

National Conference on Air and Water Pollution: Innovations in Regulation, Abatement and Monitoring

Organized by NITI Aayog and EPIC-India

July 7, 2017

University of Chicago Center in Delhi

DLF Capitol Point, Baba Kharak Singh Marg, New Delhi - 110001

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Background

Pollution regulation in India is in need of renovation. As of today, environmental regulators in India rely primarily on the conventional command-and-control approach to control pollution. In a very simple form, this requires enforcing an absolute technology-based or performance-based standard with severe penalties upon non-compliance.

Unfortunately, command and control can be effective only if: (i) regulators have access to very high quality information, (ii) regulators have significant capacity to monitor and enforce compliance and (iii) there is a great deal of flexibility in setting standards. These characteristics are not available in many settings, including the Indian context. Without these features, a command and control environmental regime is not only costly for regulators and the regulated; it may also be inefficient and lack transparency. These concerns have repeatedly been raised by all stakeholders – regulators, industry, civil society and the public – but limited success has been achieved in reforming the present framework.

One pathway to change may involve transitioning to Continuous Emissions Monitoring Systems (CEMS) (Central Pollution Control Board, 2013). Using these technologies has the potential to significantly increase the level of sophistication of data handled by regulators, and if used properly this may significantly improve enforcement. Taken by itself however, CEMS is not a magic bullet – like any metering and measurement technology, the use of CEMS requires careful calibration and regular auditing and without these processes cannot yield useful information.

Legal reform is another important means through which India might improve environmental regulation. India's Air Act (1986) and Water Act (1974) are hampered by a penalty structure that allows for criminal penalties that are far too low to act as deterrents, coupled with more extreme actions including criminal cases, imprisonments, and plant closures. It has been suggested that the absence of any civil fines has meant that penalties remain highly inflexible and difficult to impose, and therefore cannot act as effective deterrents.

In the past few years, the quality of data collected by Indian regulators has significantly improved. This opens up the possibility of using low-cost, information disclosure and transparency schemes to improve environmental outcome. Sometimes referred to 'third-way' regulation, there is evidence that these initiatives may increase the effectiveness of an underlying command and control structure at relatively low costs. Although transparency programmes have been used successfully in other parts of the world, (Toxic Release Inventory in the United States, the Program for Pollution Control, Evaluation and Rating (PROPER) in Indonesia. A particularly wide-ranging effort of this kind comes from the 'Blue Map' created by Institute of Public & Environmental Affairs in China, which releases real time data on the pollution from over 15,000 large factories across China.

An innovative pilot of this type was launched in Maharashtra on June 5 2017, India's first star-rating programme for industrial emissions. This disclosure pilot has also introduced the concept of rankings and is the first of its kind in the country. There is evidence that when a firm is seen as being better for the environment, it also does better on the stock market (Klassen and McLaughlin 1996).

Unfortunately, none of these approaches can overcome all the inherent problems with command and control regulations. The Indian government has studied areas of reform to environmental regulation through the appointment of multiple task forces, high-level committees, and external consultants (Ministry of Environment Forests & Climate Change, 2014). Several expert committees have emphasized the need to use fiscal instruments that align incentives and reduce costs of complying with regulations, following the

“polluter pay” principle (Ministry of Environment Forests & Climate Change, 2014). Reflecting this, roadmaps that include the use of economic instruments (market-based incentives) for the prevention and control of pollution (Ministry of Environment & Forests, 1992a, 1992b, 2006, 2012, 2015) have been reiterated over two decades.

An important benefit of CEMS is that they enable the deployment of market based regulatory instruments. They solve a key technical requirement of transparent and high-quality information on pollutant emissions. In other parts of the world, market-based instruments have proven that more effective pollution regulation can occur at drastically reduced costs as compared with the status quo (Ellerman & Buchner, 2008; Fowlie, Holland, & Mansur, 2012; Keohane, 2006; Wang, 2016). In theory, such instruments would ensure data transparency, internalize externalities by pricing environmental goods and services efficiently and sustainably incentivize behaviour change. Although they are relatively easy to monitor, markets need to be designed to be robust against shocks, implemented carefully and reformed if necessary (Schakenbach, Vollaro, & Forte, 2006).

