Korea, 10 - 11 June 2013
- NYU-UAE Climate Finance Workshop, Abu Dhabi, 22 April 2013



*CEEW's Karthik Ganesan & Vaibhav Gupta Post the Presentation on Strategic Industries to India's National Security Adviser*



# Only 4%

Since 1947, India's cumulative investment in domestic minerals exploration amounts to only 4% of just one year's mineral import bill

Source: CEEW

# 5-8

years needed to secure a mining lease in India

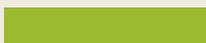
Source: Ministry of Mines



# 45%

Effective tax on Indian mining sector, much higher than global average rates

Source: FICCI



# 18%

Incremental revenue that could be earned from India's raw mineral exports through value addition at par with current import prices

Source: CEEW

# Critical Mineral Resources and Mining

**Challenge:** Pursuit of mineral resource security through strategic planning and sustainable mining practices, so as to minimise the impact of future supply restrictions on industrial growth and the environment.

## Background and Barriers

- Non-fuel mineral consumption has diversified over time in conjunction with technological advances in almost every industrial activity, infrastructure and manufacturing sectors, as indeed all sectors of economy
- Despite being a vital input in industrial and manufacturing activities, non-fuel minerals (NFM) development has not received the same attention as enjoyed by fossil fuels (coal, oil and gas)
- While the direct contribution of NFM to the economy is 2% of GDP, they are eventually indispensable to the entire manufacturing GDP (15%–17%)
- Procedural ambiguities, uncertain policies and poor governance in land acquisition and in providing environmental and other statutory clearances affect investments in mining and minerals
- A significant portion of mineral deposits are located in ecologically sensitive areas and forested lands and can have a high social and environmental impacts in adjoining areas
- Paltry budget for NFM exploration activities

## Strengths and Opportunities

- India is endowed with a diverse mix of mineral deposits (~85 minerals), many of which could invite private sector participation in exploration and production
- Beneficiation technologies for mineral ores to increase domestic value addition are available and enhanced secondary mineral recovery offers significant potential
- Stagnant manufacturing sector could get a boost if a sustainable of supply mineral resources is ensured
- For those minerals of which India has low or no domestic reserves, strategic trade relations with resource rich countries are needed

## Consequences of Inaction

- Substantial economic burden and high import dependence on processed ores/minerals/metals or even derived finished goods
- Persisting threat to resource security with the emerging trend of resource nationalism
- With little research in finding alternatives, resource insecurity magnifies
- Opportunity cost of losing economic value addition and jobs from domestic exploration and enrichment of mineral resources

## Recommendations

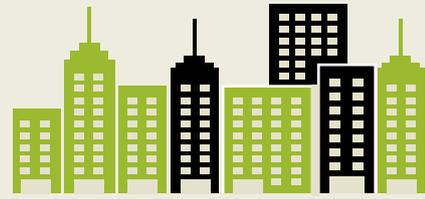
- Develop a framework to identify a set of critical nonfuel minerals for India's industrial development
- Promote domestic mining practices through incentives to the private sector, clear policy directives, and time-bound clearance procedures
- Establish an autonomous Environmental Protection Agency, develop and closely monitor "EIA follow up" codes to ensure that mining clearances are not abused while government authorities are also held accountable for delays
- Enlarged focus on R&D to identify substitutes for critical mineral resources, which show signs of dwindling availability (production/ reserves) in the medium-term



# \$300 bn

Opportunity for foreign investment in infrastructure

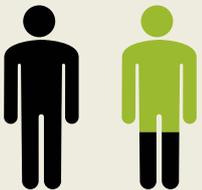
Source: Gol



# 80%

of the built environment that will exist in India in 2030 is yet to be constructed

Source: McKinsey



# 30%-50%

Average per capita energy consumption of Indians by 2030 in comparison to average global per capita energy consumption

Source: IEA



# 0.1%

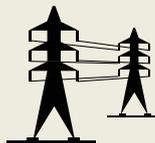
India's share of patent applications in solar PV and wind technologies amongst major economies

Source: WIPO: Espacenet Global Database



# 600mn

tonnes of coal



# 550bn

kWh of electricity



# 3.4bn

tonnes of CO2

Energy & emissions savings potential via new technologies in the cement sector between now and 2050

Source: CEEW

# Enabling Conditions for India's Sustainable Future: Finance, Trade, Technology, & Regulation

**Challenge:** Avoiding a false choice between economic growth and environmental sustainability by leveraging financial innovation, open markets, technology development and effective regulation.

## Background and Barriers

- Per capita consumption of energy and other resources in India remains lower than global average
- Political incentives to offer subsidised resources but which exacerbate inequalities by imposing higher effective costs on poor households
- Lack of deep debt market makes investments in sustainable infrastructure risky
- R&D activities have poor record of converting into commercialisation at scale
- Threat of trade disputes of clean technologies has complicated policy options to encourage manufacturing
- Regulatory ambiguity and lack of enforcement (such as for renewable purchase obligations, or pollution control norms) undermines investment

## Strengths and Opportunities

- India has successfully used reverse auctions to reduce the price of solar power; other financial methods such as generation-based incentives and viability gap funding are being attempted
- More than \$300 billion opportunity for foreign investment in infrastructure creates new routes for channelling funds to new technologies
- Nearly 80% of the built environment that will exist in India in 2030 is yet to be constructed, creating opportunities for resource efficiency in buildings
- Large energy consuming sectors, such as cement, have potential for positive economic returns through greater use of refuse-derived fuels and other low-carbon technologies
- Indian firms are already innovating to develop alternatives to high global warming chemicals such as hydrofluorocarbons
- New templates for joint technology development have emerged, such as the \$125 million India-U.S. Joint Clean Energy R&D Centers
- Global supply chain in renewable energy products and services offers an opportunity to revive Indian manufacturing in clean technology sectors

## Consequences of Inaction

- Lock-in to older technologies with associated environmental consequences and continued pressure in global negotiations
- Falling behind on new frontiers of technology development, especially as countries like China and South Korea premise their future growth strategies on clean technology industries
- Rising trade disputes and worries about costs of intellectual property licence fees
- Stranded assets in sectors using inefficient fossil fuel technologies or decentralised renewable energy without compatibility with the grid will make financial investments unviable

## Recommendations

- Establish a “one-stop” information portal for R&D funding and activities to promote resource efficiency technology development
- Create target-based competitions for resource efficiency (such as for reducing water use, lowering weight of batteries, increasing efficiency of solar panels) and permit public-private-university collaborations
- Use advance market commitments with mandated targets for clean technologies to stimulate innovation without increasing outlay of public funds
- Promote commercialisation by giving priority to universities/institutes, which are able to collaborate actively with the private sector
- Promote private sector participation by creating a Technology Risk Guarantee Fund, for converting applied research to demonstration prototypes
- Reduce administrative burden on patent examiners and establish “fast track IP courts” for patent infringements
- Offer royalty-based cooperative grants, rather than soft loans, to encourage innovation

## 3 mantras for resource security

# access + efficiency + externalities



More Than  
**70%**

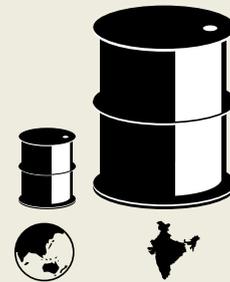
of existing and planned thermal and hydro power capacity is located or expected in water-scarce or water-stressed areas

Source: WRI

India's overseas oil production is now around 10% of domestic production

Source: Ministry of Finance

**10%**



**95%**

of India's trade by volume depends on maritime routes (or 70% by value)

Source: Gol

of India's oil demand may be import dependent by 2030

Source: Gol



**90%**

# Resource Security and Resource Diplomacy

**Challenge:** Ensuring the availability of adequate quantities of critical resources, at prices which are affordable and predictable, with minimum risk of supply disruptions, to ensure sustainability for the environment and future generations.

