

Climate Change Programme of DST : Progress, Plan and Strategy for 2020

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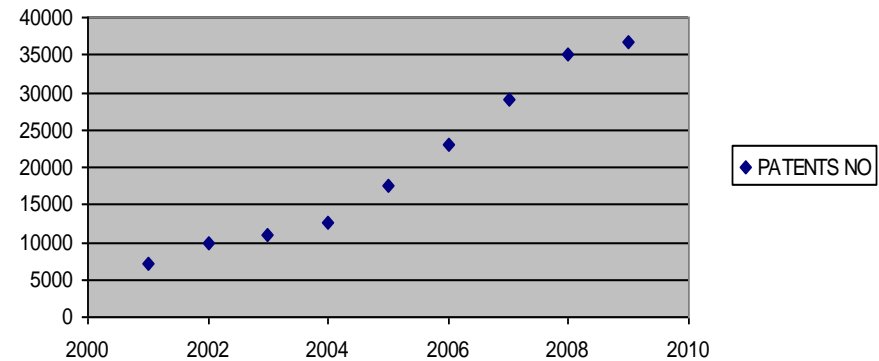
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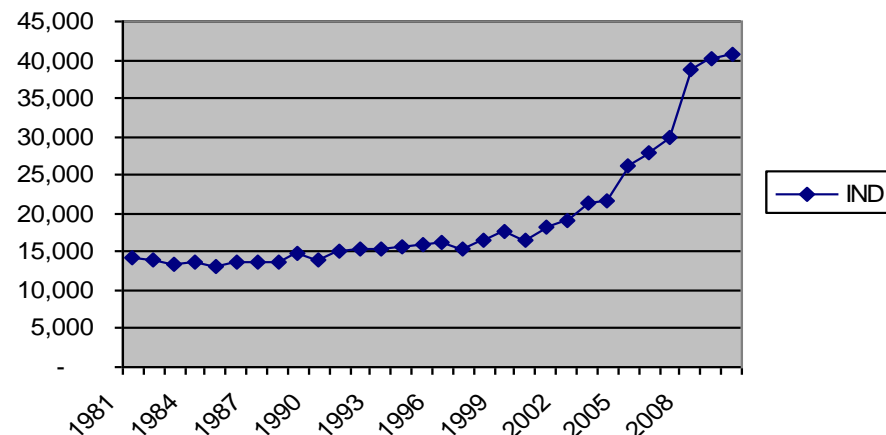
India's Recent Progress In Science Discovery

- ◆ **Relative rank of India** with respect to the **number of publications** in Science Citation Indexed journals
- ◆ Improved from **15th in 2000** to **9th in 2010** to **6th in 2015**
- ◆ Relative rank of India with respect to **patents**
- ◆ Improved from **25th in 2000** to **11th in 2010** to **9th in 2015**
- ◆ Annual growth rate of publications is **@ 14%** compared to **~4%** of global average

