

Climate Change & India



Centre for Science and Environment
New Delhi



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- **How has India warmed over the past 117 years?**
 - **How the temperatures have increased seasonally?**
 - **How far away we are from 1.5 degree C target?**



Methodology

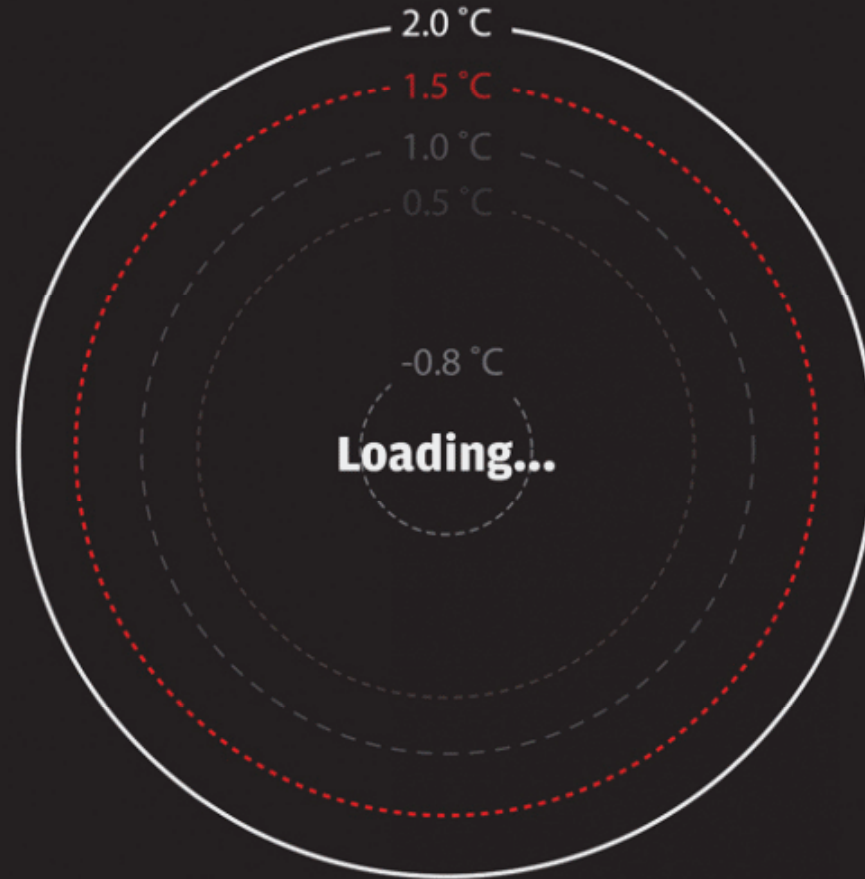
- **117 years (1901-1916) data on annual and seasonal mean, maximum & minimum temperature from IMD**
- **1901-1930 average temperature considered as baseline**
- **Temperature anomaly calculated as departure from the baseline**



SPIRALLING TEMPERATURE

ANNUAL WARMING TRENDS IN INDIA

1901 - 2016



ANNUAL TEMPERATURE ANOMALIES FROM 1901-1930 BASELINE

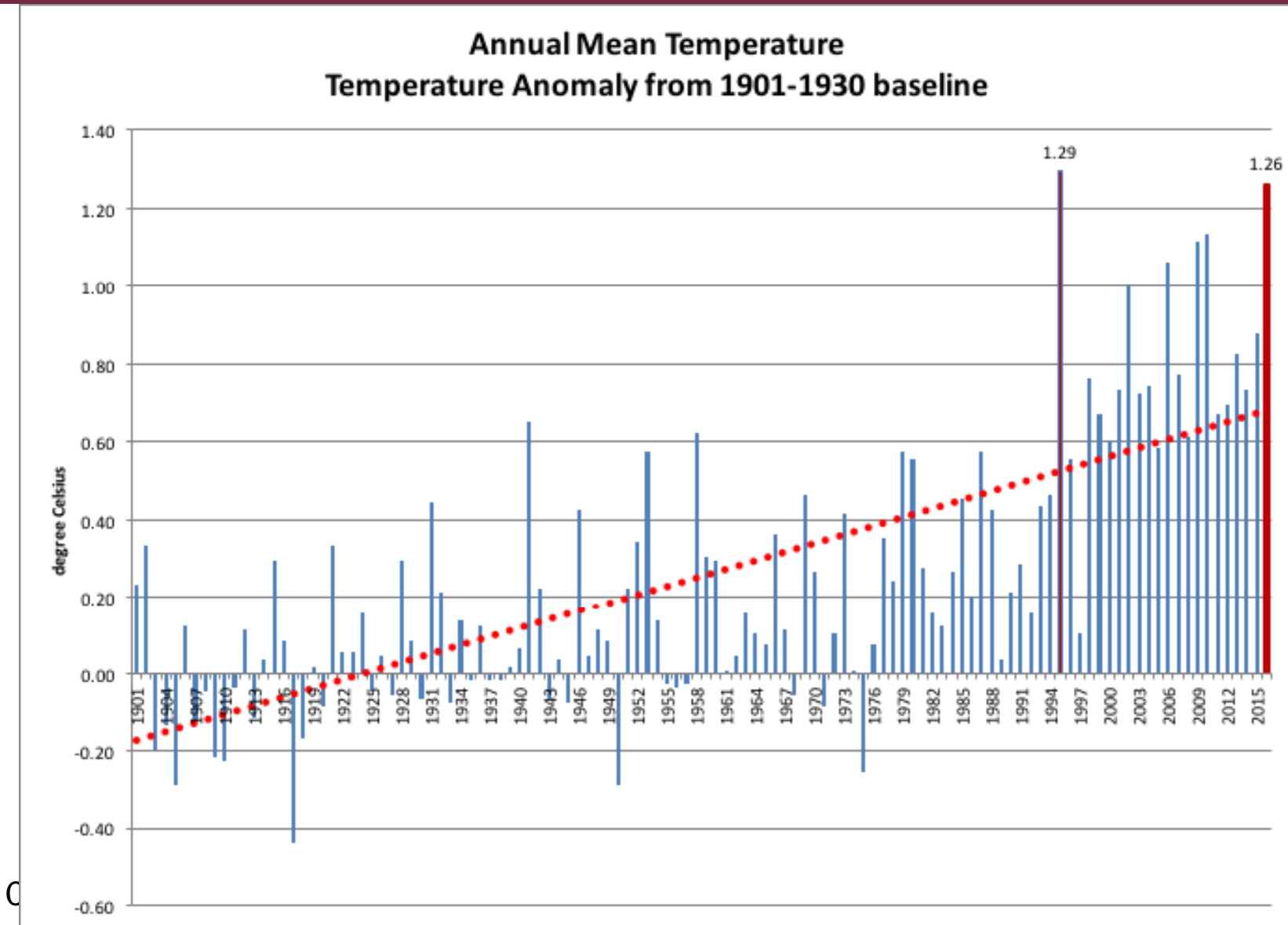
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DATA SOURCE: INDIAN METEOROLOGICAL
DEPARTMENT, PUNE



