



Fast growing countries: energy demand, technology and social change

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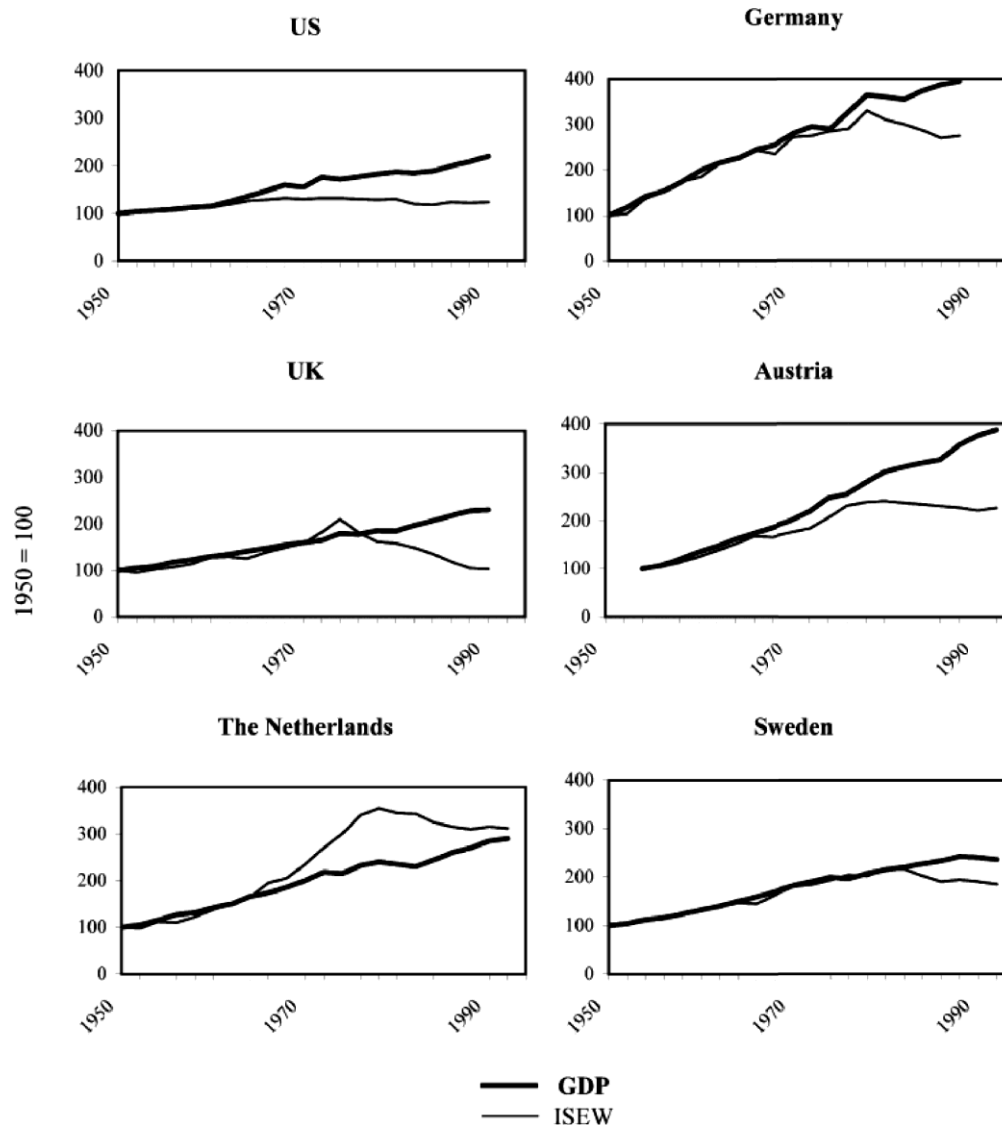


Outline

- Fast Growing Economies
- Two countries
 - India
 - Bangladesh
- Demand, Technology and Policy
- Social Change

GDP: the dominant progress indicator

GEA 2012
showed how
GDP and Well
being
Indicators
diverge for
high income
countries





Fast growing economy

- GDP of an economy growing at an average 7-10 % annually.
- Bangladesh now growing at ~7% targets 8-10% annual growth until 2041.
- India was growing at ~7% during last two decades
- China, Singapore, South Korea & Malaysia were growing at 7-10% over last four decades of last century

India's emission status

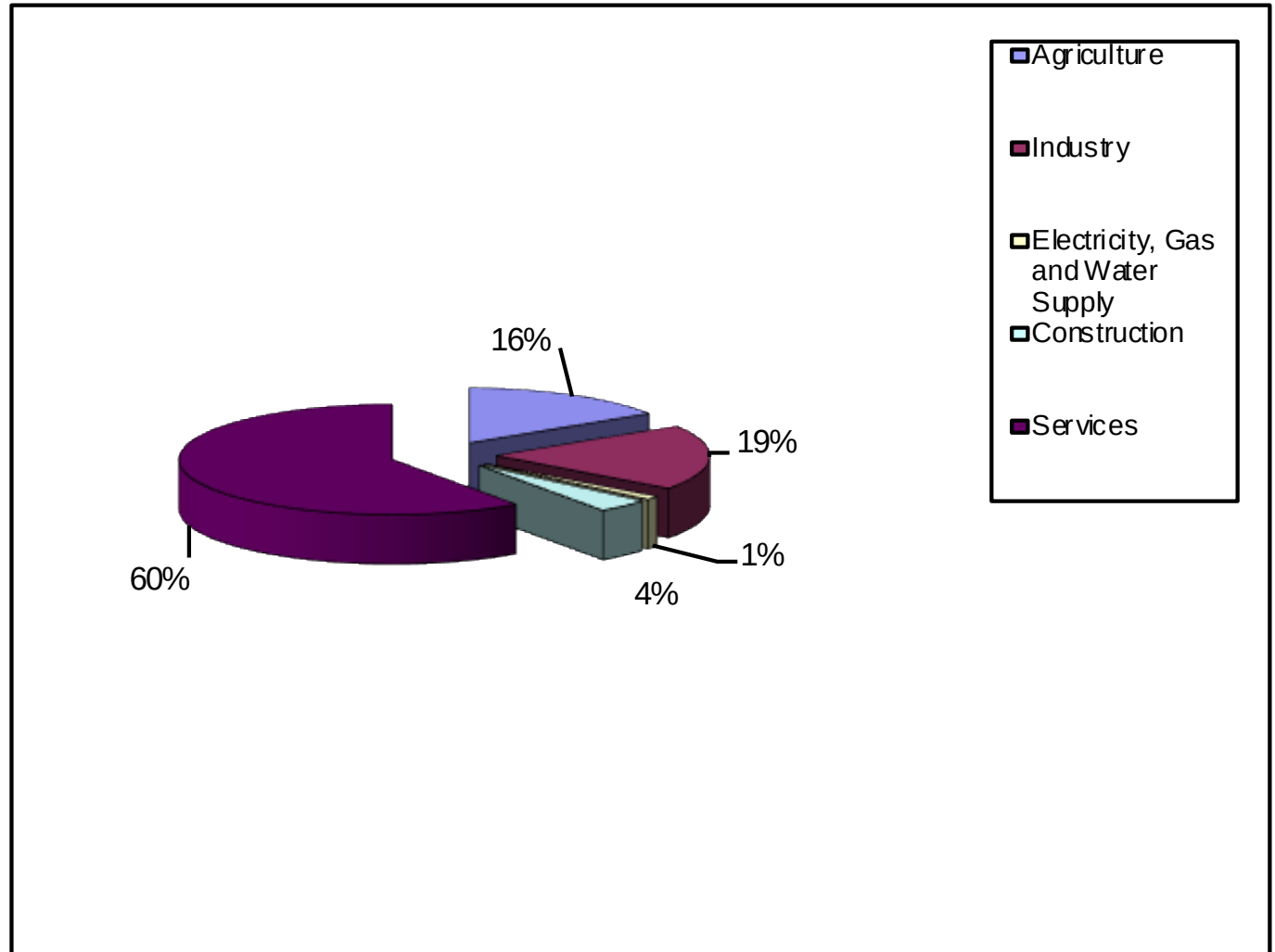
Total emission	~3002 million ktCO ₂ eq (as in 2012)
Per capita emission (Total emission/ Population)	2.37 tCO ₂ eq (as in 2012)
Share in global emission	5. 61% (as in 2012)
Share in global population	17.86% (as in 2012) 17.81% (as in 2018)

Source: World bank (2019)



