22nd March 2009
'World Water Day Special'
"Water Conservation Techniques"

Joint Bulletin By:

Rotaract Club of Chinchwad – Pune, RID 3131

And

Rotaract Club of Thane North, RID 3140

World Water Day History

- March 22 was first deemed World Water Day in 1993 by the United Nations Conference on Environment and Development (UNCED) as an international day of observance and action to draw attention to the role that freshwater plays in our world and lives. Today's reality is that one in eight people in the world don't have access to safe water, millions of women and children must still spend several hours a day collecting water from distant, often polluted sources, and 2.5 billion people live without a toilet.

Initiative by: RC Chinchwad – Pune and RC Thane North

THE WORLD WATER CRISIS

- The world water crisis is one of the largest public health issues of our time. Nearly 1.1 billion people (roughly 20% of the world's population) lack access to safe drinking water. The lack of clean, safe drinking water is estimated to kill almost 4,500 children per day. In fact, out of the 2.2 million unsafe drinking water deaths in 2004, 90% were children under the age of five. Water is essential to the treatment of diseases, something especially critical for children.
- This problem isn't confined to a particular region of the world. A third of the Earth's population lives in "water stressed" countries and that number is expected to rise dramatically over the next two decades. The crisis is worst in developing countries, especially in Sub-Saharan Africa and South Asia.
- The world water crisis is created by a confluence of factors including climate and geography, lack of water systems and infrastructure, and inadequate sanitation, something that 2.6 billion people (40% of the world's population) lack access to. Some of these countries have additional problems, including high levels of arsenic and fluoride in drinking water.
- Many women and young girls in rural areas in Sub-Saharan African and other parts of the world must trek as much as six miles everyday to retrieve water for their families. Due to this manual labor, such women and children are prevented from pursuing an education, maintaining their households or earning additional income.

Initiative by: RC Chinchwad – Pune and RC Thane North

Water – A natural resource

Ever increasing demand of water

- Increasing population
- Increasing irrigated area
- Industrialization
- Urbanization
- Improved living standards
- Improved sanitation facility

Initiative by: RC Chinchwad – Pune and RC Thane North

Water – A scarce resource

- **Competitive demand among the stakeholders**
- **Declining per capita availability of water**

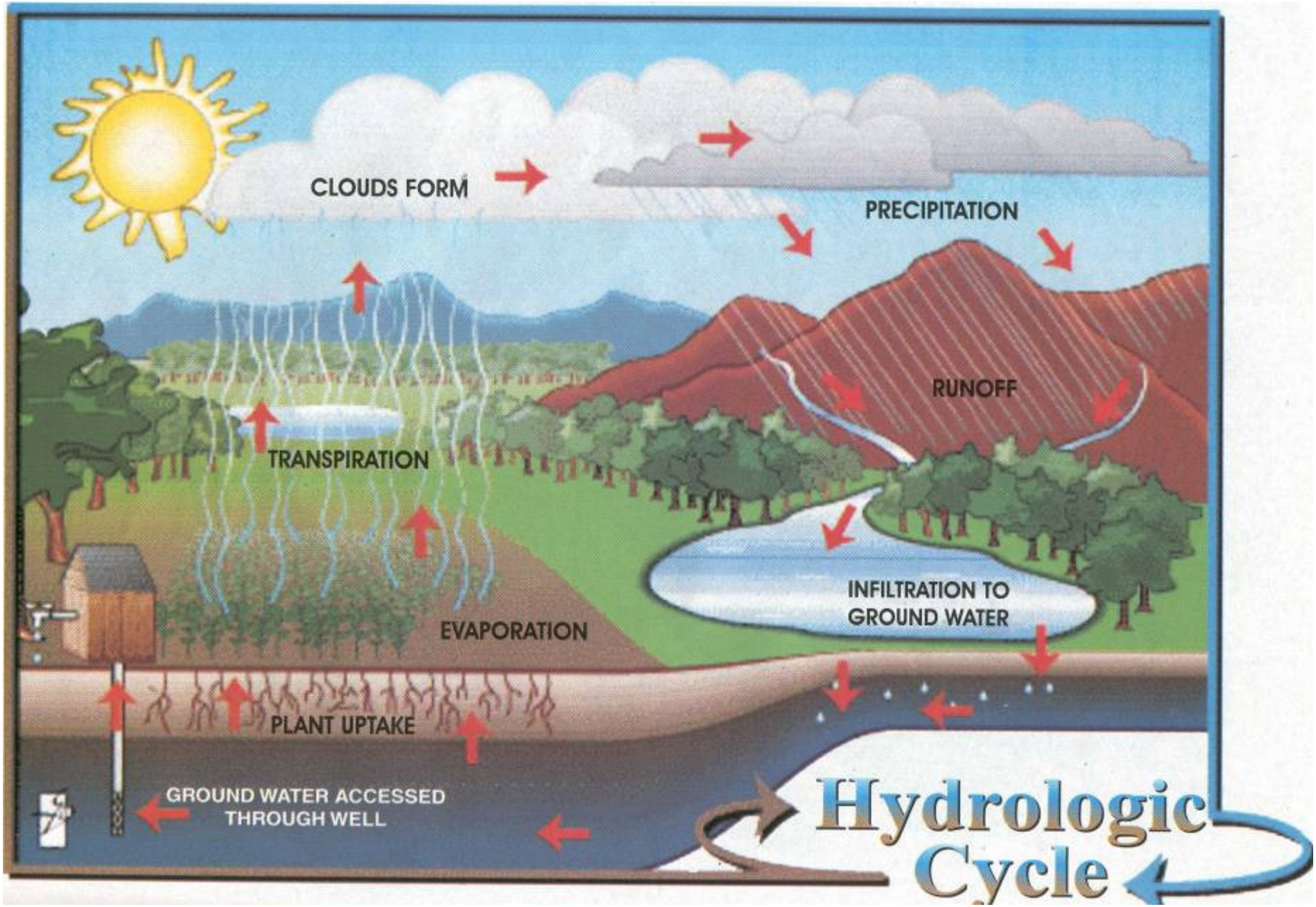
Water Resources:

- **Surface water (run off)**
- **Groundwater (sub surface)**

Enhancement of Water Resources

- **Water Resources Development (River valley project)**
- **Water conservation**
- **Water Management**
- **Efficient and judicious use of water**

Initiative by: RC Chinchwad – Pune and RC Thane North



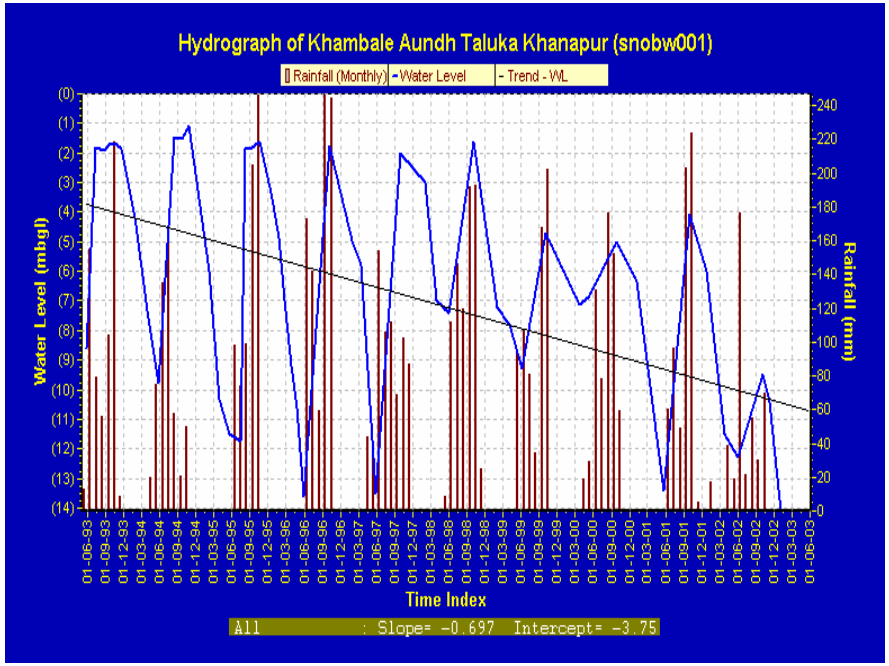
Initiative by: RC Chinchwad – Pune and RC Thane North

What does Groundwater Recharge means?

- Means transfer of water to subsurface
- Main purpose is to check the excess runoff
- Allow the residence time of water on the surface

Why GW Recharge is needed?

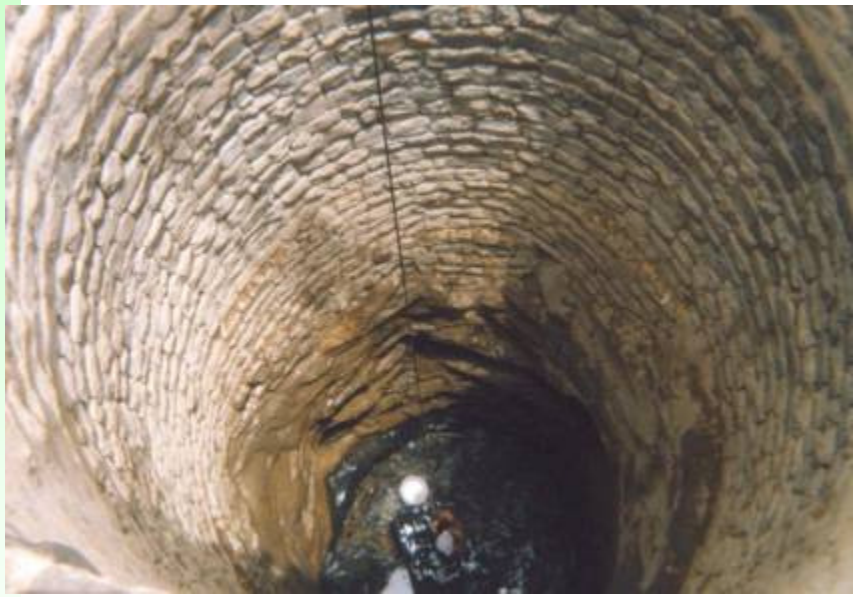
- Deficit of groundwater
- Where the aquifer is unsaturated
- Water demand is more..
- Where surface storage / resources are less or not available
- Overexploitation of groundwater



Initiative by: RC Chinchwad – Pune and RC Thane North

Where GW recharge is required?