Annual Temperature

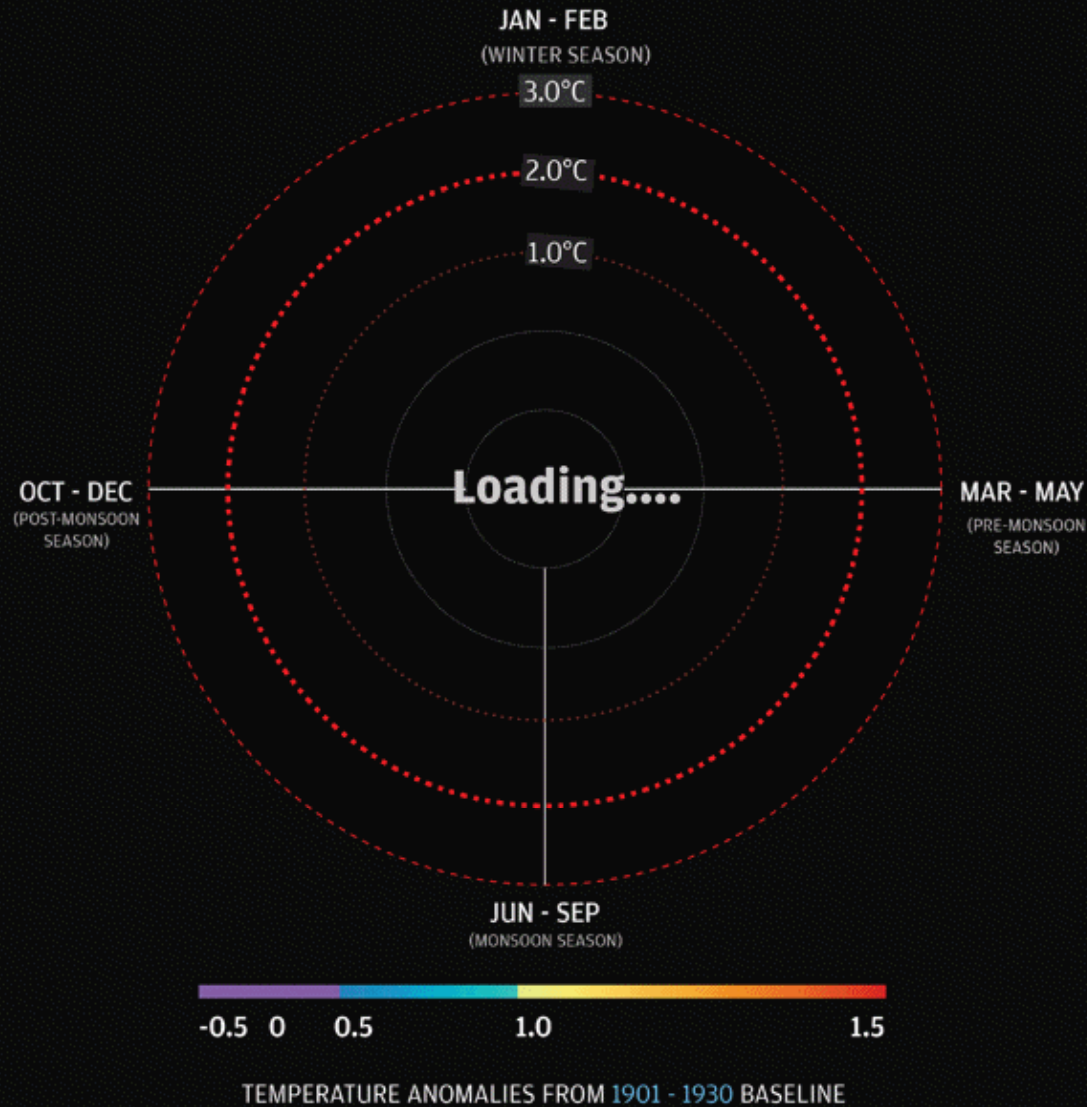




SPIRALLING TEMPERATURE

SEASONAL WARMING TRENDS IN INDIA

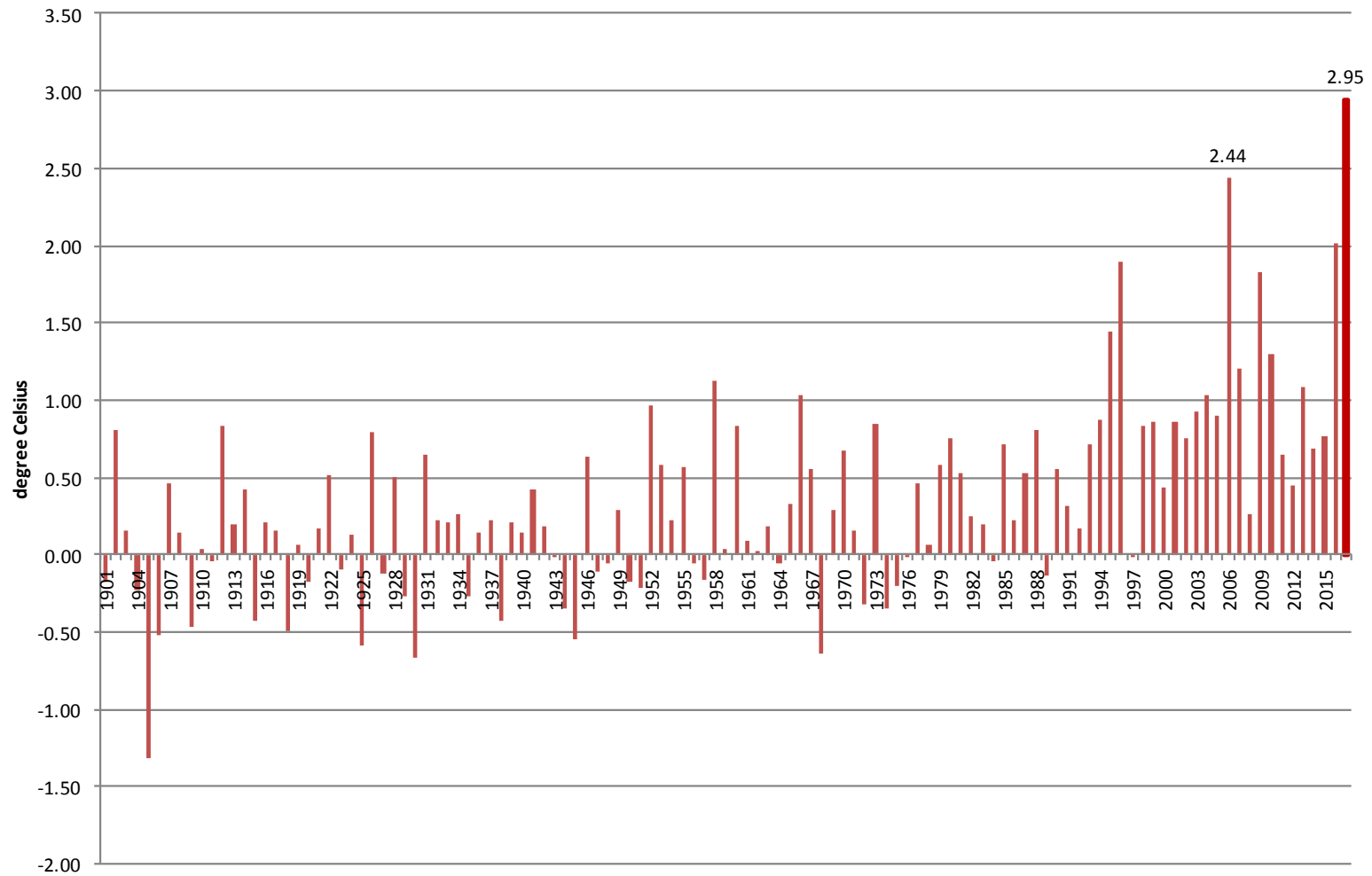
1901 - 2017





Seasonal Temperature - Winters

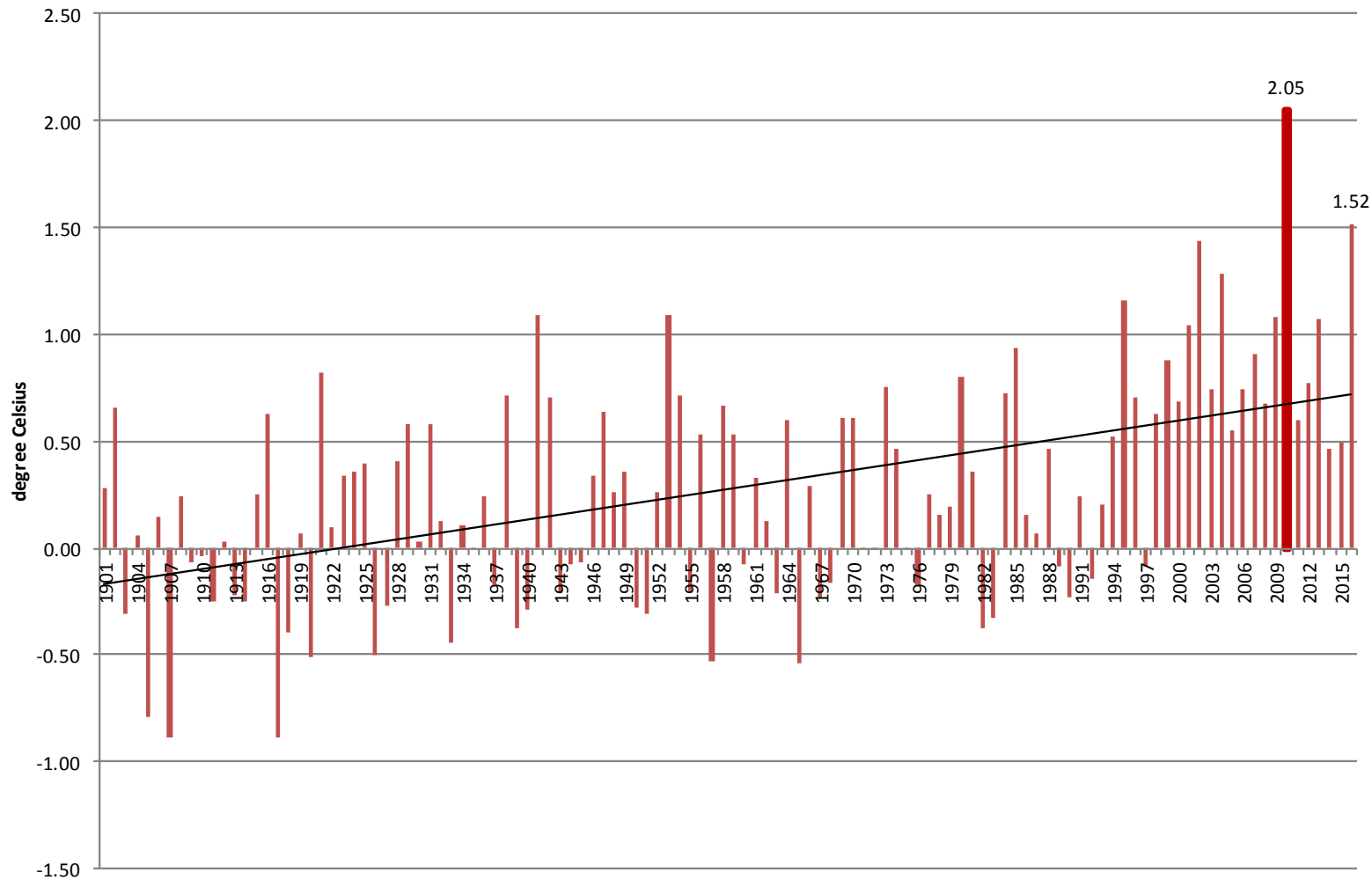
Temperature Anomaly in Winter Season (January-February)
from 1901-1930 Baseline