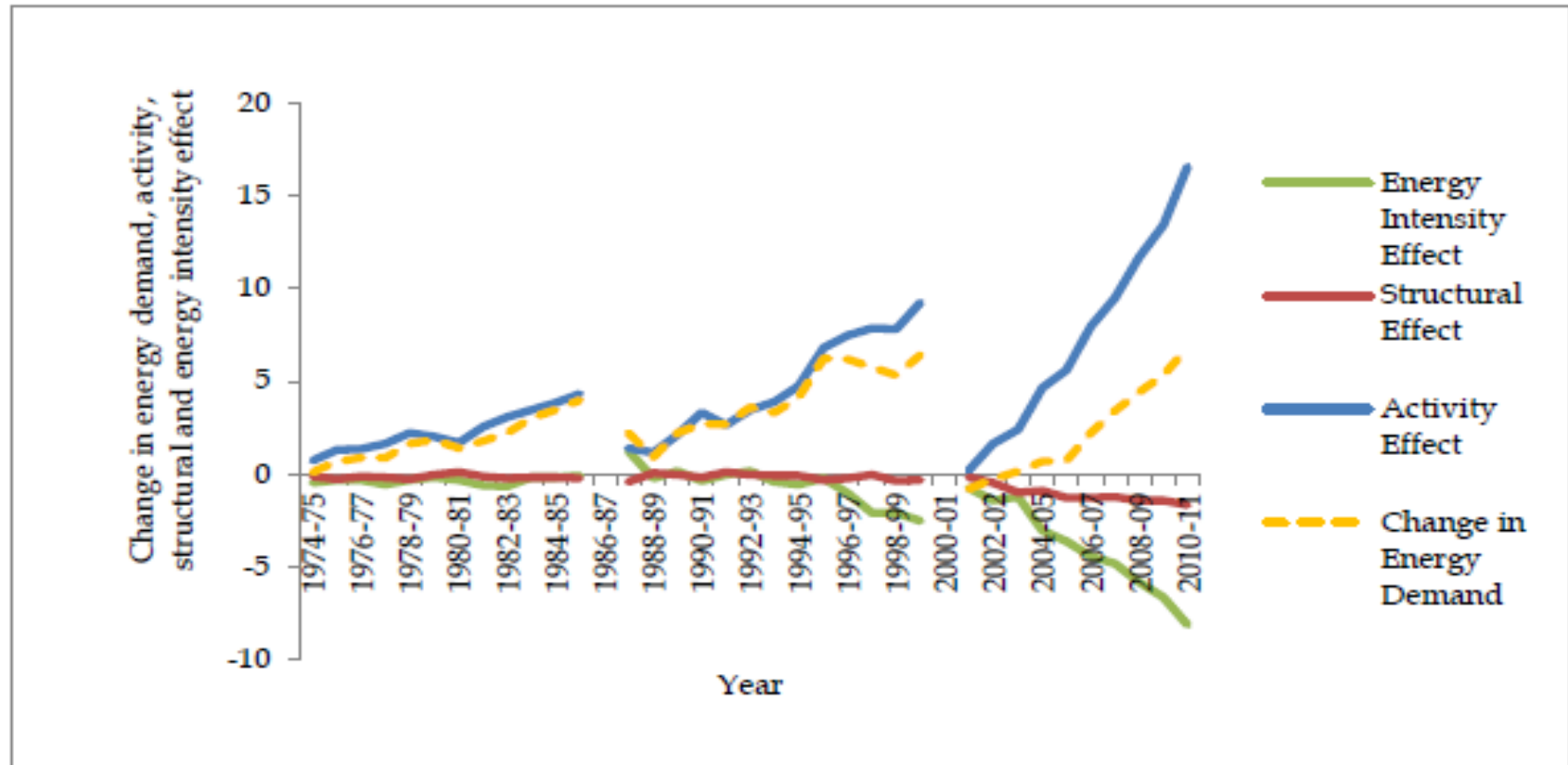
FACTORS THAT HAVE HELPED INDIA TO KEEP ON A LOW EMISSION TRAJECTORY

Structural advantage



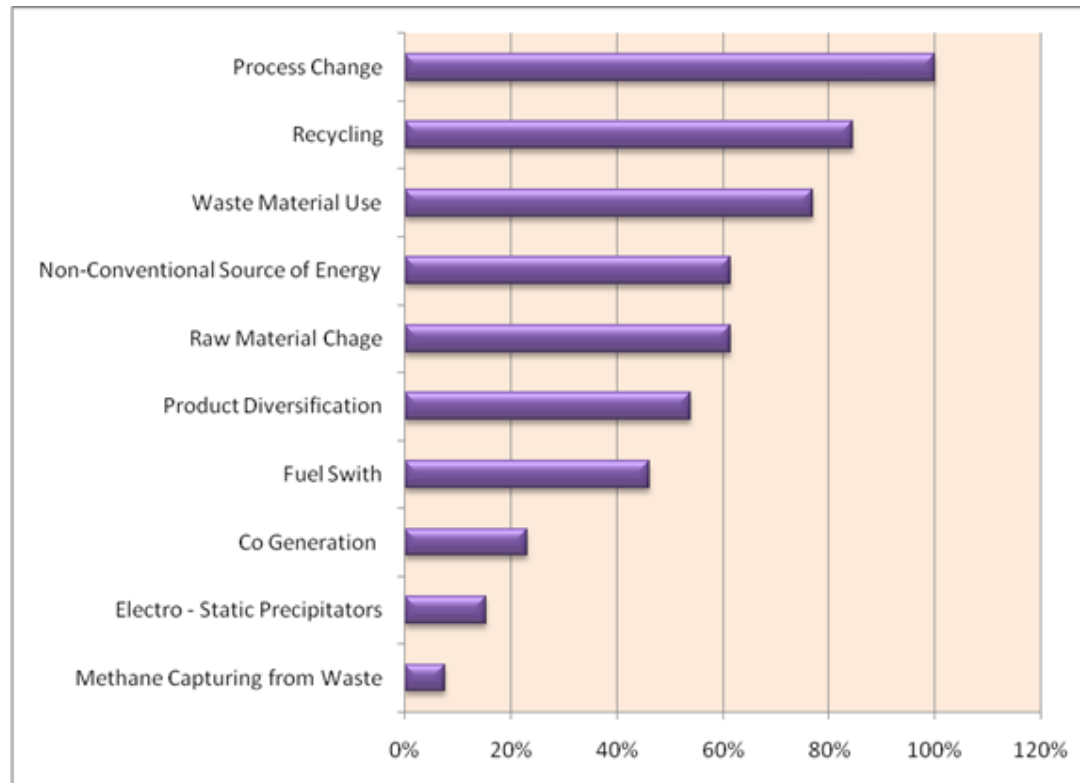
Share in GDP

Indian manufacturing industries were the leaders in EE

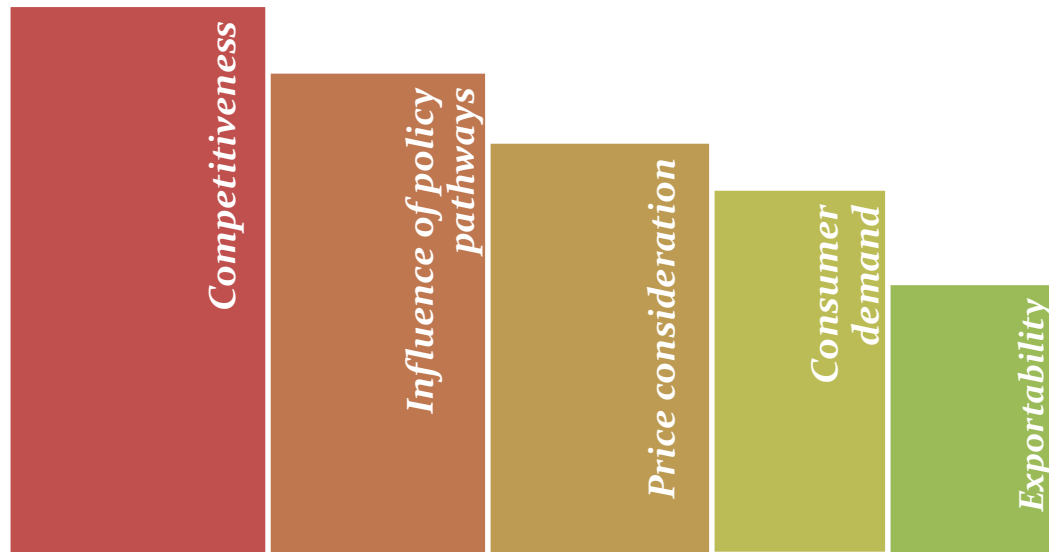


*Based on Annual Survey of Industries, India 1973-74 – 2010-11
Dasgupta and Roy (2017)*

What industries have been doing?



1. Driving forces behind undertaking actions

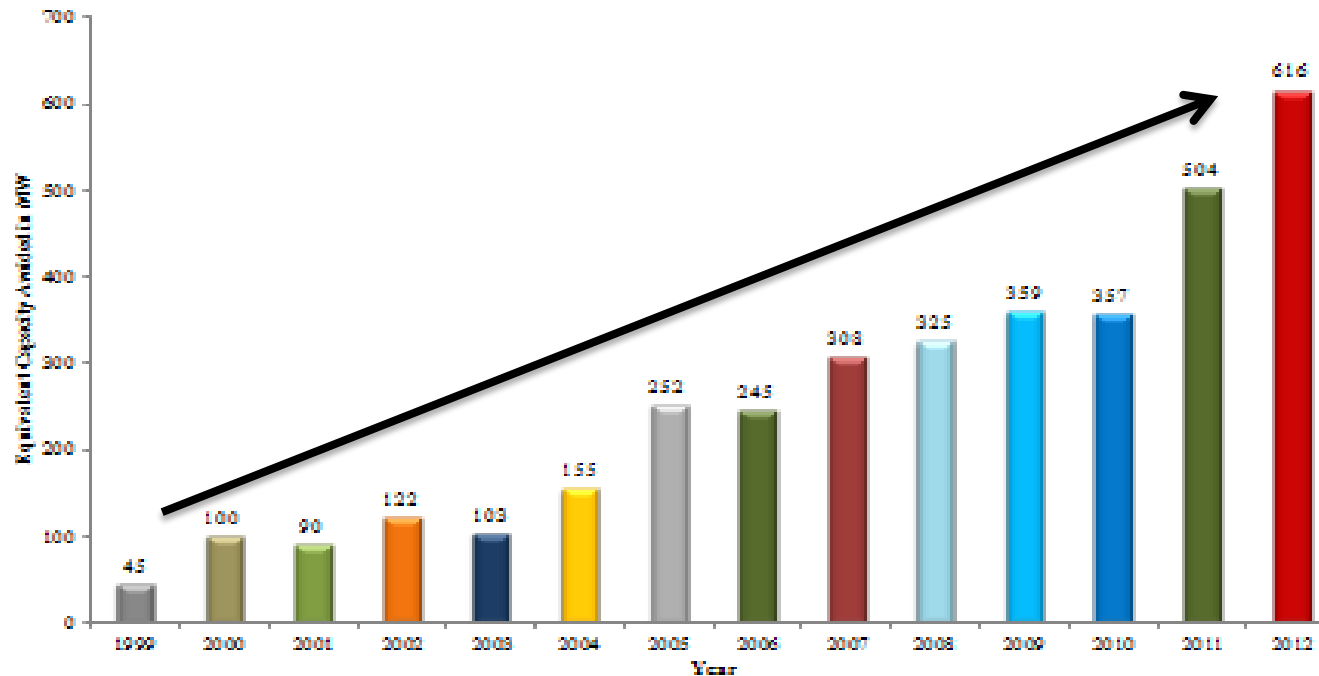


2. Emission reduction steps

Recycling (water, metal, dust, blending of inferior raw materials, putting back scrap materials to the furnace, using of rejected pipes and slags in the plants again)