## Background and Barriers

- India's primary energy consumption is likely to increase by two and a half times by 2030 as compared to 2010
- Coal and oil production have flattened and imports could account for 40% and 90% of demand, respectively by 2030
- About 35 minerals needed for manufacturing, many of which could be critical, account for 75% of India's non-fuel mineral import bill

## Strengths and Opportunities

- A resource security tool kit – MATRIX – could comprise several policy instruments
- Markets: better understanding of and integration into global resource markets, rather than only relying on long-term bilateral deals, which constrain India's options as market conditions change, prices vary or new sources open up
- Acquisition: acquiring resources elsewhere based on deep understanding of market and political conditions, supply bottlenecks and environmental constraints, to ensure that equity stakes yield maximum returns
- Transportation: strengthening, resource transportation routes (ports, terminals, freight tracks, pipelines) and leveraging India's geographical position in the Indian Ocean
- Restructuring the energy infrastructure, building on India's strengths in decentralised energy, and expanding resource efficiency measures on the demand side
- Institutions: with India's growing weight in energy markets, it can engage more with energy institutions at a global or regional level or by developing issue-specific or resource-specific regimes
- X-factor: encouraging R&D at home by building on strong base of scientific research and promoting joint collaborations on energy innovation with other countries, with the aim of commercialising technologies and business model innovations in India and elsewhere

## Consequences of Inaction

- Inability to understand and manage the resource nexus: inter-sectoral and inter-regional conflict over food and water resources; internal security challenges
- Losing out on technological advances and increasing vulnerability to supply shocks
- Rising risk of resource nationalism and breakdown of global energy markets
- "Atmospheric space" for development-related carbon emissions will continue to shrink
- Vulnerability in sea lanes and growing Chinese presence in the Indian Ocean

## Recommendations

- Access: Establish an Integrated Resource Corporation to help firms acquire resources via equity capital, guarantees for debt market financing, liability guarantees, long-term bilateral agreements, and coordination with embassies
- Access: Joint bidding with China and others to lower resource acquisition costs
- Access: Develop optimal supply infrastructure for energy and resources and monitor the state of coastal and inland infrastructure
- Access: Promote business models in decentralised energy and encourage foreign firms to establish manufacturing facilities in India
- Efficiency: Establish the business case for resource efficiency (energy, minerals and water)
- Externalities: Create an Indo-Pacific Forum for coordinated action on energy, increased transparency, strategic reserves, protection of key energy supply routes, and arbitration on energy-related disputes and protection of overseas investments
- Externalities: Find new allies in climate negotiations on issue-by-issue basis by emphasising India's basic energy needs against mercantilist negotiating positions

## Books/Reports

 Poulami Choudhury, Rajeev Palakshappa, and Arunabha Ghosh (2014) RE+: Renewables Beyond Electricity- Solar Air Conditioning and Desalination, CEEW-WWF Report, August

 Karthik Ganesan, Poulami Choudhury, Rajeev Palakshappa, Rishabh Jain, and Sanyukta Raje (2014) Assessing Green Industrial Policy: The India Experience, CEEW-IISD Report, April

 Vaibhav Gupta, Karthik Ganesan, Sanyukta Raje, Faraz Ahmed, and Arunabha Ghosh (2013) Strategic Industries and Emerging Technologies for a Future Ready India, Report submitted to India's National Security Advisory Board, Prime Minister's Office, December

 Rishabh Jain, Poulami Choudhury, Rajeev Palakshappa, and Arunabha Ghosh (2013) RE+: Renewables Beyond Electricity, CEEW-WWF Report, December

 Rudresh Sugam and Arunabha Ghosh (2013) Urban Water and Sanitation in India: Multi-stakeholder Dialogues for Systemic Solutions, CEEW-Veolia Report, November, pp. i-147

 Rajeev Palakshappa, Arunabha Ghosh, Poulami Choudhury, and Rishabh Jain (2013) Developing Effective Networks for Energy Access- An Analysis, CEEW-USAID Report, October

 Nirmalya, Choudhury, Rudresh Sugam and Arunabha Ghosh (2013) 2030 Water Resources Group National Water Platform: Preliminary Investigation of the Possible Roles, Functions and Potential Governance, New Delhi; Council on Energy Environment and Water-Water Resources Group Report, September, pp. i-25

 Arunabha Ghosh et al. (2012) Concentrated Solar Power: Heating Up India's Solar Thermal Market under the National Solar Mission, Report (Addendum to Laying the Foundation for a Bright Future: Assessing Progress Under Phase I of India's National Solar Mission), September, New Delhi, Council on Energy, Environment and Water; and Natural Resources Defense Council

 Arunabha Ghosh, with Himani Gangania (2012) Governing Clean Energy Subsidies: What, Why and How Legal?, August, Geneva: International Centre for Trade and Sustainable Development

 Rudresh K. Sugam, and Arunabha Ghosh (2012) Institutional Reform for Improved Service Delivery in Bihar: Economic Growth, Agricultural Productivity, and a Plan for Reorganising the Minor Water Resources Department, Research Report submitted to the Government of Bihar, July, New Delhi: Council on Energy, Environment and Water, and International Growth Centre, Patna

 Council on Energy, Environment and Water; and Natural Resources Defense Council (2012) Laying the Foundation for a Bright Future: Assessing Progress Under Phase 1 of India's National Solar Mission, Interim Report, April, pp. i-37

 Arunabha Ghosh, Arundhati Ghose, Suman Bery, C. Uday Bhaskar, Tarun Das, Nitin Desai, Anwarul Hoda, Kiran Karnik, Srinivasapuram Krishnaswamy, Radha Kumar, Shyam Saran (2011) Understanding Complexity, Anticipating Change: From Interests to Strategy on Global Governance, Report of the Working Group on India and Global Governance, December, pp. i-70

 Martin A. Burton, Rahul Sen, Simon Gordon-Walker, and Arunabha Ghosh (2011) National Water Resources Framework Study: Roadmaps for Reforms, October, New Delhi: Council on Energy, Environment and Water, and 2030 Water Resources Group, pp i-68

 Martin A. Burton, Rahul Sen, Simon Gordon-Walker, Anand Jalakam, and Arunabha Ghosh (2011) National Water Resources Framework Study: Research Report Submitted to the Planning Commission for the 12th Five Year Plan, September, New Delhi: Council on Energy, Environment and Water, and 2030 Water Resources Group, pp. i-584

 Arunabha Ghosh (2010) Harnessing the Power Shift: Governance Options for International Climate Financing, Oxfam Research Report, October, pp. 1-90

## Papers/Book Chapters

 Vaibhav Chaturvedi and Mohit Sharma (2014) 'Modelling Long Term HFC Emissions from India's Residential Air-Conditioning Sector', CEEW Working Paper 2014/7, July

