

PUNE'S AQUIFERS: Some preliminary findings

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GLOBAL GROUNDWATER

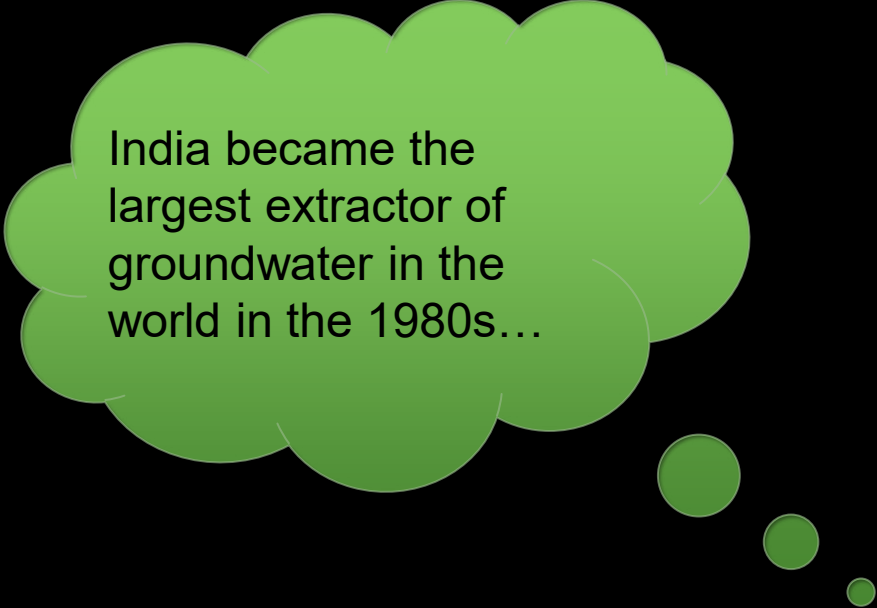
The larger picture

Foster et al, 2010; GWMATE

- ▶ Nearly 2 billion urban dwellers rely on groundwater, globally.
- ▶ Dependence on groundwater, especially in “developing cities” is quite high.
- ▶ Modification of groundwater cycle on account of urbanisation is observed.
- ▶ Many problems around groundwater are *predictable*, few are *predicted*.

- ▶ Two major consequences:
 - ▶ Paradox of urban recharge – tradeoff between reduction in infiltration-facilitative surfaces and leaking mains and sewers
 - ▶ Contaminant loading of sub-surface systems – improper sanitation, poor sewerage and haphazard waste-disposal