Before they could be implemented on a wide-spread scale in India, regulatory experience and capacity building through smaller pilots may be necessary. Although markets have not yet been used in local environmental regulation, India’s energy sector has instituted an important trading regime with the roll-out of the Perform, Achieve and Trade (PAT) Scheme in 2012. The scheme has institutionalized a mechanism for energy savings with significant reduction in industrial emissions as a co-benefit. Although the impact of this policy mandate is pending evaluation, mid-term assessment indicates potential markets in other industrial sectors (PricewaterhouseCoopers Pvt. Ltd., 2014). There is therefore scope to learn from these initiatives to examine whether similar ideas may be effective in regulating air and water pollutants. Even as we recognize the potential benefits of innovative regulation, it is essential that policymakers carefully test ideas before scaling up. The results of different policy experiments may thus inform further developments in national and state-level pollution regulation.

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Sessions

How can information-based, transparency-based and market-based regulatory instruments help tackle air and water pollution in India? How conducive is the current environmental policy landscape in India to implementing such regulation?

Broadly speaking, this is the umbrella theme of the conference. In order to thoroughly examine the problem at hand, we propose to divide the conference into sessions based on four sub-themes:

1. Command-and-Control: Successes and Challenges

Some questions this session seeks to answer are: When is the command-and-control approach successful? When is it not? What are the challenges to implementing these regulations and how do we know if they are ineffective? How does this type of regulation affect industry and their compliance levels?

2. Information and Transparency

How does improved information provide incentives for pollution-reducing behaviour? How successful have international attempts been at improving transparency of pollution data? What are some best practices to follow to ensure information transparency? What does an effective data acquisition and handling system look like?

3. Legal Framework

How does India's legal framework present opportunities for new regulation including market based regulation? Which legislations are currently archaic and are in need for amendment? How have other countries created an ecosystem for markets and what major roadblocks did they encounter? Is the penal regime embedded in Indian law robust and flexible enough to meet environmental objectives?

4. Monitoring and Enforcement

What are some common challenges encountered during monitoring rural, urban and industrial pollution? Are there some pollutants that are particularly difficult to monitor? Which enforcement strategies have proven to be most effective?

5. Market-Based Regulation: Successes and Challenges

When and where is a market-based scheme applicable? How can markets aid in achieving India's climate and development goals? What are the challenges faced by other countries while implementing markets, and how have they seen benefits?

Agenda

AIR AND WATER POLLUTION: INNOVATIONS IN REGULATION, ABATEMENT AND MONITORING

THE UNIVERSITY OF CHICAGO CENTER IN DELHI

7TH JULY, 2017

9:15 - 9:25	REGISTRATION			
9:25 - 9:30	INAUGURAL REMARKS			
	Shri Anil Jain Advisor - Energy, NITI Aayog			
9:30 - 10:00	OPENING KEYNOTE			
	Honourable Justice Swatanter Kumar, Chairperson, National Green Tribunal			
10:00 - 10:30	INAUGURAL ADDRESS			
	Michael Greenstone Milton Friedman Professor in Economics and the College, University of Chicago Director, EPIC			
10:30 - 11:30	SESSION 1: COMMAND AND CONTROL: SUCCESSES AND CHALLENGES			
	V Rajagopalan Former Secretary, MoEF&CC	Seema Arora Executive Director, Centre of Excellence for Sustainable Development, CII	Rashid Hasan Former Advisor, MoEF&CC	T.S.R Subramanian Former Cabinet Secretary
11:30 - 12:00	BREAK			
12:00 - 1:00	SESSION 2: INFORMATION AND TRANSPARENCY			
	A.K. Mehta JS (IC&SD), MoEF&CC	Kate Logan Green Choice Outreach Director, Institute for Public and Environmental Affairs, China	Sarath Guttikunda Co-Director, UrbanEmissions	V.M. Motghare Joint-Director (Air), MPCB
1:00 - 2:00	BREAK			
2:00 - 3:00	SESSION 3: LEGAL FRAMEWORK			
	Shibani Ghosh Fellow, Centre for Policy Research	Keshav Chandra Environment Secretary, Government of Delhi	Shruti Rai Bhardwaj Joint Director, MoEF&CC	Mark Templeton Associate Clinical Professor of Law, University of Chicago Law School
3:00 - 3:15	BREAK			
3:15 - 4:15	SESSION 4: MONITORING AND ENFORCEMENT			
	Cynthia Giles Former Assistant Administrator for Office of Enforcement and Compliance Assurance, US EPA	Akhila Kumar Swar Senior Environmental Engineer, OSPB	Chirag Bhimani Deputy Environmental Engineer, GPCB	Chandra Bhushan, Deputy Director General, CSE
4:15 - 4:55	SESSION 5: MARKET-BASED REGULATION: SUCCESSES AND CHALLENGES			
	Nathaniel Keohane Vice President, Global Climate, Environmental Defense Fund	Anant Sudarshan India Director, EPIC-India		
4:55 - 5:00	CLOSING ADDRESS			
	Anant Sudarshan, India Director, EPIC-India			

