

Climate change and its impact on Groundwater

Uma Badarayani

ACWADAM
Plot no.4, Lenyadri Co-op Hsg. Society, Sus Road, Pashan
Pune

Phone:020-25871539
Email: acwadam@vsnl.net



What is climate change?

- **Climate change** is a change in the statistical distribution of weather over periods of time that range from decades to millions of years.
 - The causes are:
 - Variations in solar radiations
 - Plate tectonics
 - Volcanism
 - Change in earths orbit and axis
- ***United Nations framework convention on climate change*** defines it as the change in climatic conditions due to human activities which is synonymous to **global warming**.
- In the past, civilizations got extinct due to climate change.
Example: Harappa civilization

Some facts

- Erratic rainfall pattern
 - Increase in rainfall in eastern part of N & S America, N Europe and N & central Asia.
 - Decrease in rainfall in Sahel, Mediterranean region, S Africa, S Asia and S & E Australia
- Frequent floods and droughts
- It is estimated that, by 2050, Bangladesh will loose 17% land due to rise in sea level by 0.5 m.

| | 1870 | 2008 | 2100 (Project ed) |
|--------------------------|---|----------------|-------------------------|
| Mean global temp | 13.6° C | 14.5°C | By 2°c – 6°C |
| CO2 in atmosphere | 290 ppm | 385 ppm | > 400 ppm |
| Rise in sea level | 10-20 cm below the present level | By 9- 20 cm | By 10 to 85cm |

After: Spencer and Weart

- 1/3 rd population of the world will be water stressed

India & Climate change

- The anthropogenic effects have caused change.
 - Increase in temp.- 2010 being the hottest year
 - Untimely rains- Floods in Rajasthan, Fayan cyclone
 - Retreat of glacial- Gangotri and Yamunotri glacial
 - Drying up of rivers/ springs- Peninsular rivers
- The climate change is more than an environmental threat.
- Significant wrt drinking water availability & food security of millions of people below poverty line.
- Monsoon is the lifeline of India.
- Change in rainfall pattern will have significant impact.