- Areas where runoff is more, GW slope is more, infiltration is less (HDP, MDP)
- High density of wells (8-10 wells/sq.km)
- Over exploited and critical watersheds, DPAP areas
- When there is maximum demand for GW (Rabbi Season)
- Areas where aquifer has poor storage capacity, to accommodate recharge in monsoon

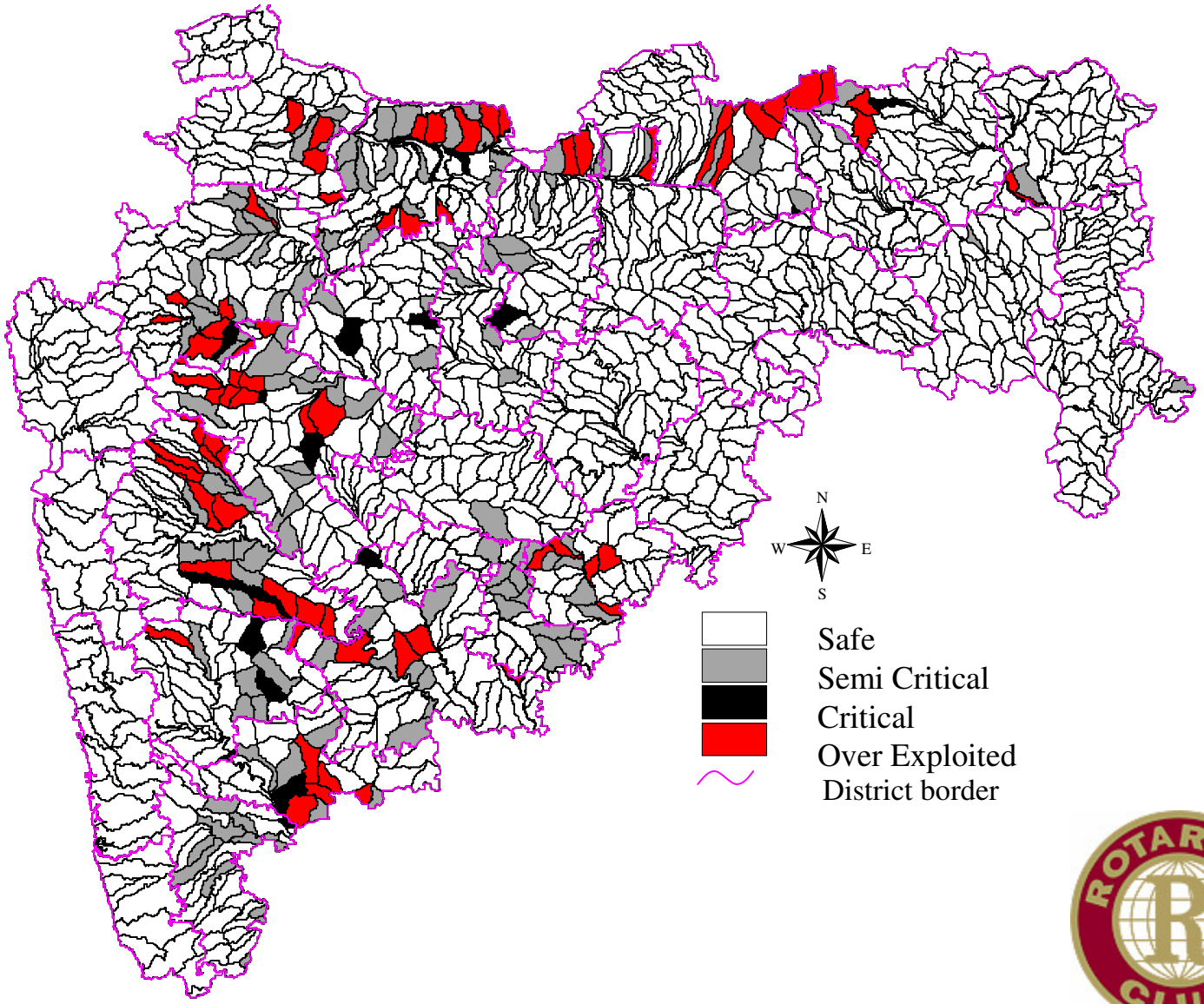


Initiative by: RC Chinchwad – Pune and RC Thane North

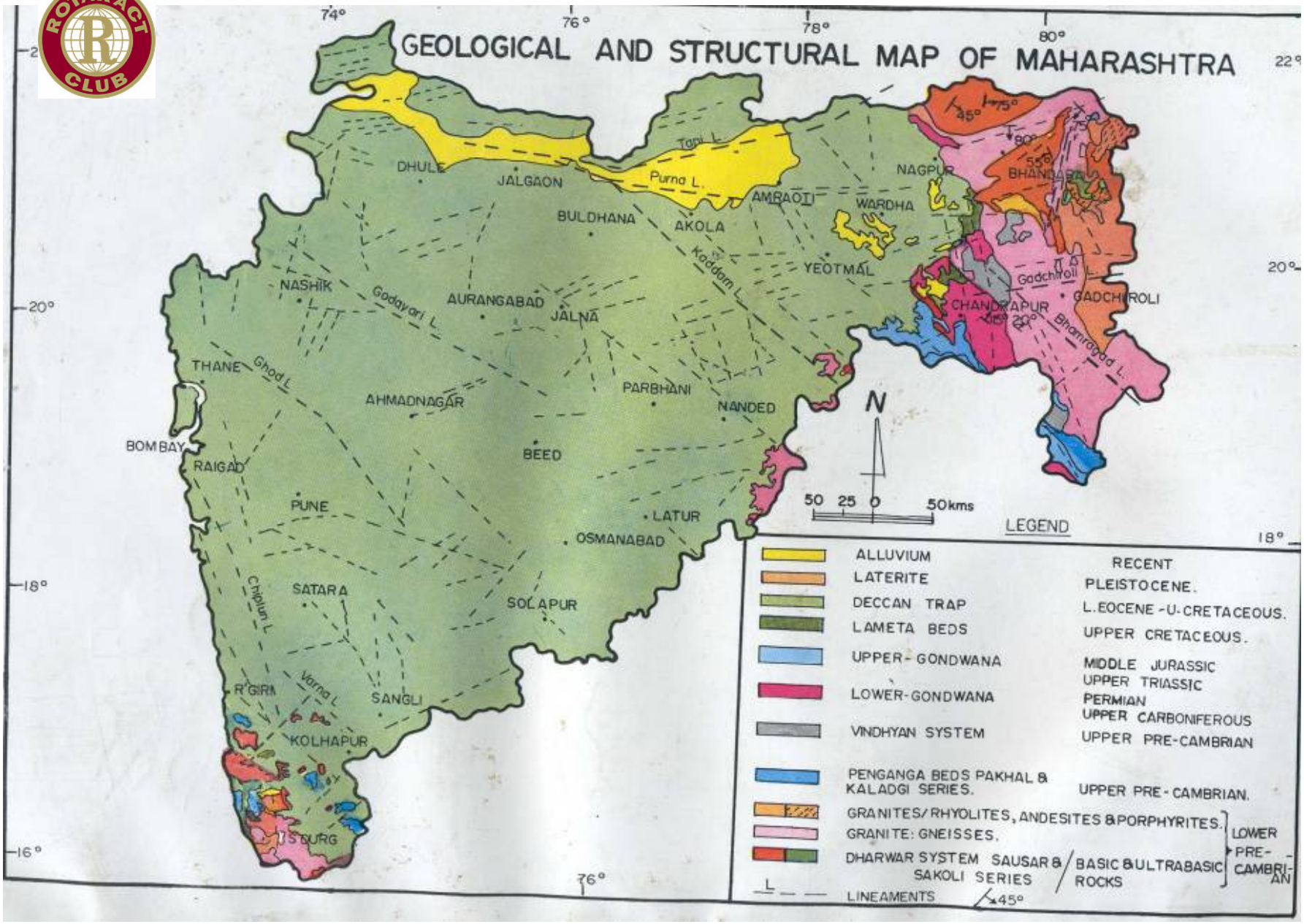
Is Maharashtra Suitable for Recharge?

- Maharashtra, a problematic state in terms of availability of groundwater
- More than 82% of area is occupied by Deccan trap, having low storability