Patent Growth

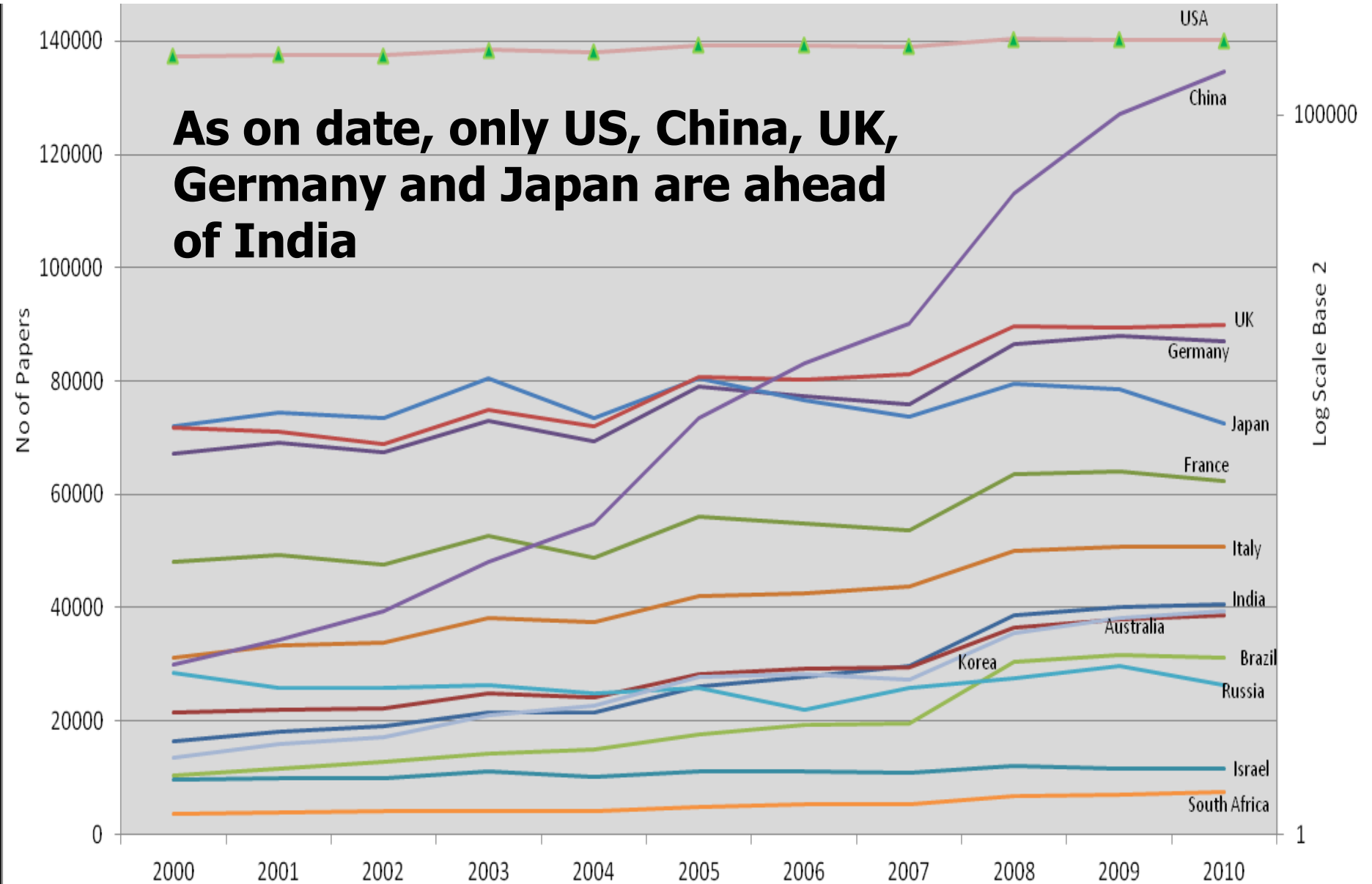


Publication growth

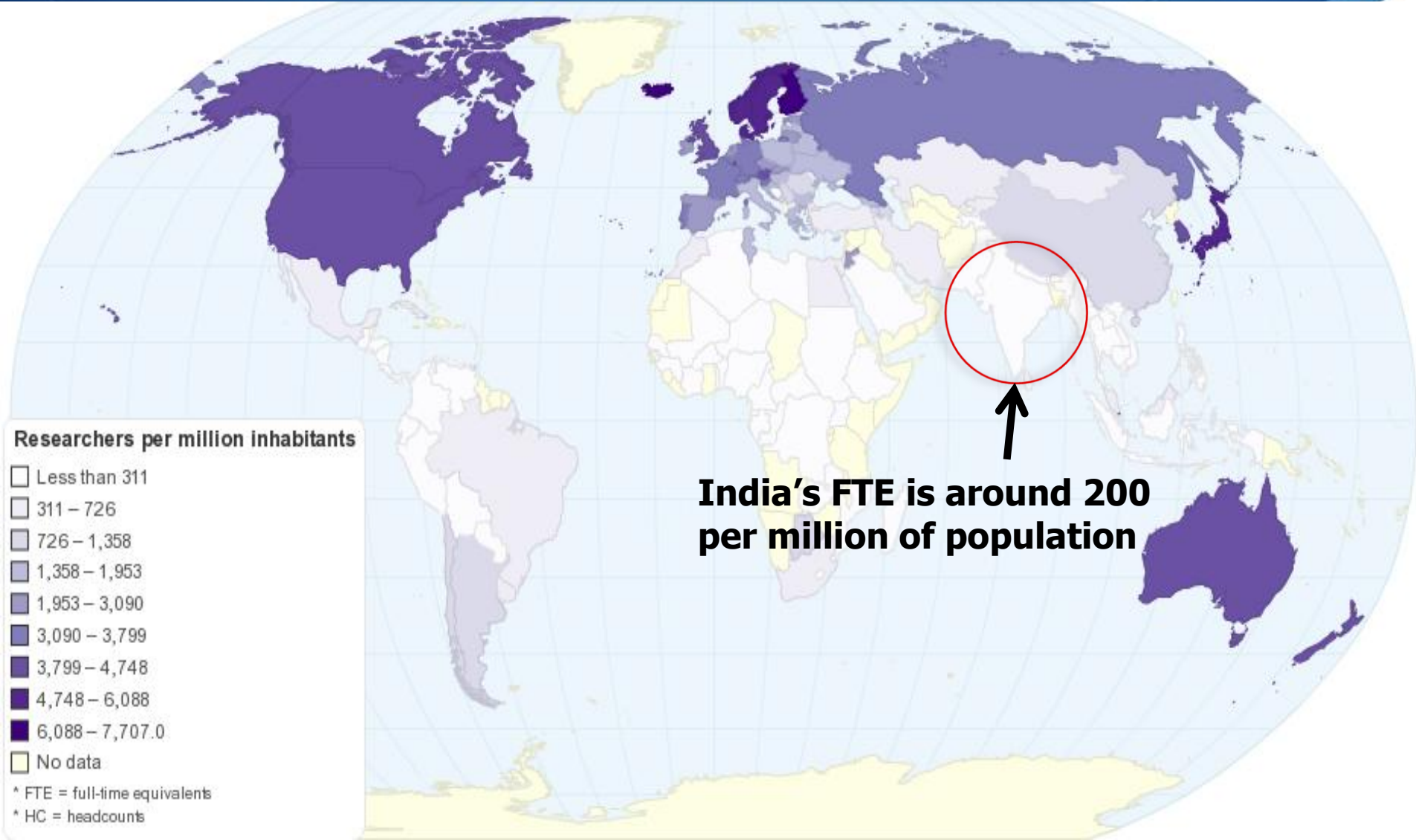


Trends in Scientific Publications By Select Countries

**As on date, only US, China, UK,
Germany and Japan are ahead
of India**

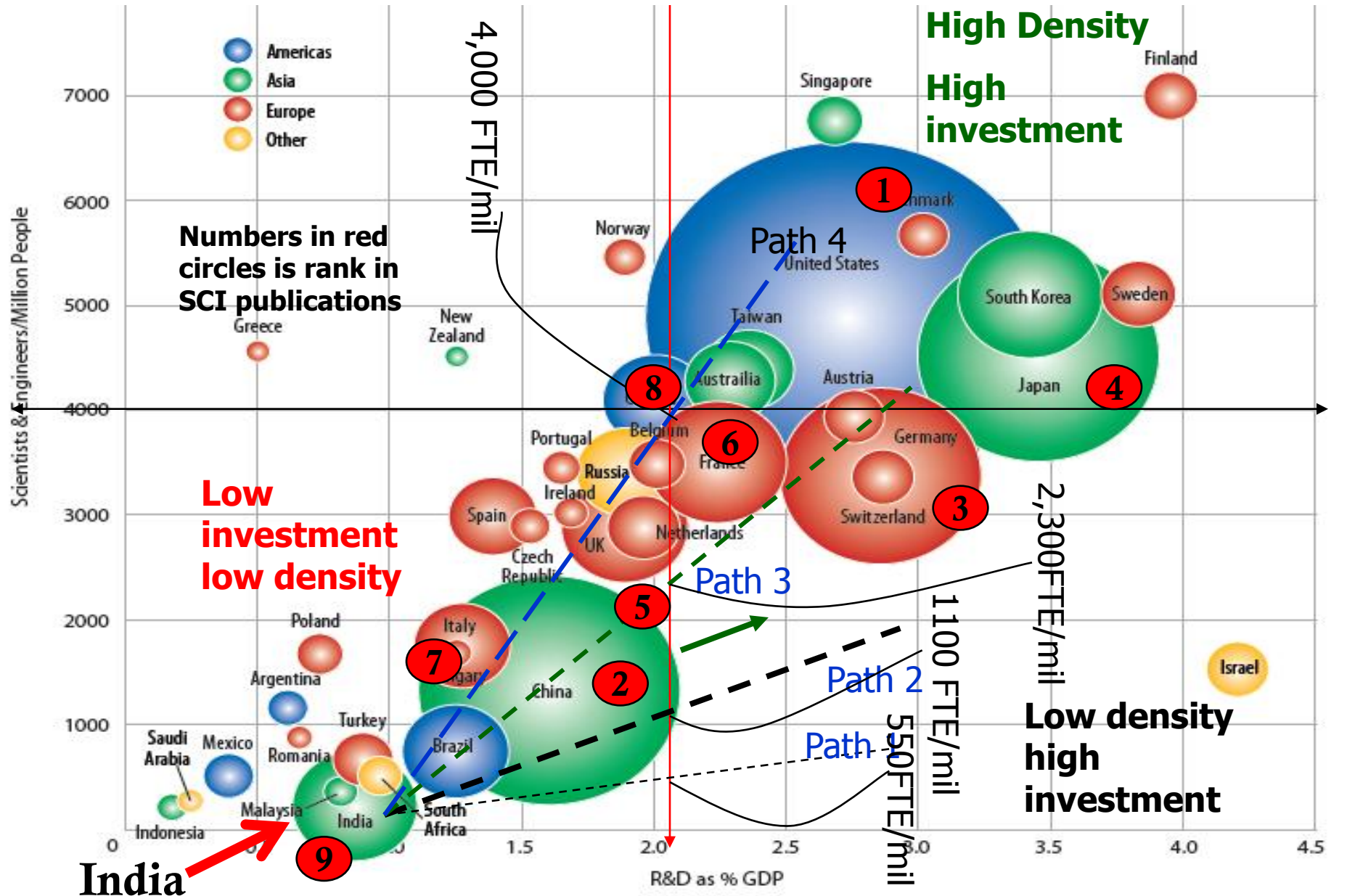


Number of FTE Researchers per million population



World of R&D