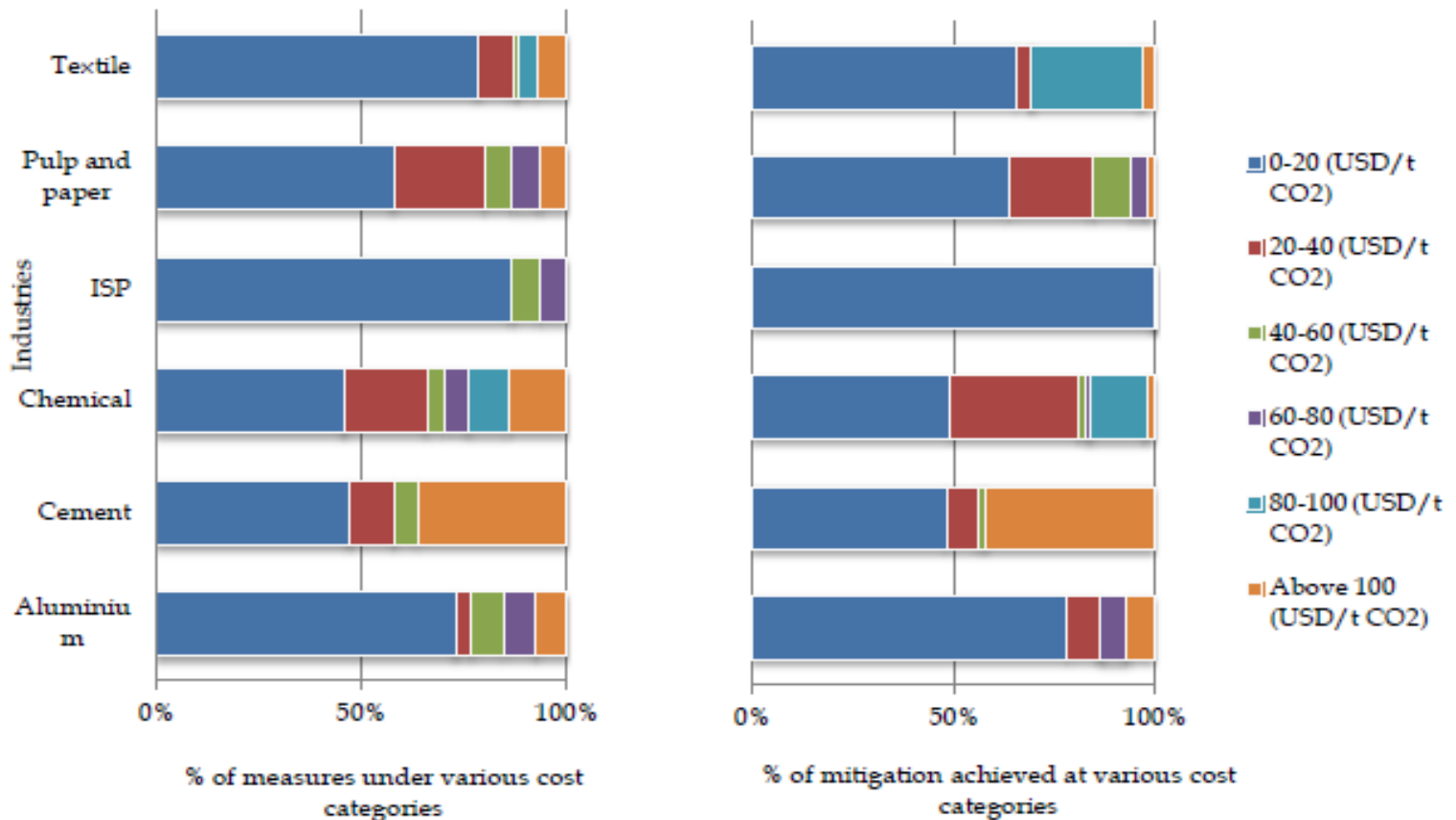
Energy Conservation Awards (since 1991)

- Participation (voluntary) increased from 123 units in 1999 to 773 in 2012
- Investment energy conservation in 2012 = INR. 1948 Crores
- Monetary saving achieved in 2013 = INR. 2886 Crores in 2013
- A payback period of 8 months



Electrical energy saving in terms of equivalent avoided Capacity in MW

Initiatives ranged from low to high cost



- achieving near - zero emission intensity levels in the industry sector would require additional realization of long - term step - change options and these options are associated with higher cost

Source: IPCC 2014. Roy, Dasgupta, Chakraborti (2017)

Behavioural Response

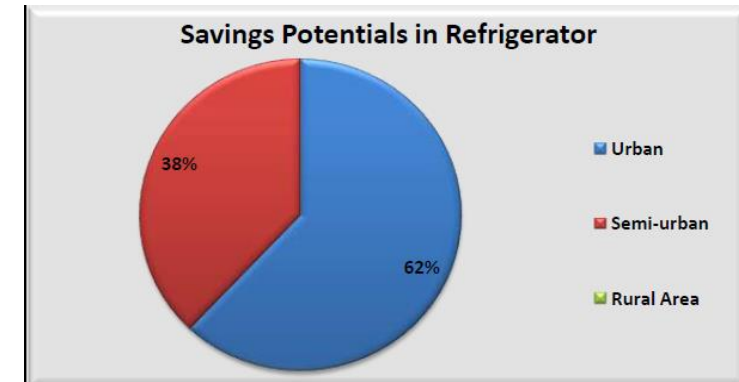
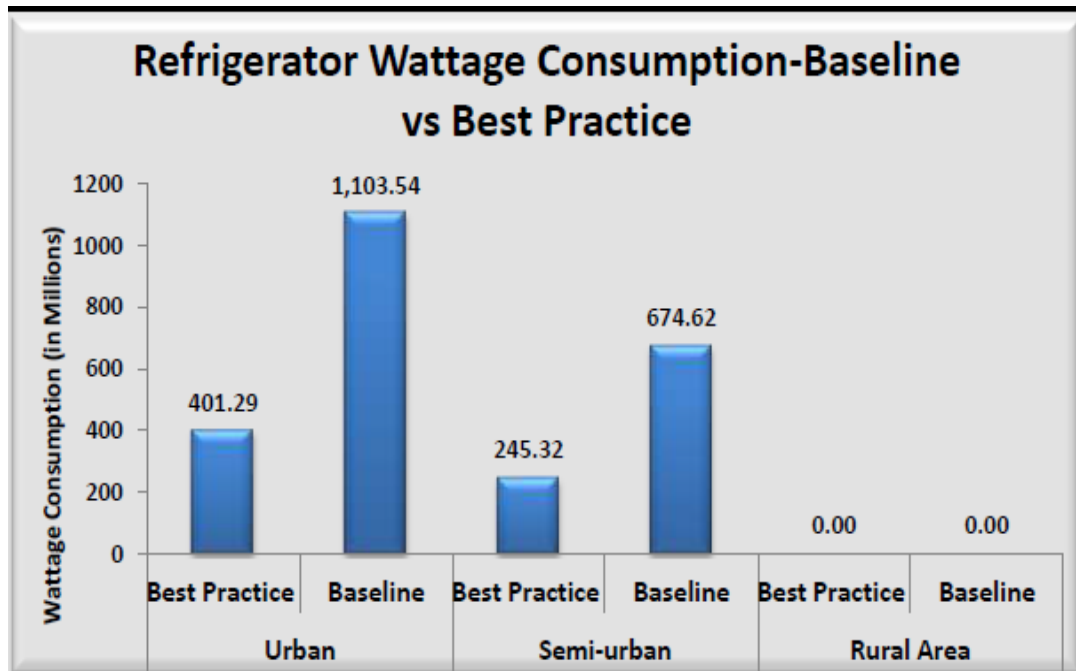
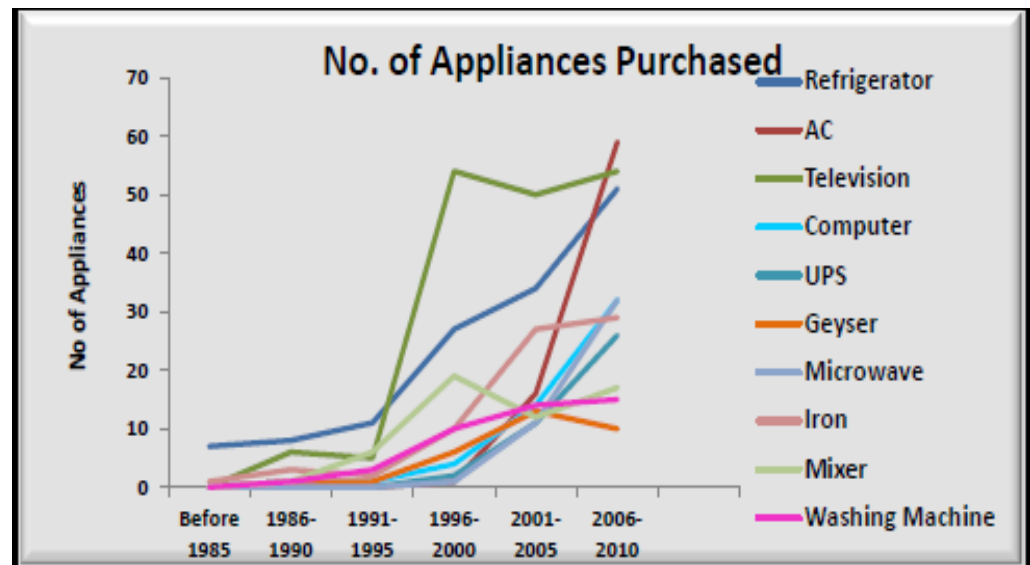


Inter-factor substitutability of inputs and own price elasticity of energy input

Factors	1973-74 to 2010-11	1973-74 to 1985-86	1986-87 to 1999-00	2000-01 to 2010-11
Capital- Labour	Complement	Substitute	Complement	Substitute
Capital - Material	Substitute	Substitute	Substitute	Complement
Capital-Energy	Substitute	Substitute	Complement	Substitute
Labour- Material	Substitute	Substitute	Substitute	Substitute
Labour- Energy	Substitute	Substitute	Substitute	Substitute
Material- Energy	Substitute	Substitute	Substitute	Substitute
Own price elasticity of energy	-0.22	-0.60	-0.74	-1.22

