

Kautilya Economic Conclave

Redefining The Future

Climate Change and its Implications for India

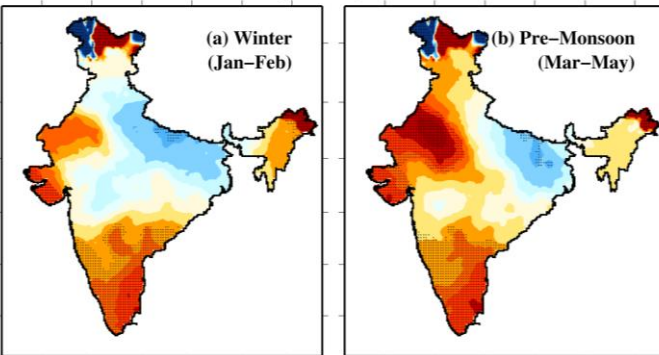


Prof. Amit Garg

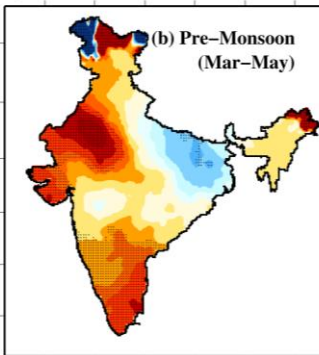
July 8-10, 2022

Current Local Implications of Climate Change

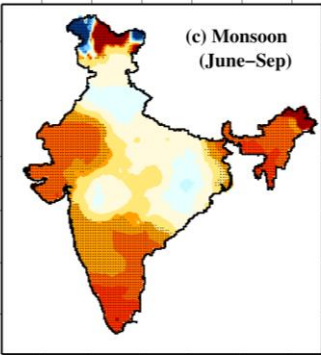
Change in temperature



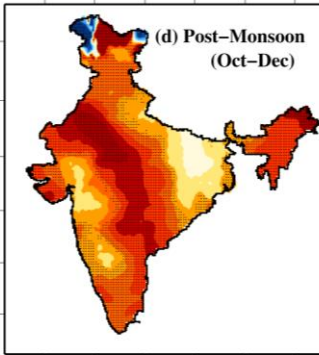
(a) Winter
(Jan-Feb)



(b) Pre-Monsoon
(Mar-May)



(c) Monsoon
(June-Sep)

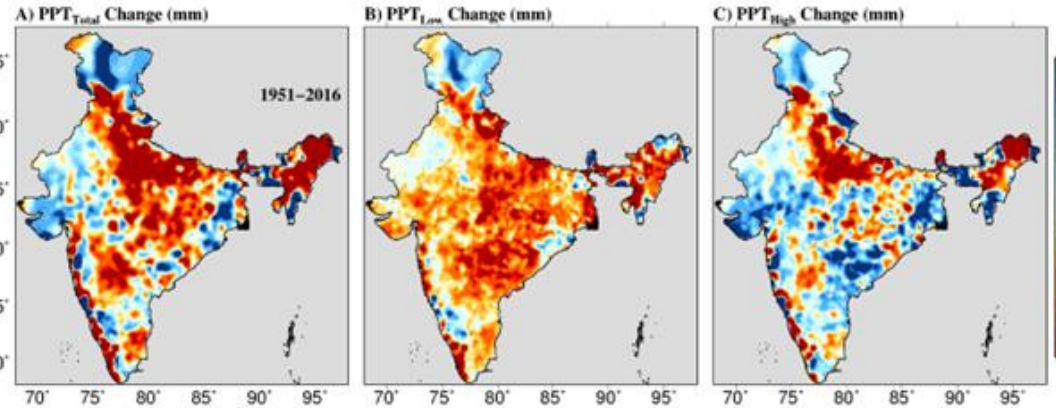


(d) Post-Monsoon
(Oct-Dec)

70° 75° 80° 85° 90° 95°

70° 75° 80° 85° 90° 95°

A **significant warming** has occurred in India during 1951-2018



Significant changes have also occurred in **rainfall characteristics** (1951-2018)

These numbers are 63% area for RCP 8.5, 2.6% area for RCP 6, 24% area for RCP 4.5 and 11% area for RCP 2.6.

