



RAINWATER HARVESTING FOR DISASTER RISK REDUCTION IN FLOOD AND DROUGHT CRISES- INDIAN EXPERIENCE

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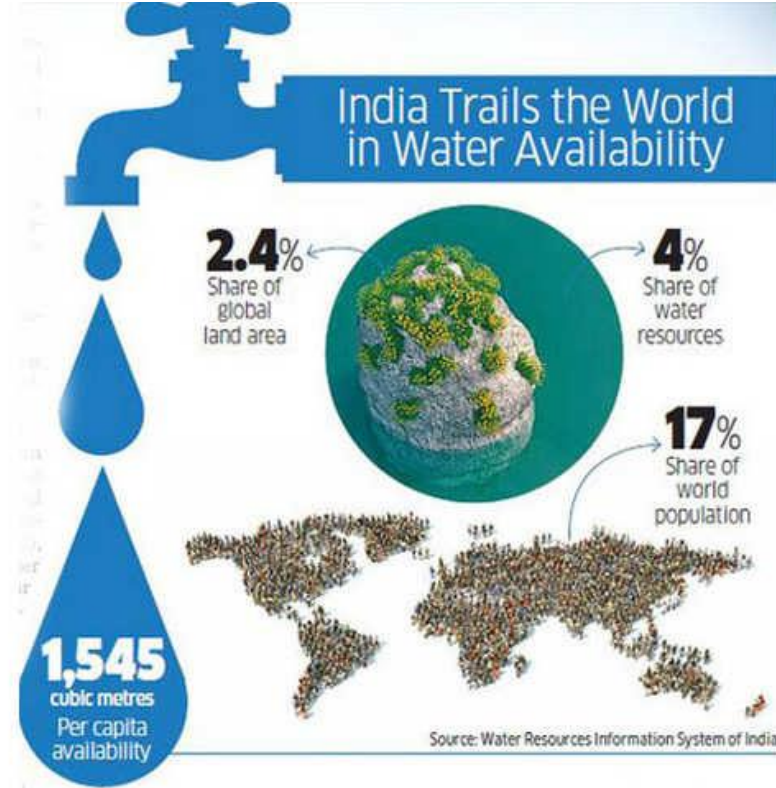
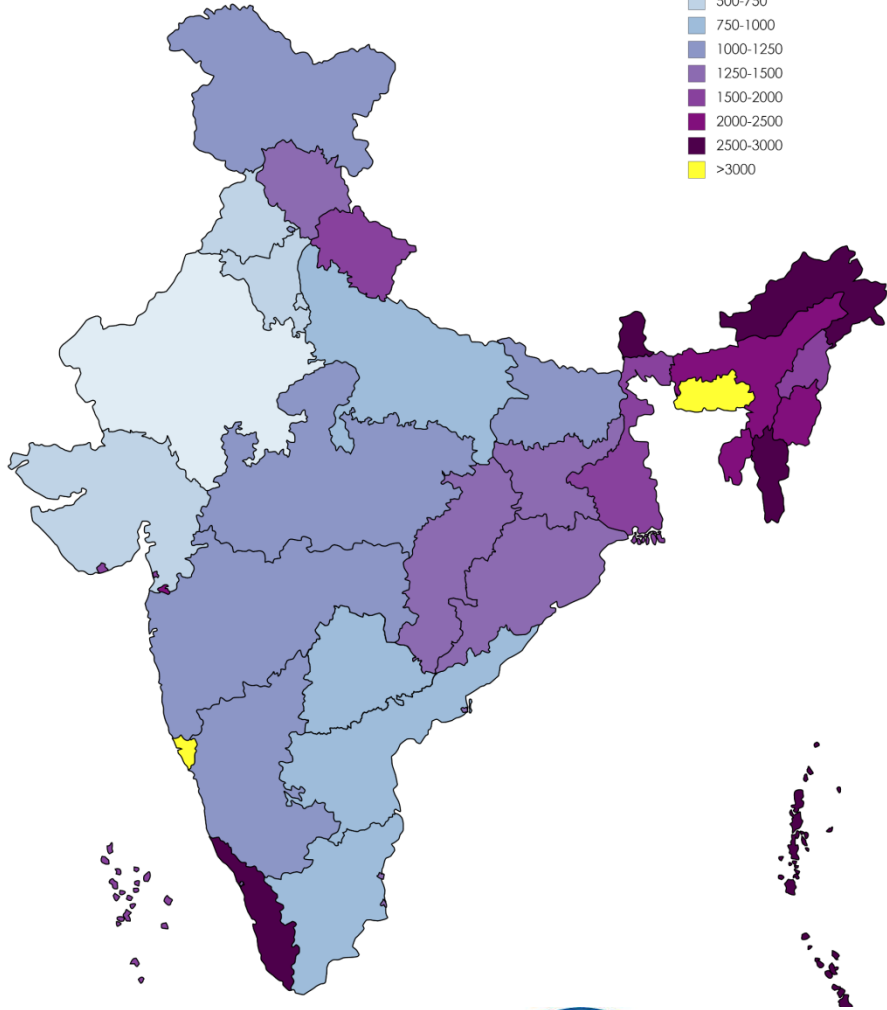
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INDIA

Indian states by average annual rainfall (in mm)

- <500
- 500-750
- 750-1000
- 1000-1250
- 1250-1500
- 1500-2000
- 2000-2500
- 2500-3000
- >3000