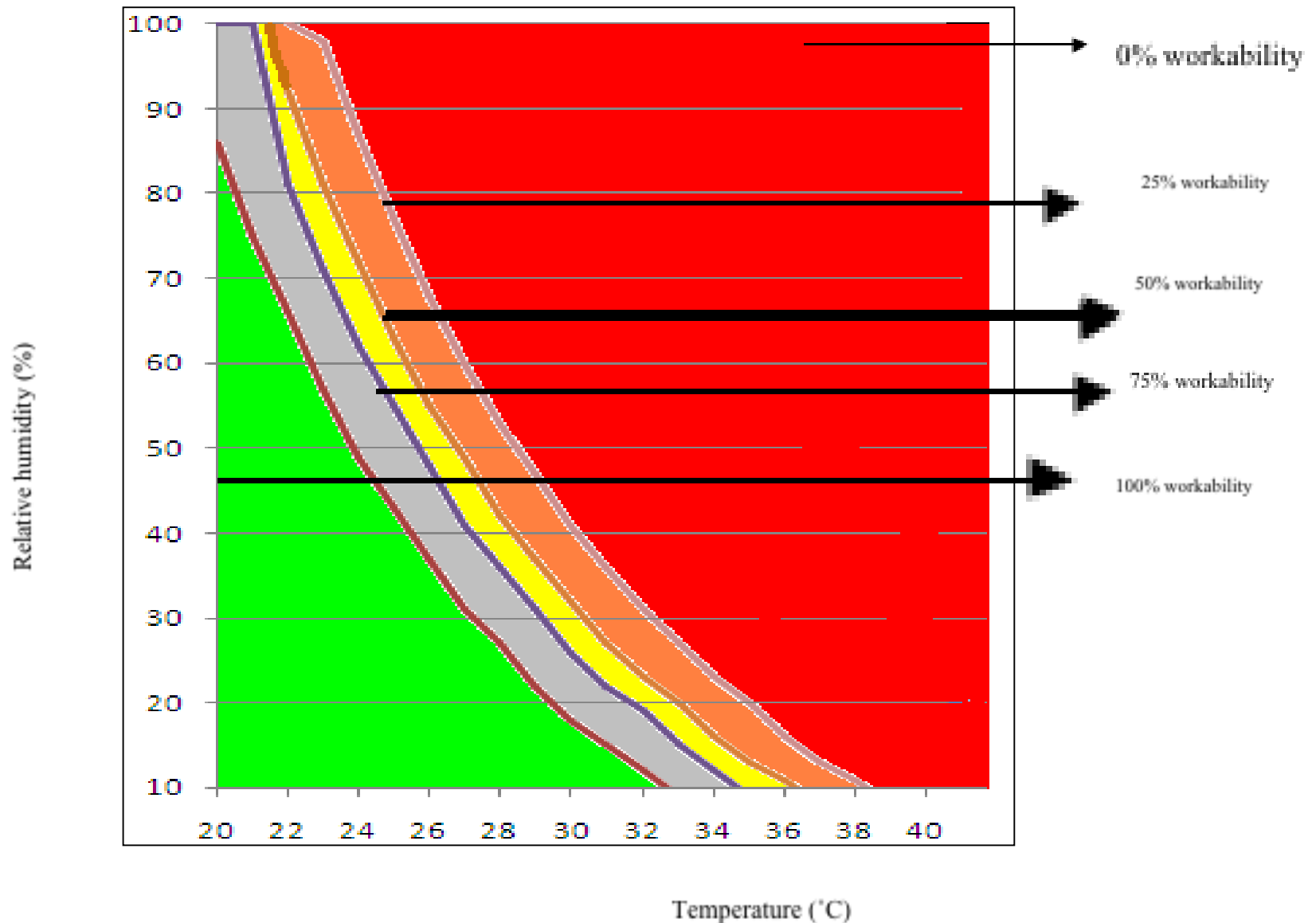
- ✓ Technological progress evolved to substitute energy input, especially by material inputs
- ✓ But, this along with a technological bias towards material input seeks attention
- ✓ Own price elasticity of energy input is negative with an increasing magnitude
- ✓ Price based intervention is expected to be effective to pull down the energy use further with far reaching implications towards reduction of emission as well.

Growing Demand with opportunities



Roy, Ganguli, Chakravorti (2016)

WBGT: Human workability locus

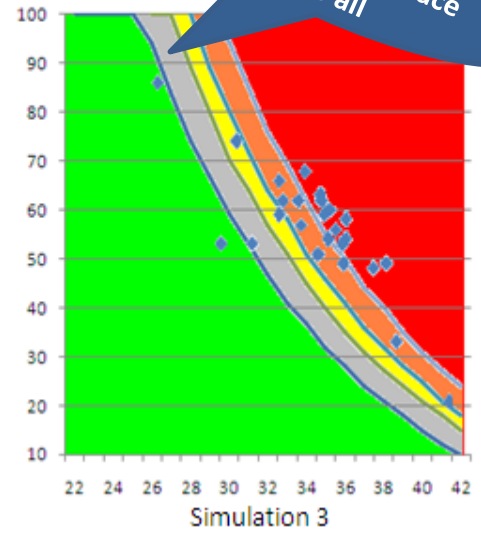
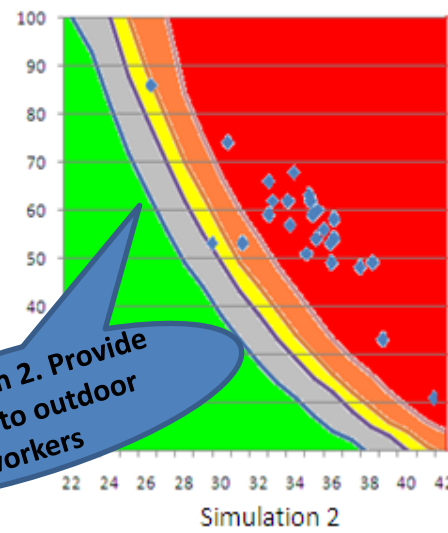
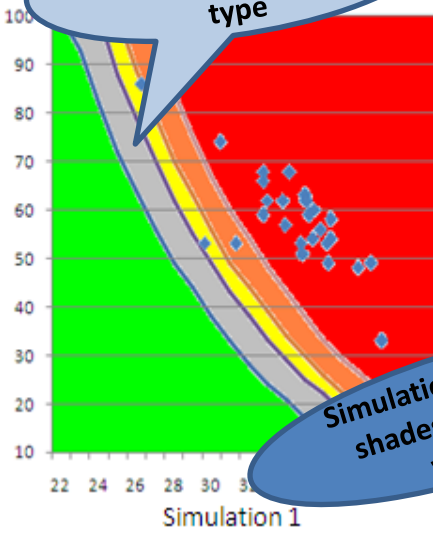
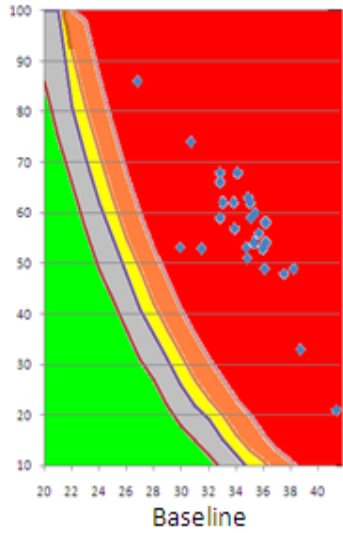


May

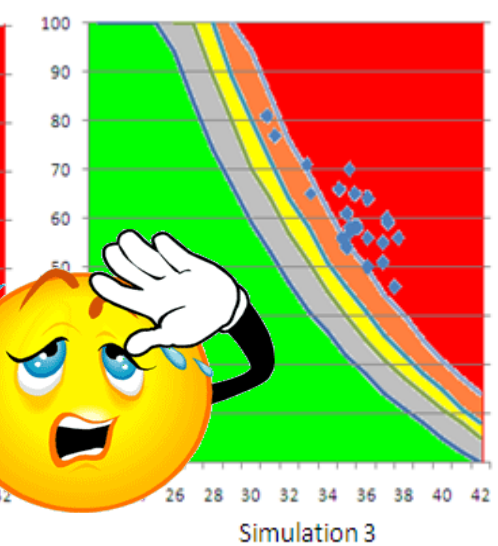
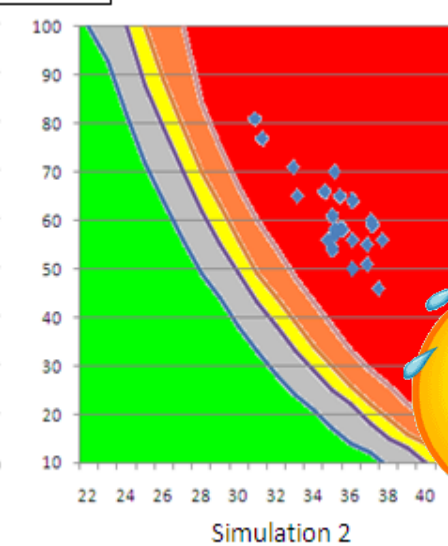
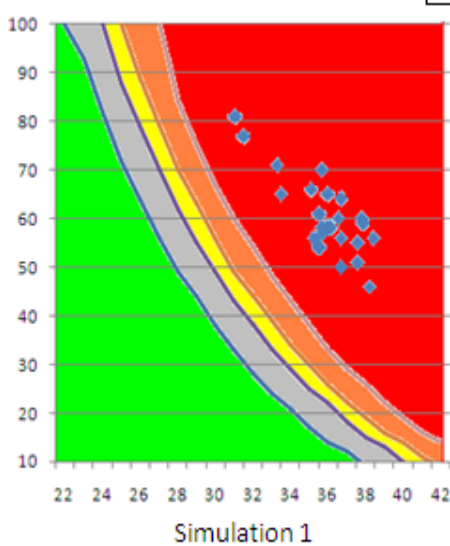
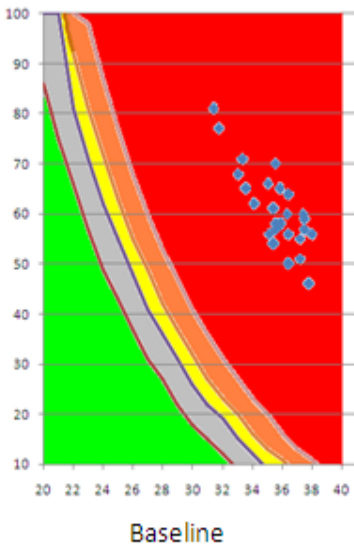
Simulation 1.
Change in clothing
type