 Karthik Ganesan and Rajeev Vishnu (2014) 'Energy Access in India-Today, and Tomorrow', CEEW Working Paper 2014/10, June

 Vaibhav Chaturvedi and Son H Kim (2014) 'Long Term Energy and Emission Implications of Global Shift to Electricity-Based Public Rail Transit System', CEEW Working Paper 2014/9, May

 Vaibhav Chaturvedi, Priyadarshi R Shukla, and Karthik Ganesan (2014) 'Implications of Risk Perceptions for Long Term Future of Nuclear Energy in India: A Sensitivity Analysis around Nuclear Energy Cost within an Integrated Assessment Modelling Framework', CEEW Working Paper 2014/6, April

 Arunabha Ghosh (2014) 'Environmental Institutions, International Research Programmes, and Lessons for Geoengineering Research', Geoengineering Our Climate Working Paper, February



Nirmalya Choudhury and Arunabha Ghosh (2013) 'Responsible Hydropower Development in India: Challenges for future', CEEW Working Paper 2013/5, December



Rishabh Jain, Karthik Ganesan, Rajeev Palakshappa and Arunabha Ghosh (2013) 'Energy Storage for Off-Grid Renewables in India: Understanding Options and Challenges for Entrepreneurs', CEEW Report, July



Arunabha Ghosh, and David Steven (2013) 'India's Energy, Food, and Water Security: International Cooperation for Domestic Capacity', in Shaping the Emerging World: India and the Multilateral Order, edited by Waheguru Pal Singh Sidhu, Pratap Bhanu Mehta, and Bruce Jones, Washington, D.C.: Brookings Press



Rajeev Palakshappa et al. (2013) 'Cooling India with Less Warming: The Business Case for Phasing-Down HFC's in Room and Vehicle Air Conditioners,' Council on Energy, Environment and Water; Natural Resources Defense Council; The Energy and Resources Institute; and The Institute for Governance and Sustainable Development, June



Arunabha Ghosh (2013) 'Energy-Food-Water-Climate Nexus: Implications for India's National Security,' Paper submitted to India's National Security Advisory Board, Prime Minister's Office, March



Vyoma Jha and Rishabh Jain (2012) 'Results-Based Financing for Off-grid Energy Access in India,' Case-study on the Economics of Results-Based Financing in Study by Vivideconomics for Energy Sector Management Assistance Program (ESMAP), World Bank, Washington DC, November



Arunabha Ghosh (2012) 'Industrial demand and energy supply management: A delicate balance,' Empowering growth - Perspectives on India's energy future, A report from the Economist Intelligence Unit: 26-32, October



Arunabha Ghosh, Benito Müller, William Pizer, and Gernot Wagner (2012) 'Mobilizing the Private Sector: Quantity-Performance Instruments for Public Climate Funds,' Oxford Energy and Environment Brief, The Oxford Institute for Energy Studies, August, pp. 1-15



Sachin Shah (2012) 'Institutional Reform for Water Use Efficiency in Agriculture: International Best Practices and Policy Lessons for India,' CEEW Working Paper 2012/3, April



Arunabha Ghosh (2011) 'Seeking Coherence In Complexity: The Governance Of Energy By Trade And Investment Institutions,' Global Policy 2 (Special Issue): 106-119



Arunabha Ghosh (2011) 'Strengthening WTO Surveillance: Making Transparency Work for Developing Countries,' in Making Global Trade Governance Work for Development, edited by Carolyn Deere-Birkbeck. Cambridge: Cambridge University Press



Jason Blackstock, and Arunabha Ghosh (2011) 'Does geoengineering need a global response - and of what kind?,' Background Paper, Solar Radiation Management Governance Initiative, Royal Society UK, Chicheley, March

## Policy Briefs & Legislative/Government Briefings



Arunabha Ghosh (2014) "High Value, Technology-Enabled Manufacturing" Briefing note for the India-U.S. Strategic Dialogue. New Delhi. 18 July



Arunabha Ghosh (2014) "India-U.S. Partnership on Energy Storage (R&D, Enterprise and Deployment)" Briefing note for the India-U.S. Strategic Dialogue. New Delhi. 16 July



Arunabha Ghosh (2014) "Clean Energy Access Network (CLEAN) and Supporting Decentralised Clean Energy" Briefing note for the India-U.S. Strategic Dialogue. New Delhi. 13 July



Vaibhav Gupta and Karthik Ganesan (2014) 'India's Critical Mineral Resources: A Trade and Economic Analysis', CEEW Policy Brief, July



Arunabha Ghosh and Susan G. Esserman (2014) 'India-U.S. Cooperation on Renewable Energy and Trade,' Briefing paper for the India-U.S. Track II Dialogue on Climate Change and Energy. Washington D.C. 12 February



Arunabha Ghosh and Karthik Ganesan (2014) 'National Wind Mission,' Briefing to MNRE Secretary, New Delhi, 4 February



Arunabha Ghosh (2013) 'Strategic Industries and Emerging Technologies for a Future Ready India,' Briefing to India's National Security Adviser, Prime Minister's Office, New Delhi, 18 October; to National Security Advisory Board, Mumbai, 3 December; and to India's Planning Commission, New Delhi, 10 December



Arunabha Ghosh (2013) 'Business Case for HFC Phase Down in India,' Briefing to Prime Minister's Office, New Delhi, 22 November



Arunabha Ghosh, Rudresh Sugam, Nirmalya Choudhury (2013) 'Integrated Energy, Environment and Water Plan for Jharkhand: Preliminary Investigations and Propositions,' Briefing to the Government of Jharkhand, Ranchi, 18 September



Nirmalya Choudhury (2013) 'Knowledge Hub under National Water Mission – Governance Issues', Briefing to the Ministry of Water Resources, Government of India, on the proceedings of the Working Group on Governance of the Knowledge Hub under the National Water Mission (a flagship mission of the Government of India under the National Action Plan on Climate Change), New Delhi, 26 August



Nirmalya Choudhury (2013) 'Governance Issues towards Creating a Knowledge Hub under the National Water Mission,' Briefing for a multi-stakeholder roundtable discussion on creating a Knowledge Hub under the National Water Mission (a flagship mission of the Government of India under the National Action Plan on Climate Change), New Delhi, 14 August



Arunabha Ghosh (2013) 'National Water Platform: Some Thoughts for Brainstorming Meeting,' Briefing to the Ministry of Water Resources, Government of India, on creating a Knowledge Hub under the National Water Mission (a flagship mission of the Government of India under the National Action Plan on Climate Change), New Delhi, 5 August



Rudresh Sugam and Urvashi Sharma (2013) 'Capacity building in the urban water sector,' Issue brief for the Fifth CEEW-Veolia Water Roundtable on Urban Water Management, 5 July



Arunabha Ghosh, Stephen O. Andersen, Bhaskar Deol, and David Doniger (2013) 'The Business Case for Avoiding & Replacing High-Global Warming Potential HFC Refrigerants While Phasing Out HCFC Refrigerants,' Briefing at the Montreal Protocol Open-Ended Working Group. Bangkok, 26 June



Rudresh Sugam and Urvashi Sharma (2013) 'Water data and measurement,' Issue brief for the Fourth CEEW-Veolia Water Roundtable on Urban Water Management, 27 May



