

The IISS Greening of Asia Project

India Strategic Energy Policy Assessment

IISS Roundtable on India's Energy Strategy Singapore International Energy Week, 26 October 2017

India is a future energy giant







The IEA may underestimate India's future demand for primary energy...









India is a very coal-intensive country...



Primary Energy Consumption by Fuel (1980-2015) mtoe 800 70% 700 60% 600 50% 500 40% 400 30% 300 20% 200 10% 100 0% 0 1985 1990 1995 2000 2005 2010 2015 1980 1980 1985 1990 1995 2000 2005 2010 2015 -Oil —Coal Coal Oil —Hydro —Gas Hydro Gas Other Renewables -Other Renewables Nuclear -Nuclear

5

...and therefore a future CO₂ giant.





2014 CO2 Emissions

 CO2 emissions (metric tons per capita)

CO2 emissions (kt)

India's energy strategy: *development first*



- Economic and social progress; Industrialisation
- Electrification: '24/7 power for all'
- Coal India target: 1 bn tonne per year (<550Mt today)
- When 'green' clashes with 'cheap', India goes for 'cheap'

COP-15 to COP-21: from villain to hero...



Copenhagen, Dec 2009

in Share

COP15: Climate-Change Conference

TIME looks at the agenda for the talks in Copenhagen that began on Dec. 7, 2009

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CAPPING CARBON

Why India Is Playing Hard to Get on Climate

Change

By Bryan Walsh | Friday, Nov. 06, 2009

If U.S. diplomats consider India to be a major obstacle to global climate change negotiations — and they do — it might be because of Sunita Narain. The director of the influential Centre for Science and Environment, Narain can be as caustic as she is intelligent, and never more so than when she is taking rich nations to task for what she sees as their hypocrisy on global warming. They pressure the developing world to control carbon emissions even as they refuse to move themselves, she says. "The rich have to reduce their emissions or the uncertainty of the maximum Varian emissions



VIEWALL

The Copenhagen Protocol How China and India Sabotaged the UN Climate Summit

What really went on at the UN climate conference in Copenhagen? Secret recordings obtained by SPIEGEL reveal how China and India prevented an agreement on tackling climate change at the crucial meeting. The powerless Europeans were forced to look on as the agreement failed.

By Tobias Rapp V, Christian Schwägerl and Gerald Traufetter V

India's climate leadership at Paris

India has done well to defend its development priorities, while detailing its ambitious renewable energy targets

Paris, Dec 2015



Prasad

Prime Minister Narendra Modi (centre), environment minister Prakash Javadekar (left) and power minister Piyush Goyal releasing a book at the inauguration of the India Pavilion at COP21 Summit, in Paris, France on 30 November. Photo: PIB

The agreement on climate change, reached in Paris on 12 December, was momentous for reasons beyond the obvious. The world watched the two weeks of negotiations at COP21 (Conference of Parties) esseries having for a strong and definitive agreement to mitigate and

...as uncertainty is shifted away from cost...



- Kyoto: translate future global 'stock' of emissions into binding targets
- Intractable 'fairness' problem
- Cost of compliance is unknown
- Fierce resistance from large developing countries
- Post-Copenhagen (Paris): strictly voluntary commitments
- No threat to emerging countries' 'right to grow'
- Resistance disappears
- Uncertainty moves onto what will be achieved globally

...and 'green' becomes much cheaper.





Sources: Bloomberg New Energy Finance; Central Electricity Regulatory Commission, India

Renewables: centrepiece of India's energy strategy



A limited impact on power sector's emissions





Sources: Greening the Grid report

...and big problems left unaddressed



Power: 50% of emissions



- CO2 emissions from other sectors, excluding residential buildings and commercial and public services
- CO2 emissions from residential buildings and commercial and public services
- CO2 emissions from manufacturing industries and construction
- CO2 emissions from transport
- CO2 emissions from electricity and heat production, total