Categorization of Watersheds

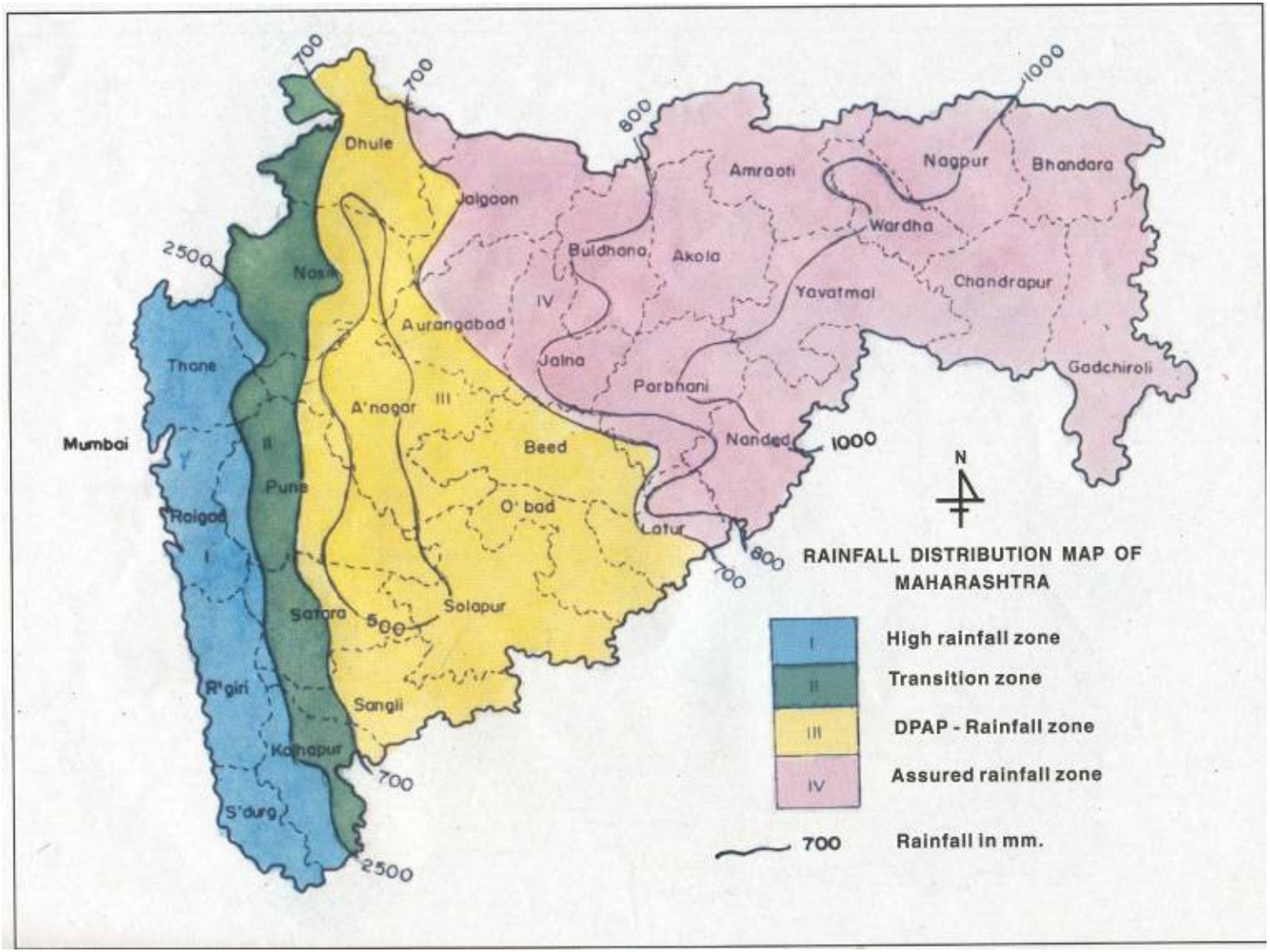


Initiative by: RC Chinchwad – Pune and RC Thane North

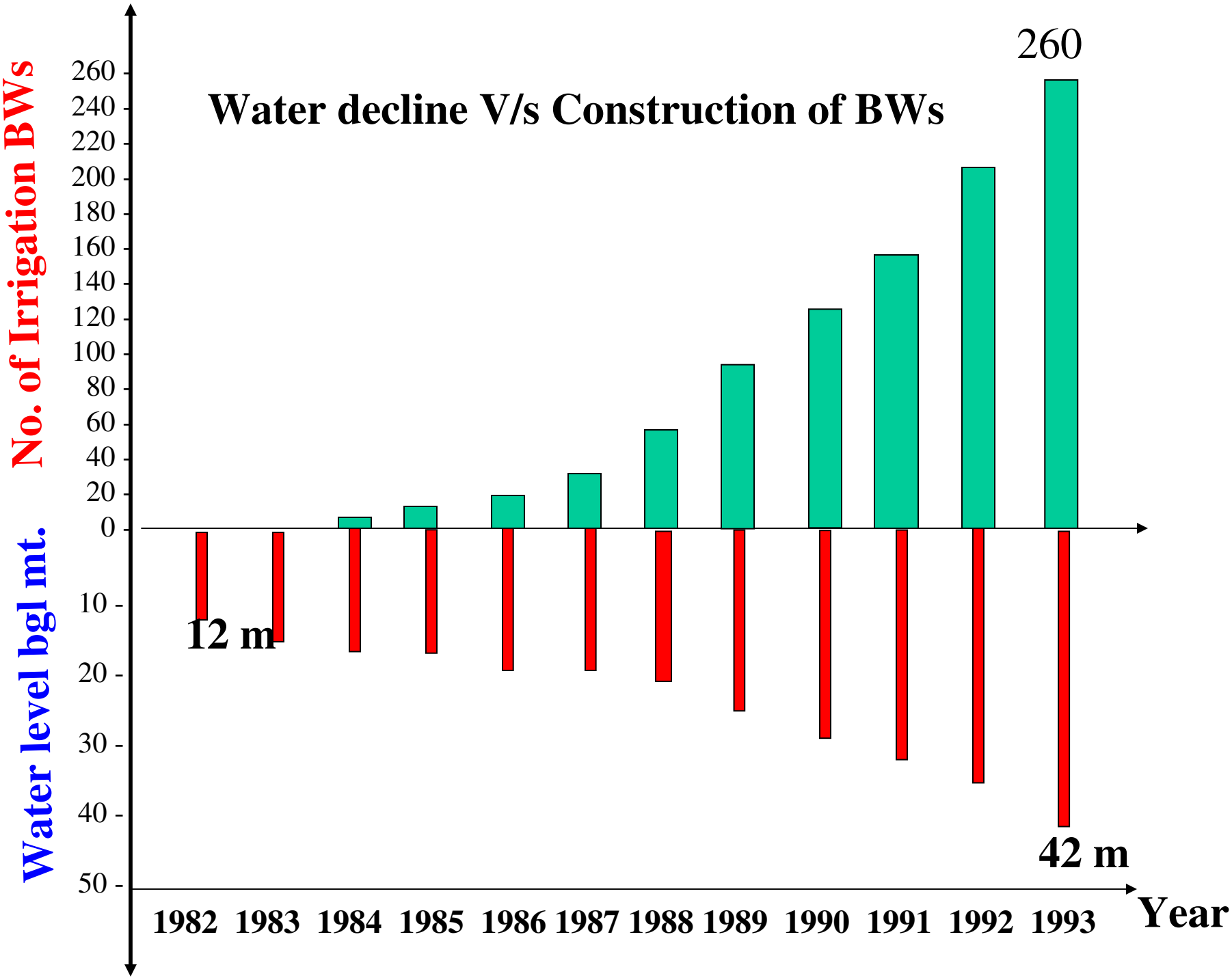


Initiative by: RC Chinchwad – Pune and RC Thane North

Rainfall Distribution Map



Initiative by: RC Chinchwad – Pune and RC Thane North

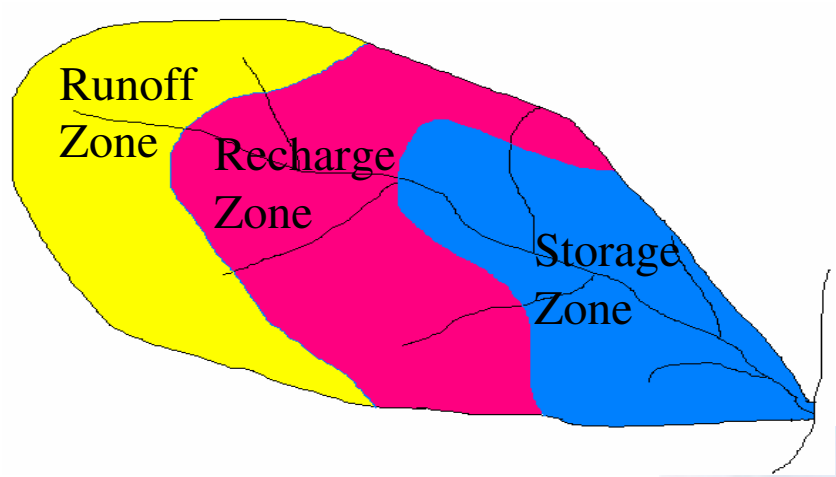

Water decline V/s Construction of BWs
No. of Irrigation BWs
Water level bgl mt.
260
240
220
200
180
160
140
120
100
80
60
40
20
0
10
20
30
40
50
260
12 m
42 m
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
Year

Prior Investigations

- **Rainfall**: Type, intensity, duration, rainy days (50 years of study)
- **Land forms**: Alluvial areas, flood plain, plateau, valley fills etc
- **Slope**: Recharging & discharging points, runoff direction & velocity
- **Geohydrological characters** of rocks, storability, sp.yield, transmissivity etc
- **Remote sensing** and aerial photograph study
- **Awareness** and participation of community

Initiative by: RC Chinchwad – Pune and RC Thane North

Watershed Studies



Initiative by: RC Chinchwad – Pune and RC Thane North

Geomorphological Studies

Aa	Ab	Ac
Ba	Bb	Bc
Ca	Cb	Cc

RUN OFF ZONE – (H D P 28% Runoff)

RECHARGE ZONE – (M D P 44% Recharge)

STORAGE ZONE – (U D P/ V F 28% Storage)

Initiative by: RC Chinchwad – Pune and RC Thane North

Where GW recharge is not needed?