Seasonal Temperature - Summers

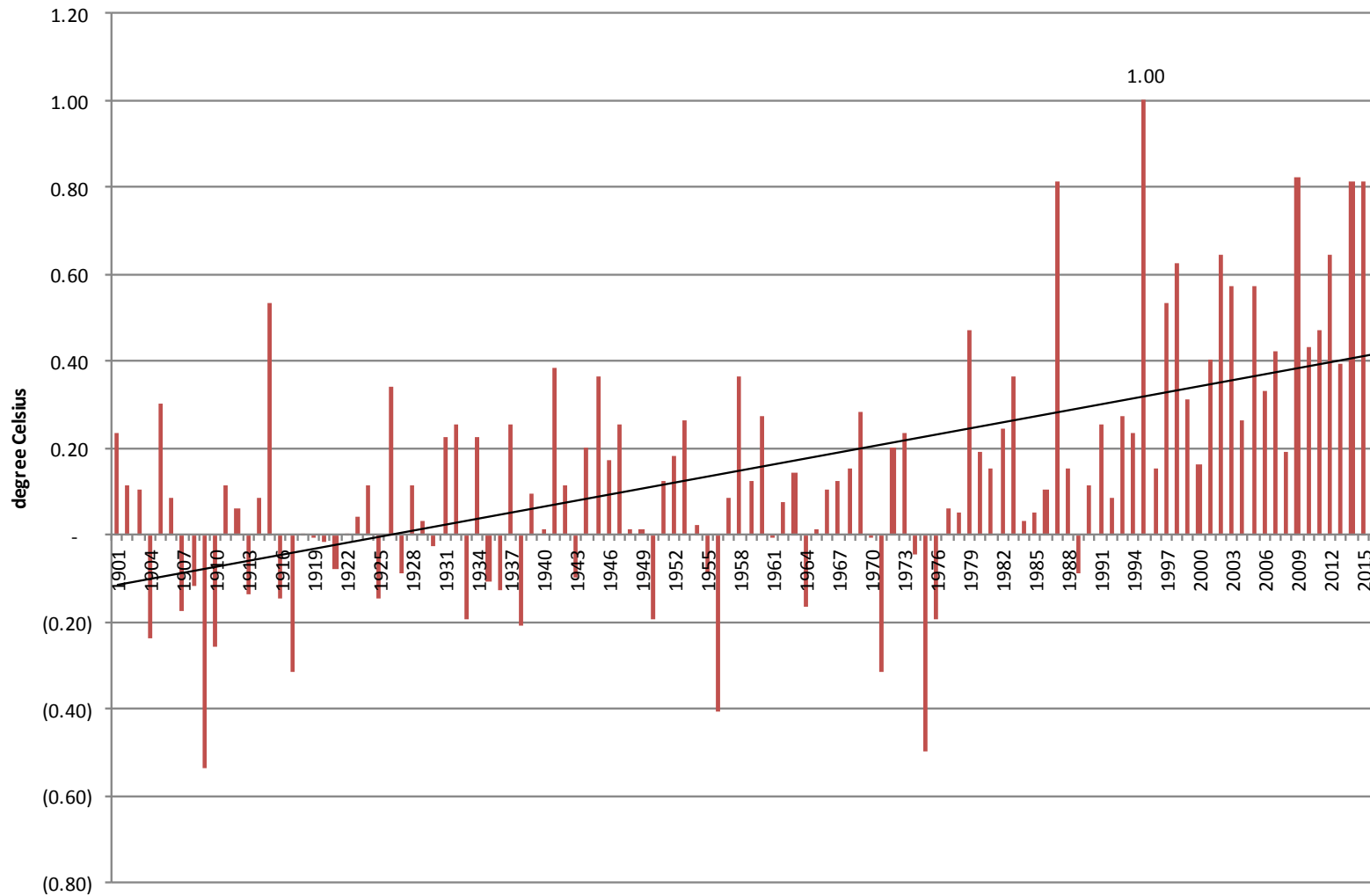
Temperature Anomaly in Pre-Monsoon Season (March-May)
from 1901-1930 Baseline





Seasonal Temperature - Monsoon

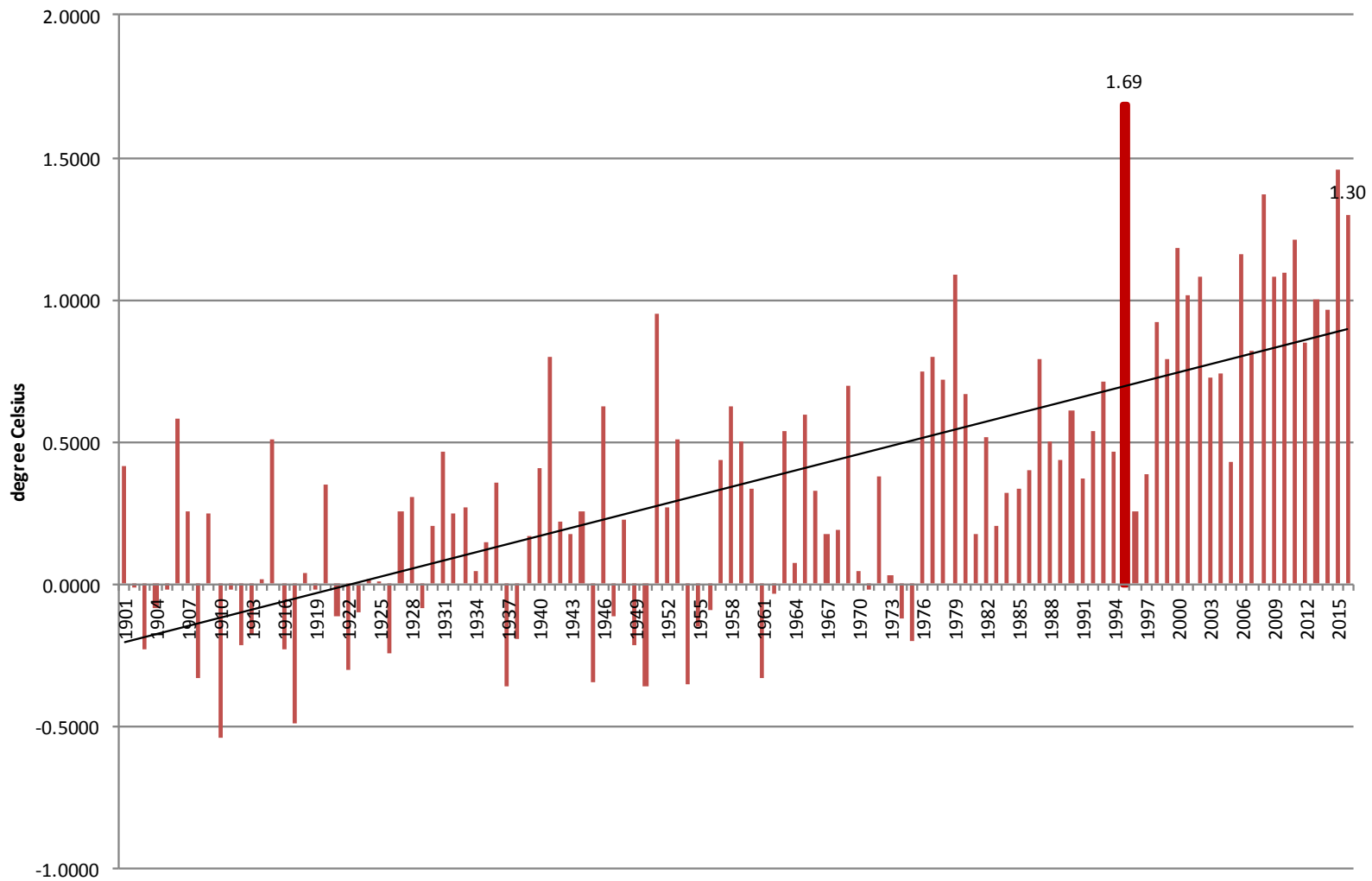
Temperature Anomaly in Monsoon Season (June-September)
from 1901-1930 Baseline