132
Rank in Water Availability

122
Rank in Water Quality



SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD

1 NO POVERTY

2 ZERO HUNGER

3 GOOD HEALTH AND WELL-BEING

4 QUALITY EDUCATION

5 GENDER EQUALITY

6 CLEAN WATER AND SANITATION

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

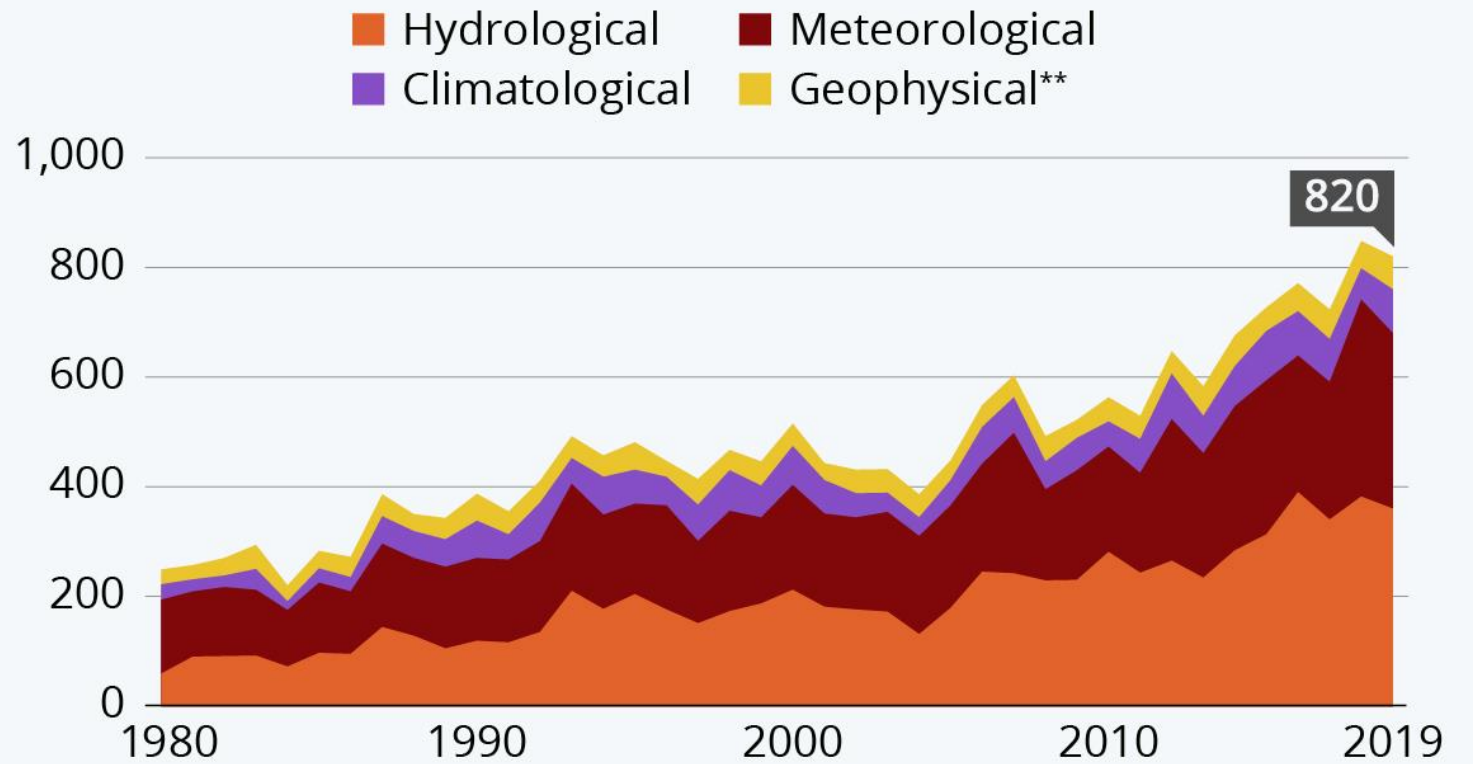
17 PARTNERSHIPS FOR THE GOALS


SUSTAINABLE DEVELOPMENT GOALS

SDG-13

Natural Disasters on the Rise Around the Globe

Number of natural disasters* by type of event (1980-2019)



* Registered as relevant loss events by MunichRe

** Volcanic/tectonic activity

Source: MunichRe



Floods

Landslides

Water Related Climate Disasters in India



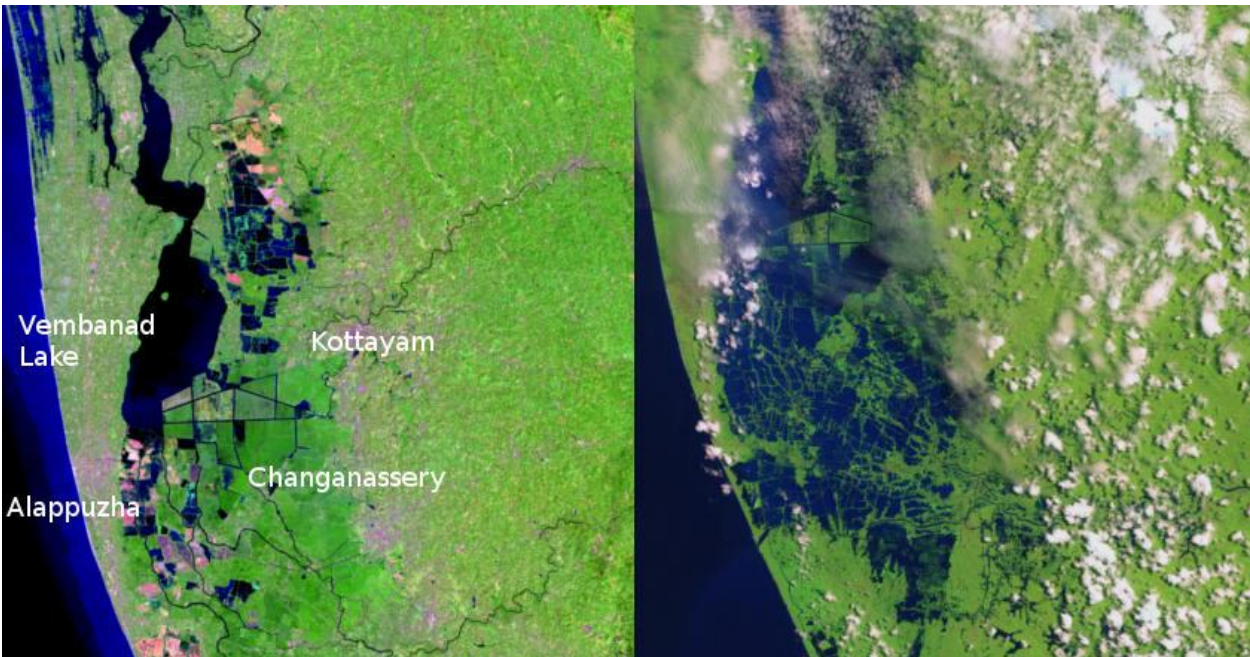
Droughts



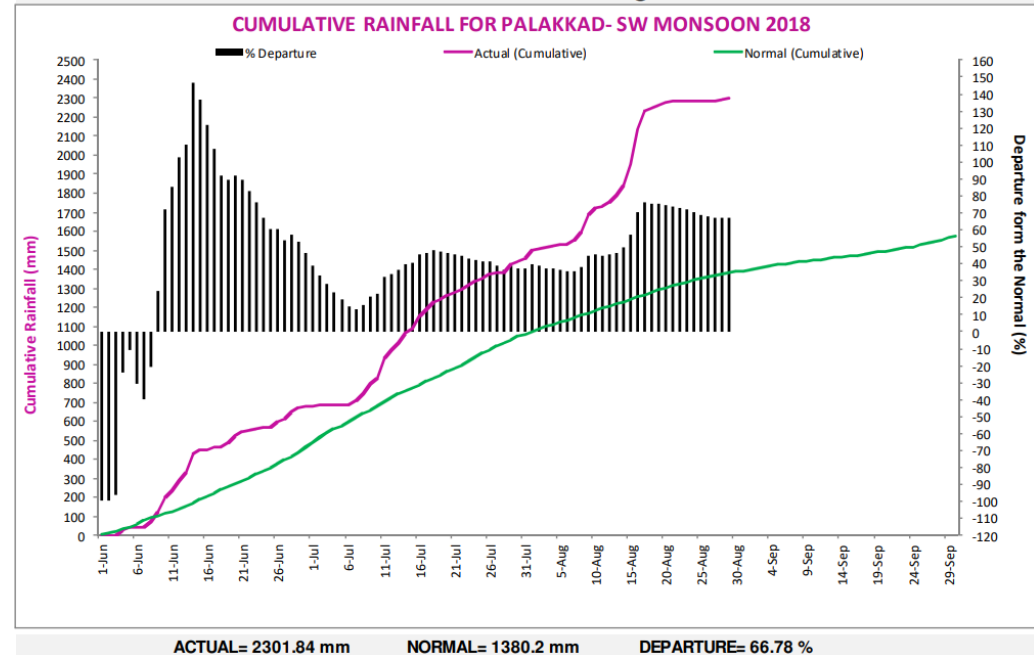
Kerala Floods- August 2018

Departure from Normal +96 %

- More than 450 people lost
- Crop damage in agriculture sector – 20,000 Crores
- More than 50,000 houses lost
- Over 8.6 lakh people have taken shelter in nearly 3,000 relief camps