Size of circle reflects the relative amount of annual R&D spending



How Much Is a Professor Worth?

Indian Univ Researchers are 4th highest paid in the world

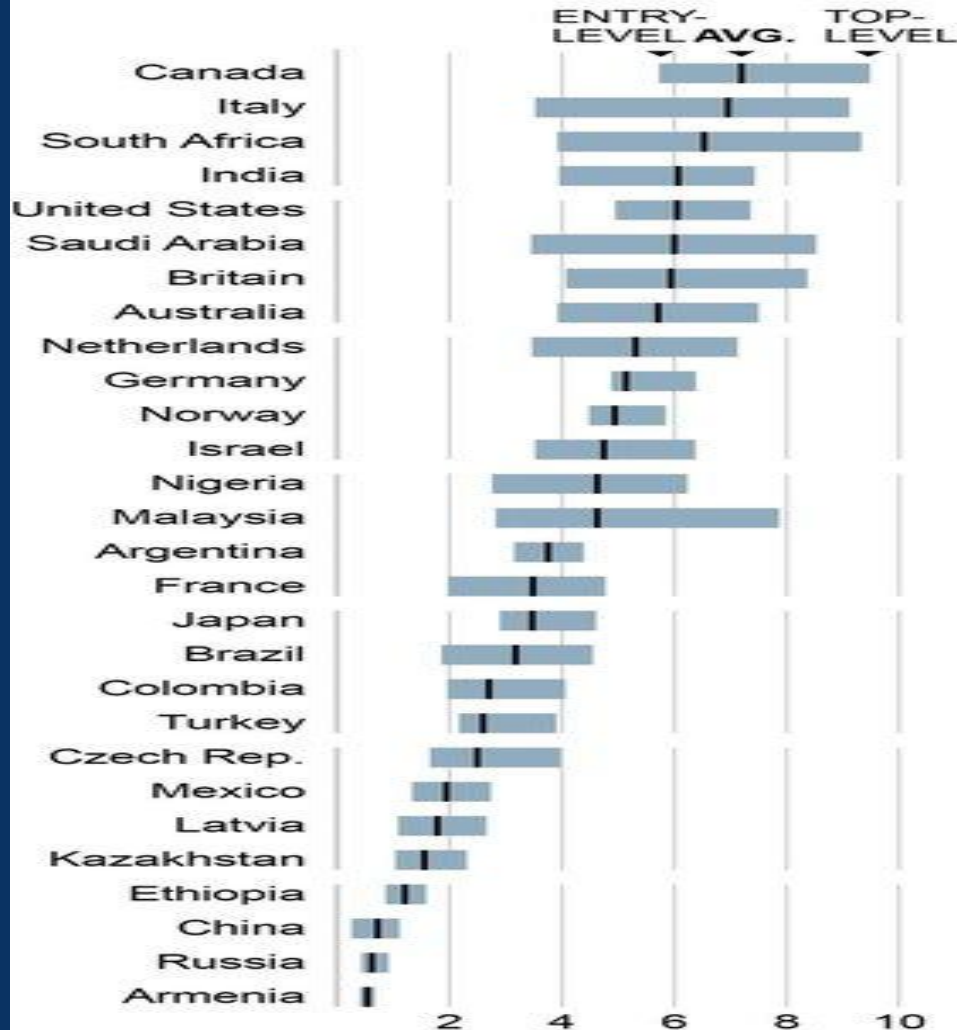
(Monthly Salaries at Public Universities in Thousands of US\$ adjusted for PPP before taxes)

Teachers' Buying Power

A new book examines relative pay among public university teachers around the world.