Rudresh Sugam and Urvashi Sharma (2013) 'Regulatory framework for urban water management in India,' Issue brief for the Third CEEW-Veolia Water Roundtable on Urban Water Management, 9 April



Rudresh Sugam and Urvashi Sharma (2013) 'Private sector participation in water management and water for all,' Issue brief for the Second CEEW-Veolia Water Round table on Urban Water Management, 11 February



Arunabha Ghosh (2013) 'Renewable Energies and Trade: Addressing tensions and challenges,' Briefing to a high-level policy dialogue at the World Trade Organization meeting of Ambassadors, Geneva, 21 January



Rudresh Sugam (2012) 'Water Utility Management in the Urban Water Sector,' Issue brief for the First CEEW-Veolia Water Roundtable on Urban Water Management, New Delhi, 20 December



Karthik Ganesan (2012) "Climate Change and Business Leadership: Pathways to GHG Emissions Reduction and Sustainability in the Indian Cement Industry," Paper presented at the Third National ICRN Conference on Climate Change, Indian Institute of Science, Bangalore, 4 November



Vyoma Jha (2012) "Trends in Investor Claims over Feed-in Tariffs for Renewable Energy," Investment Treaty News, July



Arunabha Ghosh (2012) "Water governance priorities in India, South and East Asia, the case for integrated energy, environment and water plans, and Rio+20 goals," Briefing to the Brazilian Federal Senate, Environment, Consumer Rights and Oversight Committee & Agriculture and Land Reform Committee, Rio de Janeiro, 20 June



Arunabha Ghosh (2011) "Briefing on global governance to Ambassador Shivshankar Menon, National Security Adviser, Government of India," Prime Minister's Office, 20 December



Vyoma Jha (2011) "Cutting Both Ways?: Climate, Trade and the Consistency of India's Domestic Policies," CEEW Policy Brief, August

## Op-eds/Conference Papers/Other publications



Suresh P Prabhu (2014) Rethink on Land Use' The Economic Times, 22 July. Available at <http://ceew.in/pdf/SP-Ground-Beneath-our-Foot-ET-Article-24Jul14.pdf>



Suresh P Prabhu (2014) 'Ganga Rakshak Dal Banane Ki Zaroorat' Dainik Jagran, 3 July. Available at <http://ceew.in/pdf/CEEW-SP-Article-in-Dainik-Jagran14Jul14.pdf>



Arunabha Ghosh (2014) 'Three Mantras for India's Resource Security' Seminar Magazine, June. Available at <http://ceew.in/pdf/AG-Three-Mantras-for-India-s-Resource-Security-Seminar-658-Jun14.pdf>



Suresh P Prabhu (2014) 'Handling the Energy Crisis' The Hindu, 18 April. Available at <http://ceew.in/pdf/CEEW-Handling-the-energy-crisis-SP-Article-in-The-Hindu-18Apr14.pdf>



Suresh P. Prabhu (2014) 'Idea 5: Let There Be Light, Always' Open Magazine, 22 March. Available at [http://ceew.in/pdf/Idea%205%20\\_%20OPEN%20Magazine.pdf](http://ceew.in/pdf/Idea%205%20_%20OPEN%20Magazine.pdf)



Suresh P. Prabhu (2014) 'India's Green Growth needs Policy Push' Energy Next, 8 February. Available at [http://ceew.in/pdf/Indias\\_Green\\_Growth\\_Needs\\_Policy\\_Push\\_Suresh\\_Prabhu.pdf](http://ceew.in/pdf/Indias_Green_Growth_Needs_Policy_Push_Suresh_Prabhu.pdf)



Suresh P. Prabhu (2013) 'Strengthening the regulatory network' The Hindu, 3 December. Available at <http://www.thehindu.com/opinion/op-ed/strengthening-the-regulatory-network/article5415035.ece>



Suresh P. Prabhu (2013) 'Strengthening the regulatory network' The Gulf Today, 5 December. Available at <http://ceew.in/pdf/SPP-Strengthening-the-regulatory-network-The-Gulf-Today-5Dec13.pdf>



Jake Schmidt, Stephen O. Andersen, Arunabha Ghosh, et al (2013) 'Cooling India with Less Warming: The Business Case for Phasing Down HFCS,' Fact Sheet, November.



Arunabha Ghosh (2013) 'More Lethal Greenhouse Gas' The Times of India, 25 October. Available at <http://timesofindia.indiatimes.com/home/opinion/edit-page/More-lethal-greenhouse-gas/articleshow/24675848.cms>



Arunabha Ghosh (2013) 'Himalayan Ecosystems and Himalayan Cooperation: A Himalayan Effort Needed?' Arctic Circle Forum. Reykjavik. 13 October.



Suresh P Prabhu (2013) 'Gloom to Bloom to Doom' The Economic Times, 13 August. Available at <http://ceew.in/pdf/SPP-Gloom-to-bloom-to-doom-The-Economic-Times-3Aug13.pdf>



Suresh P Prabhu (2013) 'Reviving the Power of Electricity' The Financial Express, 22 April. Available at <http://epaper.financialexpress.com/108103/Indian-Express/22-April-2013#page/6/2>



Suresh P Prabhu (2013) 'Think of Water Before it Rains Again' The Financial Express, 19 April. Available at [bit.ly/XWaALS](http://bit.ly/XWaALS)



Suresh P. Prabhu (2013) 'Sharing the burden of going green' The Hindu, 17 May. Available at [http://ceew.in/pdf/SPP-Sharing\\_the\\_burden\\_of\\_going\\_green-The-Hindu-17May2013.pdf](http://ceew.in/pdf/SPP-Sharing_the_burden_of_going_green-The-Hindu-17May2013.pdf)



Jamshyd N Godrej (2013) 'Bring in smart policies, clear the air on clean energy' The Economic Times, 17 April. Available at <http://economictimes.indiatimes.com/opinion/comments-analysis/bring-in-smart-policies-clear-the-air-on-clean-energy/articleshow/19587149.cms>



Arunabha Ghosh and Ricardo Meléndez-Ortiz (2013) 'Want clean energy? Avoid trade disputes' Business Standard, 15 April. Available at [http://www.business-standard.com/article/opinion/want-clean-energy-avoid-trade-disputes-113041500023\\_1.html](http://www.business-standard.com/article/opinion/want-clean-energy-avoid-trade-disputes-113041500023_1.html).



Arunabha Ghosh (2013) 'India's resource nexus: priorities for action' Mint, 10 April. Available at <http://www.livemint.com/Opinion/zAOvm6gwBKa6Bzr9DfSyxN/Indias-resource-nexus-priorities-for-action.html>.



Arunabha Ghosh (2013) 'Private Sustainability Finance: Need for cash, role of institutions' NYU – UAE MOFA Workshop on Climate Finance and Institutions. Abu Dhabi. 22 April.



Sanyukta Raje and Vaibhav Gupta (2013) 'India-US Track II Dialogue on Climate Change and Energy: Enhancing Bilateral Cooperation between India and the US', Proceedings Report, 18–20 April.