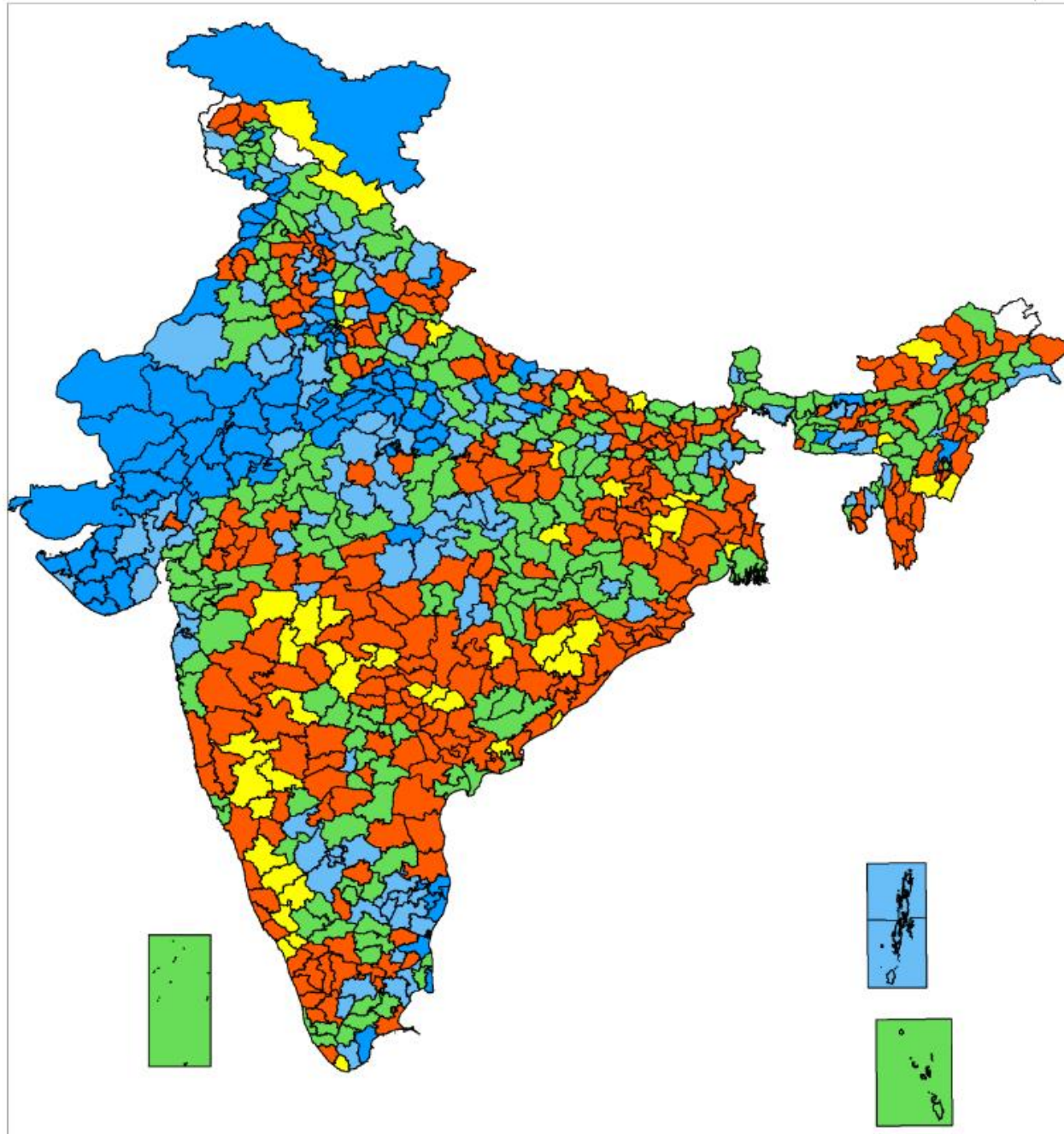


PERFORMANCE OF SOUTH WEST MONSOON 2018 OVER PALAKKAD
From 01-Jun-2018 to 29-Aug-2018



DISTRICT RAINFALL MAP

Period : 01-06-2023 To 05-07-2023

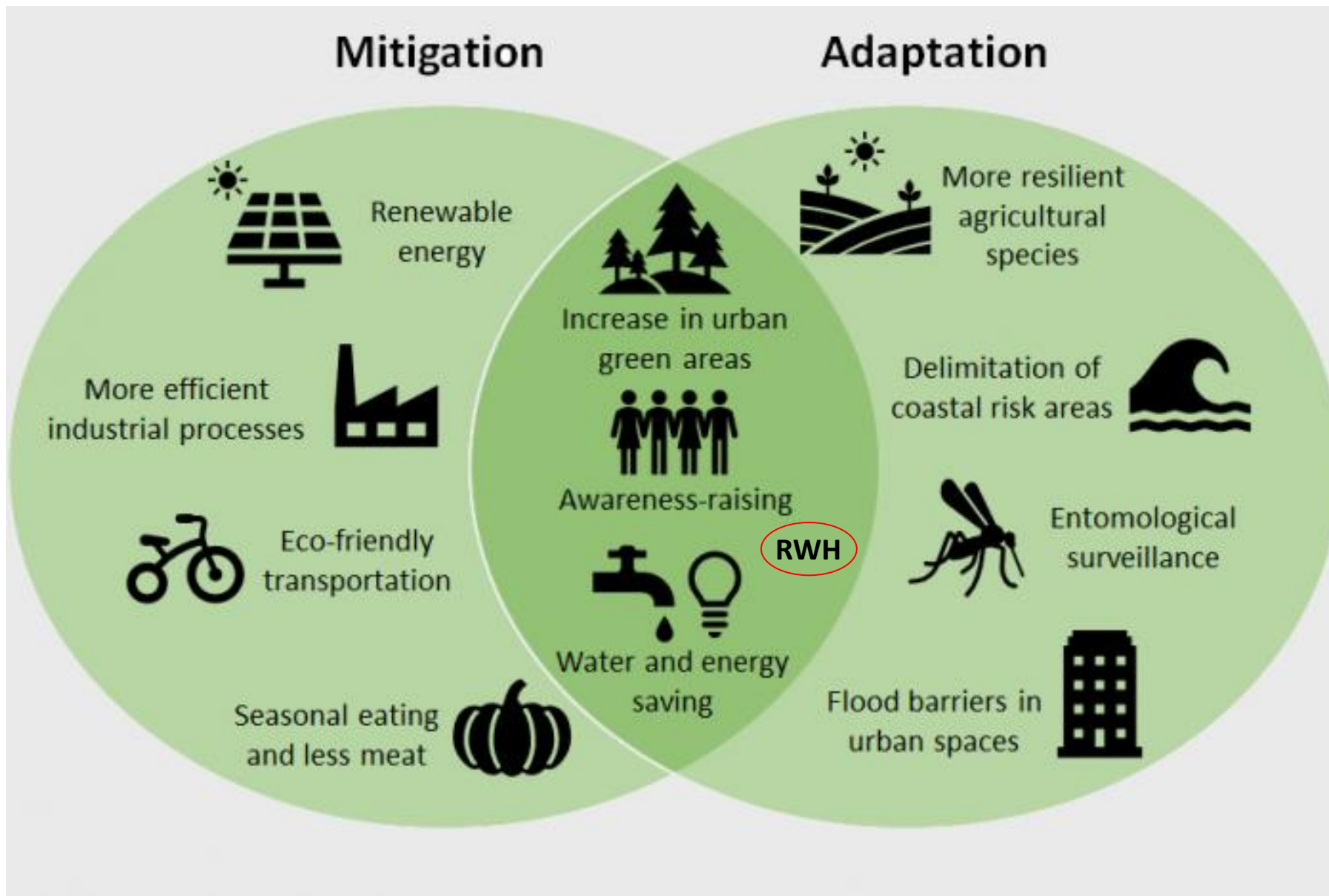


DownToEarth

10 FACTS ON CLIMATE CHANGE FROM IPCC REPORT

-  In the next 20 years the global warming will breach the threshold of 1.5°C
-  If we continue to emit greenhouse gases as now, global warming will be above 2°C by mid-2100s.
-  With every 1°C rise in temperature, there will be a 7 per cent increase in the intensification of extreme rain events
-  Carbon dioxide concentration is highest in 2 million years
-  Sea-level rise is the fastest in 3,000 years
-  Arctic sea ice is lowest in 1,000 years
-  Some changes we can't reverse any more, at least for next thousands of years
-  Ice melting will continue for the next 1,000 years even if we manage to control our GHG emissions
-  Ocean warming will continue, which has increased by 2-8 times from 1970s
- Sea-level rise will continue for hundreds of years

Climate Action- Mitigation & Adaptation





Quantity
Quality



Deficit
Excess



Demand
Supply



Blue
Green
Grey

Reduce
Reuse
Recycle
Recharge



Harvest
Protect
Keep clean
Innovative -
Strategies/
technologies





Water resources development and management in India

Implementation of proper strategies and action plan for achieving water security

Broad areas to be addressed

I. Supply Sector

II. Demand Sector

III. Water Governance and Policy

IV. Capacity building

V. Disaster Management viz., droughts, floods, landslides etc.

VI. Climate resilience



DISASTER MANAGEMENT IN KERALA