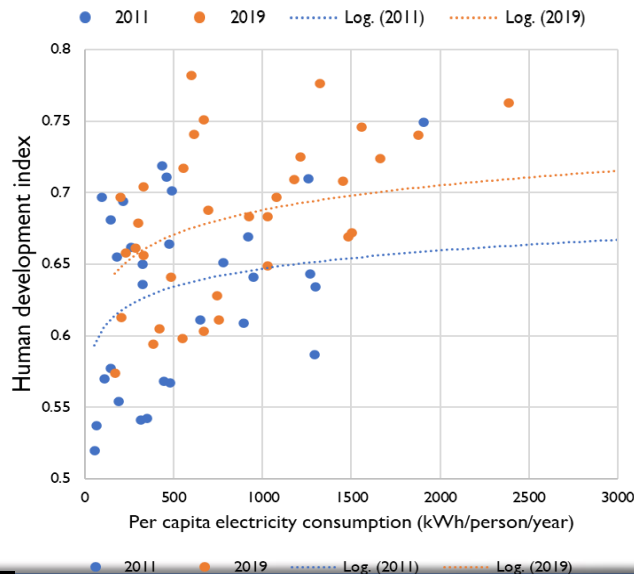
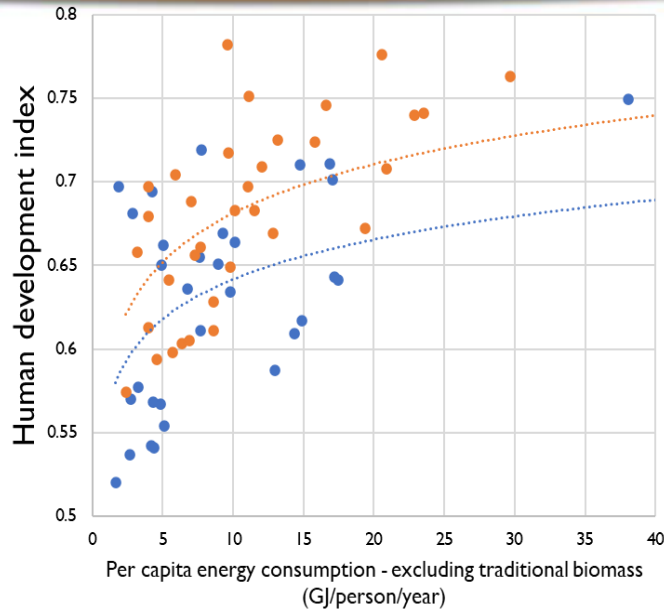
22 districts are experiencing highest extremes for both temperature and precipitation together - Aizawl, Baran, Bhilwara, Bundi, Cachar, Champhai, Chandel, Chittaurgarh, Churachandpur, Dhalai, East Garo Hills, Hailakandi, Jhalawar, Karimganj, Kolasib, Kota, Lunglei, Mamit, North Tripura, Serchhip, South Tripura and West Tripura.

Around 36 districts (5.5% of land area or ~36 million people) are observing temperature trajectories equivalent to RCP 8.5 (warming of 4°C+ by 2100), 65 districts (11% of land area or ~65 million people) RCP6 (warming of 3°C-4°C), 346 districts (59% of land area or ~704 million people) RCP4.5 (warming of 2°C -3°C) and the remaining (24.5% of land area or ~405 million people) districts RCP2.6 (warming of 2°C).

Adaptation Policy Implications: Think Global Act Local

- GHG mitigation is required, but **Adaptation to be focused now for climate action in India** and other developing countries
- Aligning Sustainable Development Goals, fulfilling national developmental targets with our Paris commitments (NDC and Net Zero 2070) are priorities
- The Indian government and state governments have instituted/strengthened over **450 plus climate policies over the last decade**. Agriculture, water, forests, and soil are included in **around 100** of them – climate adaptation is the crux. Some are -
 - *Agriculture and soil*: Crop insurance, Krishi sinchai yojana, soil health card, crop diversification, agroforestry, agri infrastructure fund, neem-coated and nano urea
 - *Forests and trees*: Compensatory Afforestation Fund Act (2016), Green highways, easier rules for allowing trees on private lands, 2.5 to 3 billion ton CO2 sequestration, 26 Mha (new) Bonn challenge, Har medh pe ped (agroforestry)
 - *Water*: Aquifer mapping and recharge, flood forecasting and management, Jal Jeevan mission, Jal shakti abhiyaan, Namami Gange
- **Each policy has market connect and support now @ federal, state and local levels**
- Over US\$ 500 billion worth of climate finance opportunities identified already (RE, EV, urban, grid, T&D, nuclear, agriculture, water, forests etc.) over next 5 years for climate investment
- So, **India is a huge market for climate action.**
- **Are international players ready to partner and invest?**