Speaker Biographies

Honourable Mr. Justice Swatanter Kumar

Chairperson, National Green Tribunal

Justice Swatanter Kumar, B.A., LL.B. began his legal career as an advocate with the Delhi Bar Council in 1971. After practicing in various High Courts as well as the Supreme Court, he served as an Additional District & Sessions Judge in the Himachal Pradesh High Court, and thereafter resumed practice at New Delhi.

He was the Legal Advisor/Standing Counsel for the Central Pollution Control Board for several years. Justice Swatanter Kumar has practised in various High Courts, particularly in Delhi High Court on the Original Side, Appellate Side, Extraordinary Ordinary Jurisdiction (Writ) and other different fields including environment. He was appointed as an Additional Judge of the Delhi High Court in 1994, following which he was transferred to Punjab and Haryana High Courts. Thereafter, he was appointed permanent Judge and subsequently, the Chief Justice of Bombay High Court.

He was appointed as Judge, Supreme Court of India in 2009. Justice Swatanter Kumar has dealt with and disposed of large number of cases in various High Courts and the Supreme Court. His various judgments delivered include cases relating to land acquisition, Public Interest Litigation, Environment, both under Criminal and Civil jurisdiction. Upon being appointed as Chairperson, NGT, he resigned as Judge of the Supreme Court of India in 2012.

Dr. Michael Greenstone

Milton Friedman Professor in Economics and the College, University of Chicago
Director, Energy Policy Institute at the University of Chicago

Michael Greenstone is the Milton Friedman Professor in Economics, the College, and the Harris School, as well as the Director of the interdisciplinary Energy Policy Institute at the University of Chicago and the Energy & Environment Lab at the University of Chicago Urban Labs. He previously served as the Chief Economist for President Obama's Council of Economic Advisers, and currently serves on the Secretary of Energy's Advisory Board. Dr. Greenstone also directed the Brookings Institution's Hamilton Project, which studies policies to promote economic growth, and has since joined its Advisory Council. He is an elected member of the American Academy of Arts and Sciences and editor of the Journal of Political Economy. Before coming to Chicago, Dr. Greenstone was the 3M Professor of Environmental Economics at MIT.

Dr. Greenstone's research estimates the costs and benefits of environmental quality and society's energy choices and is increasingly focused on developing countries. He has worked extensively on the Clean Air Act and examined its impacts on air quality, manufacturing activity, housing prices, and human health to assess its benefits and costs. He is currently engaged in large-scale projects to estimate the economic costs of climate change and to identify efficient approaches to mitigating these costs. He received a Ph.D. in economics from Princeton University and a BA in economics with High Honors from Swarthmore College.

Shri Anil Kumar Jain

Additional Secretary, NITI Aayog

Mr. Anil Jain is an IAS officer of the batch of 1986 from the Madhya Pradesh cadre. Mr. Anil Kumar Jain holds a BA (Honours) in Economics, an MBA, and a Diploma from the Indian Institute of Foreign Trade. He has published several papers and articles on the energy sector, including a book on natural gas policy framework in India (OUP, Oxford). He has been a Visiting Senior Research Fellow at the Oxford Institute for Energy Studies, Oxford, UK.