Arunabha Ghosh and Anjali Jaiswal (2012) 'What's eclipsing India's solar sector' Business Standard, 11 August. Available at [http://ceew.in/pdf/AG%20&%20AJ-Business\\_Standard\\_11Oct12.pdf](http://ceew.in/pdf/AG%20&%20AJ-Business_Standard_11Oct12.pdf)



Arunabha Ghosh (2012) 'Make it profitable to save resources' India Today, 26 March. Available at [http://ceew.in/pdf/AG-Make\\_it\\_profitable\\_to\\_save\\_resources-India\\_Today-26Mar12.pdf](http://ceew.in/pdf/AG-Make_it_profitable_to_save_resources-India_Today-26Mar12.pdf)



Arunabha Ghosh (2012) 'Leave polemics out of the water policy' The Hindu, 19 March. Available at [http://ceew.in/pdf/AG-Leave\\_polemics\\_out\\_of\\_the\\_water\\_policy-The\\_Hindu-19Mar12.pdf](http://ceew.in/pdf/AG-Leave_polemics_out_of_the_water_policy-The_Hindu-19Mar12.pdf)



Arunabha Ghosh (2012) 'Innovation needs an ecosystem' Business Standard, 26 February. Available at [http://ceew.in/pdf/AG-Innovation\\_Needs\\_an\\_Ecosystem-Business\\_Standard\\_26Feb12.pdf](http://ceew.in/pdf/AG-Innovation_Needs_an_Ecosystem-Business_Standard_26Feb12.pdf)



Jamshyd N Godrej (2011) 'ET Awards' Agenda for Renewal 2011: Energy, the new poverty, says Jamshyd Godrej, Chairman & MD, Godrej & Boyce' The Economic Times, 24 November. Available at [http://articles.economictimes.indiatimes.com/2011-11-24/news/30437448\\_1\\_clean-energy-energy-security-comprehensive-energy-plan](http://articles.economictimes.indiatimes.com/2011-11-24/news/30437448_1_clean-energy-energy-security-comprehensive-energy-plan)



Jamshyd N Godrej (2011) 'Deregulation: Solving diesel conundrum' The Times of India, 28 January. Available at <http://timesofindia.indiatimes.com/business/india-business/Deregulation-Solving-diesel-conundrum/articleshow/7375419.cms?referral=PM>



Arunabha Ghosh (2009) 'Climate for a win-win dialogue' The Financial Express, 22 December. Available at <http://www.financialexpress.com/news/column-climate-for-a-win-win-dialogue/557335/0>



Arunabha Ghosh (2009) 'Street lessons in climate governance' The Financial Express, 18 December. Available at <http://www.financialexpress.com/news/column-street-lessons-in-climate-governance/555484/0>



Arunabha Ghosh (2009) 'Red herrings in debates over climate finance' Opinio Juris, 15 December. Available at <http://opiniojuris.org/2009/12/15/red-herrings-in-debates-over-climate-finance/>



Arunabha Ghosh (2009) 'Even climate is about the money' The Financial Express, 7 December



Arunabha Ghosh (2009) 'Making Copenhagen count' the GEG blog, 7 December.



# Meet CEEW's Executive Team



**Arunabha Ghosh**  
Chief Executive Officer

Public Policy, International Relations, Energy & Resource Security, Renewable Energy Policy, Water Governance, Climate Governance, Energy-Trade-Climate Linkages; Worked @ Princeton, Oxford, UNDP, WTO; WEF Young Global Leader  
*Runs, Sings & Bakes; Connects dots*



**Vaibhav Chaturvedi**  
Research Fellow

Climate Policy, Energy Policy, Integrated Assessment Modeling, Forest Management Grad, IIM Ahmedabad Doctorate in Economics, Pacific Northwest National Lab (USA) Post-Doc  
*Music Enthusiast, Avid Reader & Nature Lover*



**Karthik Ganesan**  
Senior Research Associate

Energy Access, Energy Poverty, Nuclear Energy, Fiscal Policies for RE, Quantitative Techniques and Choice Modelling, Economic Valuation, Lee Kuan Yew School of Public Policy (NUS)  
*Football Enthusiast, Long Distance Running, Scrabble Fanatic, Quizzing*



**Abhishek Jain**  
Junior Research Associate

Energy Access, Industrial Sustainability, Project Management, Cambridge MPhil in Engineering for Sustainable Development, Chevening Scholar, IIT R Grad in Mechanical Engineering  
*Writing, Poetry, Trekking, Photography & Nature Walks*



**Sonali Mittra**  
Junior Research Associate

Water Policy, EIA, Environmental Law & Management, Water Diplomacy, Transboundary Water management, Hydropower, University of Manchester  
*Philosophical Fanatic, Motivational Speaker, Psycho-Analyst & Theatrical; Breaking all virtual palisades*



**Mohit Sharma**  
Junior Research Associate

Energy & Climate Systems, Renewable Integration, Modeling and Systems Analysis, Sustainability in Urban Ecosystems, Technical University of Denmark Post-Grad in Sustainable Energy, NIT Grad in Chemical Engineering  
*Music, Philosophy & Arts*



**Poulami Choudhury**  
Programme Officer

Renewables, Waste Management, Climate Change Adaptation & Mitigation; TERI Post-Grad in Natural Resources Management; Worked @ Clinton Foundation  
*Music Enthusiast, Avid Reader*



**Vaibhav Gupta**  
Programme Officer

Energy & Mineral Resource Security, Environmental Policy & Law, EMS (ISO 14001), Indian School of Mines (Dhanbad)  
*Sketching, Music & Sports; Be all you can be!*



**Sudatta Ray**  
Programme Officer

Energy Policy, Data Analytics, Math Junkie, Climate Policy, Energy Efficiency, Fulbright Scholar, Carnegie Mellon  
*Foodie, PG Wodehouse, Loves All 19th Century Fiction & 70-80's Music*



**Rudresh Kumar Sugam**  
Programme Officer

Water Governance, IWRM, Resources Mapping & Nexus, Climate Change, GIS, TERI, Yale  
*Superbikes & Singing*



**Shalu Agrawal**  
Research Analyst

Energy Access, Renewable Energy – Technologies & Finance, Fuel Subsidies, IIT Roorkee  
*Political Economy, Philosophy, Contemporary Dancing, Badminton, Rains & Greenery*



**Prachi Gupta**  
Strategic Partnerships and Communications

Fundraising, Partnership Building, Lobbying, Advocacy, Public Relations, Advertising, Sciences Po Masters in Communications  
*Baking & Cycling*



**Mihir Shah**  
Communications Specialist

Development Communications, Brand Management, Digital & Social Media Marketing, Documentation, MICA Post-Grad in Management. Worked @ Government of Gujarat  
*Travel Photography, Running, Trekking & World Cinema*



**Chandamita Das**  
Events Coordinator

Event/Conference Planning, Vendor Management, English Literature, NIEM  
*Freethinker, Sufi Music & Travelling; Always learning, unlearning & relearning*



**Aarti Katyal**  
Office Administrator

Administrator, Executive Assistant to CEO, Accounts & Finance; Post-Grad in HR & Supply Chain Management  
*Music, Dance, Art, Cooking & Cinema*



**Marutendra Karyee**  
Finance and Accounts Executive

Professional Accounting, Reconciliations, Year-End Closings, Financial Reports; Commerce Grad  
*Cricket Lover*