The prime objective is to ensure effective preparedness as well as mitigation from water related disasters

Strategies for achieving this

- ✓ To introduce an efficient flood and land slide protection system in the context of changing climate scenarios

Activities/ Action Plan

- Formulation of flood and associated landslide protection and rehabilitation master plans, employing both structural and non-structural measures
- Real time prediction systems along with forecast for disasters by preparing flood frequency forecasting risk maps
- Development of a preparatory process for protection and rehabilitation operations prior, during and after disasters
- Conducting training to all the stakeholders for protection and rehabilitation.



CLIMATE RESILIENCE

The prime objective is to ensure effective preparedness as well as mitigation from water related disasters

Strategies for achieving this

- ✓ Climate resilient agriculture and irrigation
- ✓ Weather prediction, Flood modelling, Early Warning etc.

Activities/ Action Plan

- Water-budget, Crop calendar, Water utilization calendar considering changing climate
- Real time prediction systems along with forecast for disasters
- Preparedness process
- Conducting training to all the stakeholders on climate resilient strategies
- Carbon Neutral/Climate resilient agriculture/villages

Disaster Management

- **Water Budgeting, Allocation and Governance**
- **River/River basin Management**
- **Watershed management**
- **Wetland and Coastal zone management**
- **Crop water management/irrigation scheduling**
- **Reservoir operations**
- **Conjunctive use of surface and Groundwater**
- **Disaster management- Mitigation**