Mr. Jain has over three decades of administrative experience at the field and policy formulation levels in various Ministries/Departments in the state and central governments. Between 2003 and 2008, as Director and Joint

Secretary in the Ministry of Petroleum and Natural Gas, he was closely involved with policy formulation and implementation on the upstream and downstream development of the gas sector in India, including on exploration, the award of acreages, and the pricing and distribution of natural gas. In his current role as Additional Secretary at NITI Aayog, Mr. Jain has led the team towards preparation of the long term energy demand and supply projection tool – IESS, 2047 (www.indiaenergy.gov.in). He is also leading the effort towards framing the new National Energy Policy of the country. Mr. Jain is serving as Part-time Director on the Board of NPCIL since 20th August 2015. He is also on the Board of BHAVINI, Public Sector Enterprise of DAE and GTNfW, a not-for-profit company.

Dr. V. Rajagopalan

Former Secretary, Ministry of Environment, Forests and Climate Change

Dr. V Rajagopalan is an IAS officer of 1978 from the Uttar Pradesh cadre. He has extensive experience in environmental governance, pollution control, industrial regulation and water systems. Dr. Rajagopalan retired as the Secretary of the Ministry of Environment, Forests and Climate Change. He has three post-graduate degrees from the University of London, Indian Institute of Technology - Madras and Indian Institute of Management, Bangalore. He also holds a PhD in Air Pollution Modelling from the University of Lucknow.

Ms. Seema Arora

Executive Director, Centre of Excellence for Sustainable Development, CII

Seema Arora pioneered the creation of services on Environment and Sustainable Development within CII. She also is a member of the Stakeholder Council of the Global Reporting Initiative (GRI), World Economic Forum Global Agenda Council on Governance for Sustainability, external review panel for Sustainability Reporting for several global companies, and Polaris Committee of FBN (Family Business Network) International.

Ms. Arora works on designing innovative products and frameworks to build the business case for industry to invest in sustainability. She has created several initiatives including the world's first Corporate Sustainability Label from CESD. As the head of CESD she networks with industry, government and community-based organisations to develop policy instruments and innovative voluntary approaches to sustainable development. She is also providing inputs to defining sustainable development action plans for state governments. She provides training and counseling to industry for evolving a sustainability vision and a portfolio of sustainability strategies. Her main areas of interest include environmental policy, management systems, corporate sustainability, institutional strengthening and capacity building. She holds a Bachelor's in Engineering from Delhi University.

Mr. T.S.R Subramanian

Former Cabinet Secretary

Mr. T. S. R. Subramanian serves as a Director at HCL Enterprise Solutions Limited. Mr. Subramanian serves as a Director at SABMiller India Ltd. He served as an Independent Non-Executive Director at HCL Technologies Ltd. from September 1999 to November 02, 2011. He served as a Director of HCL Technologies (Bermuda) Ltd. Mr. Subramanian had a distinguished career in the Indian Administrative Service, where he held various positions including that of Cabinet Secretary, the highest post in the Indian administration and the post of Secretary in the Ministry of Textiles. He has also worked in the Ministry of Commerce, where he dealt with trade policy issues and matters relating to General Agreement on Trade and Tariffs (GATT) and with UNCTAD. His assignments in the state of Uttar Pradesh included the highest executive post, Chief Secretary of the State. For over five years, Mr. Subramanian was a Senior Adviser in the International Trade Centre in Geneva, a United Nations Organization under the purview of GATT, where he dealt with issues relating to small and medium enterprises (SMES) as well as export-oriented joint ventures. His work covered developing countries in Asia, Africa and Latin America, as well as developed countries. As Cabinet Secretary to the Government of India, Mr. Subramanian took a number of initiatives to modernize and develop the infrastructure sector in India, especially in the Power, Telecom and Surface Transport

sectors. He obtained his first degree in Mathematics at St. Xavier's College, Kolkata and thereafter his Master's Degree at Calcutta University. Mr. Subramanian studied at Imperial College, London where he obtained his diploma and has a Master's Degree in Public Administration from Harvard University, specializing in economics.