India is 10th largest CO₂ emitting country in the world

India and Climate change

Damage to aquatic ecosystems due to reduced flows in the streams/ rivers

Flood disaster in Bihar, UP and West Bengal

Increasing temperatures

Health problems due to poor water quality

Water scarcity in most parts of the country

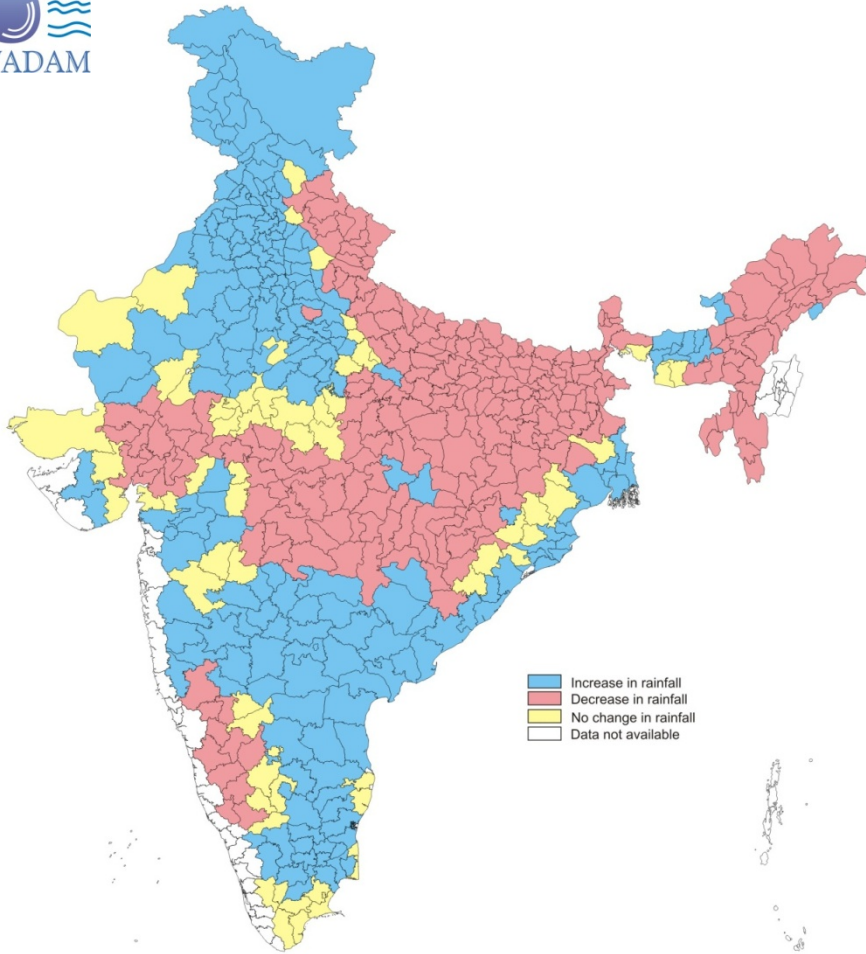
Frequent droughts

Damage due to cyclone in Orissa, Andhra Pradesh and West Bengal

High rate of erosion due to high intensity rainfall

Drying up of rivers

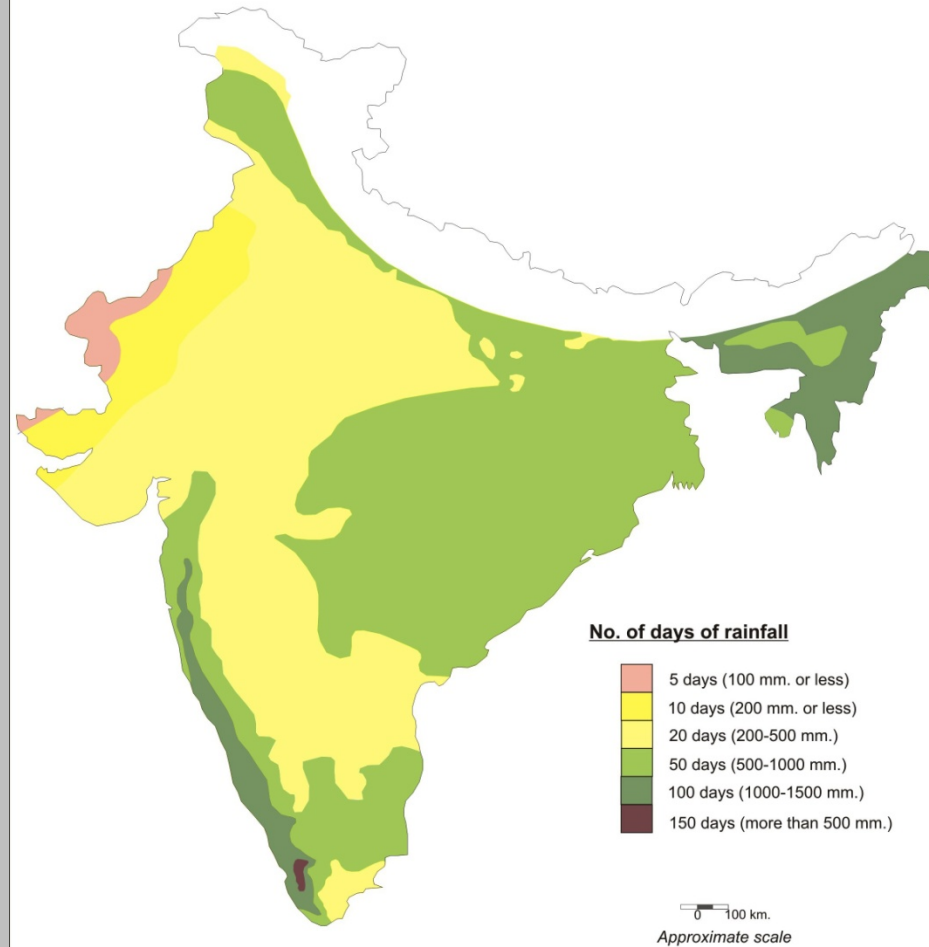
Change in cropping pattern



Change in rainfall during last 100 years

Source: IWP (Tyndall Center for Climate Change)