*Special thanks to Faraz Ahmed, Nirmalya Choudhury, Rishabh Jain, Rajeev Palakshappa, Sanyukta Raje, Meena Sarkar, Swati Trehan, Rajeev Vishnu for their contribution to CEEW over the last year.*

*We would also like to thank the following Visiting Fellows and Interns for their support: Vishnu Nanduri, Sujith Ravi, Deeya Bajaj, Priyanka deSouza, Lola Guyot, Charles Miller, Nolwenn Montheil, Urvashi Sharma, Komal Shukla, Himadri Sinha, Huijuan Wu.*

## You could play an important role in supporting CEEW

### You can support us by

- Offering financial support
- Giving a gift in kind to CEEW
- Creating partnerships with CEEW
- Helping CEEW gain visibility
- Contributing your valuable expertise and talent

For more information on how to support and engage with us, please:

Write in: **Thapar House, 124 Janpath, New Delhi 110001, India**

Email us: **info@ceew.in**

Or call us at: **+91 11 40733300**

# Board of Trustees



**Suresh P. Prabhu**  
Chairperson

*Former Federal Cabinet Minister of Industry, Power, Environment & Forests, Chemicals and Fertilisers, Heavy Industry & Public Enterprises*



**Jamshyd N. Godrej**  
Co-Chairperson

*Chairman of the Board of Godrej & Boyce Manufacturing Company Limited*



**Tarun Das**  
Founding Trustee



**Gautam Thapar**  
Trustee

*Chairman & CEO, Avantha Group*



**Anil Kakodkar**  
Trustee

*Former Director, Bhabha Atomic Research Centre (BARC); Former Chairman, Atomic Energy Commission; and Former Secretary to the Government of India, Department of Atomic Energy*



**Deepak S. Parekh**  
Trustee

*Chairman, HDFC*



**S. Ramadorai**  
Trustee

*Vice Chairman, Tata Consultancy Services  
Chairman, National Skill Development Agency,  
Government of India*

---

# International Advisory Board



**Peter Bakker**

*President, World Business Council on Sustainable Development (WBCSD)*



**Carlos Magariños**

*Former Director General of United Industrial Development Organisation (UNIDO)*



**John Briscoe**

*Gordon McKay Professor of the Practice of Environment Engineering and Environmental Health at Harvard University; former World Bank's Country Director for Brazil*



**Gunter Pauli**

*Founder of the "Zero Emission Research and Initiatives" and the Blue Economy concept*



**Ian Johnson**

*Secretary General, Club of Rome; formerly World Bank's Vice President for Sustainable Development*



**Björn Stigson**

*Former President of the World Business Council for Sustainable Development (WBCSD)*



**Anders Wijkman**

*Member of the Temporary Committee on Climate Change of the European Parliament*

# Our Partners

Together with our partners in India and across the globe, we aim to achieve the highest standards of research in finding solutions to sustainability issues – and implement those solutions to make a difference to the world.

- Administrative Staff College of India (ASCI)
- American University, United States of America
- Asian Development Bank (ADB)
- Ananta Aspen Centre
- Basque Centre for Climate Change (BC3), Spain
- Blacksmith Institute
- Brookings Institution
- Cairn Energy
- Center for Study of Science, Technology and Policy (CSTEP)
- Centre for European Policy Studies, Belgium
- Centre for International Governance Innovation (CIGI), Canada
- Institute for Social and Economic Research and Policy (ISERP), Columbia University
- Confederation of Indian Industry (CII)
- Department for International Development (DFID)
- Department of Science and Technology (DST), Government of India
- Environmental Defense Fund (EDF), United States of America
- Indian Renewable Energy Federation (IREF)
- International Centre for Trade and Sustainable Development (ICTSD), Switzerland
- Institute for Advanced Sustainability Studies, Germany
- Institute for Science, Innovation and Society (INSIS), University of Oxford
- International Finance Corporation (IFC)
- International Growth Centre (IGC)
- International Institute for Sustainable Development (IISD), Switzerland
- Joint Global Change Research Institute, United States of America
- Lee Kuan Yew School of Public Policy, National University of Singapore
- Ministry of New and Renewable Energy (MNRE), Government of India
- Ministry of Water Resources, Government of India
- Natural Resources Defense Council (NRDC), United States of America
- New York University School of Law
- Oxfam International
- Planning Commission, Government of India
- Public Health Foundation of India (PHFI)
- Royal Society, United Kingdom
- SELCO Foundation
- Shakti Sustainable Energy Foundation
- Shell International
- The Ashden India Renewable Energy Collective (AIREC)
- The Climate Group
- The Nand and Jeet Khemka Foundation
- The Energy and Resources Institute (TERI)
- United Nations Foundation
- United States Agency for International Development (USAID)
- Veolia Water India
- Vivid Economics
- World Bank
- World Economic Forum (WEF)
- World Resources Institute India
- WWF India
- 2030 Water Resources Group (WRG)

## @CEEWIndia (Highlighted Tweets)



**Jake Schmidt - NRDC** @jschmidtnrdc · 21 Jun 2013

Congrats to a fantastic Indian partner: [@CEEWIndia](#) for being ranked the #1 [#climate](#)-related think-tank in India and 15 globally



**Asia Society India** @AsiaSocietyIC · 20 Jun 2013

Asia Society's [#Asia21](#) delegate [@GhoshArunabha](#) leads the [@CEEWIndia](#) to number one in India in the [@ICCGOV](#) Climate... [fb.me/T9HIZe9b](https://fb.me/T9HIZe9b)



**Rob Garris** @robgarris · Oct 10

RT [@ceewindia](#): [#Obama](#) & [#ManmohanSingh](#) endorse proposal to launch "Promoting Energy Access through Clean Energy" [pmindia.nic.in/press-details](http://pmindia.nic.in/press-details).



**Thomas Hale** @thomasnhale · Feb 28

Great to meet w/ [@CEEWIndia](#)'s [@GhoshArunabha](#) & hear about the concrete steps Indian ministries and states are taking on energy and climate

# CEEW Research in Action

Over the past four years, we have continuously strived to produce high quality research aimed at offering policy innovations and sustainable development solutions for global, national and local problems. As part of our commitment towards sustainable growth and development, we are now establishing programmes and collaborations to 'Action our Research'. Clean Energy Access Network (CLEAN), Indian Alliance on Health and Pollution (IAHP), CEEW Action Research Mentorships (CARM), Centre for Quantitative Environmental Research (CQER) and Low Carbon Rural Development (LCRD) are just the beginning of this new journey.

## Clean Energy Access Network (CLEAN)

CEEW is a founding partner of the Clean Energy Access Network (CLEAN), an all India representative organisation for decentralised clean energy (DCE) entrepreneurs and related stakeholders. CLEAN's mission is to convene hundreds of stakeholders in decentralised energy to strengthen the sector in India, develop lessons for other parts of the world, and continue to increase energy access.

Over the past two years, CEEW played a pivotal role in the formation of CLEAN. With a research grant from USAID, CEEW surveyed the DCE sector during 2013 and held consultations with more than 100 firms across the country. After the case and business plan for a countrywide network was presented in August 2013, the idea of supporting such a network was incorporated as one of the activities under a new India-U.S. initiative called "PEACE: Promoting Energy Access through Clean Energy", announced during Prime Minister Manmohan Singh's visit to the U.S. last September. Thereafter, CEEW focused its efforts on bringing several partners on board. By February 2014, besides CEEW, Ashden India Collective, Indian Renewable Energy Federation, SELCO Foundation, Shakti Sustainable Energy Foundation, The Energy and Resources Institute, The Climate Group, The Nand and Jeet Khemka Foundation, UN Foundation, and WWF-India had signed an Alliance Charter as partners for CLEAN.