Dr. Rashid Hasan

Former Advisor, Ministry of Environment, Forests and Climate Change

Dr. Hasan has over 30 years of experience in the field of environmental policy and development. About two-thirds of this experience has been spent in government service, where he has resolved problems in a variety of areas including pollution control, wildlife conservation, environmental policy and planning and environmental education. In addition to environmental governance, Dr. Hasan has worked with multilateral institutions such as the World Bank and the United Nations Development Program on a variety of development projects. He has also spent a considerable time of his career on researching environmental policy. Dr. Hasan received his PhD and two Master's degrees from Aligarh Muslim University.

Ms. Kate Logan

Green Choice Outreach Director, Institute for Public and Environmental Affairs, China

Kate is Green Choice Outreach Director at IPE, a non-profit environmental organization based in Beijing that promotes information disclosure and public participation as means of strengthening environmental governance mechanisms, reducing emissions and improving environmental quality. Her main work focuses on outreach surrounding IPE's green supply chain initiative to integrate transparency and stakeholder participation into existing supply chain management systems. Prior to joining IPE, she received a Princeton-in-Asia fellowship to serve as a research fellow on the China Environmental Law & Governance Project at the Natural Resources Defense Council (NRDC) in Beijing, where she researched the implementation of environmental public interest litigation in China. Kate is a summa cum laude graduate of Middlebury College (VT) with a B.A. in International and Global Studies – East Asia (focus on Economics).

Dr. Sarath Guttikunda

Co-Director, UrbanEmissions

UrbanEmissions.info was founded by Dr. Sarath Guttikunda in 2007 with the vision to be a repository of information, research, and analysis related to air pollution. Dr. Guttikunda conducts research on air pollution. His interest stems from the guidance received during Bachelors at the Indian Institute of Technology (Kharagpur, India) and during Doctorate from the Center for Global & Regional Environmental Research (CGRER) at the University of Iowa (Iowa City, USA). He then worked as an air pollution analyst at the World Bank in Washington, DC (USA). Since returning to India in 2007, he conducts research in an independent capacity with various organizations and research institutions. He is an affiliate associate research professor at the Desert Research Institute (Reno, USA). In 2009 Sarath became part of the global TED fellows community.

Dr. V.M. Motghare

Joint-Director (Air), Maharashtra Pollution Control Board

Dr. Motghare is an expert on industrial pollution control and has been instrumental in leading many regulatory innovations with the Maharashtra Pollution Control Board including an information disclosure program, and the development of innovative air purifiers with researchers from the National Environmental Engineering Institute and the Indian Institute of Technology - Bombay.

Shri A.K. Mehta

Joint Secretary, Ministry of Environment, Forests and Climate Change (IC&SD)

Mr. Mehta is an officer in the Indian Administrative Services of the batch of 1988 and the Jammu and Kashmir Cadre. Prior to serving as the Joint Secretary at the Ministry of Environment, Forests and Climate Change, Mr. Mehta was the Principal Secretary of the Power Development Department in Jammu and Kashmir. Mr. Mehta is well versed with the system of environmental governance in India, having served in various capacities with the Ministry of Environment, Forests and Climate Change since 1998.

Ms. Shibani Ghosh

Fellow, Center for Policy Research

Shibani Ghosh is a public interest lawyer and a fellow at CPR. She specialises in environmental and access to information laws. At CPR, she researches on issues relating to domestic environmental law and regulation. Ms Ghosh has been a Sustainability Science Fellow at the Harvard Kennedy School (2014-2015), and a visiting faculty at the TERI University and the RICS School of Built Environment, where she taught environmental law.

She is a Rhodes Scholar and holds both a master's in science in environmental change and management and a bachelor's in civil law (a graduate degree in law) from the University of Oxford. She has an undergraduate degree in law from the National University of Juridical Sciences, Kolkata.

She was previously associated with the Legal Initiative for Forest and Environment (LIFE), a New Delhi-based environmental law firm, and has also worked as a legal consultant with the Central Information Commission, a quasi-judicial body set up under the Right to Information Act, 2005. In 2011, she was awarded the first DoPT-RTI fellowship by the Department of Personnel and Training, Government of India to undertake research on the implementation of the Right to Information Act 2005.