UDP area

Storage Zone

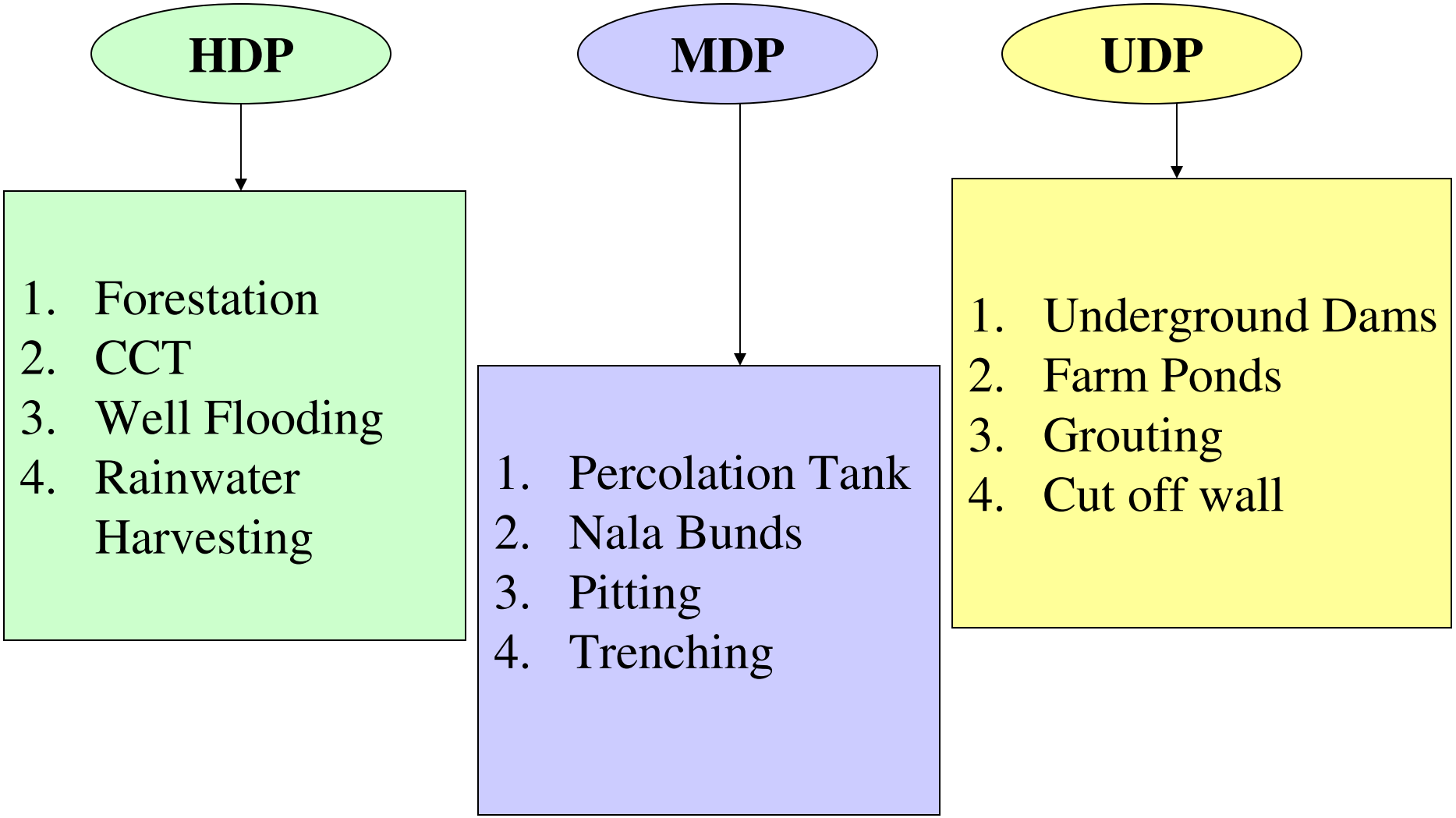
Settling time of water is more

Poor Slope

Fully saturated aquifers

Initiative by: RC Chinchwad – Pune and RC Thane North

Plateau wise Techniques

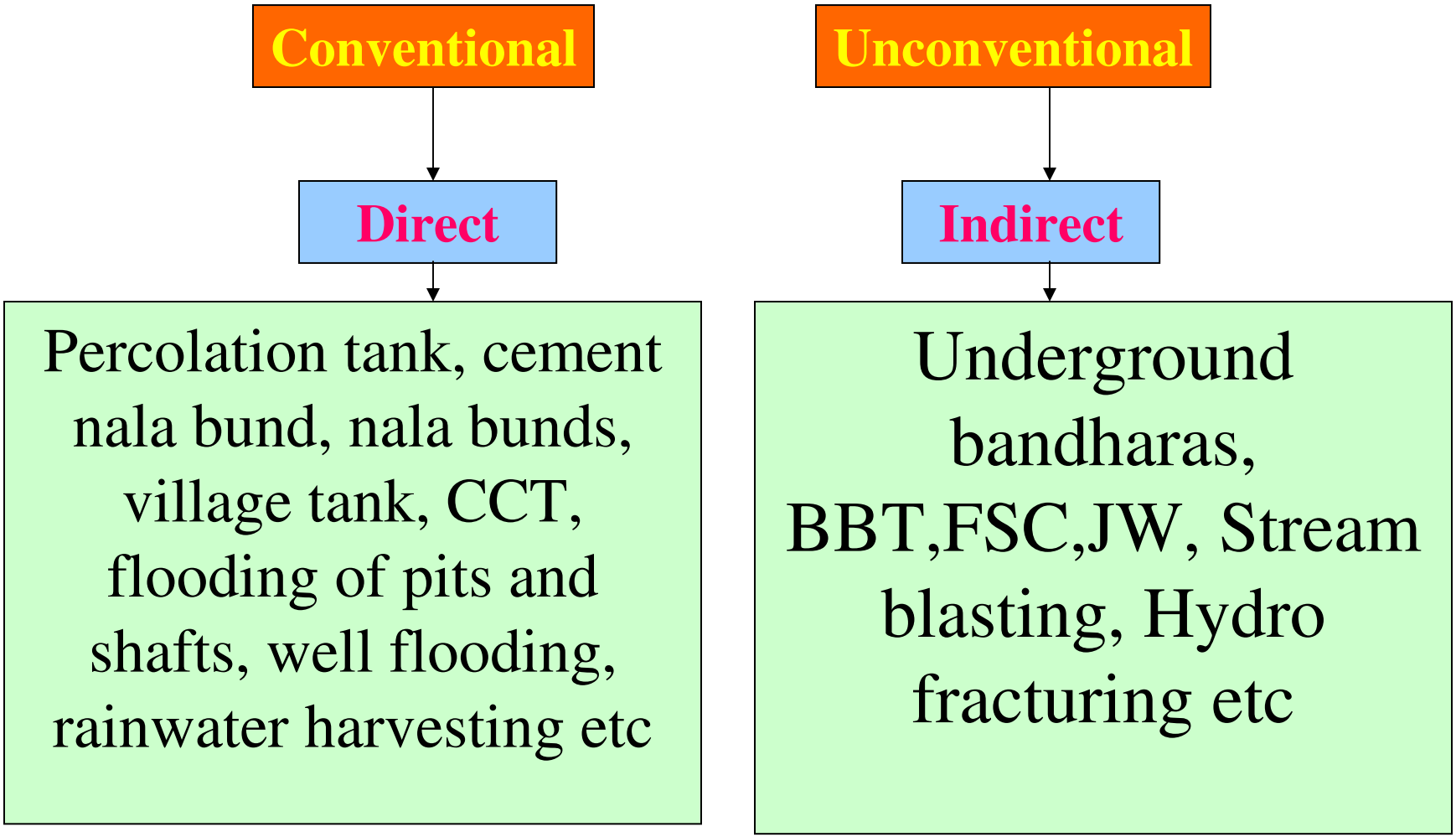


Initiative by: RC Chinchwad – Pune and RC Thane North

Water Availability for Recharge

- Canal water, lift irrigation water
- P.T and check dam
- Run-off (rainfall water)
- Stream water/outflow from aquifer

Various Recharge Techniques



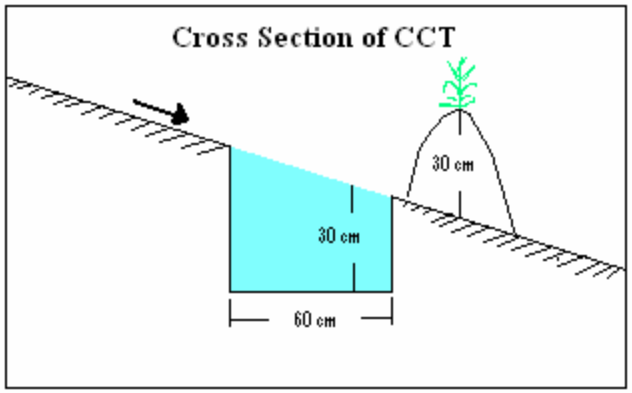
Initiative by: RC Chinchwad – Pune and RC Thane North

Direct methods

- Water from surface source made to percolate in subsurface
- Direct recharge to groundwater
- Avoids evaporation losses
- Suitable for irrigation purposes

Continuous Contour Trenching

- Since 1993..in barren land
- Contour line demarcation from the ridge line
- 60cm wide & 30cm deep trenches
- Dump on the downstream side with plantation



Slope %	Horizontal interval m
0 to 4	10 or 12
4 to 8	8
8 to 15	6
15 to 33	4

Initiative by: RC Chinchwad – Pune and RC Thane North

Continuous Contour Trenching

- Waste land treatment for soil and moisture
- Every drop of rainfall is recharged
- Rise in water table
- Catalyst for environmental cycle

Initiative by: RC Chinchwad – Pune and RC Thane North

Gabion Bandhara

- Loose Boulder structure with the suport of galvanized mesh is called as Gabion Bandhara
- Where nala slope is more than 3% and loose boulder structure are not feasible due to high rainfall, gabion structure are suitable for these sites
- Gabion structures are suitable for black cotton soils or where no other treatments are feasible

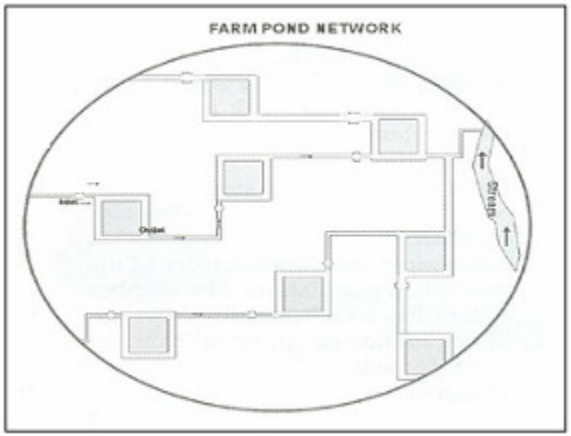
Initiative by: RC Chinchwad – Pune and RC Thane North