Seasonal Temperature – Post-Monsoon

Temperature anomaly during Post-Monsoon Season
(October-December)





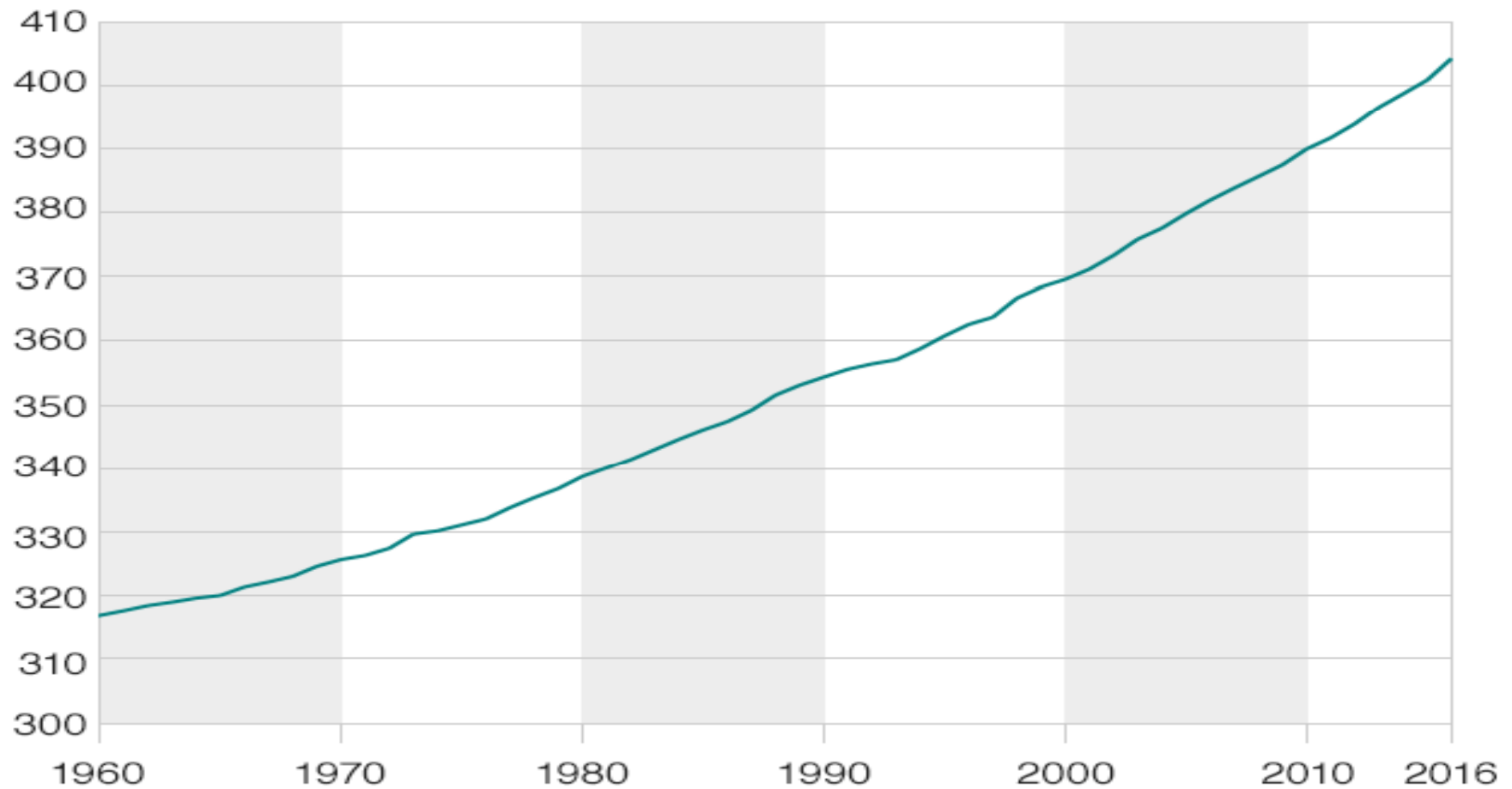
**Who is emitting how
much? Who is responsible?**



CO₂ concentration highest in 2016 - 403.3 ppm

Carbon dioxide concentrations have reached record levels

CO₂ parts per million (annual mean figures)