Entry-level, average and top-level monthly salaries for teachers at public universities

In thousands of dollars, adjusted for purchasing power parity, before taxes

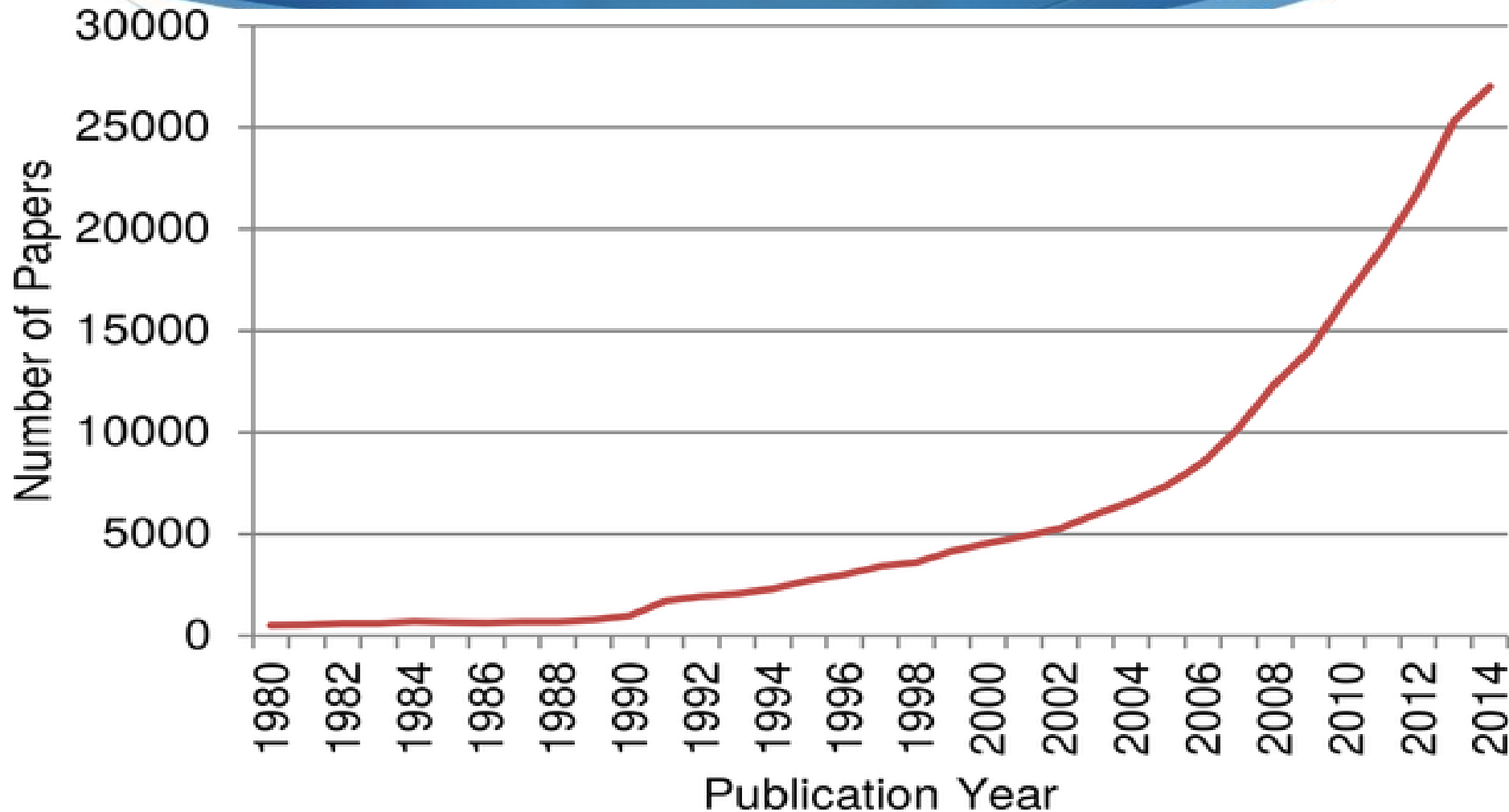


Source: "Paying the Professoriate, A Global Comparison of Compensation and Contracts," edited by Philip G. Altbach, Liz Reisberg, Maria Yudkevich, Gregory Androushchak and Iván F. Pacheco

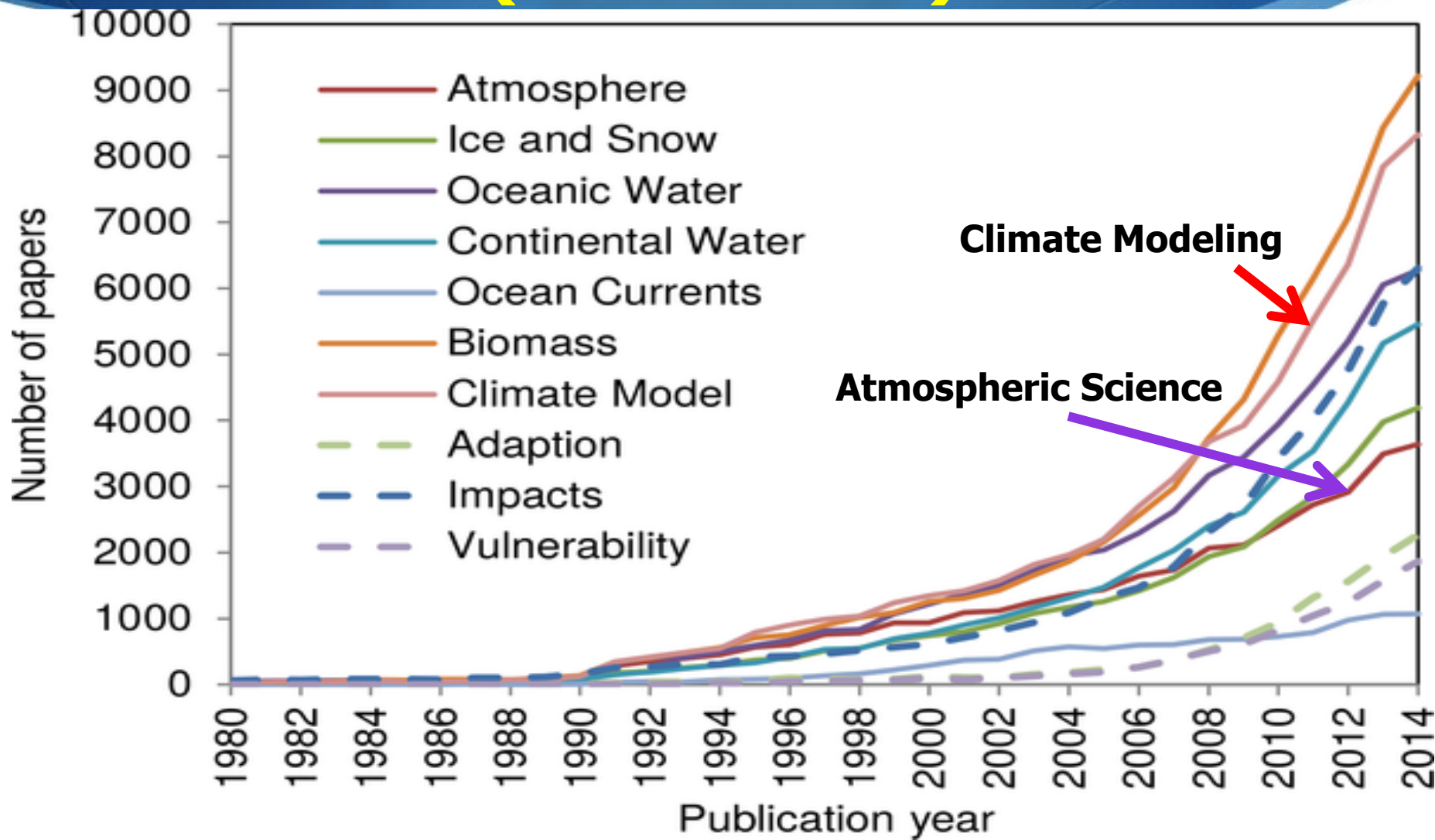
Landscape of India's Climate Change Research on the World's Canvas