Dugout Sunken Pond

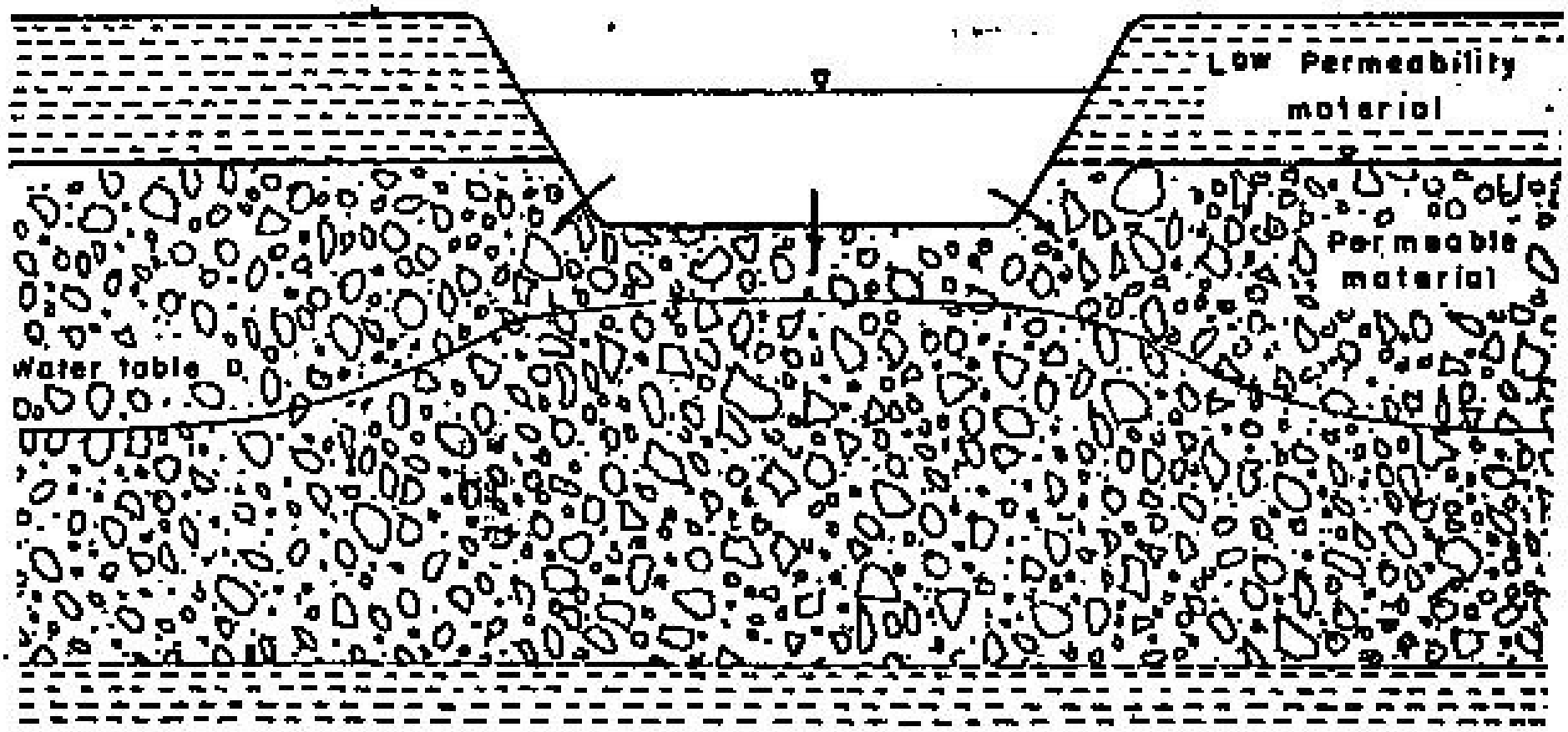
- Excavating the stream bed like pond for storing the water is called as Sunken Pond
- Reduces the velocity of water
- Low cost structure as no construction material is required

Farm Pond

- Used for protective irrigation
- Depth of the farm pond upto 3 m and side slope 1:1.5 for excavation
- Improves the water logging condition of soil and used for fish production