CLEAN is expected to deliver five core sets of services; information and networking; technology development, testing and certification; skills, training and capacity building; opportunities for policy advocacy; and increasing access to and lowering costs of finance.



## Indian Alliance on Health and Pollution (IAHP)

CEEW is collaborating with Blacksmith Institute India (BII) and Public Health Foundation of India (PHFI) to create and sustain the "Indian Alliance on Health and Pollution (IAHP)". IAHP is envisaged as a unique platform to strategically engage and partner with various stakeholders on the issues of pollution and its health impacts in India.

As part of IAHP, CEEW is slated to take lead in research and advisory engagement on the policy, regulatory and institutional challenges for pollution-related issues. It will also be a key contributor in impact evaluation of pollution and clean up actions along with information dissemination and awareness generation activities.



## CEEW Action Research Mentorships (CARM)

Since inception, CEEW has constantly strived to collaborate and work closely with agents of change at the grassroots – social entrepreneurs, industry, financing entities, and other NGOs active in the pursuit of holistic and sustainable development. With CARM, CEEW envisages building on this approach, empowering social entrepreneurs and innovators working at the grassroots with broader exposure to policy issues, and simultaneously improving our own understanding of grassroots challenges and barriers to policy implementation. CARM, an independent programme, will function in three ways:

- CEEW researchers spending 3-6 weeks on the field with identified partners. This is expected to enhance the quality of research output, and open up new areas of research
- Partners spending 3-6 weeks at the CEEW office to better understand broader policy elements that affect their functioning in their respective focus areas. Time spent by individuals could be used to learn the basics of quantitative and qualitative research techniques, which are employed in house, from experts within CEEW
- CEEW will pursue or support a novel idea in its domain areas, from inception to completion, through the active involvement of multiple actors.

## Centre for Quantitative Environmental Research (CQER)

There is growing emphasis on analysing regional pressures (for resource security), understanding state-level challenges in an integrated manner, and supporting urban local bodies in delivery of services. This cannot be done without access to quality primary data and sound modelling techniques. Through CQER, CEEW will develop the in-house capabilities for triangulating research results and building primary databases. CQER will further strengthen CEEW's efforts of supporting various arms and levels of government through non-ideological, evidence-based research inputs.



## Low Carbon Rural Development (LCRD)

Under this programme, in partnership with the Environmental Defense Fund, CEEW will promote integrated interventions combining water and soil management, reduced tillage and fertiliser, multi/inter-cropping, and decentralised energy (for cooking and lighting) at a state or district level. The programme aims to boost agricultural productivity and farmers' incomes, improve farmers' and local government participation, reduce greenhouse gas emissions, and increase adaptation to climate change.

# Tracing CEEW's Four Year Journey

## Key Milestones and Achievements



**Jan 2010**

Idea for a think-tank to integrate energy, water and environment conceived



**Aug 2010**

CEEW starts operations in a single empty room in Gurgaon



**Oct 2010**

Conceptualised and enabled the Maharashtra-Guangdong Partnership on Sustainability



**Dec 2011**

Submitted first ever report on India and Global Governance to the National Security Adviser at the PM's Office



**May 2012**

Published the first assessment of India's 22 gigawatt National Solar Mission



**Aug 2012**

National Security Adviser of India delivered keynote lecture at CEEW's Second Anniversary



**Sep 2011**

Published a 584-page National Water Resources Framework Study for India's 12th Five Year Plan



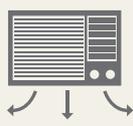
**Sep 2012**

Published study on minor irrigation reform for the Indian State of Bihar



**Jul 2014**

Co-Founded Clean Energy Access Network (CLEAN)



**Jul 2014**

India's HFC emission scenarios released at Montreal Protocol meetings in Paris



**Jun 2014**

Organised Climate Geoengineering Governance conference with University of Oxford



**Jun 2014**

Published scenarios on Energy Access in India



### Nov 2010

Organised a series of India Water Dialogues

### Dec 2010

Convened the working group on India and Global Governance

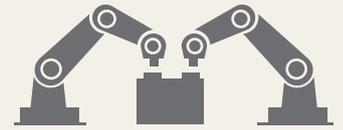


### Jul 2011

Facilitated the \$125 million India-US Joint Clean Energy R&D Center

### Jun 2011

Keynote lecture delivered to the IPCC Experts Meeting on Geoengineering in Peru



### Mar 2013

CEO Dr Arunabha Ghosh nominated Young Global Leader by World Economic Forum

### Jun 2013

Ranked number 1 climate think tank in India, 15th globally, by International Centre for Climate Governance (ICCG)

### Nov 2013

Published report on Urban Water and Sanitation in India

### Nov 2013

Submitted Report on Strategic Industries to the National Security Advisory Board



### Jun 2014

Ranked number 1 climate think-tank in India for second year running by ICCG

### Apr 2014

Published first report on India's Green Industrial Policy

### Mar 2014

Hosted Dr Ernest Moniz, US Energy Secretary, for a dialogue on Scaling Decentralised Clean Energy in India

### Jan 2014

Featured on University of Pennsylvania's '2013 Global Go To Think Tank Index' - Topped India in three categories

# Council on Energy, Environment and Water

The Council on Energy, Environment and Water ([www.ceew.in](http://www.ceew.in)) is an **independent**, not-for-profit policy research institution. It addresses pressing global challenges through an **integrated** and **internationally focused** approach.

## Our Vision

A Path of Sustainable Growth and Development through the Holistic Management of Energy, Environment and Water Resources

## Growth: In 4 Years of Operation



Engaged in more than 60 Research Projects



Published more than 35 Policy Reports and Papers



Advised Governments around the World over 80 Times



Promoted Bilateral and Multilateral Initiatives between Governments on more than 30 Occasions



Organised more than 75 Seminars and Conferences

## Recognition for CEEW

### 2013 and 2014 ICGG Ranking

1st in India - Climate Related Think Tank, Two Years in a Row

### Media Coverage

The Economist, Forbes, The Globe and Mail, NDTV  
CNN-IBN, The Times of India, The Hindu  
The Economic Times, Mint, Business Standard  
The Financial Express, India Today

### 2013 Global Go To Think Tank Report

1st in India, 14th Globally - Top Think Tanks with Annual Operating Budget of Less than USD 5 Million  
1st in India, 14th Globally - Best Policy Study/Report  
1st in India, 68th Globally - Best Institutional Collaboration Involving Two or More Think Tanks

## Scope of work



### National Level

Resource Efficiency and Security  
Water Resources  
Renewable Energy



### Global Level

Sustainability Finance  
Energy-Trade-Climate Linkages  
Technology Horizons  
International Cooperation



### Local/State Level

Develop Integrated Energy, Environment and Water Plans  
Facilitate Industry Action to Reduce Emissions