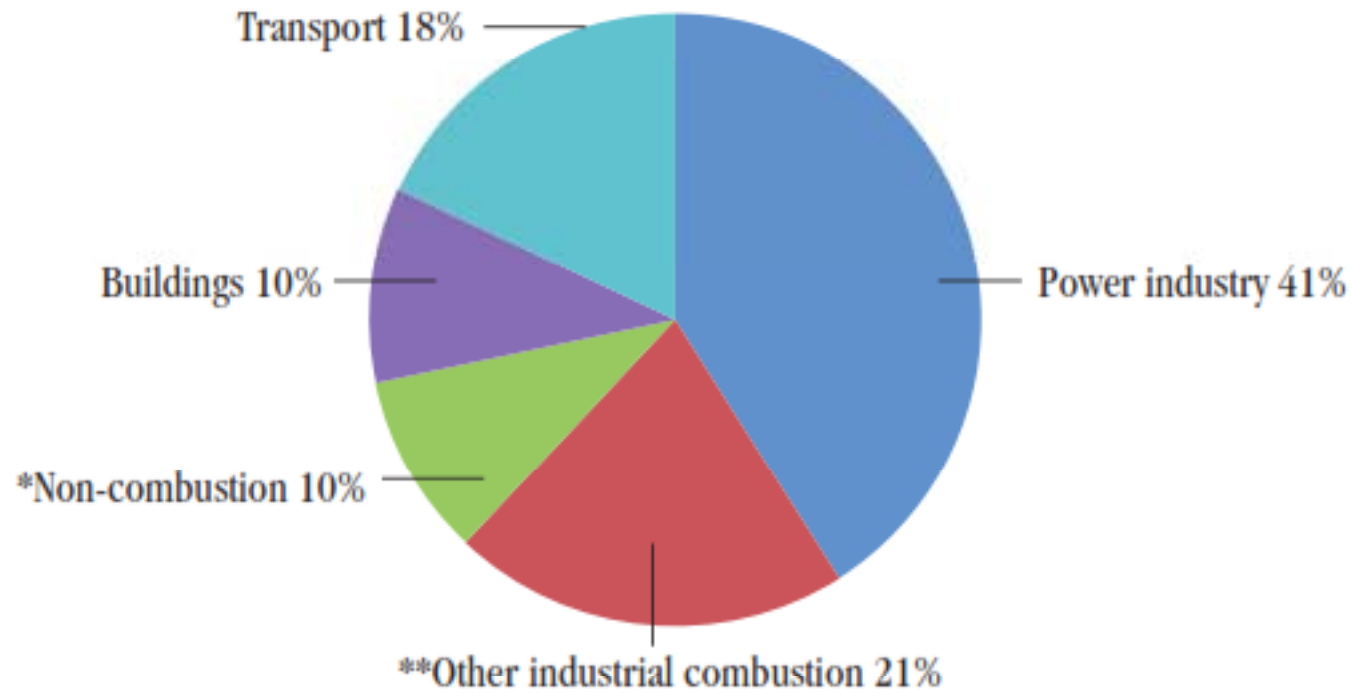


Total CO₂ Emissions, 2016: 35.8 billion tonnes

Countries	Total CO ₂ emission (MT CO ₂ eq)	Share of world population	Share of global CO ₂ emission	Per capita emission (MT)
China	10,432	18.5	29.2	7.4
USA	5,011	4.3	14.0	15.6
EU-28	3,431	6.8	9.6	6.7
India	2,533	17.7	7.1	1.9
Russia	1,661	1.93	4.7	11.5
Japan	1,239	1.70	3.5	9.7
Germany	775	1.1	2.2	9.4
Canada	675	0.48	1.8	18.6
Iran	642	1.07	1.7	8
South Korea	604	0.68	1.6	11.8
Indonesia	530	3.50	1.5	2
Saudi Arabia	517	0.43	1.4	16
Mexico	441	1.71	1.2	3.4
Australia	441	0.32	1.2	18.3
Brazil	462	2.79	1.3	2.2
South Africa	390	0.75	1.1	6.9
United Kingdom	367	0.87	1.0	5.6
Italy	358	0.81	1.0	5.9
France	331	0.89	0.9	4.9
Poland	296	0.51	0.8	7.8
Spain	251	0.62	0.7	5.4
Ukraine	233	0.60	0.6	5.2
Netherlands	163	0.22	0.4	9.6
Rest of world	6,576	36.5	18.3	2.4



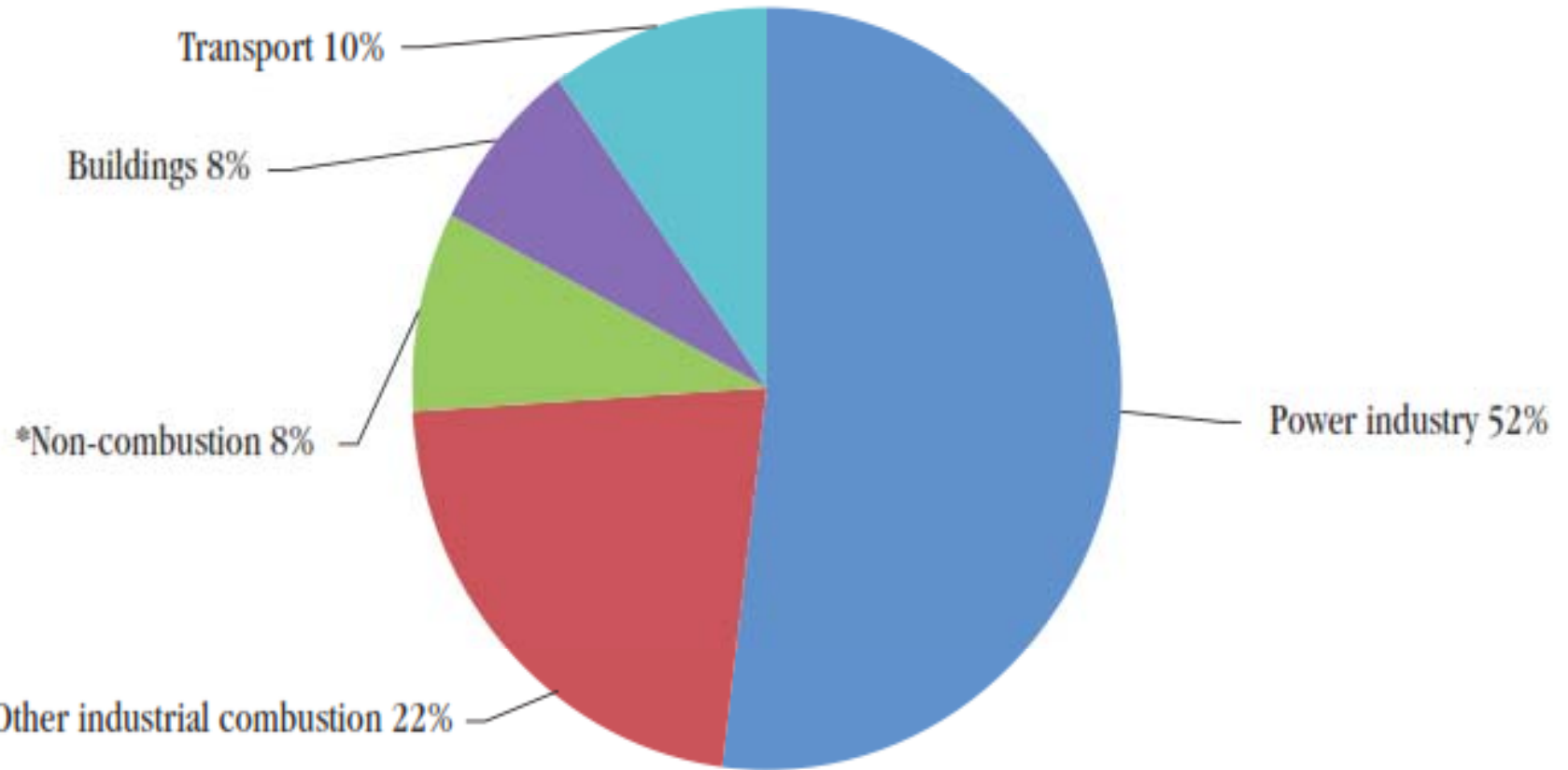
Global CO₂ emissions sector-wise: 2016



*Industrial process and agriculture and waste; **Industrial manufacturing and fuel production
Source: The EDGARv4.3.2 database, EC-JRC/PBL, 2017