Simulation 2. Provide
shades to outdoor
workers

Simulation 3.
Indoor workspace
to all



June

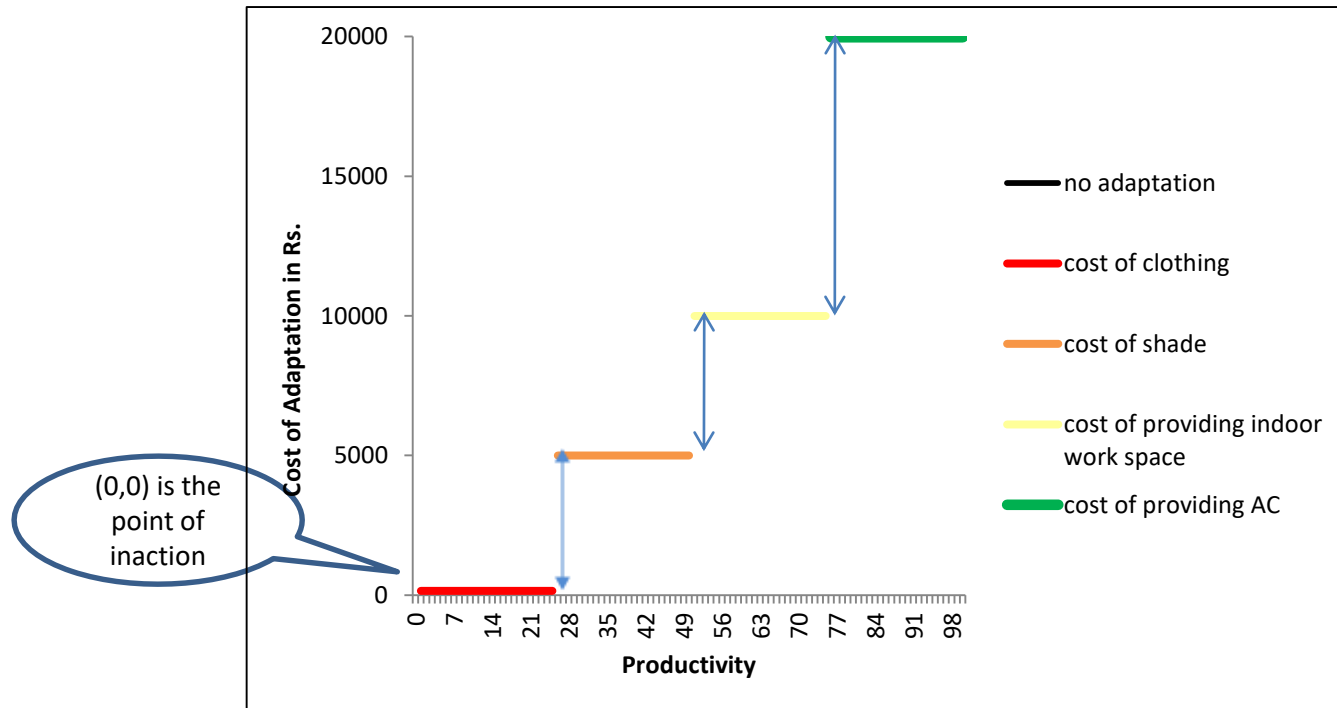




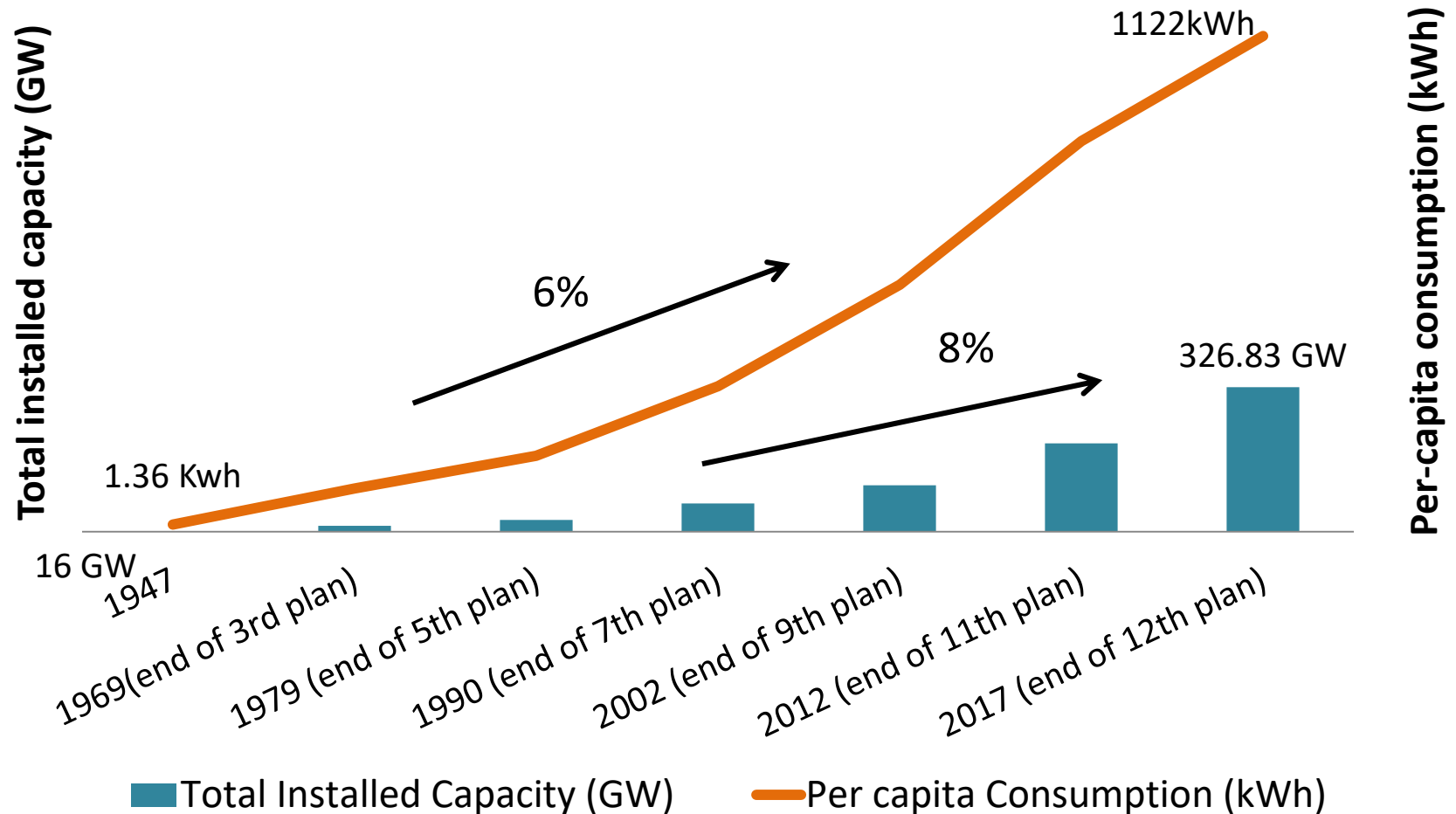
AS ON 2015: NO WORK ZONE

- KOLKATA: 357 DAYS
- DELHI: 343 DAYS
- MUMBAI: 362 DAYS
- CHENNAI: 345 DAYS

Levels and cost of Adaptation

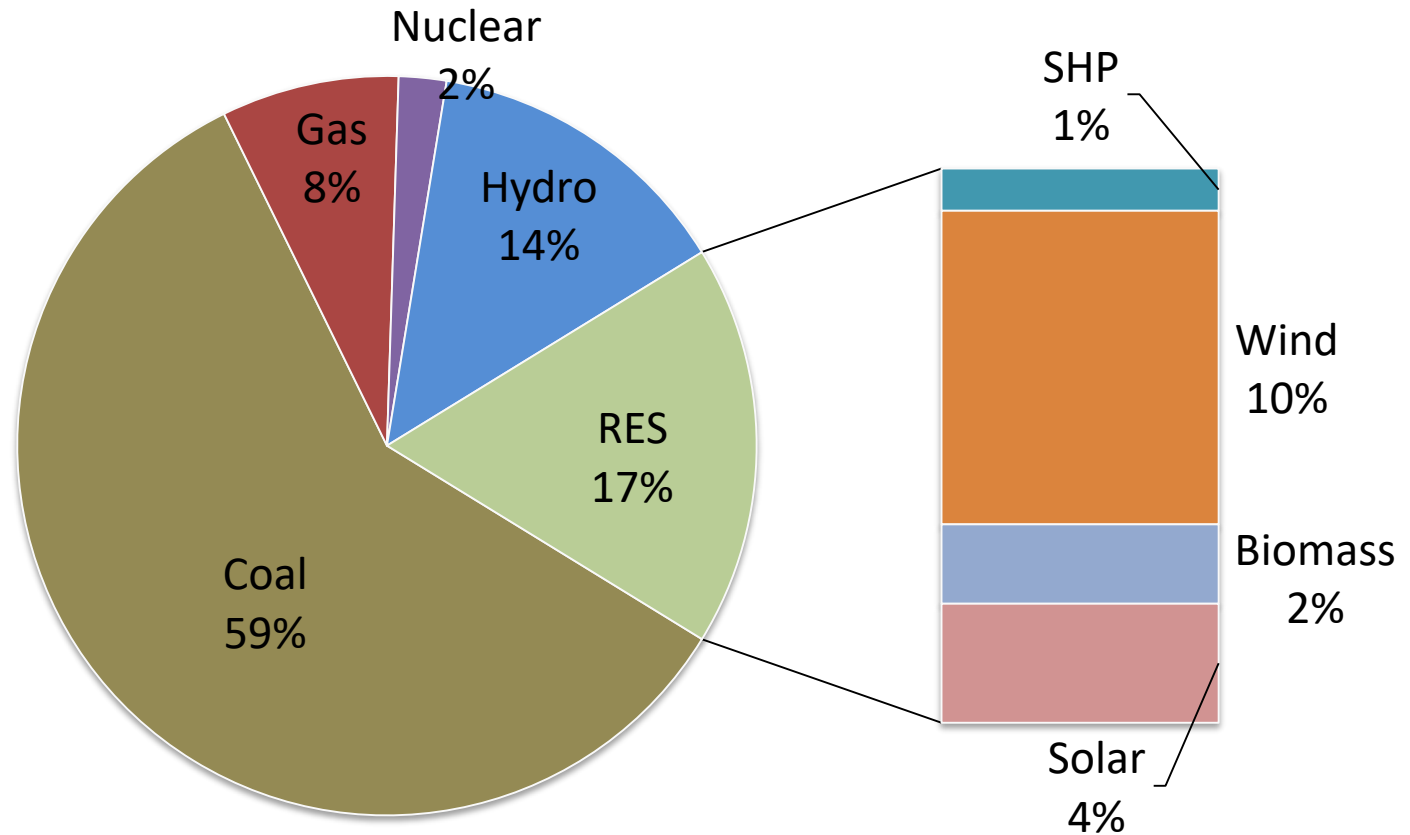


Sector that needs special attention is: power sector

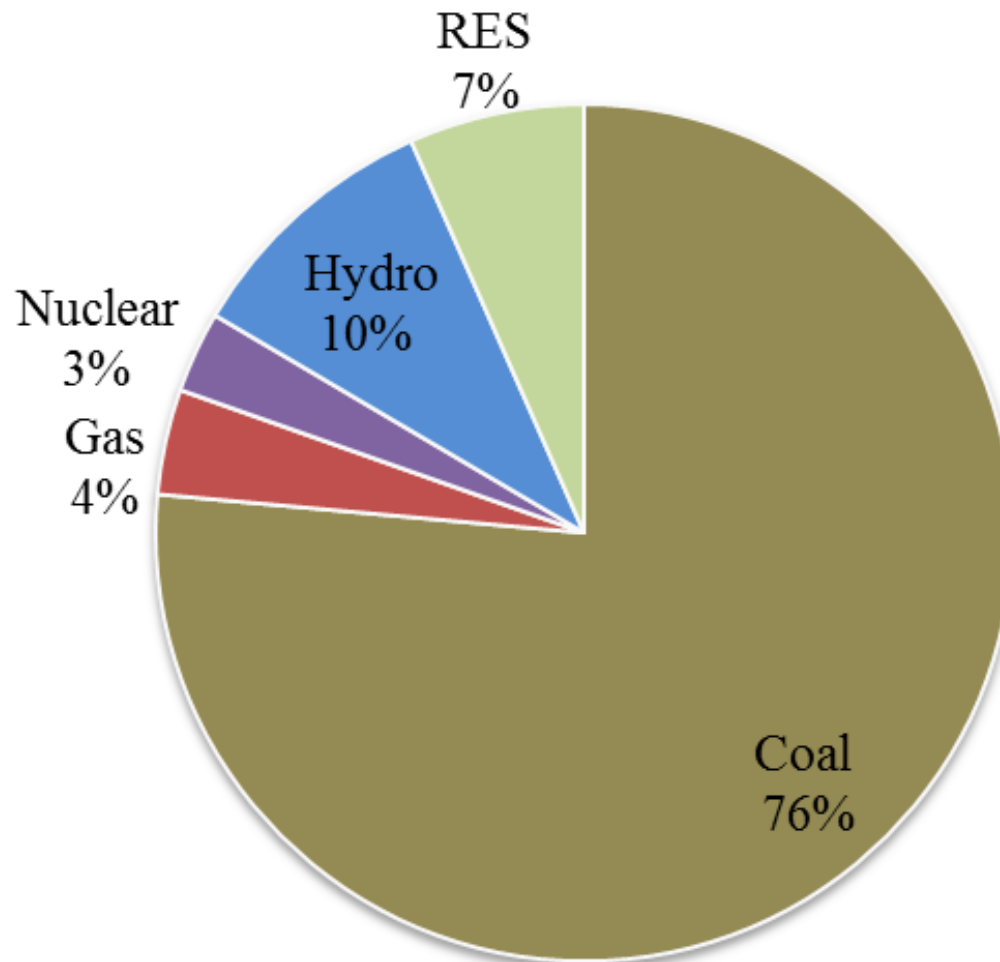


Source: Various issues of Annual Report of Central Electricity Authority

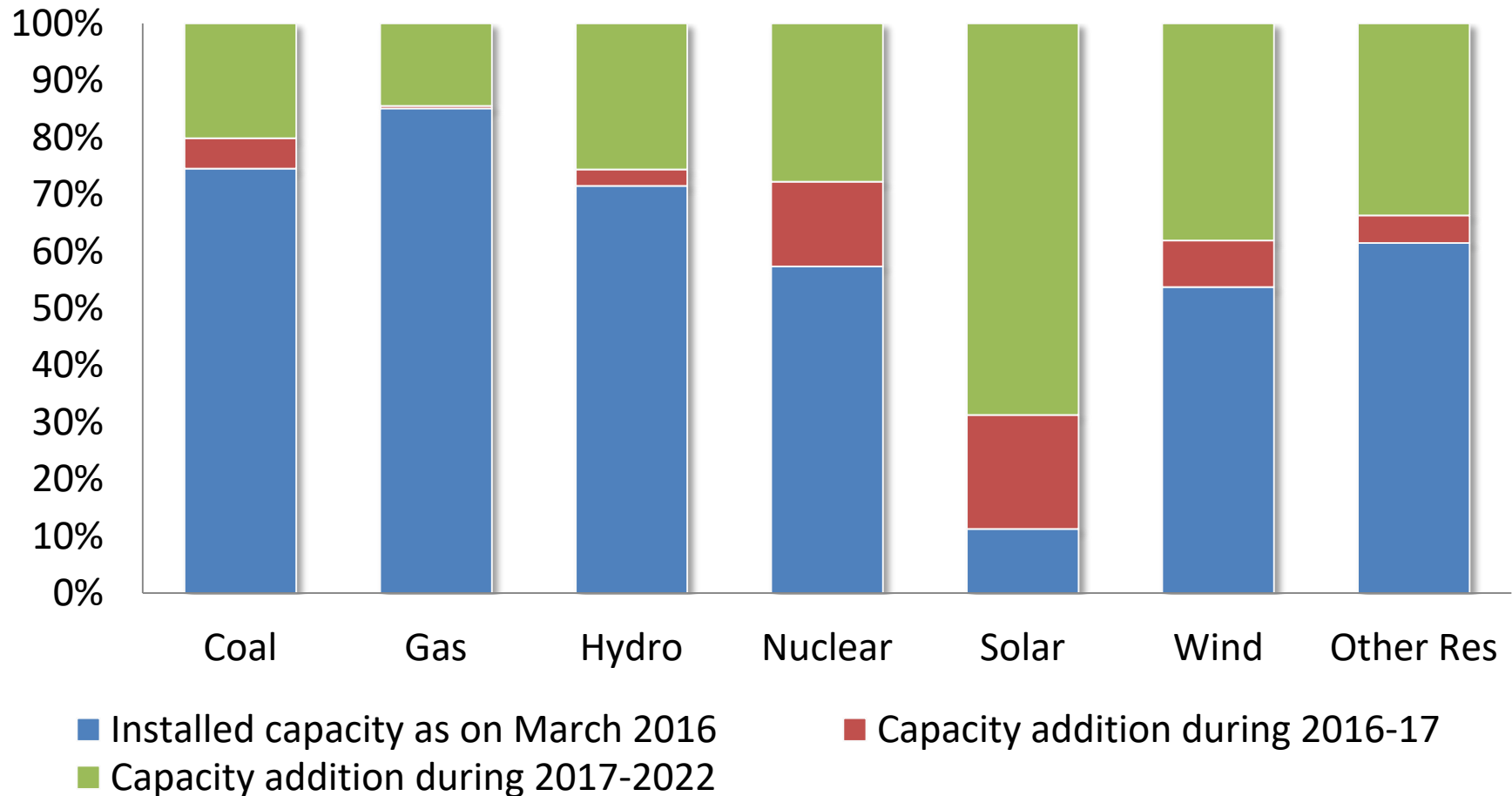
Fuel mix in installed capacity, as on March 2017