Mr. Mark Templeton

Associate Clinical Professor of Law, University of Chicago Law School

Mark N. Templeton is Associate Clinical Professor of Law, Director of the Abrams Environmental Law Clinic at the University of Chicago Law School, and a Research Affiliate of the Energy Policy Institute at Chicago.

Previously, Professor Templeton was a Trustee and Executive Director of the Office of Independent Trustees for the \$20 billion Deepwater Horizon Oil Spill Trust. He served as the cabinet-level Director of the Missouri Department of Natural Resources, leading the state's efforts in energy, environmental protection, state parks, and water resources and overseeing a staff of approximately 1750 FTEs and a \$310 million annual budget.

From 2005 to 2009, Professor Templeton served as Associate Dean and COO at Yale Law School. From 2001 to 2005, he developed environmental and sustainability strategies at McKinsey & Company, among other projects. Prior to joining McKinsey, Professor Templeton was special assistant and senior adviser to the U.S. Assistant Secretary of State for Democracy, Human Rights and Labor and an adviser to the U.S. Delegation to the U.N. Commission on Human Rights. He was a Financial Analyst at Goldman Sachs from 1994 to 1996. Professor Templeton earned an A.B., magna cum laude, in Social Studies from Harvard College in 1994 and a J.D. from Yale Law School in 1999.

Dr. Shruti Rai Bhardwaj

Joint Director, Ministry of Environment, Forests and Climate Change

Dr. Bhardwaj's areas of expertise are biotechnology and the environmental sciences. She has worked extensively on issues related to the transboundary movement and regulation of hazardous waste. She serves in the Capacity Building for Industrial Pollution Management Initiative by the Ministry of Environment, Forests and Climate Change.

Dr. Bhardwaj has also represented India at technical diplomatic meetings such as the Basel Convention. She holds a PhD in Biotechnology from the University of Delhi and GGSIP University, Delhi.

Shri Keshav Chandra

Environment Secretary, Government of Delhi

Mr Keshav Chandra is an IAS officer of the 1995 batch and at present is the CEO of Delhi Jal Board. Delhi Jal Board (DJB), constituted under Delhi Jal Board Act 1998, is responsible for production and distribution of drinking water as also for collection, treatment, and disposal of domestic sewage in the Capital. Mr. Chandra has served in various parts of country starting including Arunachal Pradesh, Delhi and Goa. He was the district magistrate for more than 6 years, secretary to the Hon'ble Chief Minister of Delhi for 5 years, secretary, NDMC, and commissioner excise, Delhi. Mr. Chandra has done his masters from London school of Economics. In his spare time, he likes to engage in painting, photography and reading.

Ms. Cynthia Giles

Former Assistant Administrator for Office of Enforcement and Compliance Assurance, US EPA

Cynthia Giles has more than 30 years of service in the public, private and non-profit sectors. She prosecuted civil violators of environmental laws as an Assistant United States Attorney in Philadelphia, led the water protection program for the Commonwealth of Massachusetts, served as the Director of Enforcement Coordination for EPA Region 3, and before returning to EPA, was the Director of the Conservation Law Foundation's Advocacy Center in Rhode Island, where she advocated for laws and policies to combat climate change and promote clean energy. Giles has a BA from Cornell University, a JD from the University of California at Berkeley and an MPA from the Harvard University Kennedy School of Government.

Dr. Akhila Kumar Swar,

Senior Environmental Engineer, OSPCCB

Dr. Akhila Kumar Swar is a Senior Environmental Engineer of the State Pollution Control Board, Odisha with a Ph.D degree in Engineering from Sambalpur University , R. E.C., Rourkela at centre of research, Odisha, India in 2003 and Masters in Environmental Engineering from the Asian Institute of Technology, Bangkok, Thailand in 1990. He has been working in the State Pollution Control Board, Odisha, since February 1991. He has been heading consent to operate of highly polluting industries, online monitoring and hazardous waste management cell of SPCB, Odisha. He has wide experience in implementations of pollution control technologies in industries and utilization of hazardous waste. He has introduced Y-cable concept since 2011 which first of its kind in India for tamper proof real time data transmission through GPRS link from online ambient air, stacks and effluent quality monitoring stations installed in industries of Odisha. In addition, he has several publications in national and international journals. He has also attended international training programmes / seminars in the field of environment in China, Japan, USA, Thailand, Malaysia and Singapore. Currently he is also guiding Ph.D scholars in the field of environmental research and a renowned external examiner for IIT, Kharagpur and few other universities.