Global Trend of Climate Change Relevant Papers (1980-2014)



Global Trend of No. of Papers in Different Disciplines of CC Research (1980-2014)

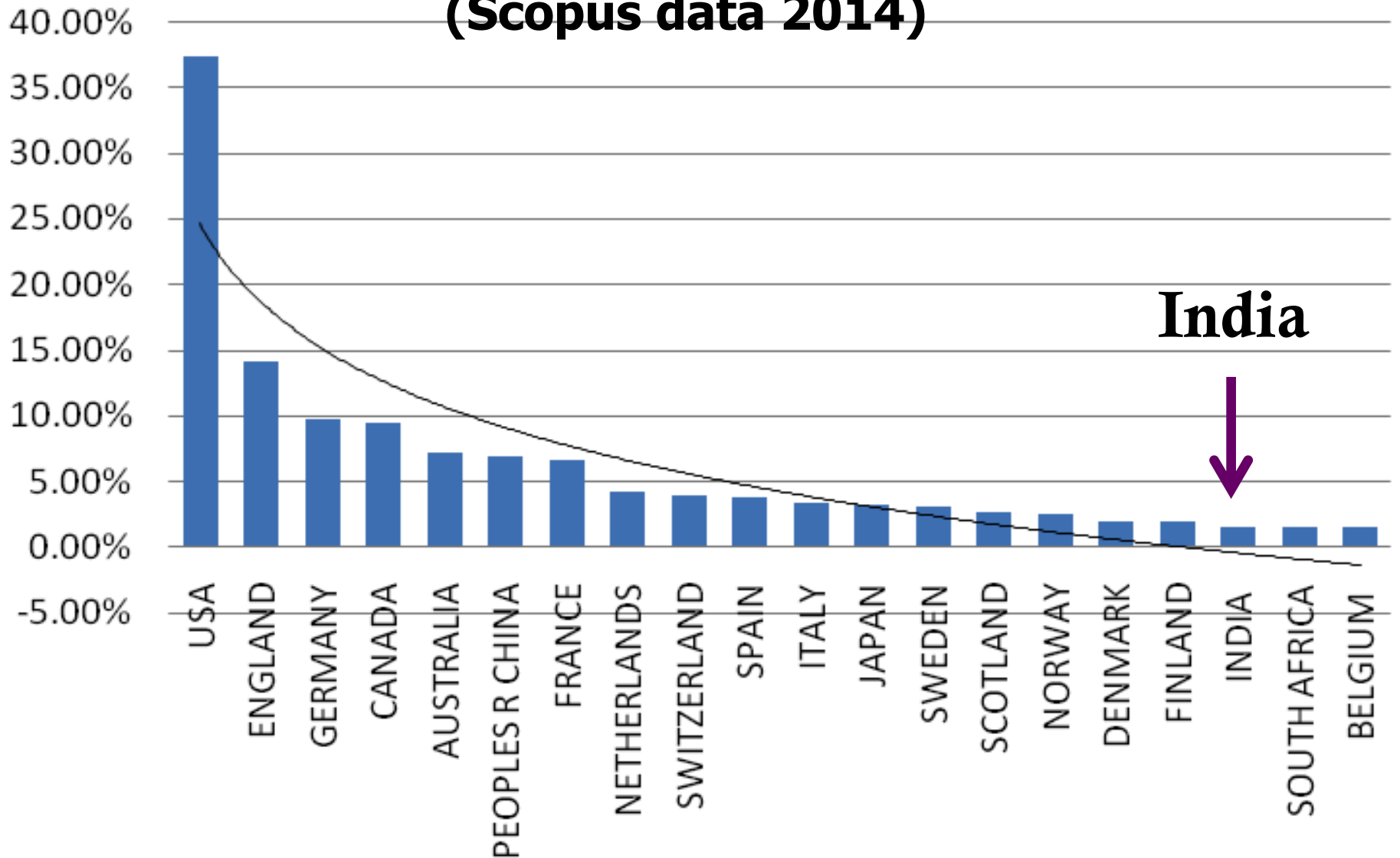


Climate Change Science Research: India's Position in terms of % share of the world's publications (Scopus data 2014)

Country	% share of the World's publications	Ranking
USA	37%	1
UK	14%	2
China	7%	6
Japan	3%	12
India	1.5%	18

Top 20 Countries - Climate Change Science

(Scopus data 2014)



Discipline-wise Share of World's Publications

(Scopus data 2014)

Subject Area	% share of world publication	Ranking
Environmental Sci.	21	1
Geo-sciences	19.5	2
Ecology	17.3	3
Meteorology & Atmospheric Sciences	15.6	4
Oceanography	4.5	10
Agronomy	1.8	23