Link climate action with HDI, Energy and GDP

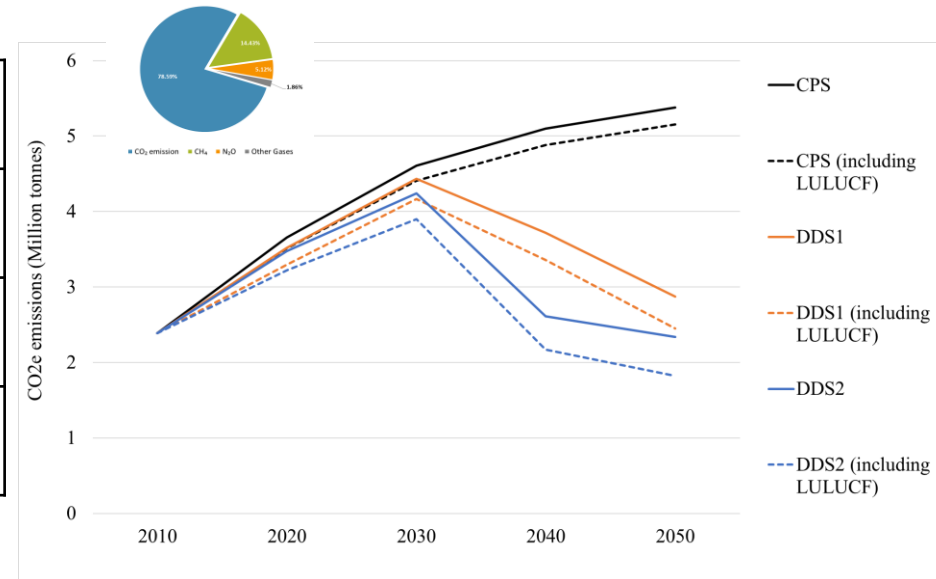


- High correlation between low human development index (HDI) and low per capita energy use (UNDP, 2016)
- Energy required for human development decreasing consistently - A reasonable HDI (above 0.7) was achievable at **100 GJ/person/year in 1975**, 60 GJ/person in 2005, 50 GJ/person in 2012, and **30 GJ/person in 2017** (Garg, 2020; UNDP, 2016) – primarily due to electrification. **Developing and emerging economies today could achieve higher HDI at lower levels of energy consumption (thus GHG emissions) owing to rising energy efficiencies**
- Improved equity in the energy parameters between states shows that the ratio of the maximum and minimum per-capita electricity consumption across states was 40 in 2011, which has reduced to 13 in 2019.
- **Indian states are moving towards higher HDI - no states with low HDI (i.e. below 0.55) in 2019. In 2011, five states had an HDI of less than this**
- This could in turn support responsible production and consumption and reduced GHG emissions in the process

Mitigation Implications for India



Scenario	Cumulative Budget	CO2/capita
CPS (including LULUCF)	142 136	3.1
DDS1 (including LULUCF)	114 104	1.66
DDS2 (including LULUCF)	98 86	1.35



Notes: Carbon budget 2020-2050 in billion ton-CO₂e
Ton CO₂e/capita is for year 2050

**Cumulative CO2 budget 2020-2050:
86-114 billion tons (3.7-11.6% of global budget
range as indicated in AR6)**

CPS to DDS1 reduction is up to **28 bt-CO₂**
including LULUCF, it will be upto 32 bt-CO₂

CPS to DDS2 is upto **44 bt-CO₂**
including LULUCF, it will be upto 50 bt-CO₂

Cumulative CO2 budget: India needs room for
development, results **within range of global models.**

India's historical **cumulative emissions sum less than
5% from 1850 to 2019.**

Based on remaining carbon budget from 2020 for
2C global warming limit (~ **900-2300 GtCO₂**)
(AR6 WGI SPM)