Mr. Chirag Bhimani

Deputy Environmental Engineer, Gujarat Pollution Control Board

In addition to enforcing environmental regulations as the DEE of GPCB, Mr. Bhimani supports independent research projects that seek to partner with GPCB. Some of these projects include the implementation of a novel audit system to improve the performance of environmental auditors to reduce under-reporting, the implementation of Continuous Emissions Monitoring Systems and the implementation of India's pilot emissions trading scheme for particulate matter.

Dr. Chandra Bhushan

Deputy Director General, Center for Science and Environment

Dr. Bhushan advises a range of institutions as part of advocacy for environmental issues worldwide. He was the co-chair of the technical advisory committee, Global Reporting Initiative, USA/Netherlands till 2002. He is also a member of Food and Agriculture Division (FAD 14), Bureau of Indian Standards, BIS Environmental management sectional committee, Copenhagen Working Group on CSR (business and development), Copenhagen Business School, EIA Accreditation Committee, QCI, and on the board of Governors, NABET, QCI. He is also an expert member for the BASIC (Brazil, South Africa, India, China) group of countries.

Mr. Anish De

Partner & Head, Strategy & Operations Advisory (Infrastructure), KPMG- India

Mr. Anish De is a Partner with Infrastructure and Government Services (IGS) at KPMG. He has over 20 years of experience and specializes in fields of energy market design, generation, pricing, energy trading, renewable energy, fuels and utility regulation and transactions. He has played an active role in policy formulation and has contributed to the development of the National Electricity Policy, Tariff Policy and the Competitive Bidding Framework for the power sector in India. Prior to joining KPMG, he was the Chief Executive of Asian Operations of AF - Mercados – EMI.

Dr. Amit Garg

Professor, Public Systems Group, IIM Ahmedabad

Chairman, Fellow Programme in Management, IIM Ahmedabad

Amit Garg is a member of the Nobel Peace Prize-winning Intergovernmental Panel on Climate Change (IPCC) and a professor at IIM-Ahmedabad teaching Carbon Finance, Managing Energy Businesses, Public Management and Climate Policy. He is a member of the Expert Committee on Climate Change, MoEF&CC and has previously served on the national committee on Nationally Appropriate Mitigation Actions for climate change. Professor Garg has varied research interests including water-energy- nexus, solar agriculture pumps, smart grids and grid responsive buildings, green infrastructure, energy policy and energy modelling, green products, corporate and services, climate change risk assessment, energy and climate change, emission inventory assessment, carbon finance, adaptation policy for climate change impacts, climate change mitigation policy, demand side management, new and renewable energy technology policy.

Dr. Nathaniel Keohane

Vice President, Global Climate, Environmental Defense Fund

Nathaniel Keohane is a Vice President at Environmental Defense Fund, where he leads EDF's Global Climate program and helps to shape the organization's advocacy for environmentally effective and economically sound climate policy. Nat's areas of expertise include U.S. and global climate and energy policy, the economic impact of climate change, the benefits and costs of reducing greenhouse gas emissions, and the design and performance of cap-and-trade programs and other policy instruments.

Dr. Anant Sudarshan

India Director, EPIC-India

Anant Sudarshan is India Director of the Energy Policy Institute at Chicago University (EPIC-India). He is also a Senior Research Associate at the Department of Economics, University of Chicago. Prior to working at EPIC, he was the Giorgio Ruffolo Post-doctoral Fellow in the Sustainability Science Program at Harvard University's Kennedy School of Government. He received his PhD in Management Science and Engineering from Stanford University and he holds

undergraduate and masters degrees in Mechanical Engineering from the Indian Institute of Technology (Delhi) and Stanford University respectively.

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