India's Research Output: Discipline-wise (Scopus data 2014)

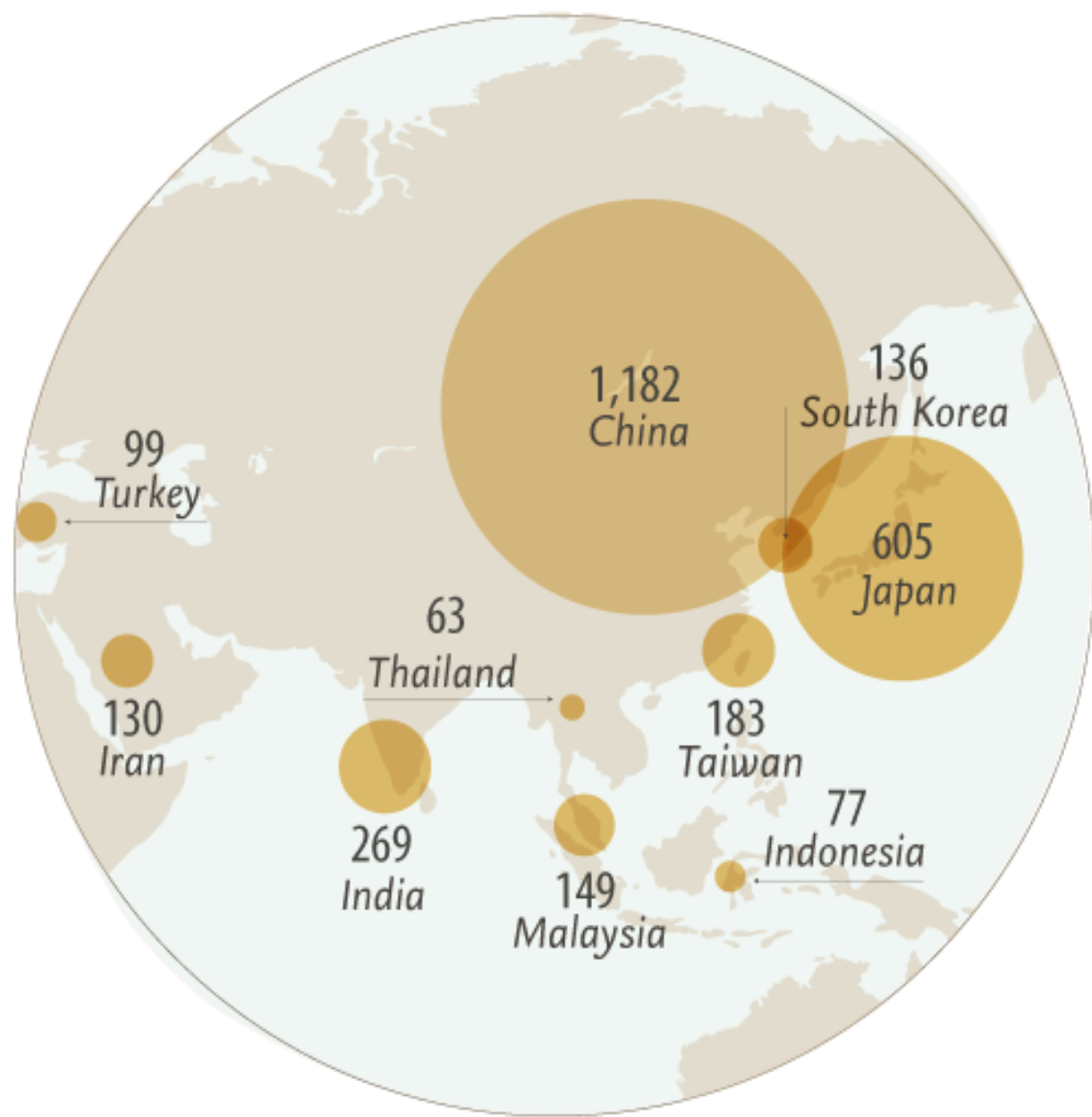
Subject Area	% share of world publication	Ranking
Multi-disciplinary sciences	20.2	1
Environmental Sci.	18.9	2
Geo-sciences	17.6	3
Meteorology & Atmospheric Sciences	16.4	4
Ecology	5.9	7

Global Disaster Science Output: India Ranks 6th in terms of Number of Publications (Scopus data 2011-15)



Disaster Science Research Outcome Among Asian Countries:

- **India Ranks 3rd**
- **India Tops Field Weighted Citation Impact**



(based on Scopus data 2011-15)

India's Position in Terms of Disaster Specific Research Output

Disaster	In the world	In Asia
Earthquake	5 th	3 rd
Drought	4 th	2 nd
Tsunami	5 th	2 nd
Flood	5 th	3 rd
Landslide	5 th	4 th
Cyclone	-	4 th
Heat Wave/Cold Wave	-	2 nd

(based on Scopus data 2011-15)

India Lags Research Outcome in Climate Modeling (Scopus data 2014)

- ◆ Climate Science appears to be obsessively focused on modeling
- ◆ Nearly 97% of the total number of papers (nearly 9 lakh global Climate science research publications) use the term modeling at least once
- ◆ Roughly 55% of the total publications use or refer global or regional climate modeling products
- ◆ Globally nearly 12.8 % of the total climate science publications are on modeling (~ 8000 in 2014)
- ◆ **In India, only 2.7% of total Climate Science publications are on Climate Modeling**

Status of S&T Capacity in Climate Science in India

Strengths:

- ◆ **3000 Scientists**
- ◆ **400 scientists with International recognition**
- ◆ **450 Institutions teaching/doing Research**
- ◆ **100 years of systematic Climate Data**

Weaknesses:

- ❖ **Fragmented Research efforts**
- ❖ **Weak linkage between Science and Policy**
- ❖ **Limited linkage with the Society**
- ❖ **Absence of partnership with private sector**

Eight National Missions on Climate Change

- ◆ **National Solar Mission**
- ◆ **National Mission for Enhanced Energy Efficiency**
- ◆ **National Mission on Sustainable Habitat**
- ◆ **National Water Mission**
- ◆ **National Mission for Sustaining the Himalayan Eco-system**
- ◆ **National Mission for a Green India**
- ◆ **National Mission for Sustainable Agriculture**
- ◆ **National Mission on Strategic Knowledge for Climate Change**

Both the missions call for mission mode actions to build, strengthen and sustain national S&T capacities

DST's Climate Change Programme: Identification/selection of Institutions/Scientists Based on Bibliometric Analysis

- ◆ Using SCOPUS data, top 30 institutions and top 30 scientists working in the areas of CC research were shortlisted
- ◆ All 30 of them were invited to submit proposals in three categories viz., Centres of Excellence; Major R&D Programmes and Human Capacity Building Programmes
- ◆ 29 proposals from 22 institutions were received
- ◆ An Expert Committee of CCP, DST was set in 2010 which assessed these proposals through interaction with PIs and shortlisted 14 proposals- 12 major R&D programmes and 2 CoEs. Later on 2 more CoEs were added.