Sector-wise CO₂ emissions in India: 2016

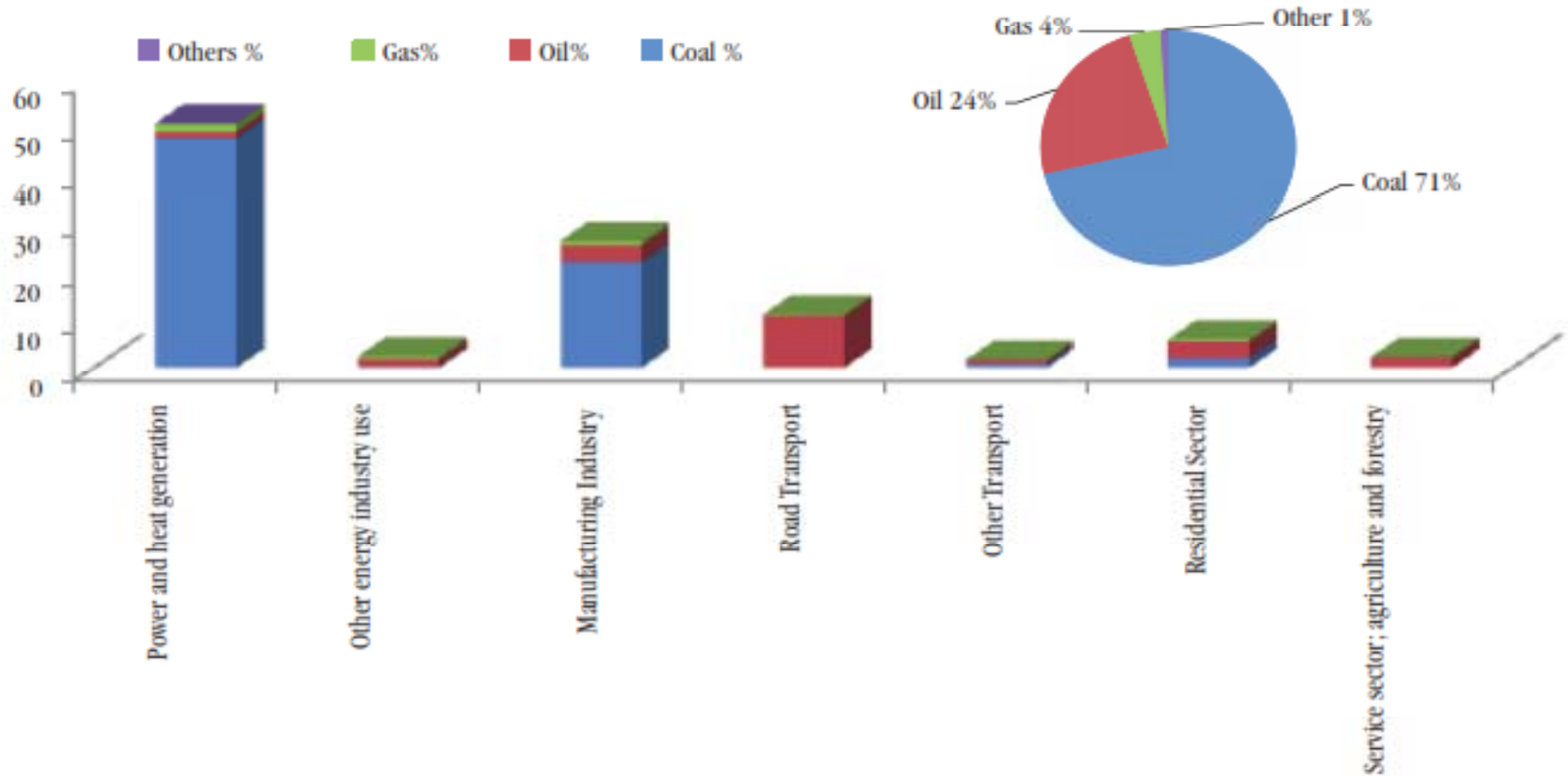


*Industrial process & agriculture & waste; **Industrial manufacturing & fuel production

Source: The EDGARv4.3.2 database, EC-JRC/PBL, 2017



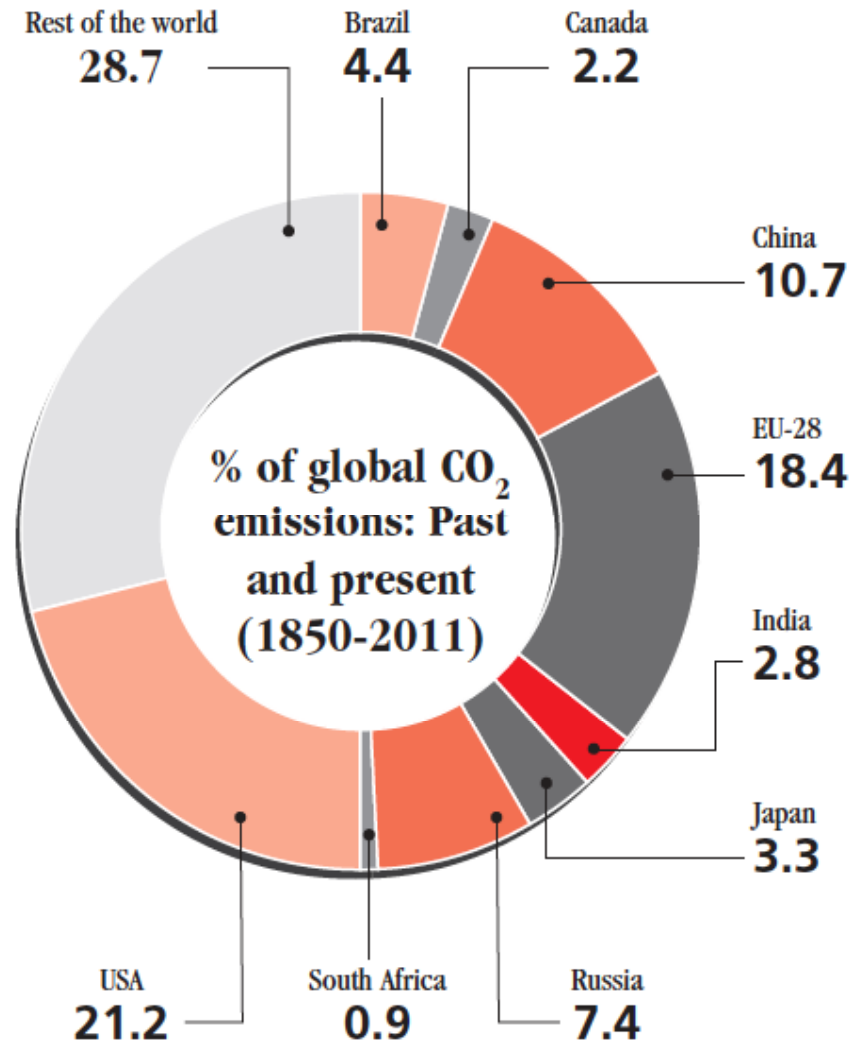
Contribution of fuel types and sectors in CO2 emissions in India: 2015



Source: The EDGARv4.3.2 database, EC-JRC/PBL, 2017



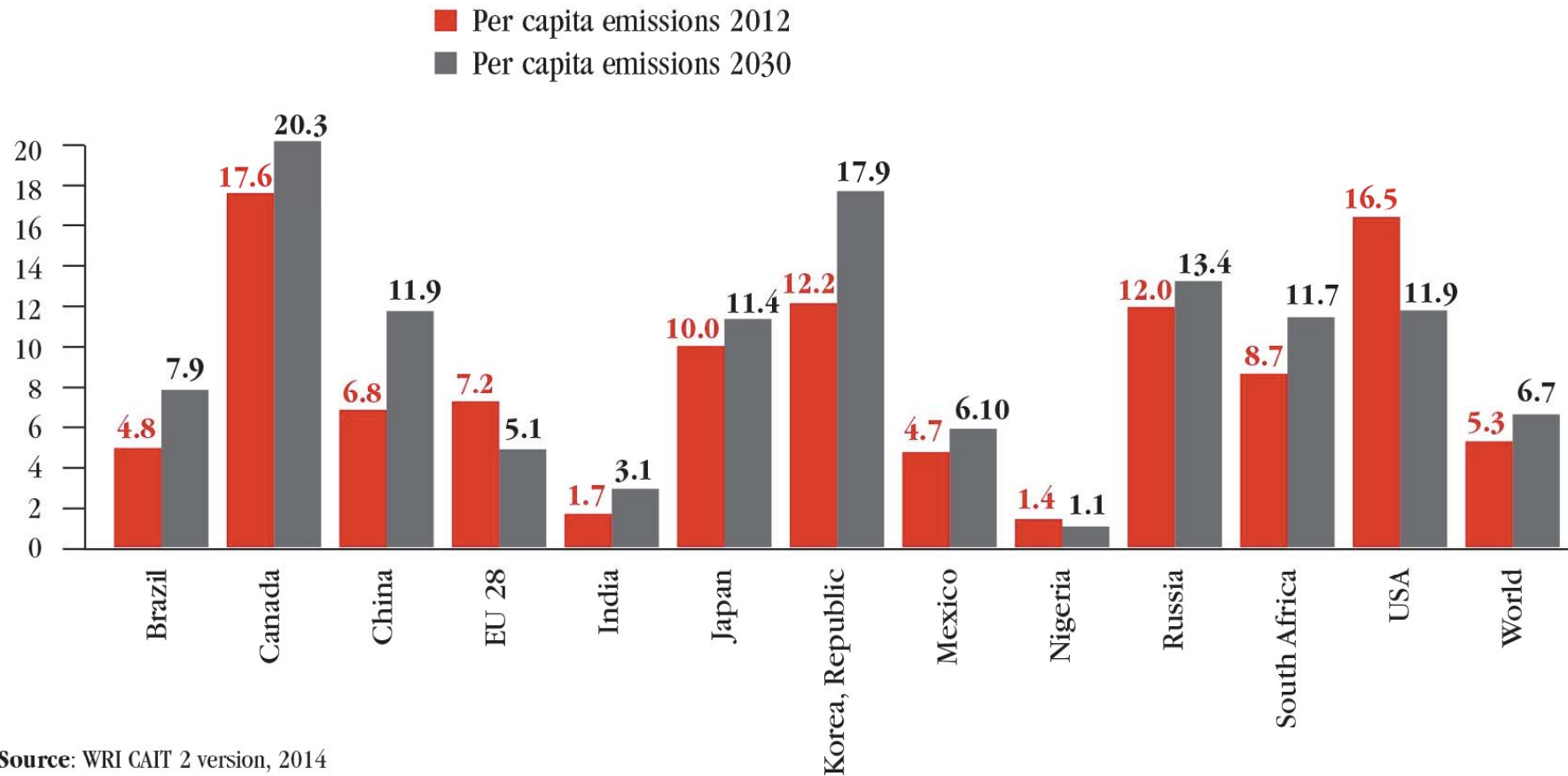
Who has contributed how much to climate change?