Share of different fuel and technology in generation in 2017

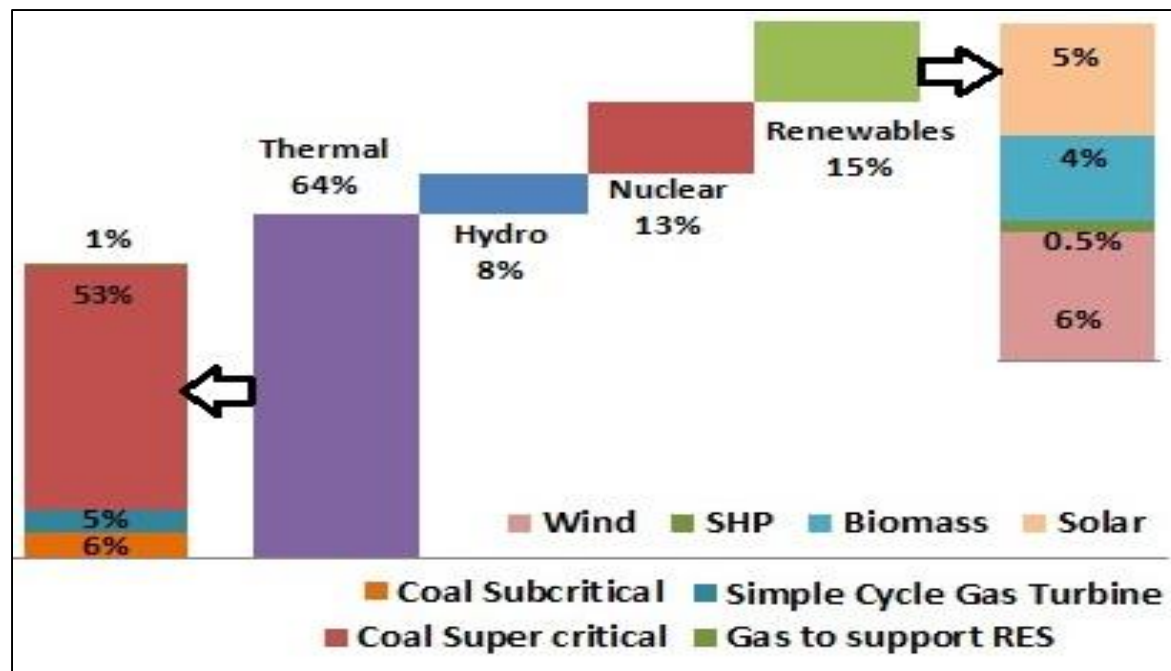


Capacity expansion



Source: CEA, 2016

Share of different fuel and technology in generation NDC Scenario in 2050





Bangladesh fast-growing in this decade: what are the takeaways

Economic Growth 6-10% aspiration till 2041

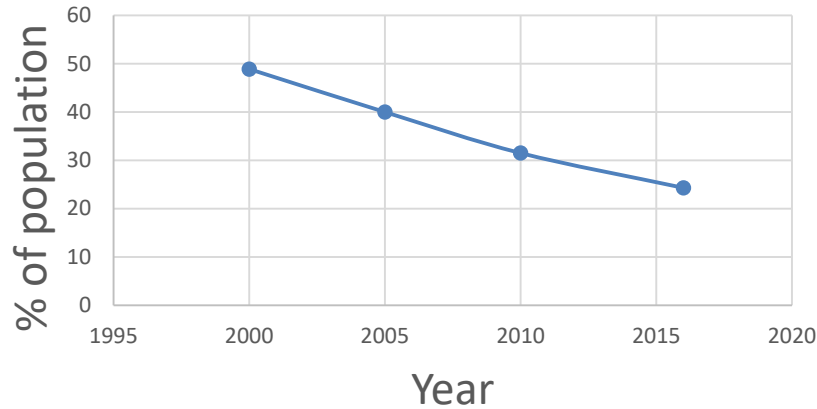
Energy Consumption Growth ~ same

The energy efficiency story : technology, policy, market, investment is missing (much remains to be done)

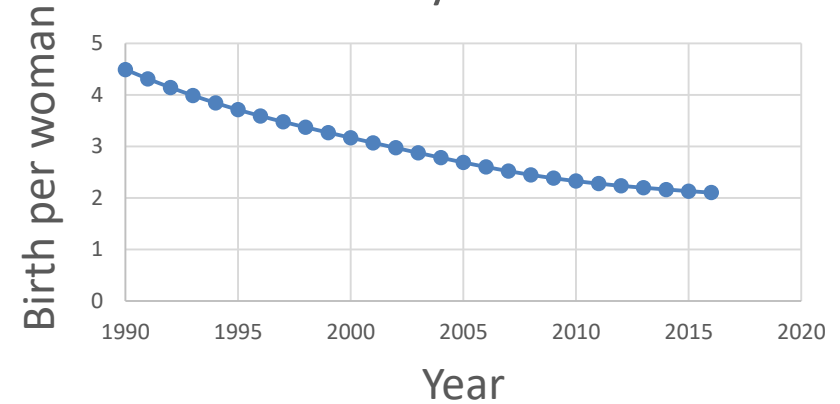
However, social sector has been doing very well over past decade

How are the social indices?