Floods

Preparedness

Droughts

Response

Landslides

Rebuild

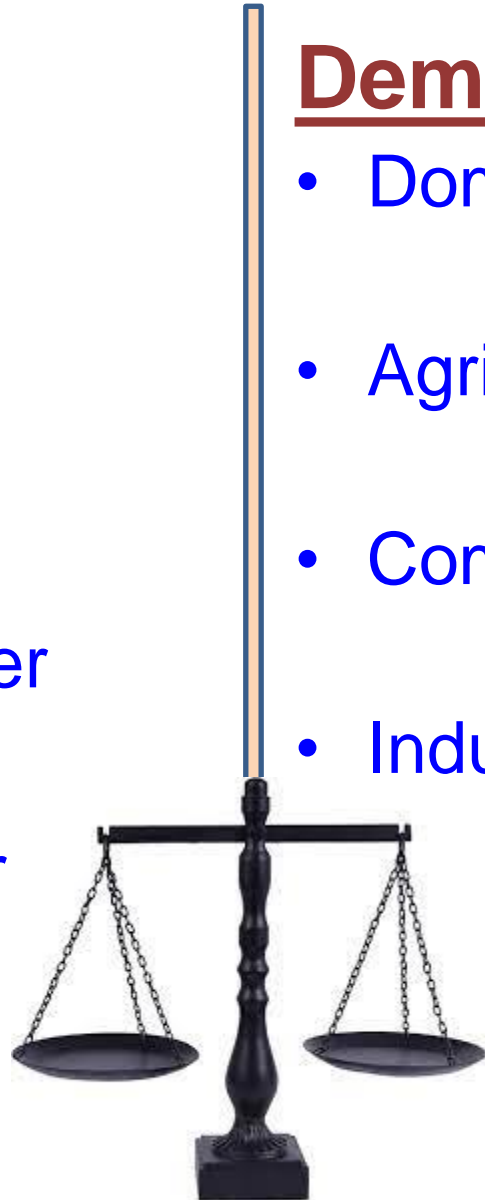
Water Budgeting

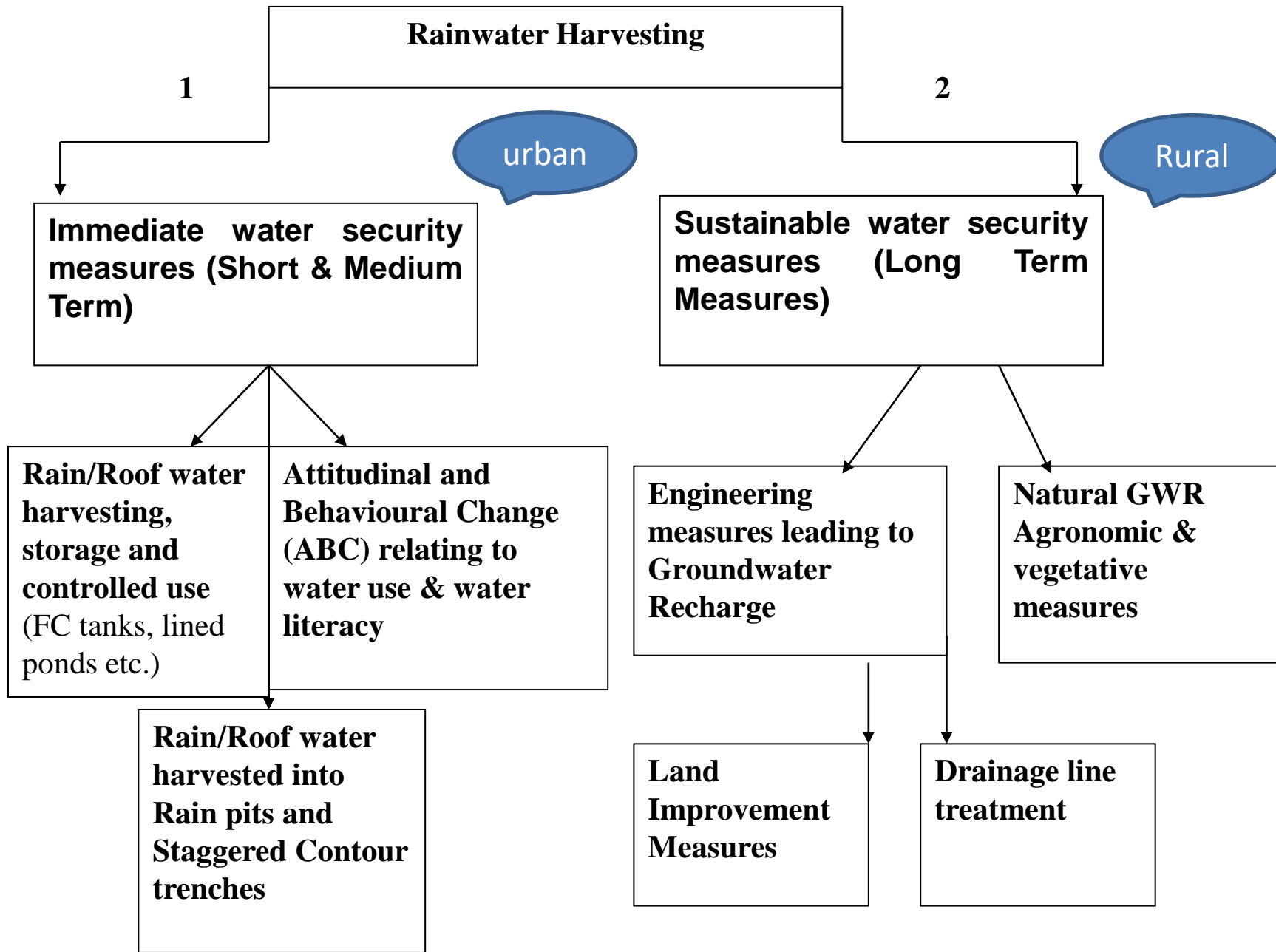
Demand

- Domestic
- Agriculture
- Commercial
- Industrial

Supply