India's future carbon budget share ranges between

- ❖ **5.9%-15%** in CPS scenario and
- ❖ **3.7%-11.6%** in DDS scenarios

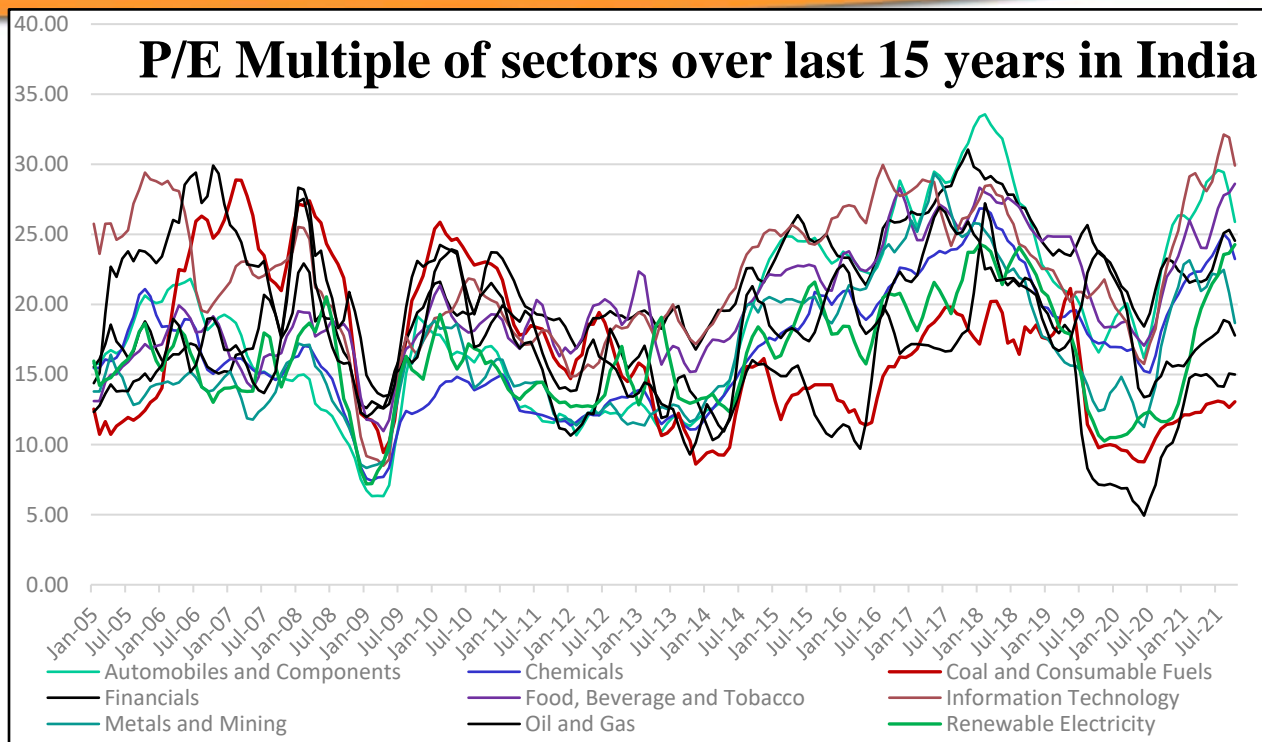
Climate finance implications - Global ESG listing of Indian companies



- **445 large Indian companies across 93 sectors** are listed on **Bloomberg** - total market capitalization of USD 2.4 trillion, average USD 5.4 billion
- Top 20% firms' market cap is 164x that of the bottom 20%. They perform 70% better on ESG scores than the bottom 20%.
- **International climate Finance possible for these**
- **What about MSME?**

Sector	# companies	Market Cap (USD)			ESG Disclosure score (Out of 100)		
		Min	Max	Avg	Min	Max	Avg
Steel	29	63.8 Mn	21.6 Bn	2 Bn	15.70	47.11	27.30
Commodity Chemicals	28	128 Mn	9.7 Bn	1.5 Bn	16.53	52.48	28.63
Diversified Banks	25	248 Mn	113 Bn	15.8 Bn	14.91	62.72	29.65
Pharmaceuticals	24	268 Mn	26 Bn	3.7 Bn	15.70	51.65	29.79
Specialty Chemicals	19	35.7 Mn	42.1 Bn	3.2 Bn	17.36	37.19	25.18
Industrial Machinery	19	67.3 Mn	3.8 Bn	1.1 Bn	14.88	34.71	24.14
Construction Materials	16	109 Mn	15.8 Bn	2.6 Bn	16.94	66.94	32.83
Construction & Engineering	15	36.5 Mn	36.8 Bn	3.3 Bn	15.29	53.31	28.98
Fertilizers & Agricultural Chemicals	14	123 Mn	8.1 Bn	1.8 Bn	18.18	47.52	28.72
IT Consulting & Other Services	11	214 Mn	190 Bn	34.3 Bn	16.53	59.92	38.77
Packaged Foods & Meats	10	281 Mn	11.7 Bn	2.7 Bn	16.53	47.52	27.27
Total	445	32.1 Mn	224 Bn	5.4 Bn	10.33	66.94	27.99
Top 20% (Mkt Cap)	89	5 Bn	224 Bn	22 Bn	16.23	66.94	38.22
Bottom 20% (Mkt Cap)	89	32.1 Mn	248 Mn	134 Mn	10.33	38.28	22.19