## Major Projects

- 584-page National Water Resources Framework Study for India's 12th Five Year Plan
- India's 1st Report on Global Governance Submitted to the National Security Adviser
- Assessment of Solar Mission, Wind Sector and Green Industrial Policy
- Report on Strategic Industries and Technologies Submitted to National Security Advisory Board
- Facilitated the \$125 million India-U.S. Joint Clean Energy R&D Center
- Business Case for Phasing Down HFCs in Indian Industry: HFC Emission Scenarios
- Created the Maharashtra-Guangdong Partnership on Sustainability
- Research on Energy-Trade-Climate Linkages for the Rio+20 Summit
- Reports on Decentralised Clean Energy in India
- Designed Irrigation Reform for the Indian State of Bihar
- Developing the Clean Energy Access Network (CLEAN)
- Modelling India's Long-Term Energy Scenarios
- Supporting the Ministry of Water Resources with India's National Water Mission
- Modelling Exercises on Energy-Water-Climate Linkages
- Business Case for Greater Energy Efficiency and Emissions Reductions in the Cement Industry

## India's green growth needs policy push

At a time when countries in the world are revolutionising their power generation by moving towards renewables, India is still struggling to bridge the demand-supply gap to

## India Floods Spark Hydropower Debate

ISSUES AND INSIGHTS

### Want clean energy? Avoid trade disputes

Subsidies, tariffs and public-procurement policies are trade barriers in large-scale use of renewable sources

making their input vital in identifying concrete responses to trade barriers in clean energy technologies. India, for instance, could spearhead this process, having already demonstrated leadership in clean energy through its National Solar Mission. Its experience could help spark discussions among fellow CEM members on how countries can retain policy space for promoting energy access while also maintaining open and predictable markets.

Second, countries could use regional trade agreements (RTAs) more imaginatively as tools for promoting energy access. With their limited membership, these agreements could be used to lower

# mint

CONTENT PARTNER  
THE WALL STREET JOURNAL.

NSEX 18,226.48 ▼ 211.30 NIFTY 5,495.10 ▼ 47.85 DOLLAR ₹54.58

the world craves cheaper and cleaner energy, but are global trade and energy policies distorting towards greater

## Green goals

A latest report by WWF and CEEW highlights that innovative renewable energy applications like solar food dryers and milk pasteuriser will be the future of India. By KARAN BHARDWAJ

## QUESTIONS

### questview

# the pioneer

NEW DELHI, FRIDAY DECEMBER 20, 2013; PAGES 16-13  
www.dailypioneer.com

# THE FINANCIAL EXPRESS

READ TO LEAD  
MONEY & MARKETS  
Sebi evaluates introducing T+1 settlement cycle

# THE ECONOMIC TIMES

The Edit Page

## Gloom to Bloom to Doom

From the investor's darling for a short period, the power sector has again become a pariah

If you Google news for renewable sources of energy, the recent headlines highlight Scotland's landmark achievement of 40 per cent of renewable energy, or Australia's improving figures in this sector or Catalonia (Spain) being declared as energy independent. Back home, there's no such great news except for the fact that things are moving on, getting better and renewable sources of energy are welcomed in rural as well as urban areas with equal enthusiasm.

The Jawaharlal Nehru National Solar Mission Phase 1 (JNNSM1) is used to make India a leader in solar power as its growth agenda increased the installed capacity around 30 MW to more than 40 MW. However, when we think of renewable sources of energy, imagination is confined to things on lights and fans. A latest report by WWF-India and CEEW on Energy, Environment and Water (CEEW) jointly

# HINDU

NEW DELHI, December 20, 2013

# THE TIMES OF INDIA

Green energy catching on

Increasingly Put To Uses Other Than Generating Power

DOING WITHOUT ELECTRICITY

- HEATING: Solar water heaters
- COOLING: Solar airconditioning, Geo-thermal cooling
- COOKING

# The Economist

JULY 20TH-26TH 2013

## Think of water before it rains again

India needs a long-term drought-proofing plan to create water security for the country. But it seems we are also facing another drought of ideas to deal with this daunting challenge

drought syndrome can not be wiped away as reality and keep was thousands of acres annually these available disasters. India one of the lowest per capita capacity which, in the long run, make change in water security.

Lighting rural India  
Out of the gloom

Villagers enjoy sunlight after dark

FLY by night over Uttar Pradesh in northern India, the country's most populous state, and its cities appear as dazzling islands. In between, however, lies an inky sea. Perhaps two-thirds of Uttar Pradesh's 200m people have no regular electricity in India as a whole, 700m, or more, of the world's population.

SURESH PRABHU

Many parts of India are under severe drought. Maharashtra, Karnataka, Andhra Pradesh and Gujarat are affected. We have decided to address this challenge with a very simple solution, blame each other for this crisis. Maharashtra, the worst affected state, is wrong. There's no concrete plan to ensure that

Broadening horizons with renewable energy

The Council on Energy, Environment and Water (CEEW) has published a compendium on renewable energy here on Thursday.

Titled 'Renewable Energy beyond Electricity', the study focuses on applications beyond power-generation.

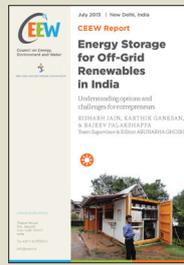
Creating awareness

Research on the potential of renewable energy is needed to enhance the



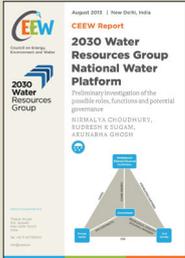
### Cooling India with Less Warming: The Business Case for Phasing Down HFCs in Room and Vehicle Air Conditioners

(June 2013)



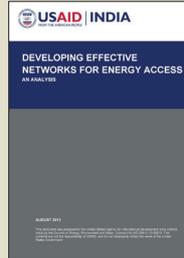
### Energy Storage for Off-Grid Renewables in India: Understanding Options and Challenges for Entrepreneurs

(July 2013)



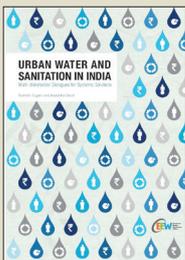
### 2030 Water Resources Group National Water Platform: Preliminary Investigation of the Possible Roles, Functions and Potential Governance

(September 2013)



### Developing Effective Networks for Energy Access: An Analysis

(October 2013)



### Urban Water and Sanitation in India: Multi-Stakeholder Dialogues for Systemic Solutions

(November 2013)



### RE+ Renewables Beyond Electricity

(December 2013)



### Responsible Hydropower Development in India: Challenges for the Future

(December 2013)



### Environment Institutions, International Research Programmes, and Lessons for Geoengineering Research

(February 2014)



Council on Energy, Environment and Water,  
Thapar House, 124, Janpath, New Delhi 110001, India

Tel: +91 407 333 00 | Fax: +91 407 333 99

#### OUR WEB RESOURCES

- [ceew.in/publications](http://ceew.in/publications)
- [ceew.in/blog](http://ceew.in/blog)
- [ceew.in/news](http://ceew.in/news)
- [ceew.in/events](http://ceew.in/events)
- [ceew.in/videos](http://ceew.in/videos)
- [ceew.in/images](http://ceew.in/images)
- [ceew.in/annualreport](http://ceew.in/annualreport)

#### OUR SOCIAL MEDIA RESOURCES

- CEEWIndia
- @CEEWIndia
- company/council-on-energy-environment-and-water
- CEEWIndia