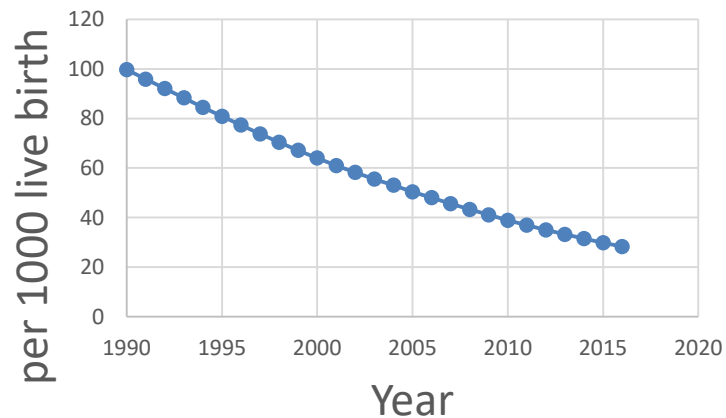
Poverty Rate



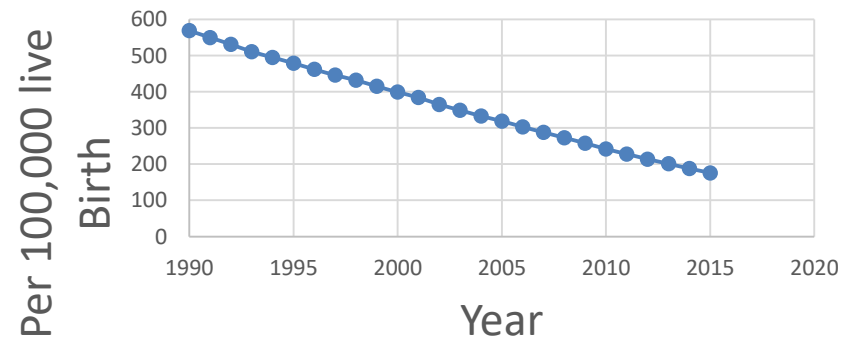
Fertility Rate



Infant Mortality Rate



Maternal Mortality Ratio



(WB, 2019)

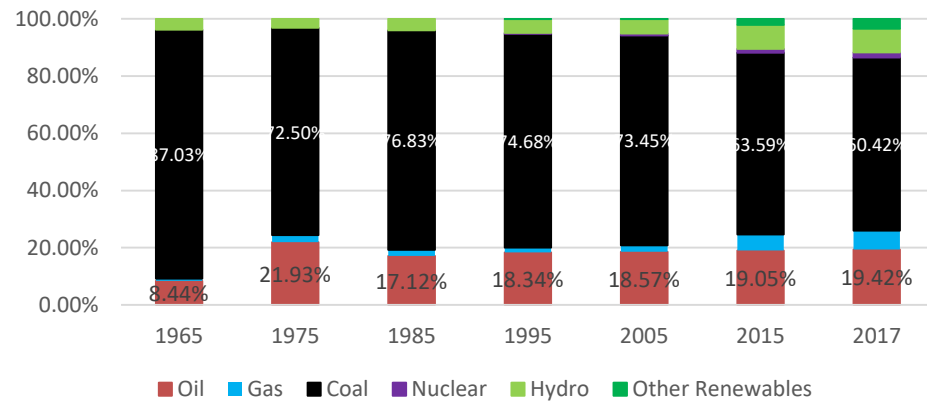
Bangladesh's emission status

Total emission	~183 million ktCO ₂ eq (as in 2012)
Per capita emission (Total emission/ Population)	1.21 tCO ₂ eq (as in 2012)
Share in global emission	0.34% (as in 2012)
Population share	2.13% (as in 2012) 2.27% (as in 2018)

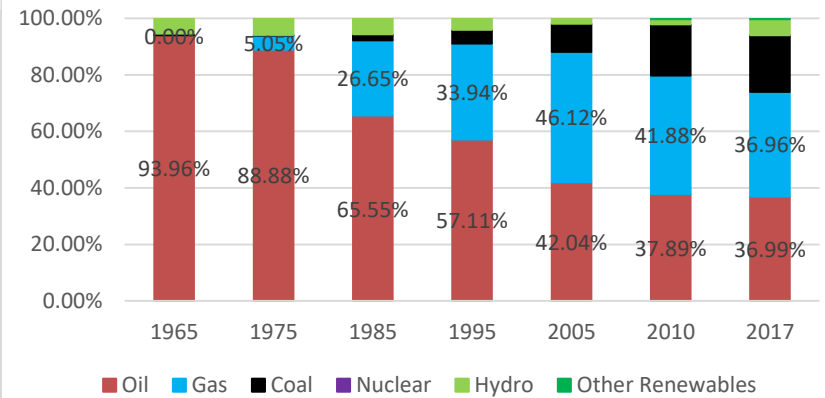
Source: World bank (2019)

Energy mix: Other Asian countries

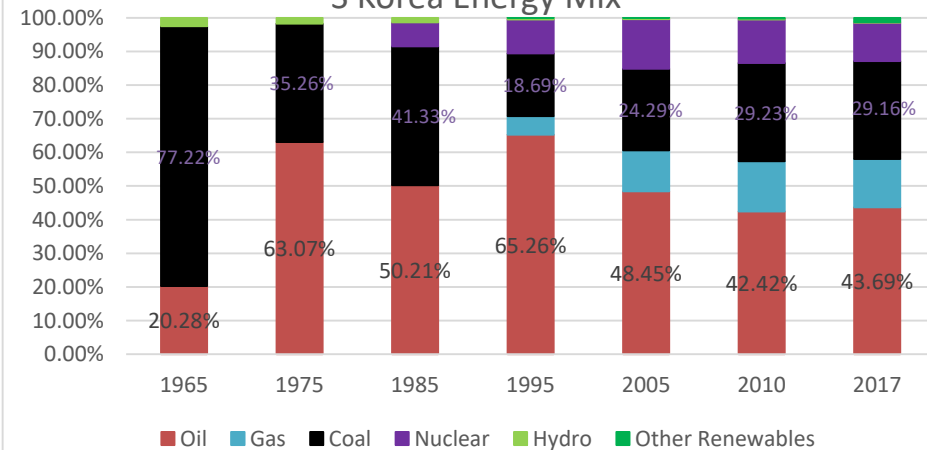
China Energy Mix



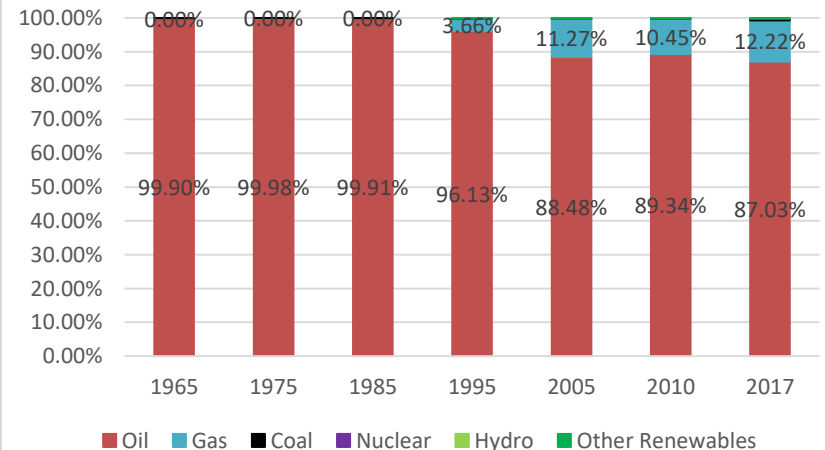
Malaysia Energy Mix



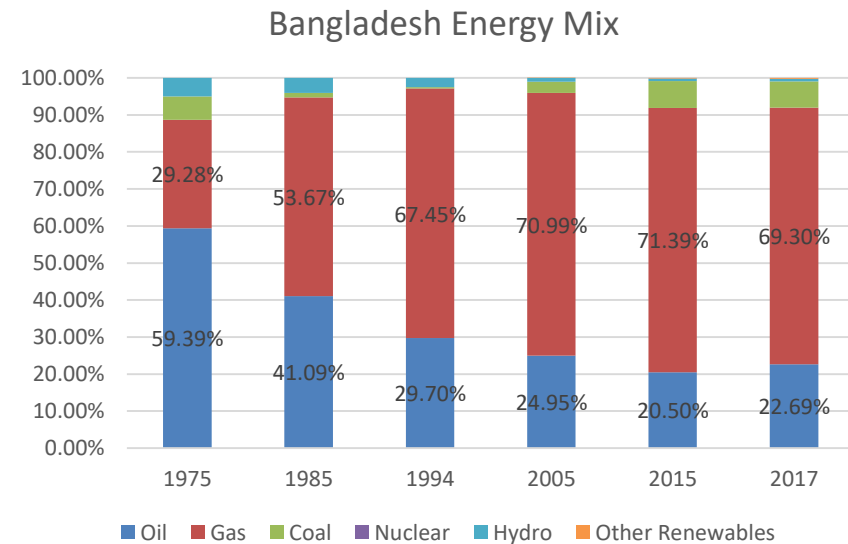
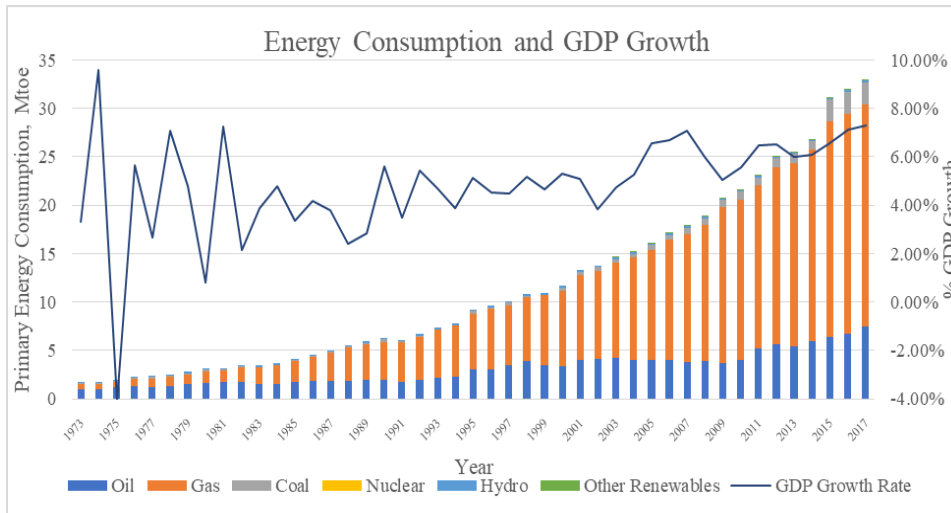
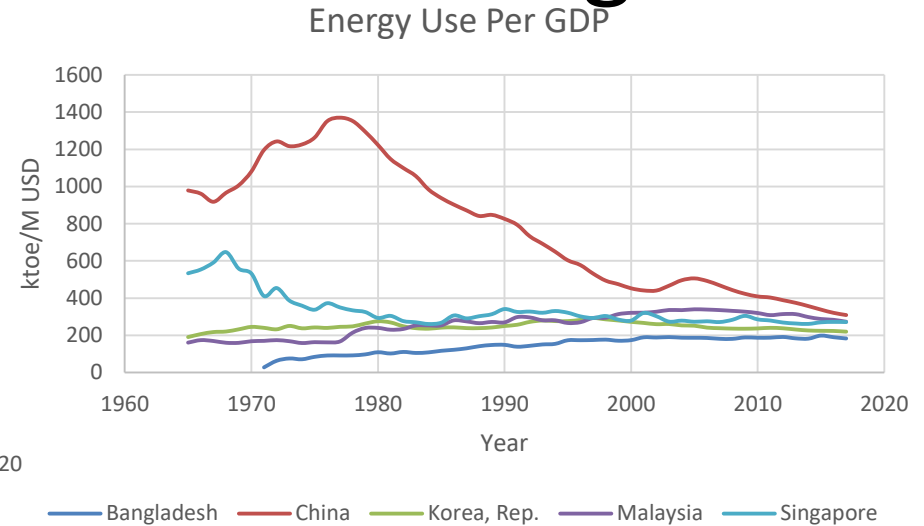
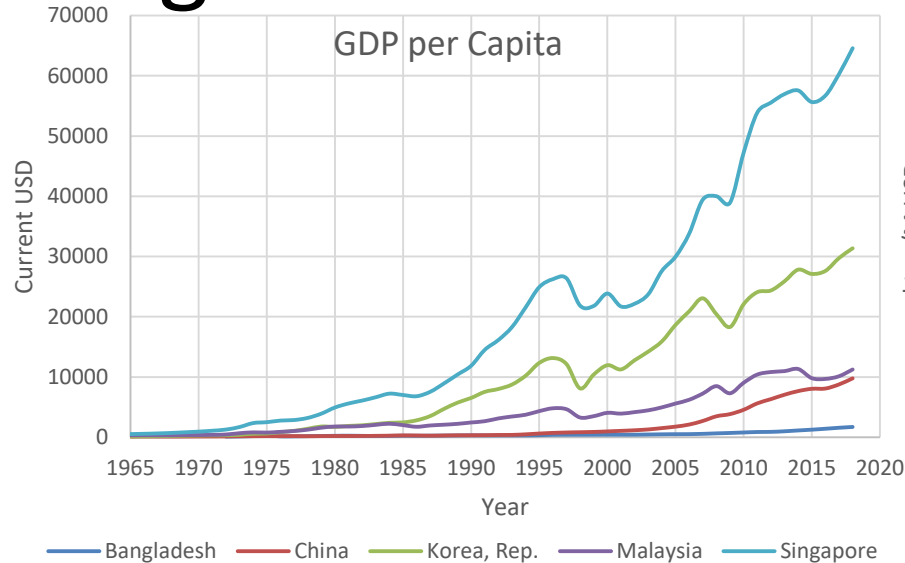
S Korea Energy Mix