INDIA: ANNUAL RAINFALL



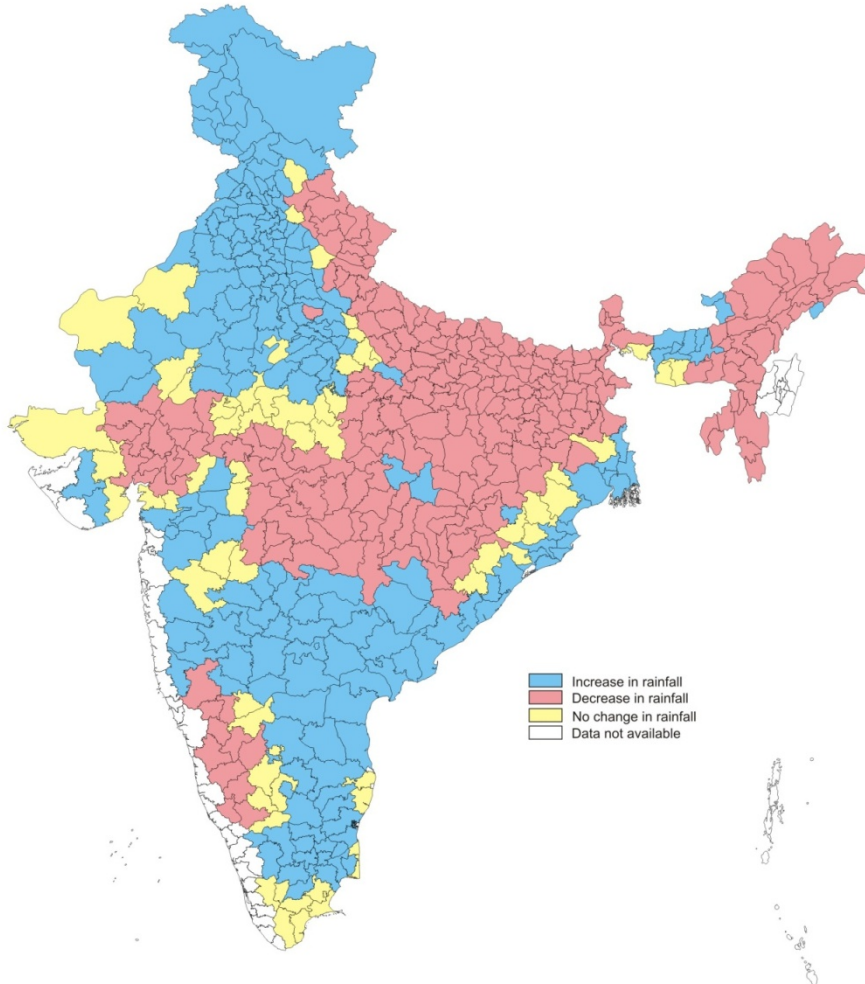
Source: Indian Meteorological dept.

In Bihar & Arunachal Pradesh the decrease is by 15% to 20%.
 In Punjab, Haryana & Andhra Pradesh the increase in rainfall is by 10% to 15% during the last 3 decades.

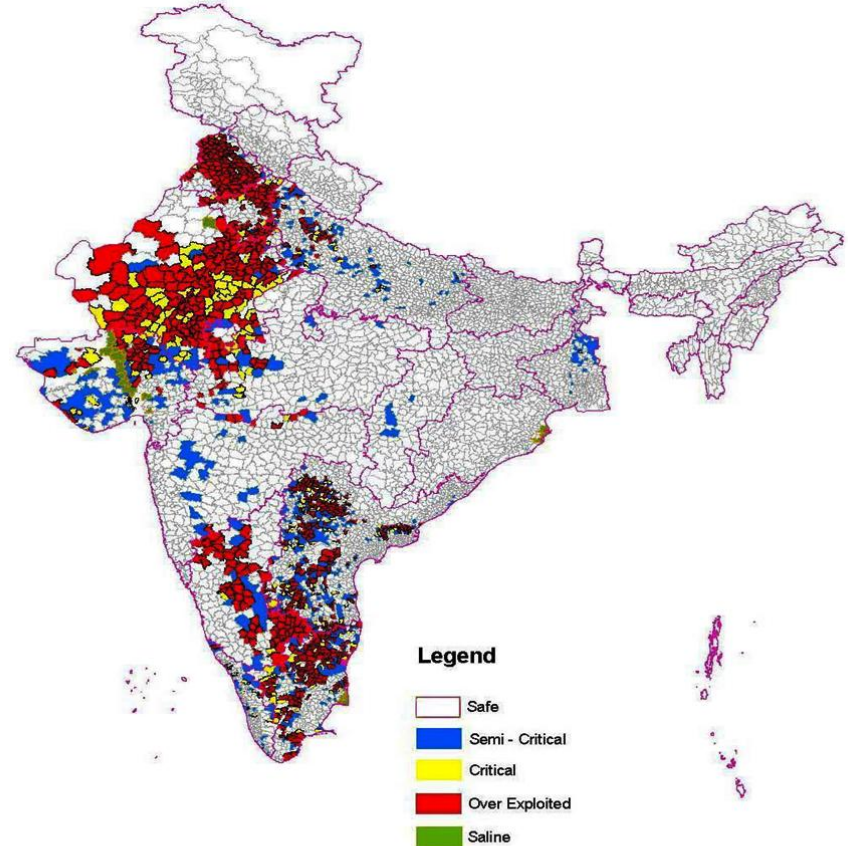
Impact on groundwater

- South Asia is the largest user of GW with $\frac{1}{4}$ th of the total use.
- The effects of climate change and over use is a disastrous combination.
- Impacts
 - Drying up of millions of wells/bore wells
 - Poor quality of groundwater
 - Salinity ingress
 - Drying up of rivers like Swarnamukhi

Rainfall pattern and groundwater



Change in rainfall during last 100 years



Semi- critical, critical and overexploited blocks in India, 2004

Source: CGWB

Is there any impact of climate change on groundwater?