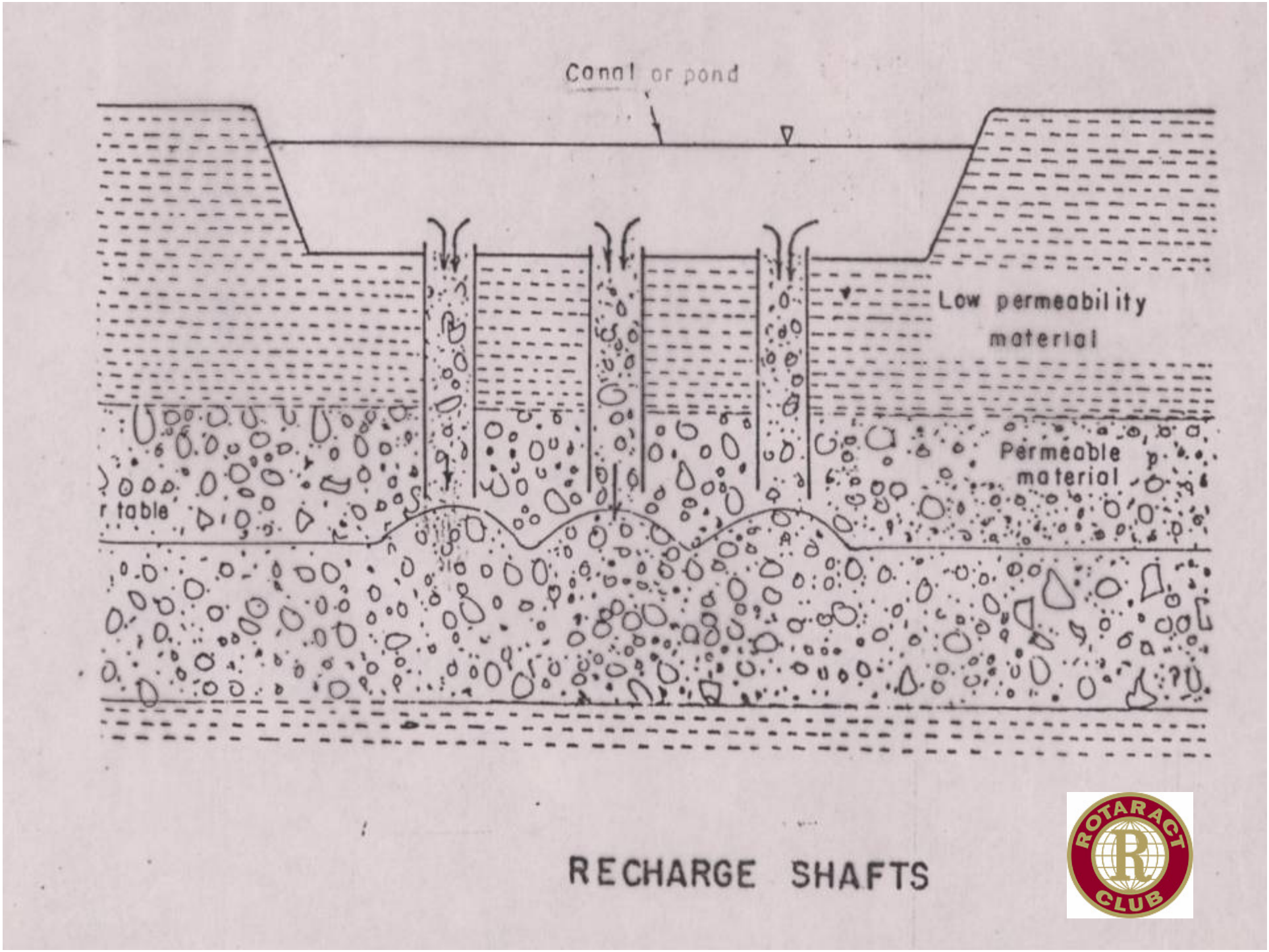


Initiative by: RC Chinchwad – Pune and RC Thane North



Recharge Pit

Initiative by: RC Chinchwad – Pune and RC Thane North



RECHARGE SHAFTS

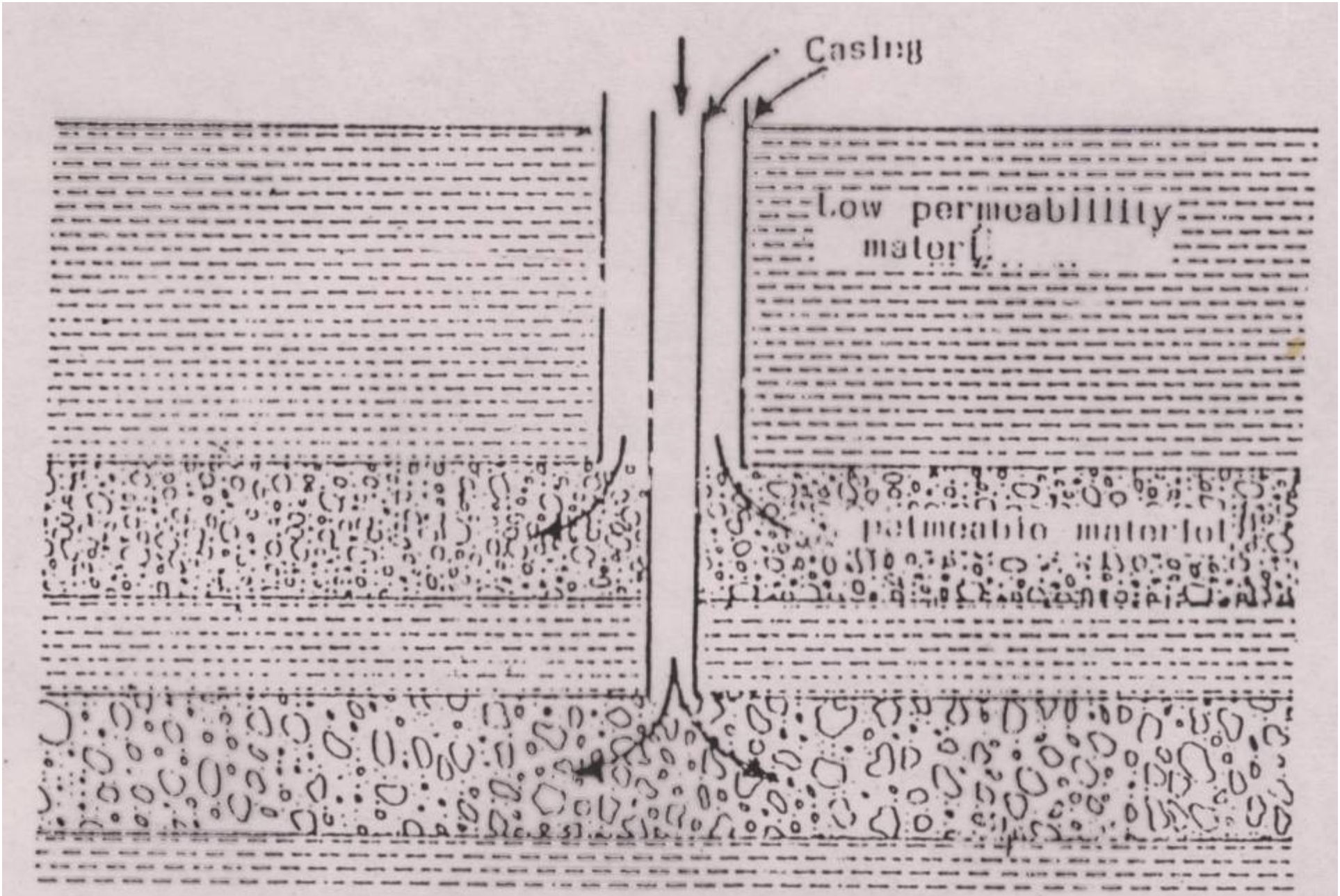


FIG. 4 (A) INJECTION WELL TECHNIQUE

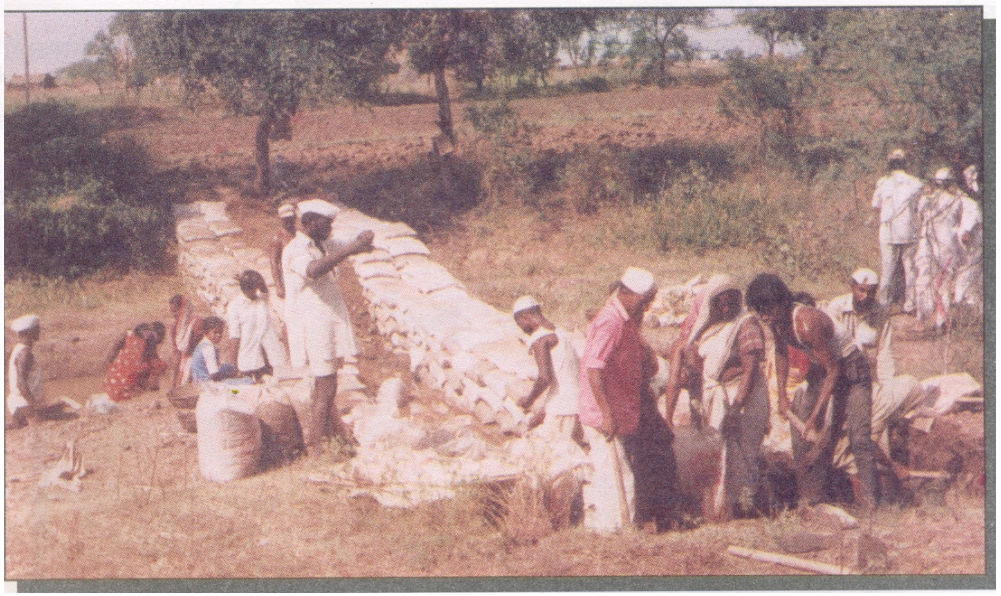
Gully Plugs

* Earthen Gully Plug * Stone Gully Plug

- Velocity control, soil erosion control, moisture conservation and development of vegetative barriers
- Outlet for extra water and vegetative support on downwards sides

Vanarai Bandhara

Check of post monsoon flow of water in the streams by cement bags



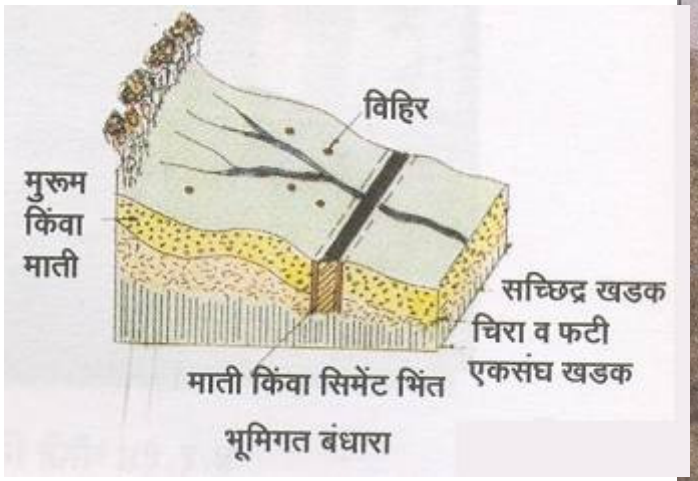
Initiative by: RC Chinchwad – Pune and RC Thane North

Indirect methods

- Transfer of surface water is induced by human activity to recharge aquifer. Effected by locating GW abstraction well near influent seepage.
- Small scale, with localized effect
- Mainly used for strengthening of drinking water sources
- Suitable for hardcore villages
- It is just like creating an island of water in a monolithic rock

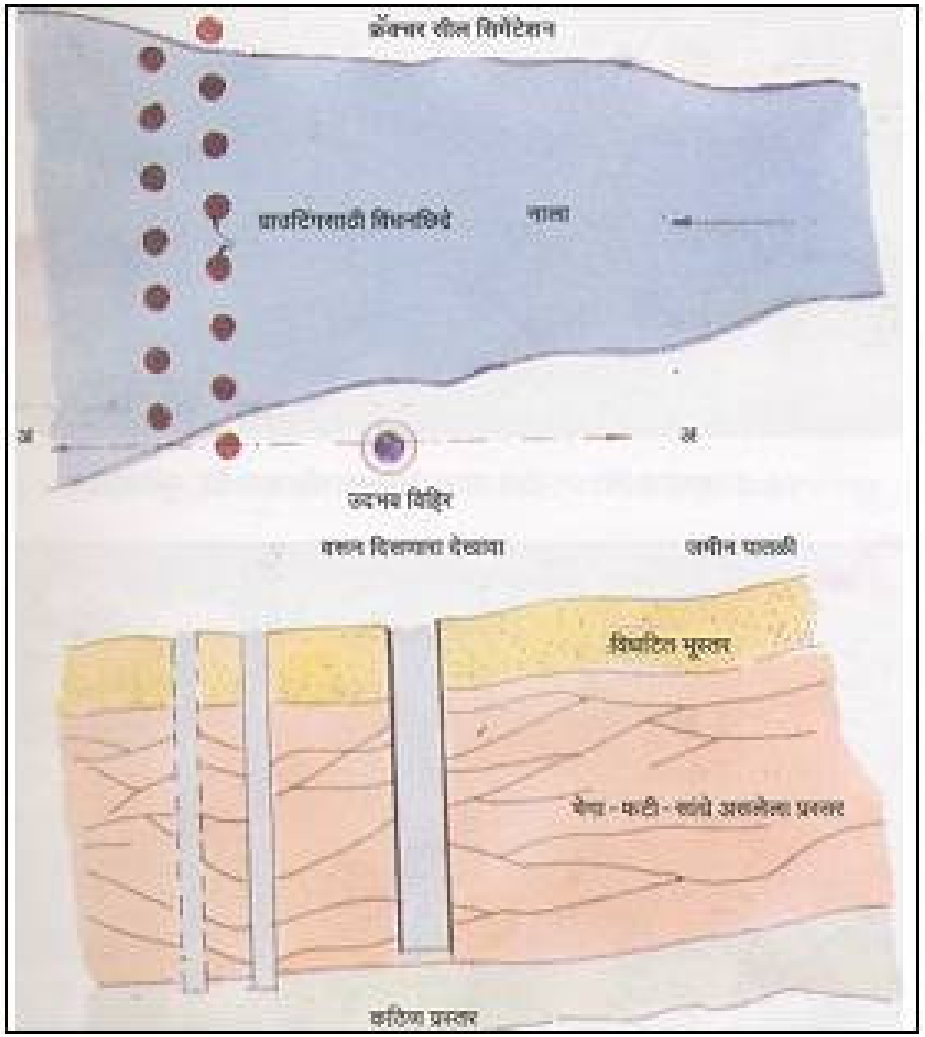
Underground Bandhara

- The structure is aimed at controlling the groundwater discharge with the help of underground barrier
- The trench is excavated across the nala bed upto the depth of aquifer bottom and filling the trench with impervious material



Fracture Seal Cementation

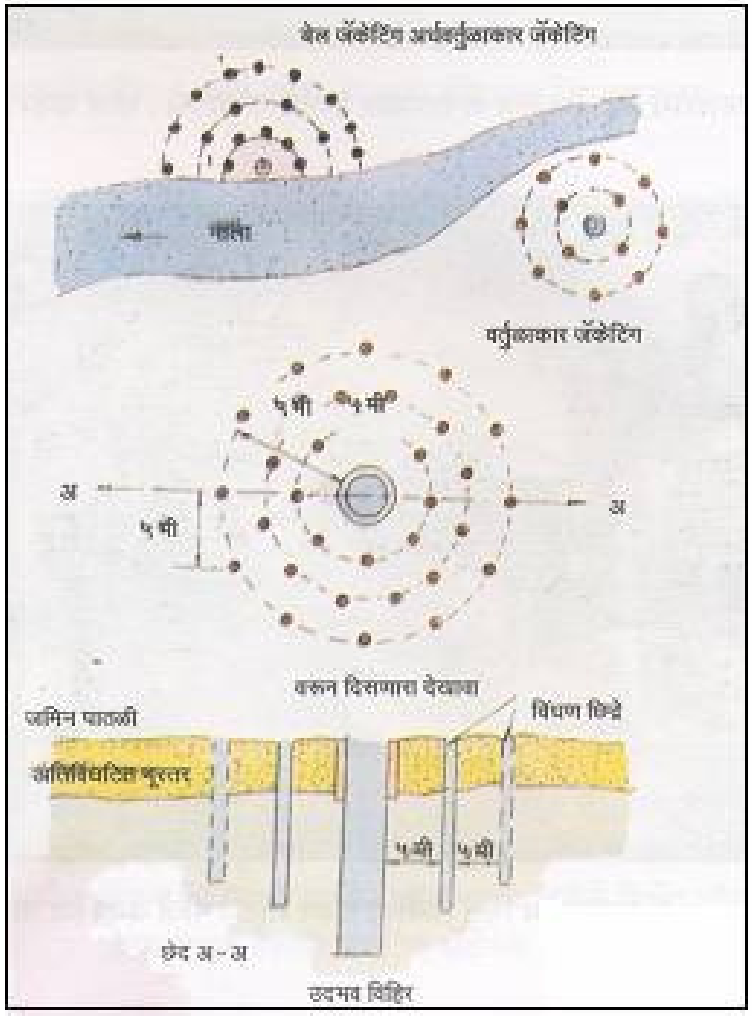
- Control of leakage of groundwater from aquifer
- The locations of seepages and springs are closed with the cementing material (mechanically / cement slurry injected under pressure)