1 American = 4 Indians in 2030

Per capita emissions: Present and future



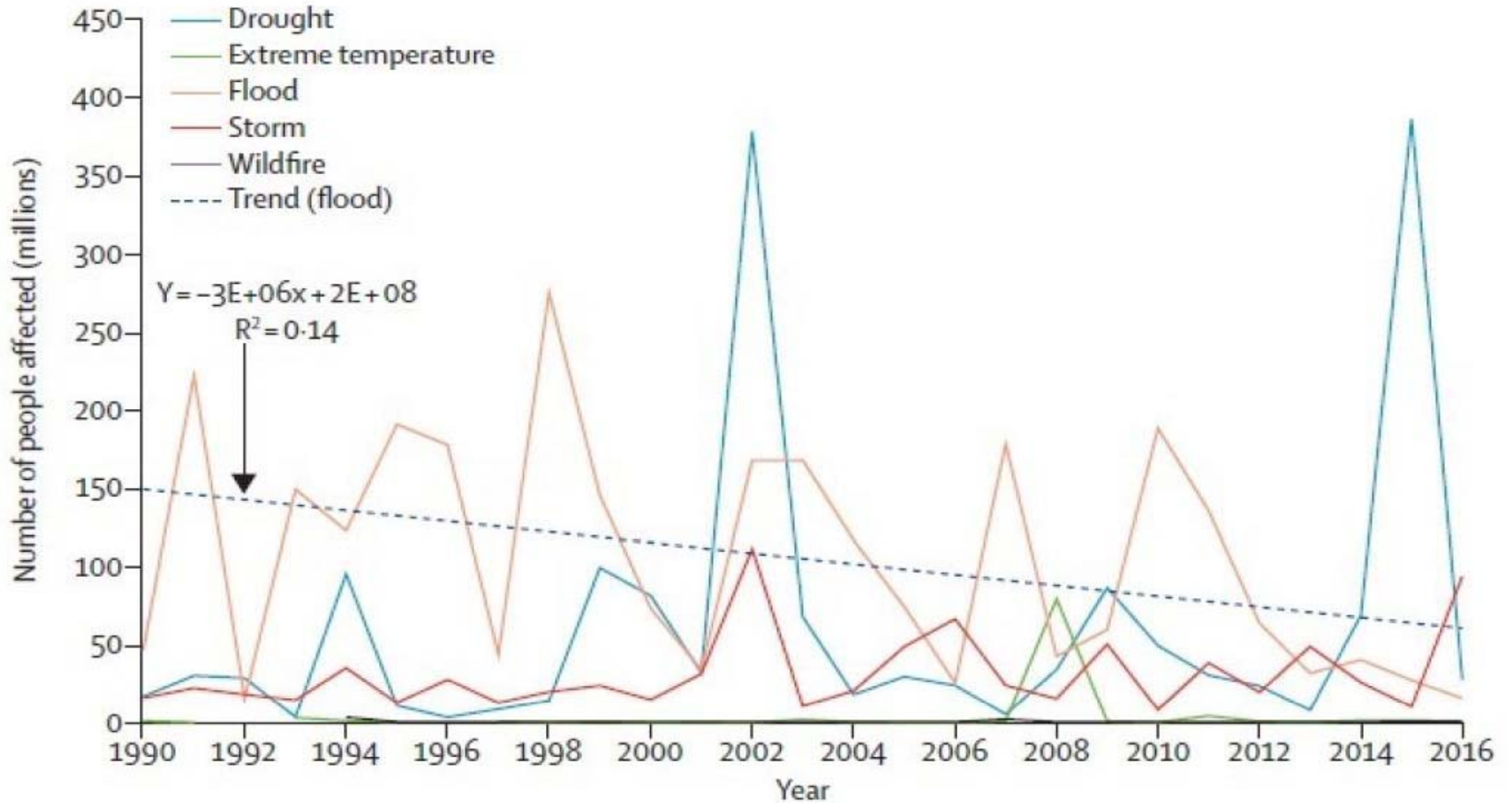
Source: WRI CAIT 2 version, 2014



Impacts



2,843 climate disasters, affected 4.8 billion people, mostly in developing countries





Climate disasters on the rise

- **306 disasters recorded on an average between 2007 and 2016; a 46 per cent increase compared to the 1990-99 average, (Lancet 2017)**
- **More than 90 per cent of all disasters have been associated with weather-related events in the last 20 years**
- **Asia being the continent most affected**
- **But developed countries are also facing the brunt**

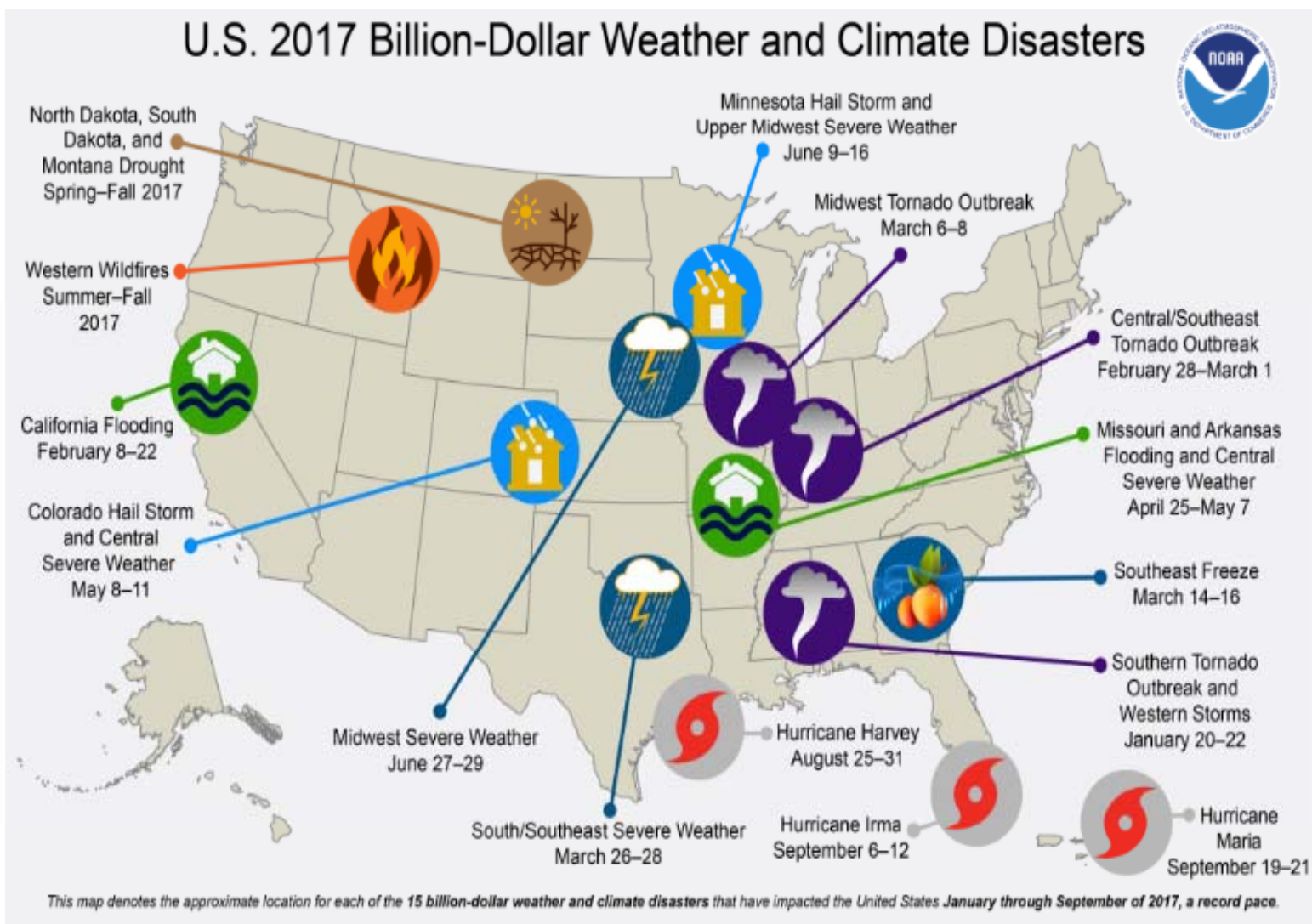


Developing countries most impacted

Ranking 2015 (2014)	Country	CRI score	Death toll	Deaths per 100 000 inhabitants	Absolute losses (in million US\$ PPP)	Losses per unit GDP in %	Human Development Index 2014 ²¹
1 (23)	Mozambique	12.17	351	1.25	500.07	1.499	180
2 (138)	Dominica	13.00	31	43.66	611.22	77.369	94
3 (60)	Malawi	13.83	111	0.61	907.98	4.451	173
4 (10)	India	15.33	4317	0.33	40 077.22	0.501	130
5 (29)	Vanuatu	20.33	11	4.09	278.86	40.650	134
6 (94)	Myanmar	20.83	173	0.33	1 359.65	0.479	148
7 (138)	The Bahamas	22.83	33	9.07	80.64	0.904	55
8 (118)	Ghana	23.33	267	0.99	306.28	0.265	140
8 (34)	Madagascar	23.33	118	0.49	228.04	0.642	154
10 (62)	Chile	25.17	39	0.22	2 652.69	0.627	42



Developed facing the brunt as well



In 2017, 15 weather and climate disaster events with losses exceeding \$1 billion each across the United States.