GROUNDWATER USE IN AGRICULTURE: GLOBAL TRENDS

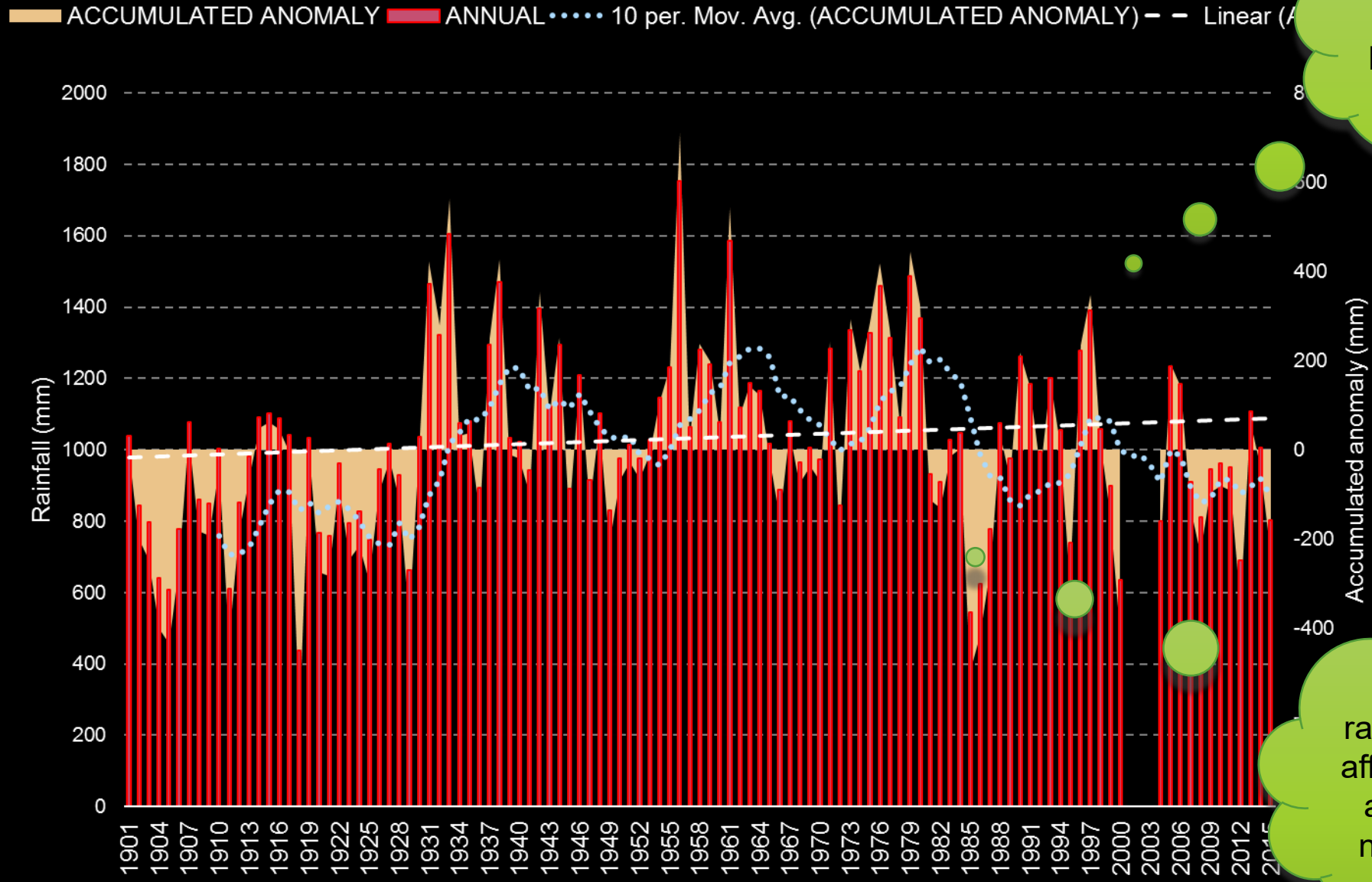


India became the largest extractor of groundwater in the world in the 1980s...

INDIA'S HYDROGEOLOGICAL DIVERSITY



Pune district annual rainfall with accumulated anomaly 1901 – 2015 (after IMD and IWP)