- Rainfall
- Surface Water
- Groundwater
- Import
- Export

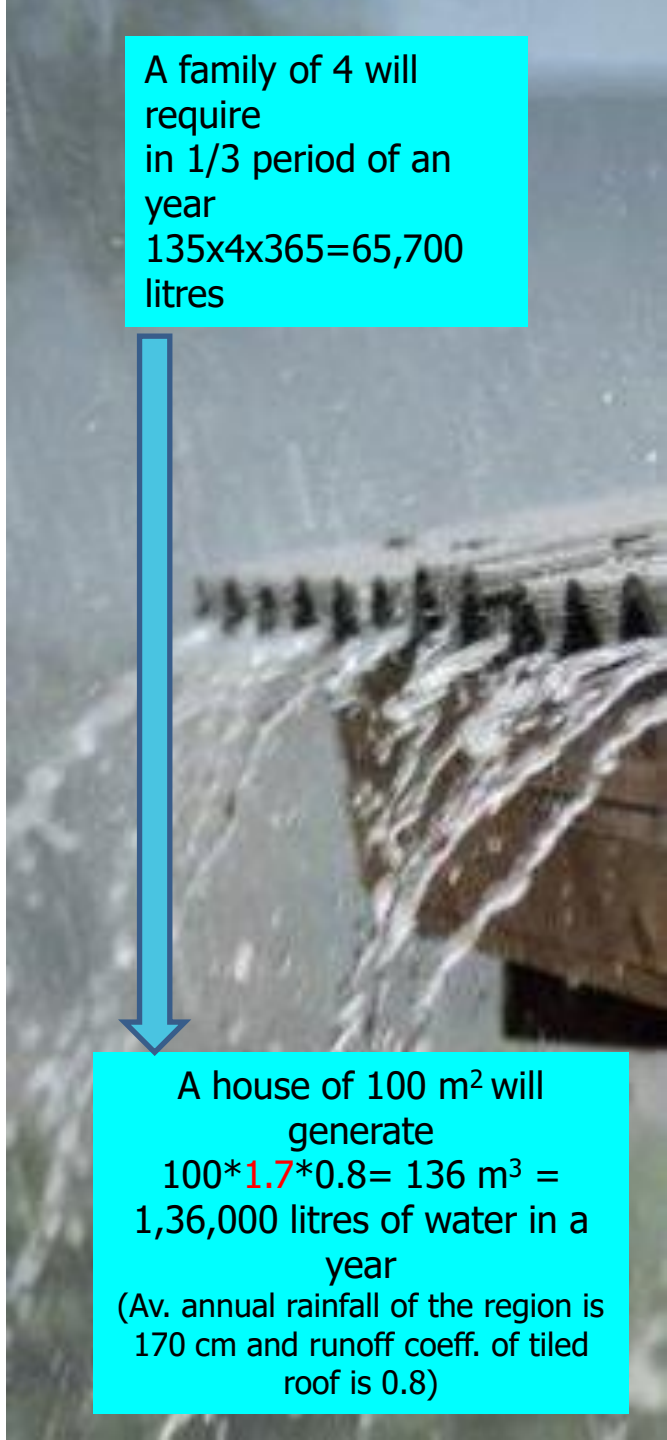


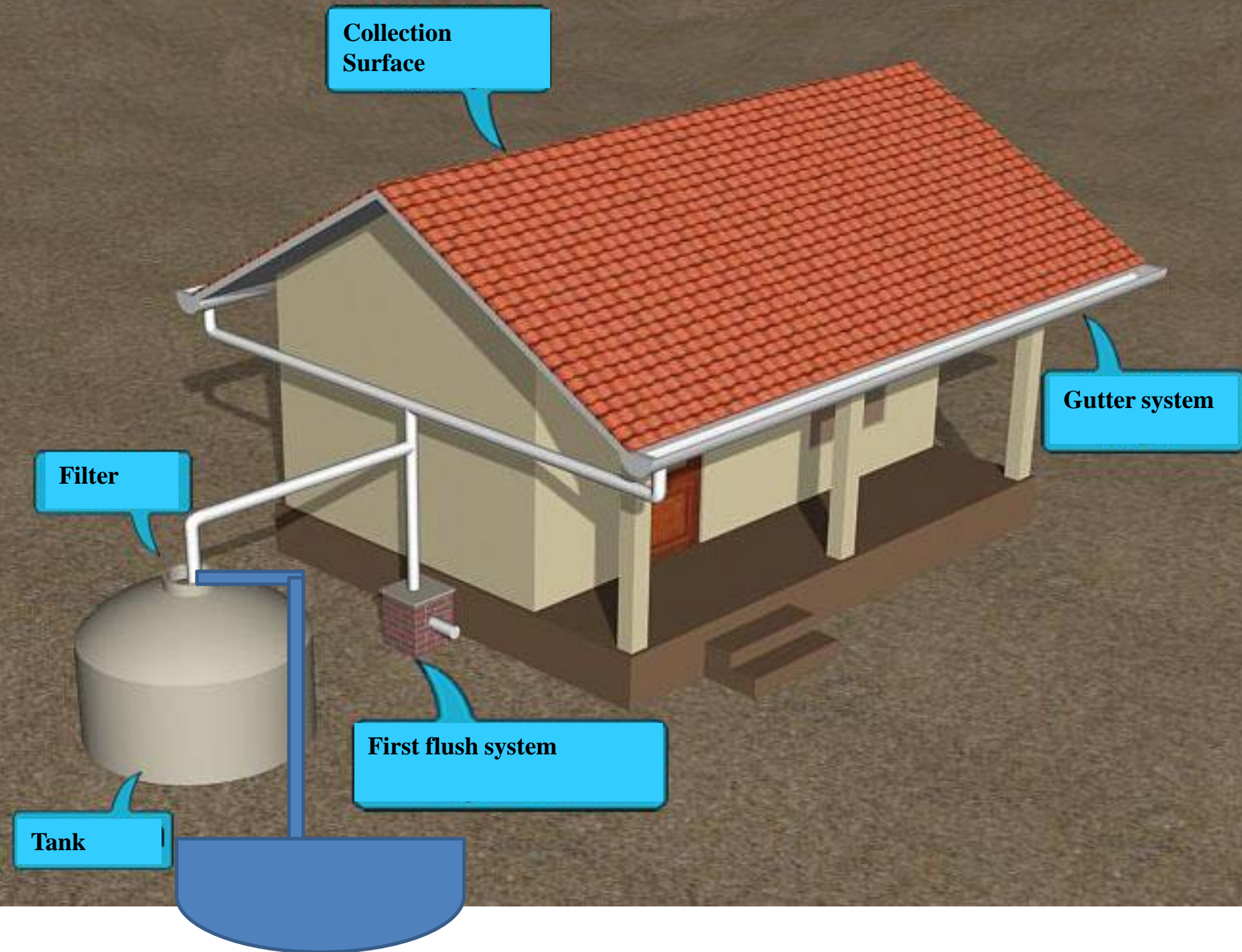


A family of 4 will require in 1/3 period of an year $135 \times 4 \times 365 = 65,700$ litres