Existing Programmes of Climate Change Programme, DST

- ◆ 4 Centres of Excellence, one each at Divecha Centre for CC, IISc, Bangalore; IIT Bombay; IIT Madras and ICRISAT, Hyderabad
- ◆ 12 major R&D Programmes
- ◆ 2 National Network Programmes one each on climate Modeling and Climate Change & Human Health
- ◆ 8 Global Technology Watch Groups (GTWGs) in the areas of Renewable Energy Technology, Advance Coal Technology, Enhanced Energy Efficiency, Green Forest, Sustainable Habitat, Water, Sustainable Agriculture and Manufacturing
- ◆ Indo-Swiss Capacity Building Programme in glaciology
- ◆ Inter-University Consortium on Himalayan Cryosphere and Climate Change
- ◆ 6 Thematic Task Forces
- ◆ 18 State CC Centres
- ◆ Indo-US Fulbright-Kalam Doctoral and Post-Doctoral Fellowships in Climate Change

An Appraisal of Quantitative Output and Outcome of DST's funded CC Research



Category of project	Number of Projects	Number of scientists involved	No of research papers/ Monographs	Cumulative Impact factor
CoEs	4	36	273	340.7
MRDPs	12	51	73	93.56
Network-Modeling	7	24	35	41.56
Network-Health	9	26	35	22.53
NMSHE-TFs	4	14	76	21.01
NMSHE-Consortium	4	14	15	17.09
GTWGs	2	18	12	-
State CC	18	30	27	-
Total	60	213	510	536.45

Category of project	No. of projects	No of Phd/PG students enrolled/ Completed	No of workshops	No of personnel trained/interacted	No of foreign deputation
CoE	4	83	118	4160	72
MRDP	12	17	17	90	14
Network-Modeling	7	12	13	110	14
Network-Health	9	6	5	88	15
NMSHE-TFs	4	1	43	1503	-
NMSHE-Consortium	4	31	5	48	6
Total		150	201	5999	121

Category of project	Number of Projects	Number of scientists involved	No of new techniques developed	Sanctioned budget (In Cr of Indian rupees)
CoE	4	36	15	20.56
MRDPs	12	51	16	11.09
Network-Modeling	7	24	9	2.36
Network-Health	9	26	12	3.41
NMSHE-TFs	4	14	1	69.15
NMSHE-Consortium	4	14	1	18.0
GTWGs	2	18	-	4.21
State CC	18	30	-	47.0
Total	60	213	54	175.78

Climate Change Programme of DST **New Initiatives**



Programmes Launched Recently

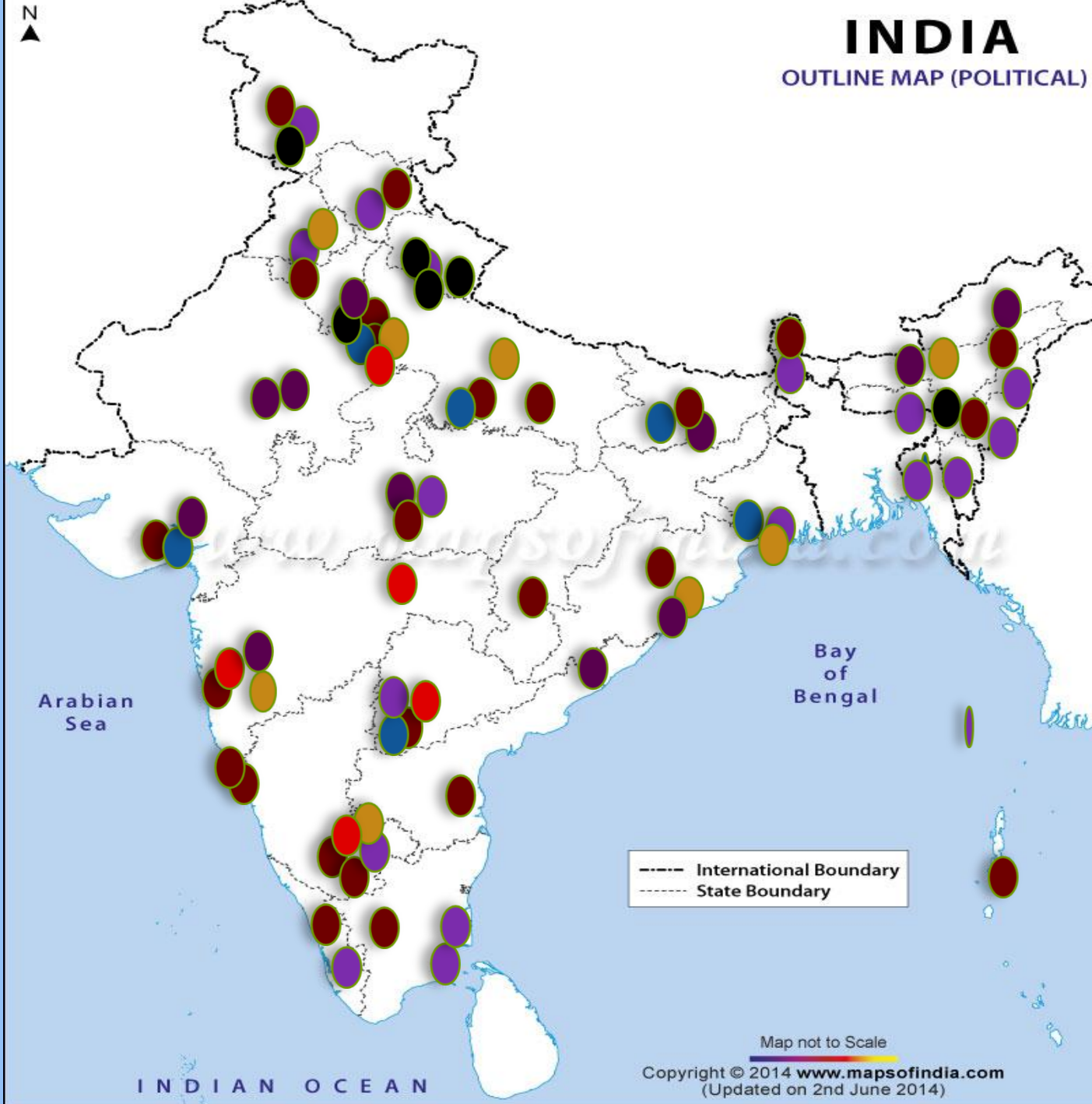
- ◆ Centres of Excellence (4)
- ◆ Major R&D Programmes (8)
- ◆ Human Capacity Building Programmes (7)
- ◆ Network Programme on CC & Human Health (19)
- ◆ Network Programme on Climate Modeling (13)
- ◆ Network Programme on CC & Agriculture (49)
- ◆ Network Programme on CC & Coastal Vulnerability (10)
- ◆ State CC Centres (3) – Arunachal Pradesh, Maharashtra and Orissa
- ◆ Indo-Swiss Joint Research Programme
- ◆ National and International Professor Chairs (50)