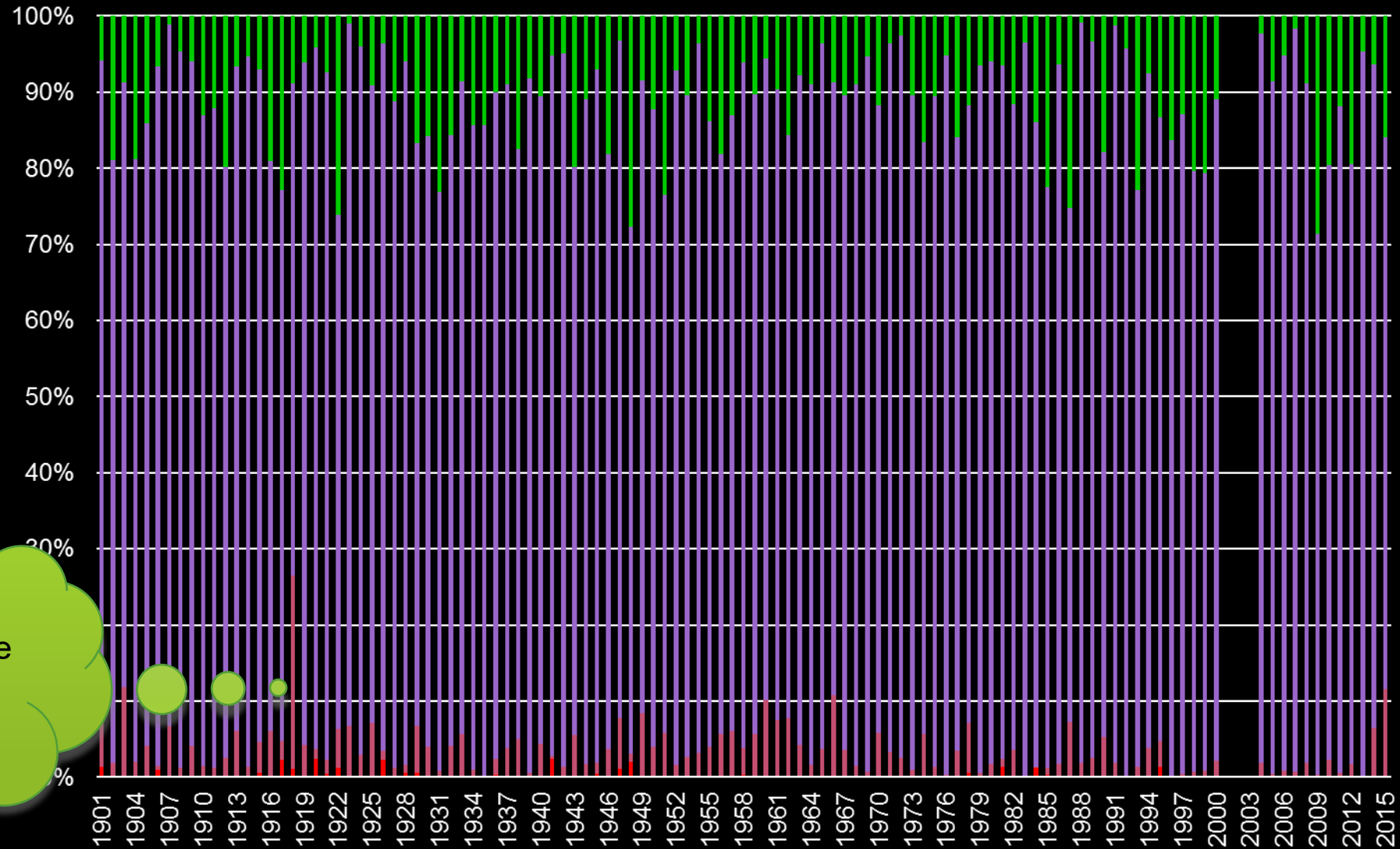


Rainfall and variability both have increased

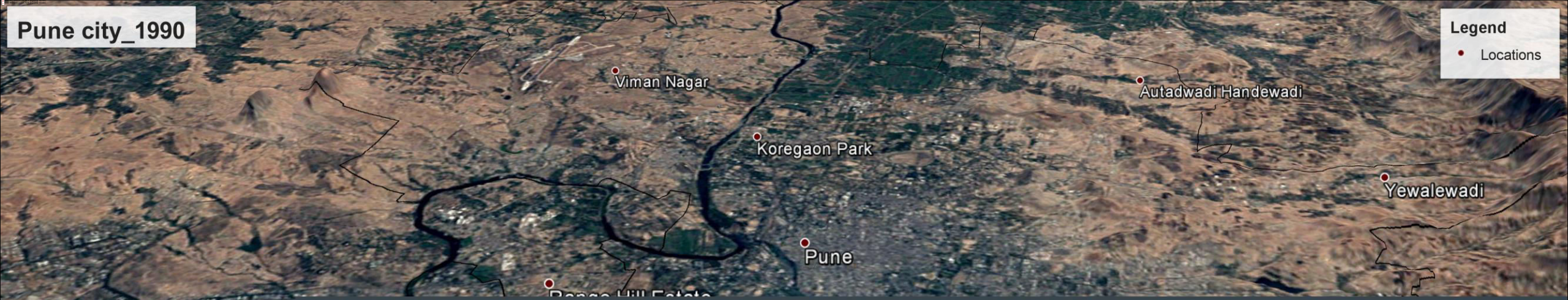
Accumulated rainfall anomalies affecting recharge are dominantly negative now...