- Punjab & Haryana: Increase in rainfall. However, the state is in GW overexploited zone.
- Andhra Pradesh, Tamilnadu and Maharashtra: Increase in rainfall. Groundwater in semi critical, critical or overexploited zone.
- Eastern India: Decrease in rainfall. GW safe zone

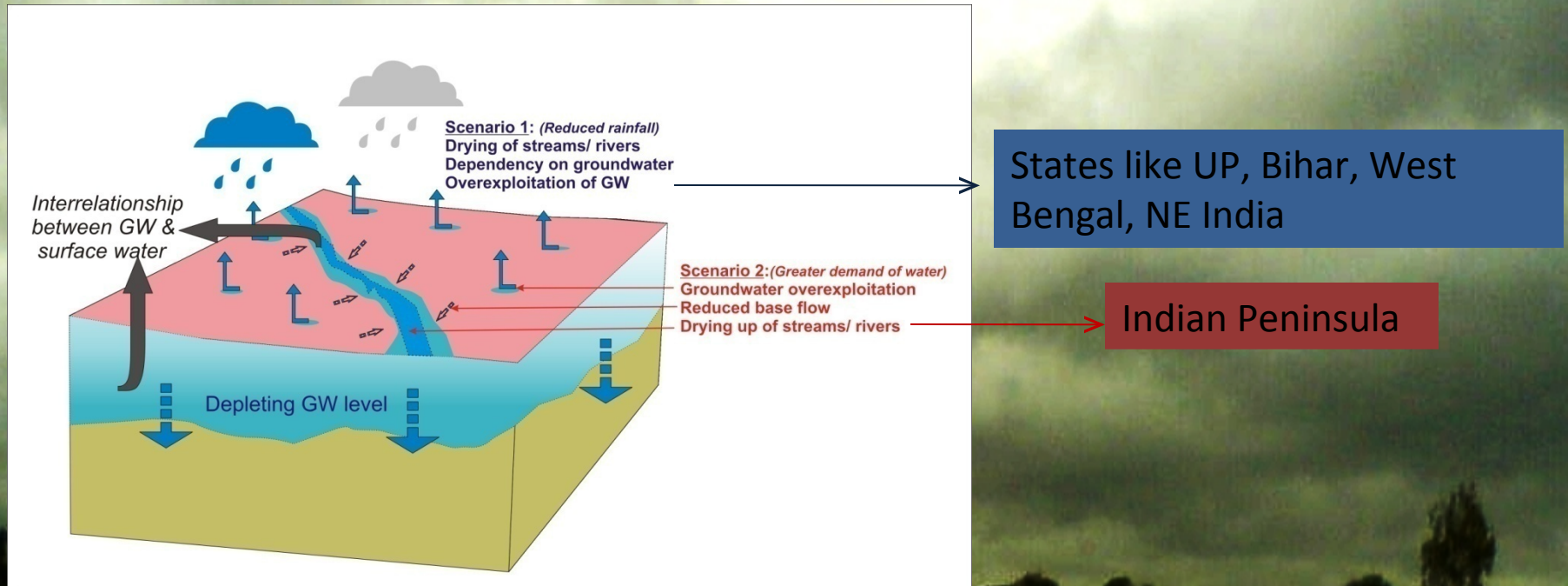


There is definitely some impact of rainfall on GW. In normal condition, impact will be visible in a decade but due to over use of the resource in one part and under use in the other part , it is difficult to assess the impacts.

In case of groundwater, anthropogenic conditions override.

Climate change and Groundwater

- Surface water: Impact is visible.
- Groundwater: Impact is not visible.



The major impacts are on quality of GW, availability of GW and quantity of GW

Strategy to defy climate change

- Resource planning
- State wise strategy should be developed.
- Groundwater management is necessary.
- Drinking water and food security should be the top priority.
- Detail research should be done specifically on groundwater to assess the impacts in greater detail.

Climate change is a natural and frequently occurring phenomena.

The anthropogenic factors are hastening this change at an alarming rate.

Thank you!