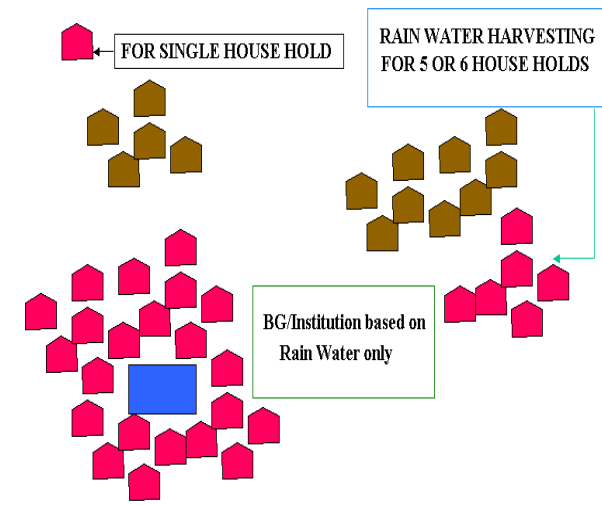


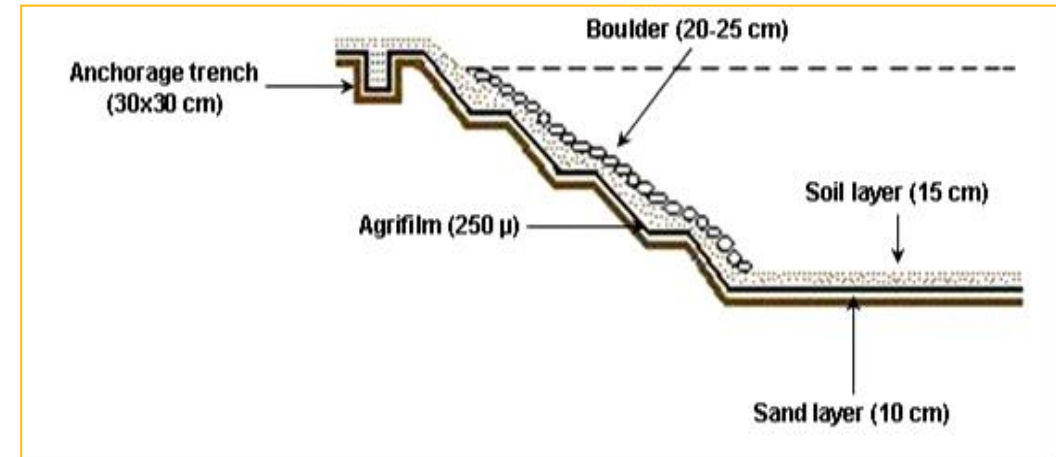
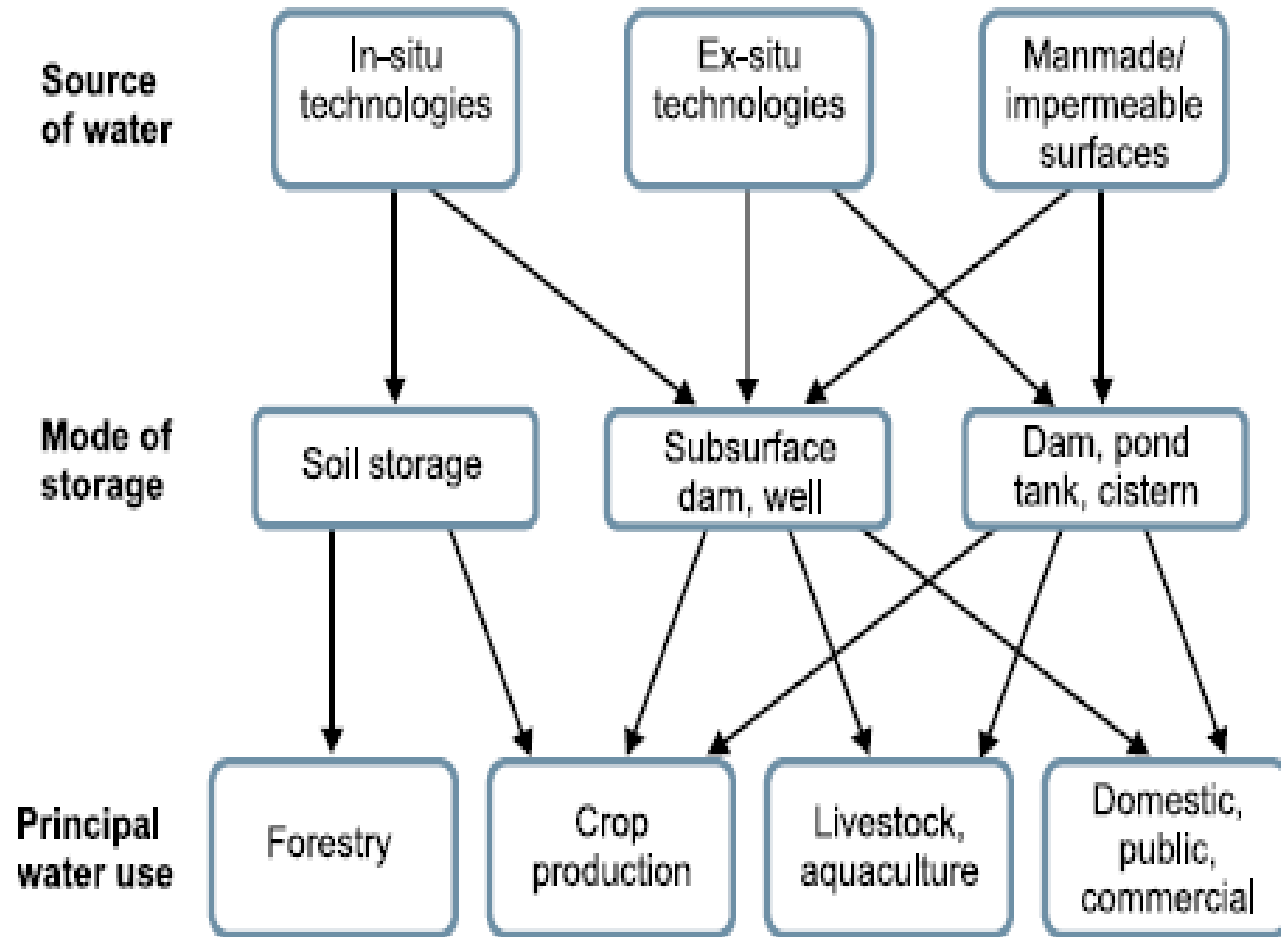
A house of 100 m² will generate $100 \times 1.7 \times 0.8 = 136 \text{ m}^3 = 1,36,000$ litres of water in a year (Av. annual rainfall of the region is 170 cm and runoff coeff. of tiled roof is 0.8)





THREE OPTIONS OF RAIN WATER HARVESTING





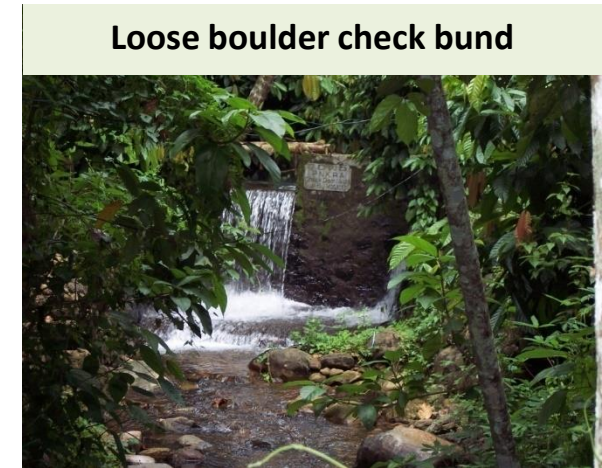
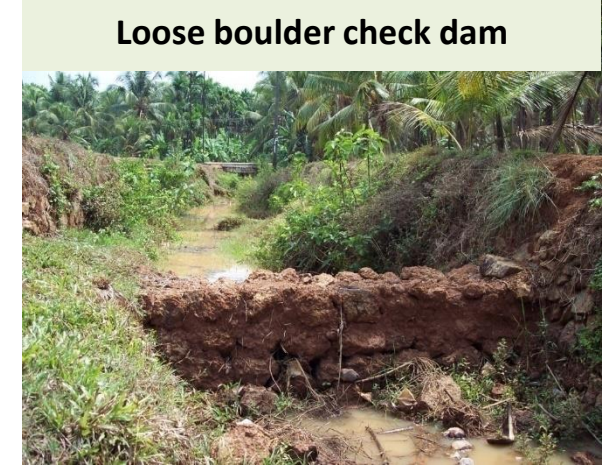
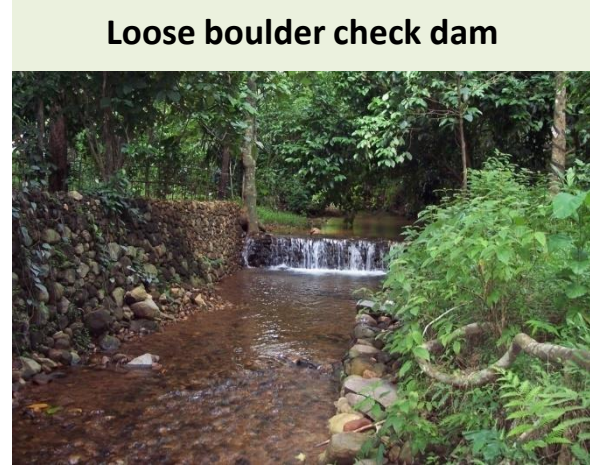