Initiative by: RC Chinchwad – Pune and RC Thane North

Jacket Well

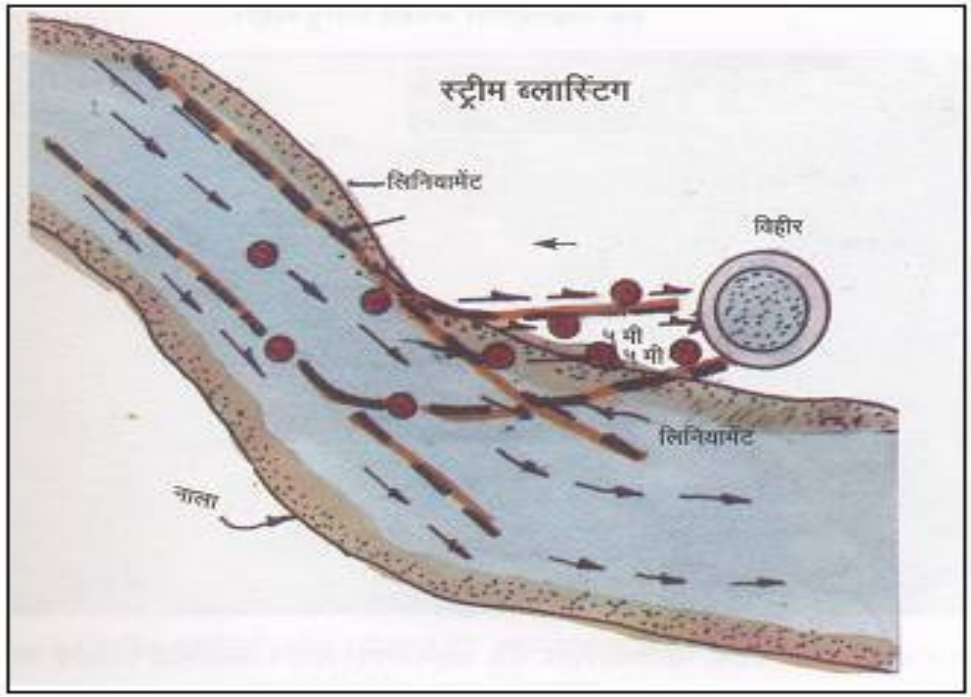
- Used for improvement of hydraulic of dug well,
- Shallow bore wells are drilled on a circular interval and blasted with special gelatin and detonators
- It produces a fracture porosity creating more storage



Initiative by: RC Chinchwad – Pune and RC Thane North

Stream Blasting

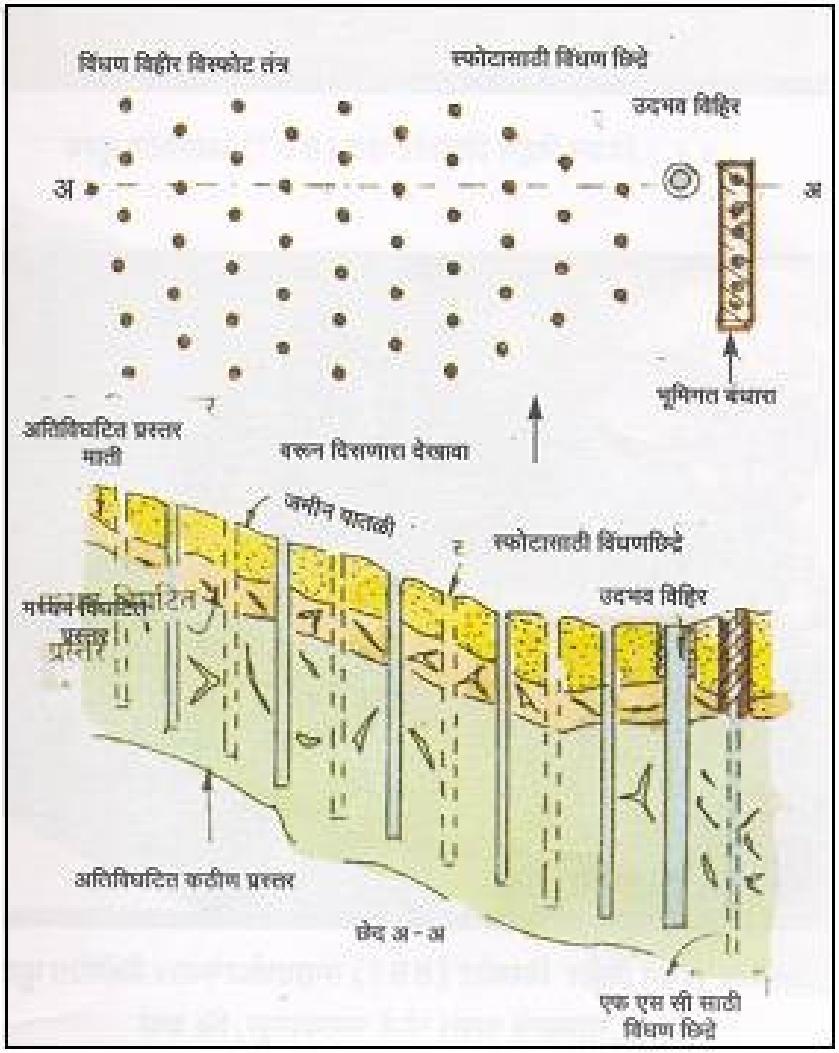
- Shallow bores are drilled in the direction towards the well site
- Fracture permeability is created channeling the water from streambed



Initiative by: RC Chinchwad – Pune and RC Thane North

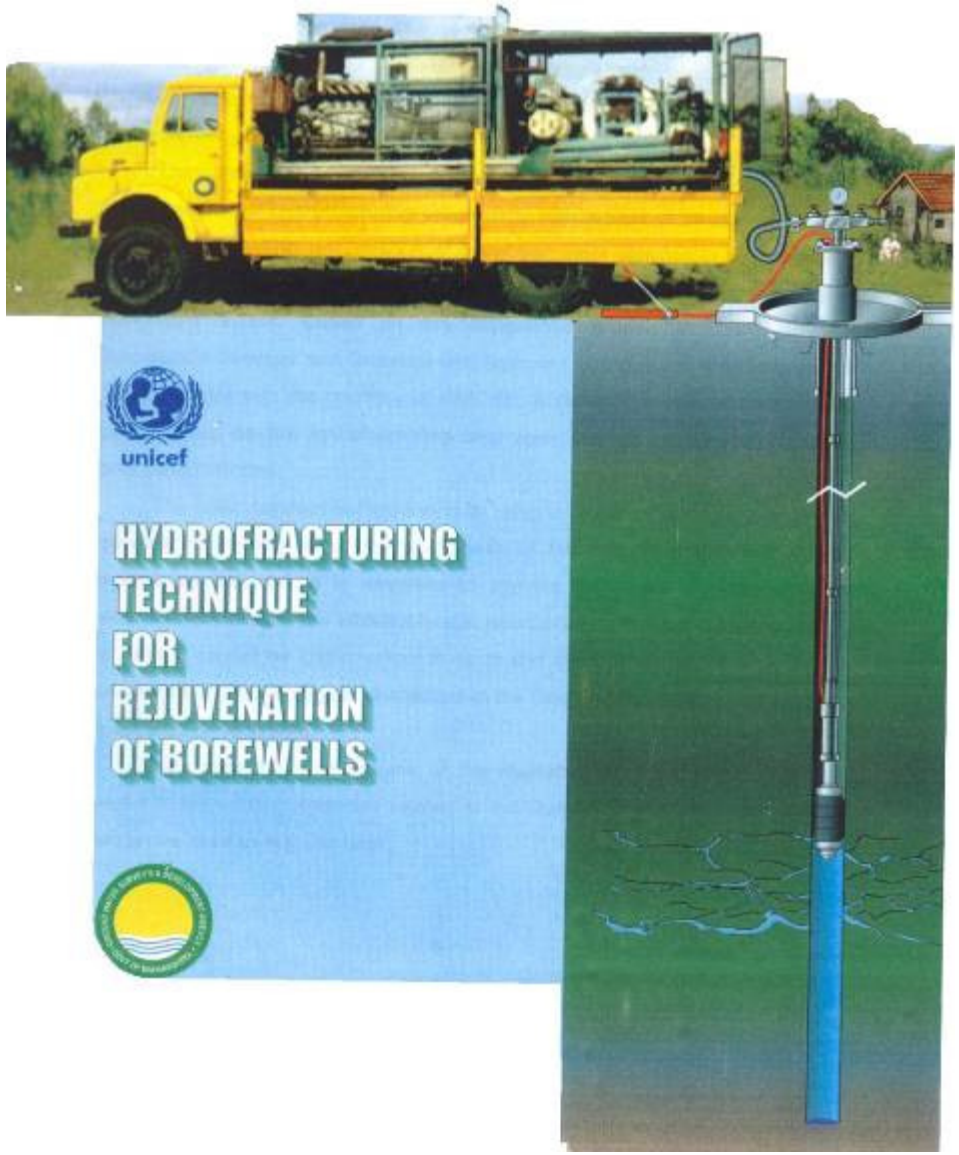
Bore Blast Technique

- Shallow bore wells are drilled in a network of a smaller area
- The bores are blasted with the help of specialized explosives
- Creates fracture porosity