Singapore Energy Mix

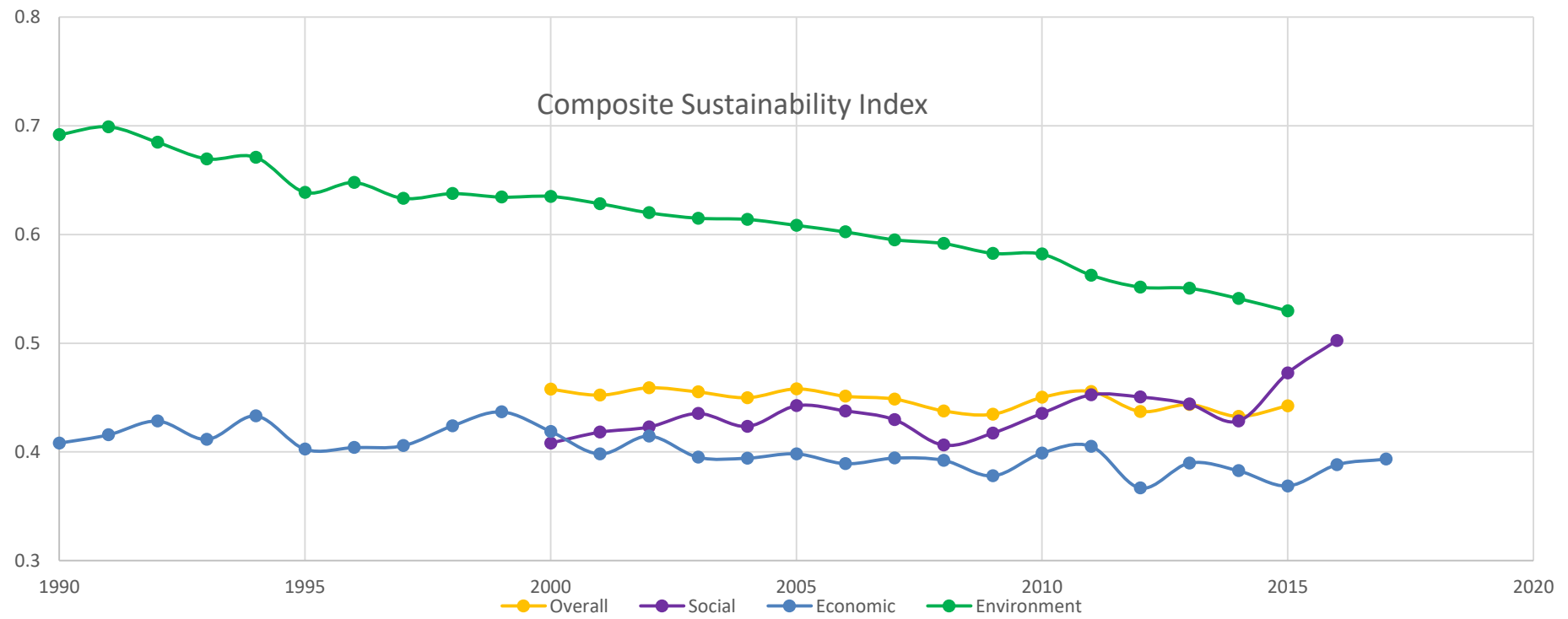


Bangladesh vis-vis others in the region



Dimension	1990	2000	2015
Overall		0.4578	0.4424
Social		0.4082	0.4724
Economic	0.4080	0.4188	0.3687
Environment	0.6918	0.6350	0.5297

PCA results: Bangladesh, Although social sustainability is increasing. Unsustainable in both economic & environmental dimension.

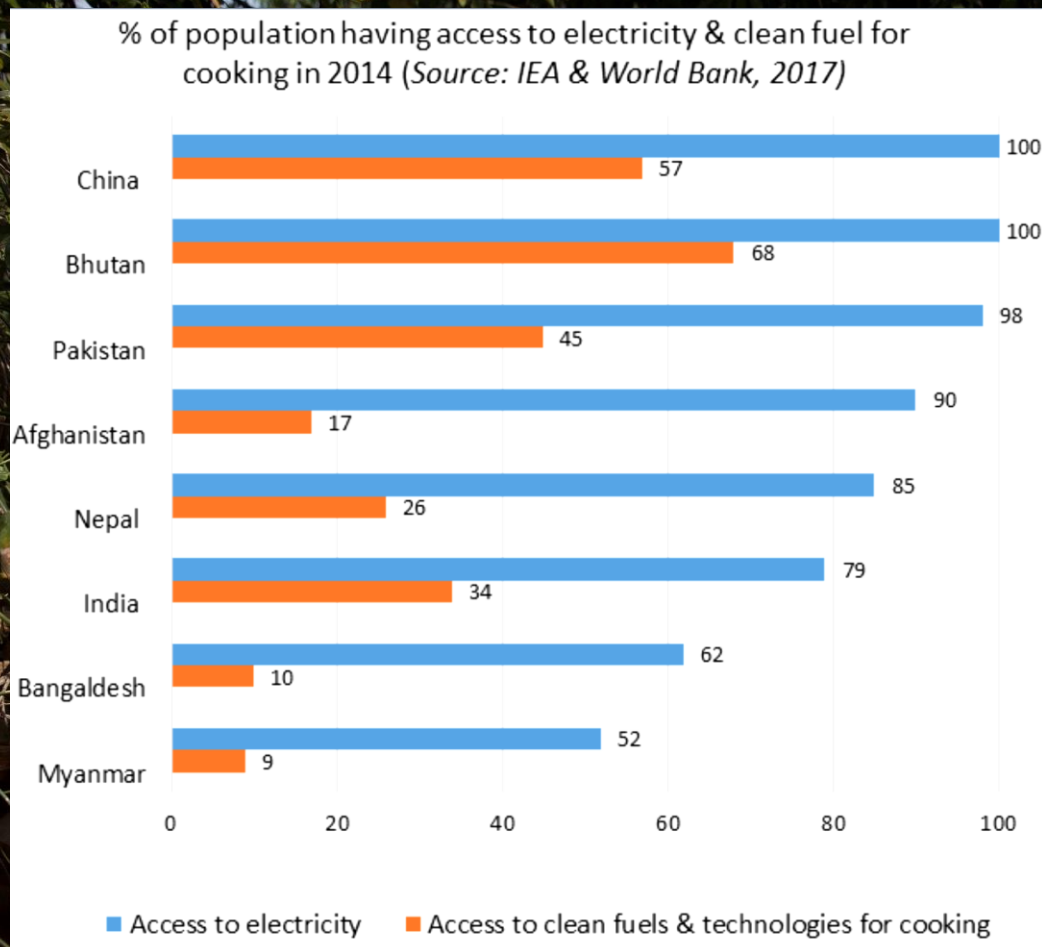




Challenges can be seen as opportunity : case of Bangladesh

- To meet reliable supply of electricity along with space cooling demand increase
- What can be the leapfrog technological solution
- To solve trilemma of Just transition, Increasing demand and nationwide ready infrastructure and skilled human resource in gas sector

In Hindu Kush Himalaya Region Challenges and Opportunities are there



Energy Poverty

500 GW hydro potential = energy for half a billion homes

80% rural population in HKH countries lacks access to clean energy for cooking

Energy development policy in the HKH too strongly focused on supply and growth—and not yet on sustainability, despite region's huge potential for renewables.

Regional energy cooperation is critical to achieve both rapid development and energy self-sufficiency

Key Issue

Inequalities of multiple kinds a barrier to
(among many things) sustainable
development and political participation.
(world social sciences report 2016)

In reality going forward globally some will
deliver absolute decoupling while others will
continue with relative decoupling?



Need some clear goal

- In sustainable development context
- Income growth vs. Wellbeing growth for all?
- Wellbeing growth is widely accepted goal (GEA, Stiglitz, Dasgupta, Arrow,.....) which does not see monotonically increasing income as a necessary condition.
- Energy demand Implications remains to be seen



Thank you

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