Lined pond for Rainwater harvesting

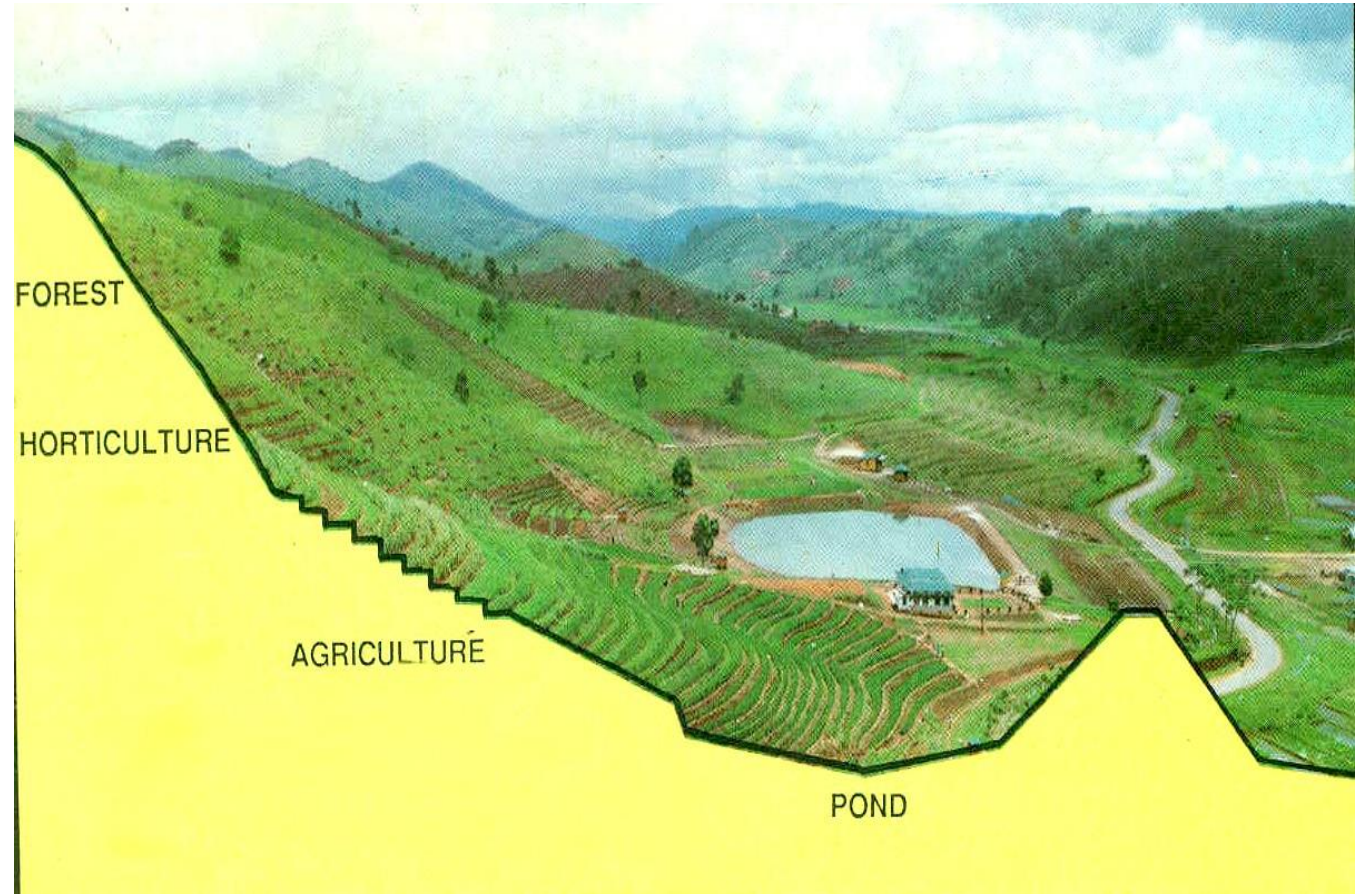


Community-based rainwater harvesting/ groundwater recharging structures

- Check dams
- Percolation tanks
- Gabion structures
- Grassed waterways
- Diversion drains



WATERSHED MANAGEMENT





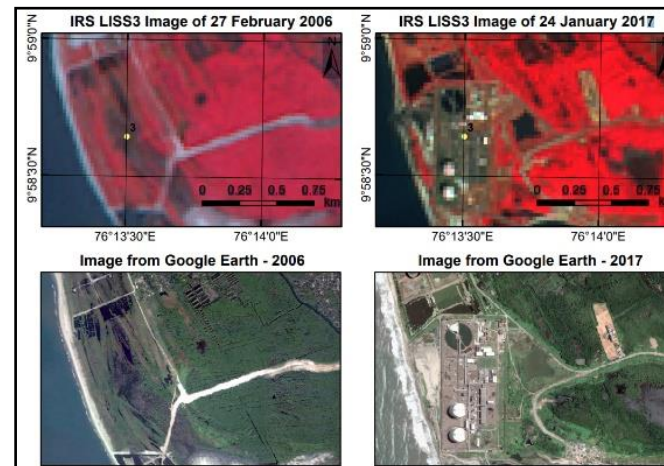
Management of Rivers and Wetlands

Restoration Activities in Rivers and Wetlands

- De-silting
- De-weeding
- Embankment Protection



- **National Wetland Inventory and Assessment (NWIA) Phase – II (Kerala and Lakshadweep)**



Flood and water quality- Flood has negative impacts on the environment, economy and human health



Coimbatore, TN



Storm water Filter



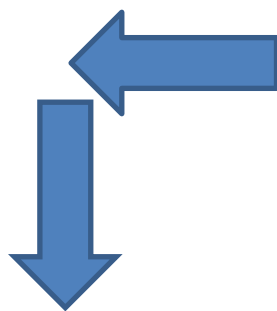
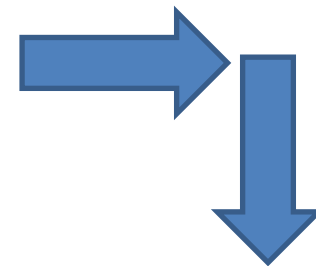


STEP 1



STEP 2

Roofwater Recharge Filter



STEP 4



STEP 3



STEP 5

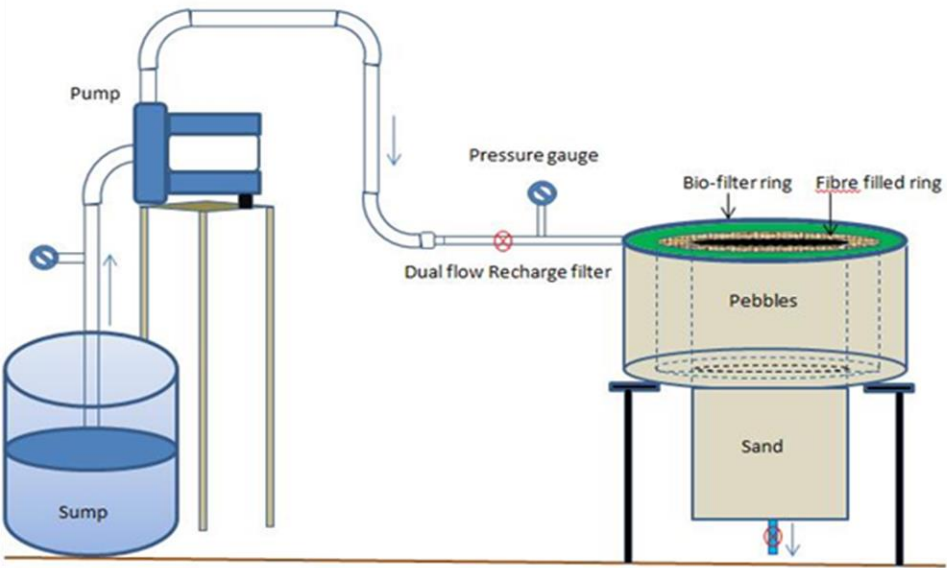


STEP 6



STEP 7

Urban Floodwater Recharge Filter



THANK YOU



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