Sources: World Bank; WHO

10 Indian cities among 20 most polluted

Country	City	PPM 2.5	Rank	Country	City	PPM 2.5
Iran	Zabol	217	20	India	Amritsar	108
India	Gwalior	176	21	India	Gobindgarh	108
India	Allahabad	170	22	Pakistan	Rawalpindi	107
Saudi Arabia	Riyadh	156	23	China	Hengshui	107
Saudi Arabia	Al Jubail	152	24	Bangladesh	Narayangonj	106
India	Patna	149	25	Iran	Boshehr	105
India	Raipur	144	26	India	Agra	105
Cameroon	Bamenda	132	27	Uganda	Kampala	104
China	Xingtai	128	28	China	Tangshan	102
China	Baoding	126	29	India	Jodhpur	101
India	Delhi	122	30	India	Dehradun	100
India	Ludhiana	122	31	India	Ahmedabad	100
Saudi Arabia	Dammam	121	32	India	Jaipur	100
China	Shijiazhuang	121	33	India	Howrah	100
India	Kanpur	115	34	India	Faridabad	98
India	Khanna	114	35	Saudi Arabia	Yenbu	97
India	Firozabad	113	36	China	Langfang	96
India	Lucknow	113	37	India	Dhanbad	95
China	Handan	112	38	Bangladesh	Chittagong	95
Pakistan	Peshawar	111	39	Iran	Ahvaz	95
	Country Iran India India Saudi Arabia Saudi Arabia Saudi Arabia India Cameroon China China India Saudi Arabia China India India India India India India Pakistan	CountryCityIranZabolIndiaGwaliorIndiaAllahabadSaudi ArabiaRiyadhSaudi ArabiaAl JubailIndiaPatnaIndiaRaipurCameroonBamendaChinaXingtaiChinaDelhiIndiaDelhiIndiaDammamChinaShijiazhuangIndiaKanpurIndiaFirozabadIndiaLucknowChinaShijiazhuangIndiaKhannaIndiaLucknowChinaPirozabadIndiaLucknowChinaHandanPakistanPeshawar	CountryCityPPM 2.5IranZabol217IndiaGwalior176IndiaAllahabad170Saudi ArabiaRiyadh156Saudi ArabiaAl Jubail152IndiaPatna149IndiaRaipur144CameroonBamenda132ChinaXingtai128ChinaDelhi122IndiaDelhi122IndiaLudhiana122Saudi ArabiaDammam121ChinaShijiazhuang121IndiaKanpur115IndiaKhanna114IndiaFirozabad113IndiaLucknow113ChinaHandan112	CountryCityPPM 2.5RankIranZabol21720IndiaGwalior17621IndiaAllahabad17022Saudi ArabiaRiyadh15623Saudi ArabiaAl Jubail15224IndiaPatna14925IndiaRaipur14426CameroonBamenda13227ChinaXingtai12828ChinaBaoding12629IndiaDelhi12230IndiaLudhiana12231Saudi ArabiaDammam12132ChinaShijiazhuang12133IndiaKanpur11534IndiaFirozabad11336IndiaLucknow11337ChinaHandan11238PakistanPeshawar11139	CountryCityPPM 2.5RankCountryIranZabol21720IndiaIndiaGwalior17621IndiaIndiaAllahabad17022PakistanSaudi ArabiaRiyadh15623ChinaSaudi ArabiaAl Juball15224BangladeshIndiaPatna14925IranIndiaRaipur14426IndiaCameroonBamenda13227UgandaChinaXingtai12828ChinaChinaBaoding12629IndiaIndiaDelhi12230IndiaIndiaLudhiana12231IndiaSaudi ArabiaDammam12133IndiaIndiaKanpur11534IndiaIndiaKhanna11435Saudi ArabiaIndiaLucknow11336ChinaIndiaLucknow11337IndiaPakistanPeshawar11139Iran	CountryCityPPM 2.5RankCountryCityIranZabol21720IndiaAmritsarIndiaGwalior17621IndiaGobindgarhIndiaAllahabad17022PakistanRawalpindiSaudi ArabiaRiyadh15623ChinaHengshuiSaudi ArabiaAl Jubail15224BangladeshNarayangonjIndiaPatna14925IranBoshehrIndiaRaipur14426IndiaAgraCameroonBamenda13227UgandaKampalaChinaXingtai12828ChinaTangshanChinaBaoding12629IndiaJodhpurIndiaDelhi12230IndiaDehradunIndiaLudhiana12231IndiaAhmedabadSaudi ArabiaDammam12133IndiaHowrahIndiaLudhiana12231IndiaHowrahIndiaKanpur11534IndiaFaridabadIndiaKanpur11534IndiaFaridabadIndiaKanpur11336ChinaLangfangIndiaLucknow11337IndiaDhanbadChinaHandan11238BangladeshChittagongPakistanPeshawar11139IranAhvaz

However, significant implementation challenges



- Contractual structure
- Integration of intermittent / unreliable generation





• Addressed in Ashwin's presentation

Broadening and hedging the strategy



- Implicit bet on cheap electricity storage
- Electric vehicles: good complement to the RE strategy
 - Storage
 - Urban air quality
- India needs a gas strategy
 - Reduces RE integration problems
 - Precondition for industrial emissions regulations
 - Good hedge of the bet on cheap storage
- Cheap v green is less severe. Seizing RE opportunity is smart.
- RE-based energy strategy is incomplete. I needs broadening and hedging to avoid political legitimacy crisis when problems arise.