Proposed Centres of Excellence and Major R&D Programmes

SN	CoE's location	SN	MRDP's location
1	IIT Kharagpur	1	ISSER, Pune
2	BHU, Varanasi	2	CUSAT, Kochi
3	IIT Delhi	3	NBRI, Lucknow
4	National Institute of Malaria Research	4	IISc Bangalore
		5	Andhra Univ
		6	IIT Guwahati
		7	IIT Bhubaneswar
		8	ISSER Mohali

INDIA

OUTLINE MAP (POLITICAL)



Locations of DST-CCP Programmes (Existing + New)

Total No of programmes/ projects: **172**

Total no of institutions: **93**

Total no of scientists: **467**

AP Mitra Climate Change National and International Professor Chairs

- ◆ Total 50 such chairs will be positioned in next 5 years in key Indian institutions pursuing research in climate science, adaptation and mitigation.
- ◆ Out of these 50, 35 will be for National Professor chairs and remaining 15 for International chairs.

Eligibility for Professor Chairs

- ◆ Open to distinguished scientists/ academicians/ researchers in India/abroad including people from public service, government and social organizations
- ◆ Merit will be judged based on candidates' research/academic accomplishments as evident from publications; fellowships of science and engineering academies in India & abroad, national /international awards
- ◆ Essential criteria :
 - ❖ Ph.D. in basic or applied sciences or engineering related to climate science and technology with first class or equivalent grade at the preceding degree
 - ❖ Minimum 20 years of Post qualification experience in teaching / R&D / consultancy / industry / organization in the field of Climate change out of which minimum 10 years experience at the level equivalent to that of full Professor.
- ◆ The appointment shall on contract basis for a period of 3 years extendable upto 5 years after a rigorous review process.
- ◆ The candidate should be preferably below 70 years at the time of appointment.

New Programmes in Offing

- ◆ **Collaborative Programmes with ICIMOD –**
 - ❖ Himalayan University Consortium,
 - ❖ Fellowship programme,
 - ❖ Human Capacity Building,
 - ❖ National & Regional workshops,
 - ❖ Long term Research programme
- ◆ **Institutional Capacity Building programme for the Himalayan region –**
 - ❖ Centres of Excellence,
 - ❖ Major R&D Programmes and
 - ❖ Human Capacity Building Programmes

Young Scientists Mentoring & Leadership Programme

- ◆ The programme aims at developing **leadership in climate research** in India
- ◆ Mapping of young and bright climate scientists **below 35 years**
- ◆ Annually 10 such scientists are selected based on their credentials as evident from their academic qualification and research contribution
- ◆ They will undergo a **Mentoring and training programme** guided by a group of **internationally acclaimed climate scientists from India & abroad**
- ◆ 5 of them will be selected to **receive a grant of Rs 3 Cr for 3 years** to undertake an independent research as PIs.
- ◆ The grant will also cover support for domestic and **international travel**

CCP –DST: Long Term Strategy

◆ Expansion

- ❖ Enrol as many institutions as possible into Network Programmes – **4 Network Programmes**
- ❖ Connect them with CoEs/MRDPs who can motivate and guide them to come up to **CoE/MRDP level in next 3 years**

◆ Excellence –

- ❖ Establish 20-25 Centres of Excellence and Major R&D Programmes
- ❖ Induct young and bright scientists into such programmes– **Young Scientists Mentoring Programme**
- ❖ Build support system and infrastructure – **Super-Computing Mission**
- ❖ Provide mentorship through internationally accomplished experts – **Professor Chairs programme**
- ❖ **MRDPs must come to CoEs level in next 3 years**

◆ Equity –

- ❖ Build capacity among the young scientists/students of relatively weaker institutions - **Fulbright-Kalam Doctoral and Post-doctoral fellowship**
- ❖ Training and International exposure of these scientists so that they come up to a reasonable quality level – **HCBPs** and proposed **ICTP training programme**
- ❖ These **institutions must come upto level of Network partners in next 2 years**

Concluding Remarks

- ◆ India has a **strong climate change research base** in terms of number of quality researchers, data and infrastructure
- ◆ The Country is witnessing emergence of a **large number of research institutions** (mostly extra-mural) in climate science areas
- ◆ Climate Change Programme (CCP) DST has emerged as the largest source of extra-mural funding (**nearly 60%**) in climate change research in the country
- ◆ CCP aims to build, strengthen and sustain S&T Capacity in the country in climate change research.
- ◆ CCP has outlined a long term strategy to focus on **Expansion, Equity and Excellence**
- ◆ To draw maximum gain to country (and the researchers), **there is urgent need to build synergy between extra- and intra-mural research systems**

Thanks !!