Pune district - seasonal distribution 1901 – 2015 (after IMD and IWP)

JAN-FEB MAR-MAY JUN-SEP OCT-DEC



Decrease in the
January-May
precipitation



Pune city_1990

Legend

- Locations

Pune's urban sprawl

URBAN DEMAND EQUALS PRECIPITATION IN MANY CITIES...

	Sr. No.	Name	Typology	Water demand (mm)	Actual annual rainfall (mm)
Metropolitan <i>Region of India</i>	1	Greater Mumbai city	Volcanic	1770	2257
	2	Delhi city	Alluvial	1108	747
	3	Kolkata city	Alluvial	1987	1709
	4	Chennai city	Crystalline	1032	1324
	5	Bengaluru city	Crystalline	574	870
	6	Hyderabad city	Crystalline	512	851
	7	Pune PMRDA	Volcanic	1084	1015

WATER SUPPLY METRICS

1. Supply @ 228 lpcd corrected to 26% losses	6.8 TMC
2. Sewage generated at 66% of actual supply (above)	4.5 TMC
3. Estimated/actual sewage generation	6.08 TMC
4. Estimated additional sewage generation due to groundwater usage	1.58 TMC or 44740616 m ³ or <u>166 mm</u>

MORE THAN 90% HARD-ROCK AQUIFERS...

Geology map overlay on Pune municipal boundary

Geology on municipal wards

PUNE'S AQUIFER SYSTEM

POTENTIAL GROUNDWATER STORAGE IN PHREATIC AQUIFERS

GROUNDWATER FLOW IN THE SHALLOW AQUIFER

Water table contour map-June 2018

Water table contour map-November 2018

Broad recharge-conducive areas of Pune



Aquifer - 1



Aquifer - 2



Aquifer - 3



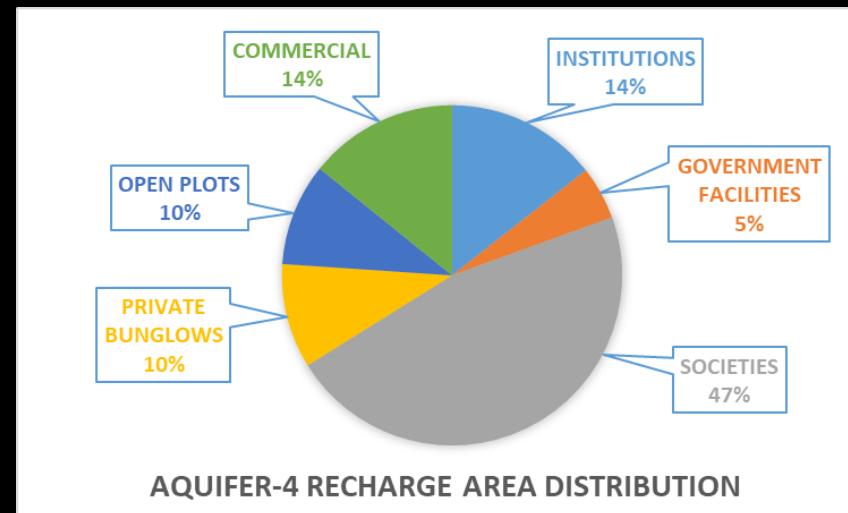
Aquifer - 4



Aquifer - 5

Distribution of infrastructure-types in different aquifer recharge areas

Aquifer-wise distribution of institutional land-cover



Pump capacity (Hp)	Pump output (LPM) (min postulated)	Pump output (M3/hr)	Daily pumping hours (Avg)	Groundwater abstraction (M3/day)	Pumping days	Total Groundwater abstraction/ borewell (M3)	No of BWs in and around Pune city	Total Groundwater abstraction (M3)	Total Groundwater abstraction (TMC)
2	80	4.8	2.74	13.2	90	1184	125000	147960000	5.23
2	80	4.8	2.74	13.2	90	1184	80000	94694400	3.34

Thank you !!!!

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