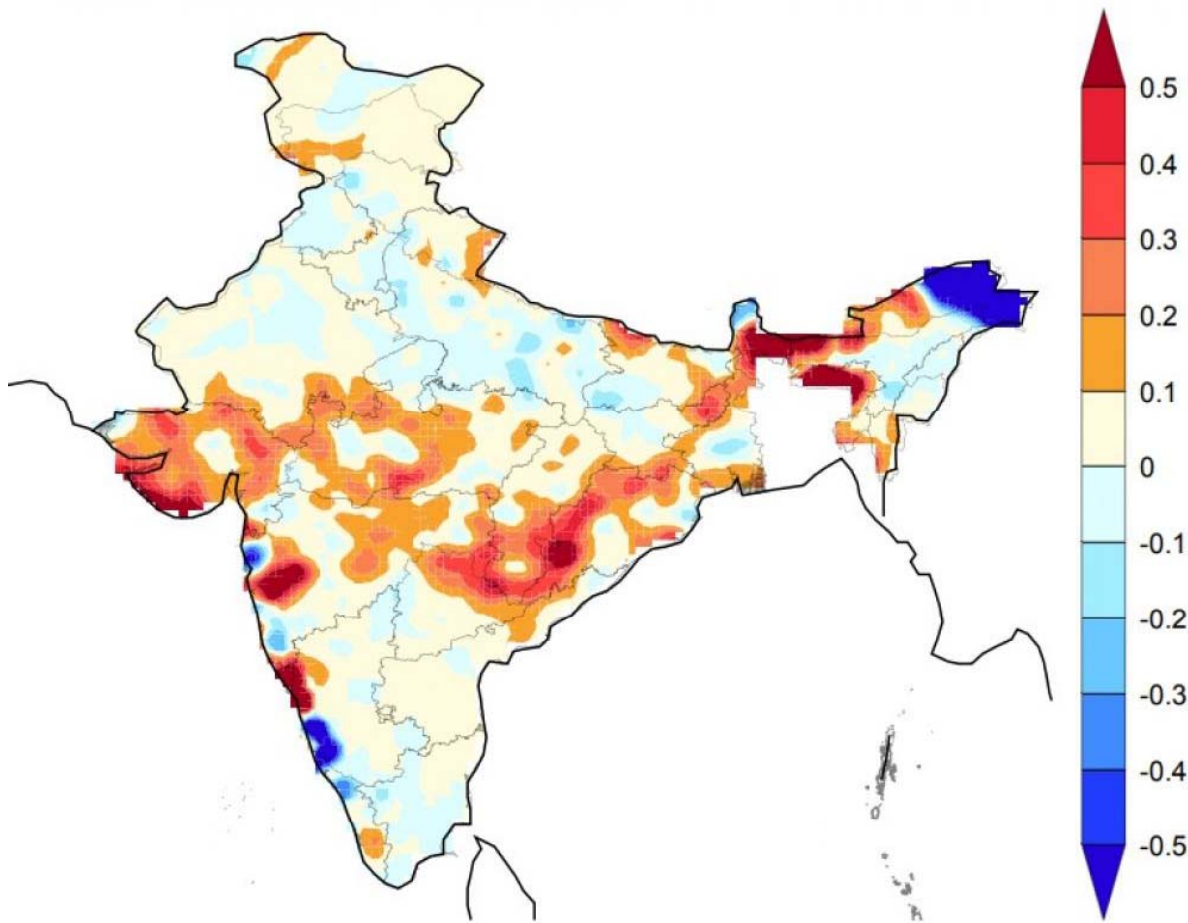
Developed facing the brunt as well

- **Since 1980 to 2017, U.S. has sustained 218 weather and climate disasters where overall damages/costs exceeds \$1.2 trillion, NOAA (2017)**
- **In Europe, Weather and Climate related loss from 1980-2015 amounted to €433 billion or €12 billion per year, according to European Environmental Agency (EEA).**



India's climate woes

Trend in extreme rain events over India



The frequency of extreme weather events have increased by 75 percent from 1950-2015 in central India

Monsoon rainfall in central India decreased by 10 percent from 1990-2015



Climate Impacts in India

- **According to CRIDA, Hyderabad, climate change has about 4-9 per cent impact on agriculture each year.**
- **Causes about 1.5 per cent loss in GDP, every year**
- **By 2030, rice and wheat are likely to see about 6-10 per cent decrease in yields**
- **The World Bank projects that under 2° C warming by the 2050s, India may need to import more than twice the amount of food-grain than would be required without climate change.**



Future looks grim

- According to UN Emission Gap Report, 2017, the 2° C emissions gap or 2030 is 11 to 13.5 GtCO₂ e.
- The gap in the case of the 1.5° C target is 16 to 19 GtCO₂ e.
- *NDCs cover only approximately one third of the emissions reductions* needed to be on a least cost pathway for the goal of staying well below 2° C
- Current pledges will take 80 percent of carbon budget by 2030 for 2 degree C
- If the emissions gap is not closed by 2030, achievement of 2 degree C goal highly unlikely



Issues at COP

- ***Procedural Issues-*** New mechanism- transparency framework, New Market Mechanism, Global Stocktake, Facilitative Dialogue. Parties must come up with draft rule book by the end of Bonn Summit.
- ***Agenda Issues-*** Adaptation, loss and damage, finance, agriculture

Rule book to be formed by 2018



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- **Global Stocktake (Article 14):**
 - **To assess collective progress of efforts to address climate change, to be held in 2023**
 - **To include mitigation, adaptation, means of support and implementation, is comprehensive, *talks of equity***
 - **Facilitative Dialogue**
 - **To be held in 2018**
 - **To assess progress and effect of NDCs ‘*towards temperature goal*’, next cycle of submission of NDCs**



Enhanced transparency framework (Article 13)

- To establish common reporting, review requirements for all Parties.**
- Talks of “flexibility” for developing countries**
- To be built on existing transparency mechanisms**



New Market Mechanism (Art 6)

- **Talks of trading units or Internationally Transferred Mitigation Outcomes (ITMOs) to help meet emission reduction targets, as part of (Nationally Determined Contributions)**
- **Also talks of creation of mechanism to contribute to the mitigation of greenhouse emissions and support sustainable development**
- **Double counting, registration of units, accounting, demand and supply are the key issues emerging in discussions**



Finance

- **Has ‘differentiation’, mandating developed countries to help developing countries, but “other countries” encouraged**
- **Green Climate Fund (GCF) has the mandate of 100 billion USD by 2020**
- **10 billion USD in pledges, actual around 4US pull out further reduces it**

Agriculture

- **No substantive outcomes, A non-paper for discussions not released by the US and EU**



Loss and Damage (Art 8)

- **Warsaw International Mechanism (WIM) to address loss and damage in 2013.**
- **No funds in loss and damage, Parties suggesting 50 billion USD by 2020/2022.**

Adaptation

- **Paris Agreement talks of Parity in mitigation and adaptation**
- **A ‘global goal on adaptation’ in Agreement**
- **Guidelines for reporting on adaptation to develop**
- **80 million USD pledged for Adaptation Fund in Marrakech COP**



Climate Agenda sans the US at Bonn

- **US has pulled out of the Agreement but would still be part of the negotiations until late 2020, as per the lock in clause of the Paris Agreement**
- **The world must forge ahead collectively and other developed countries from G-20 must come forward and fill in the emission gap left by the US**
- **The rule book of Paris Agreement must be strong, fair, equitable and ambitious**
- **Critical issues like adaptation, finance, loss and damage must be duly addressed, India should take leadership on such issues**