ESG for Climate finance: Sectoral growth trends in India



ESG Data from Sustainalytics (2021) <https://www.sustainalytics.com/esg-data>
 Negligible risk (0-10), Low (10-20), Medium (20-30), High (30-40), Severe (40+)

Sector	ESG Risk
Coal	50.9
Oil & Gas	45.9
Metals	39.2
Utilities	31.7
Chemicals	31.6
Financials	27.7
Food	26.5
Automobiles	17.7
IT	14.6
Renewables	N.A.

- A high price-to-Earning (P/E) ratio could mean that a company's stock is overvalued, or that investors are expecting high growth rates in the future. **High ESG risky sectors like fossil fuels have witnessed decline in valuation multiples in an otherwise growing economy** and are currently trailing the other sectors at 15x and 13x P/E respectively.
- **Extremely low ESG risky sector like Renewable Energy has witnessed an increase in the valuation multiples** over last 15 years from ~15x P/E to ~25x P/E - **potentially due to market growth expectations and substantial govt. support**
- Also, sectors with relatively lower risk rating like Food and Information Technology are trading at higher valuation multiples compared to sectors with higher risk rating like metals and utilities.



Act Local: MSME Initiatives for climate finance



- Contribute **~30%** of India's GDP
- Accounts for **~95%** of the industrial units and **~45%** of total exports (2020-21)
- 2nd largest source of employment besides agriculture - **~110 Mn workers** employed across **630K+ MSMEs**
- Emits **~135** million-ton CO₂e (~5% of Indian GHG)
- Only **~16% MSMEs** are being financed by the formal banking system in India
- **~5000 medium** level MSMEs (annual turnover INR 50-250 Crore each). **Could we work with these for international ESG compliance, attract international finance, and move them to large enterprise levels?**
- Opportunities for IFSCA, domestic financial institutions and Banks?
- Countries such as China have included SMEs in their green finance plan, and are piloting innovative technologies like AI/ML to develop matchmaking platforms to address the supply demand gap

Climate Finance needs



SDG and NDC target achievements complement each other – over 50% in India

- **Enhanced NDC 2030 @ COP26 Glasgow by India:** Averaging around US\$ 246 billion per year during 2021-2030 (Total ~ US\$ 2.46 trillion)
- **1.5 °C compliant:** Average projected to be US\$ 224 - 364 billion per year during 2021-2030 (Total ~ US\$ 2.2-3.6 trillion)
- **Net-Zero by 2070:** Average projected to be US\$ 140 - 168 billion per year during 2021-2030, and average around 113-142 billion/year subsequently during 2031-2070 (Total ~ US\$ 5-7 trillion)
- **All other sectors put together** also have similar investment requirements (**Thus total for India - US\$ 10-13 trillion for NZ 2070**). Some other estimates – \$10.1 trillion until 2070 (CEEW), \$3.1 during 2018-2030 (IFC), \$160 billion/year during 2022-2030 (IEA). **Annual flows need to be upscaled 8-10 times from current levels.**
- **Main investment and technology transfer opportunities:** Solar, wind (including offshore), EV (including charging I/S), batteries (including flow batteries), grid flexibility, Energy efficiency all sectors, green hydrogen, bioenergy, **Nuclear (\$350-450 Billion)**, housing and urban, use of remote sensing and drone technologies, water, agriculture and soil, Forests trees outside forests and agroforestry (FTA)
- **Adaptation linked investments** (insurance embedded) : climate risk resilient power, transport, agriculture and supporting infrastructure for all sectors



Thank you

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