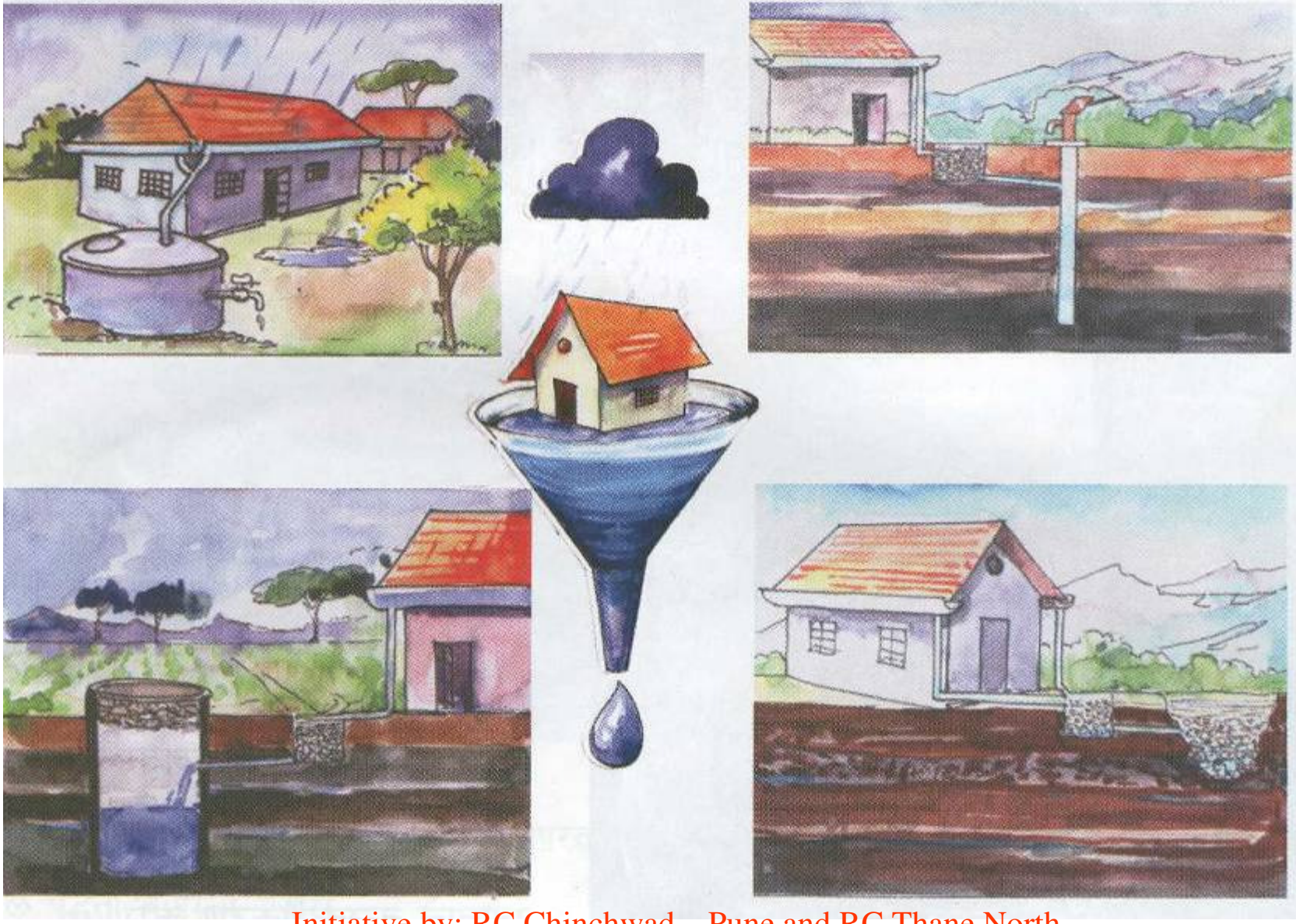
Initiative by: RC Chinchwad – Pune and RC Thane North

Hydro fracturing



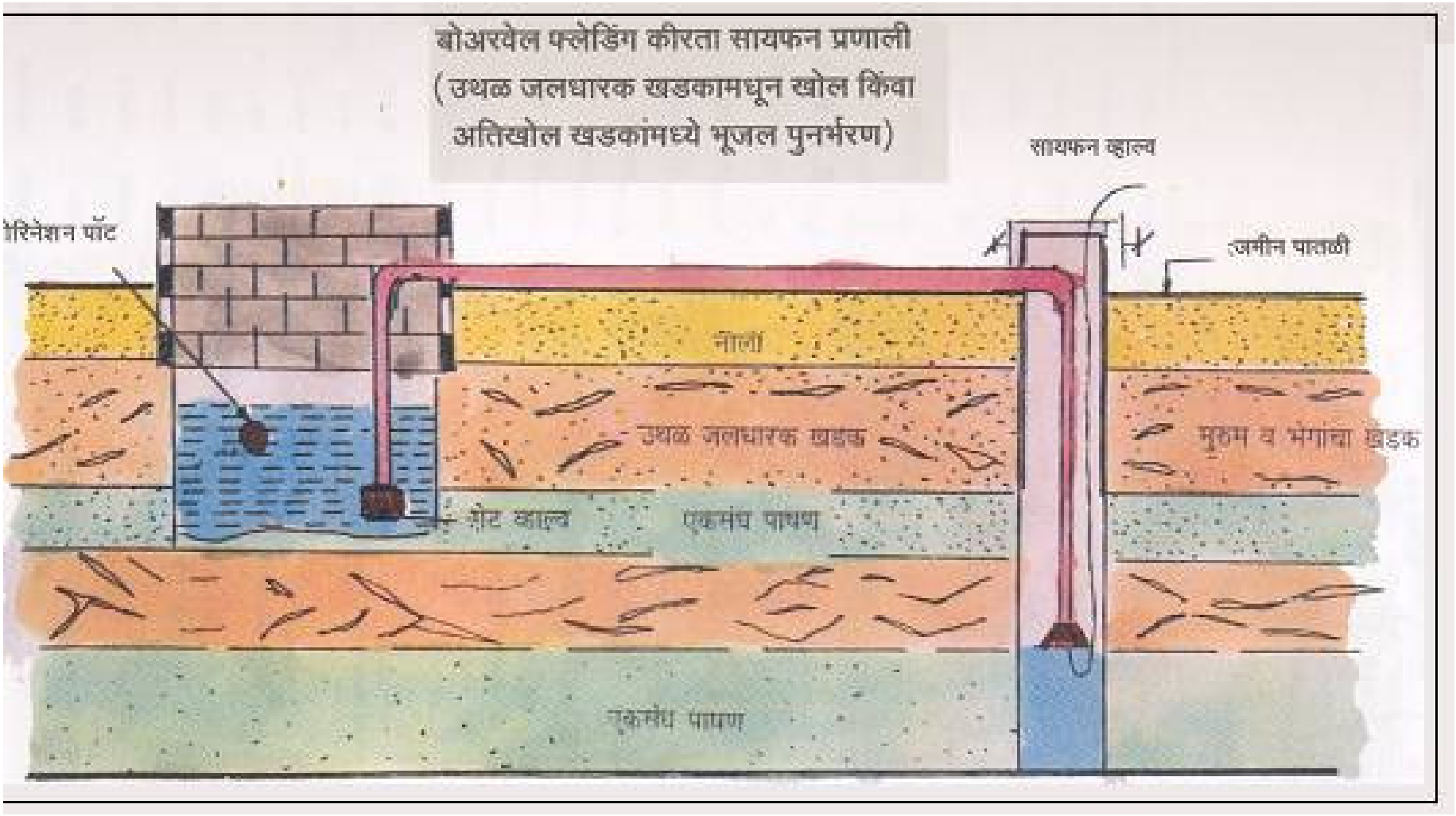
Initiative by: RC Chinchwad – Pune and RC Thane North

RAIN RATER HARVESTING STRUCTURES



Initiative by: RC Chinchwad – Pune and RC Thane North

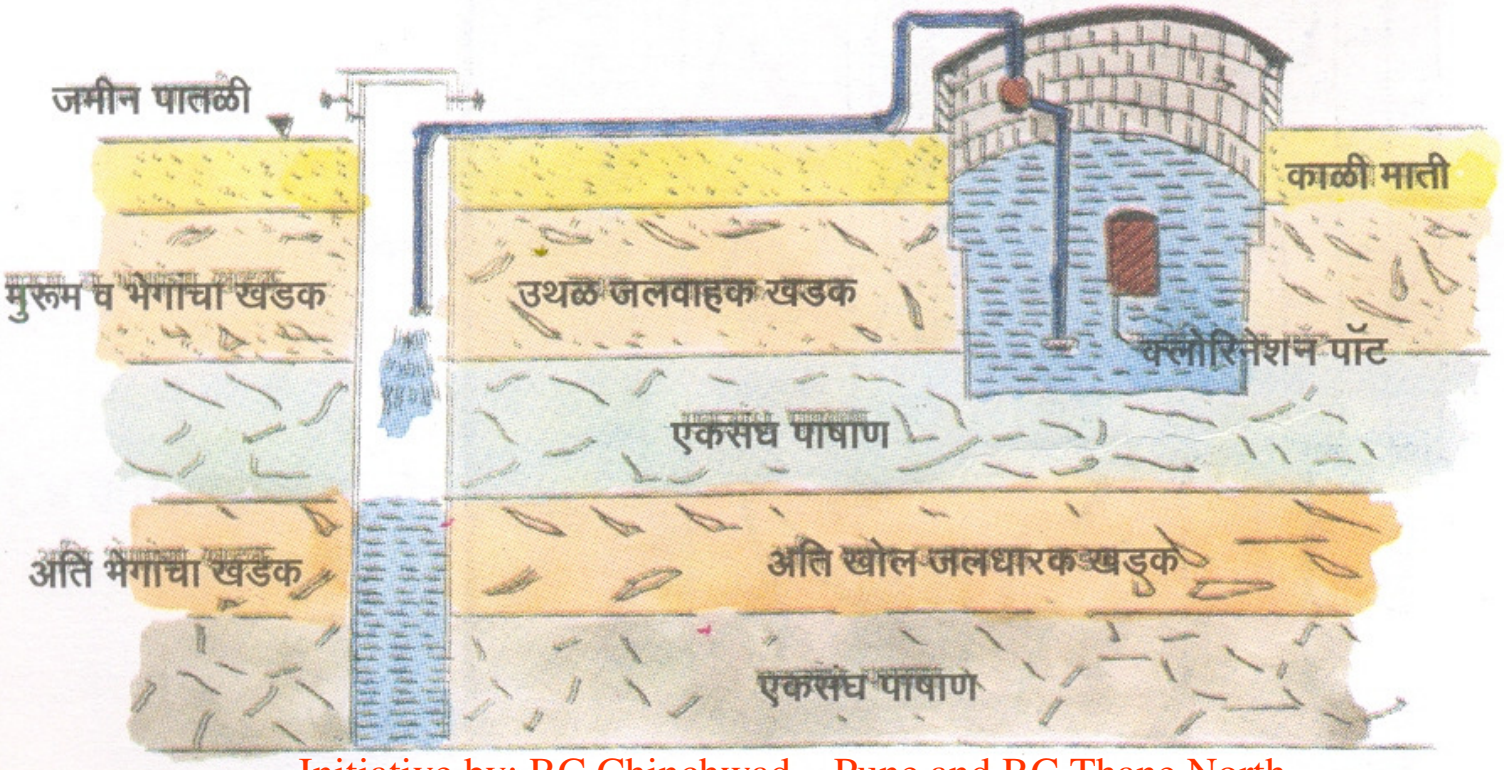
Well flooding



Initiative by: RC Chinchwad – Pune and RC Thane North

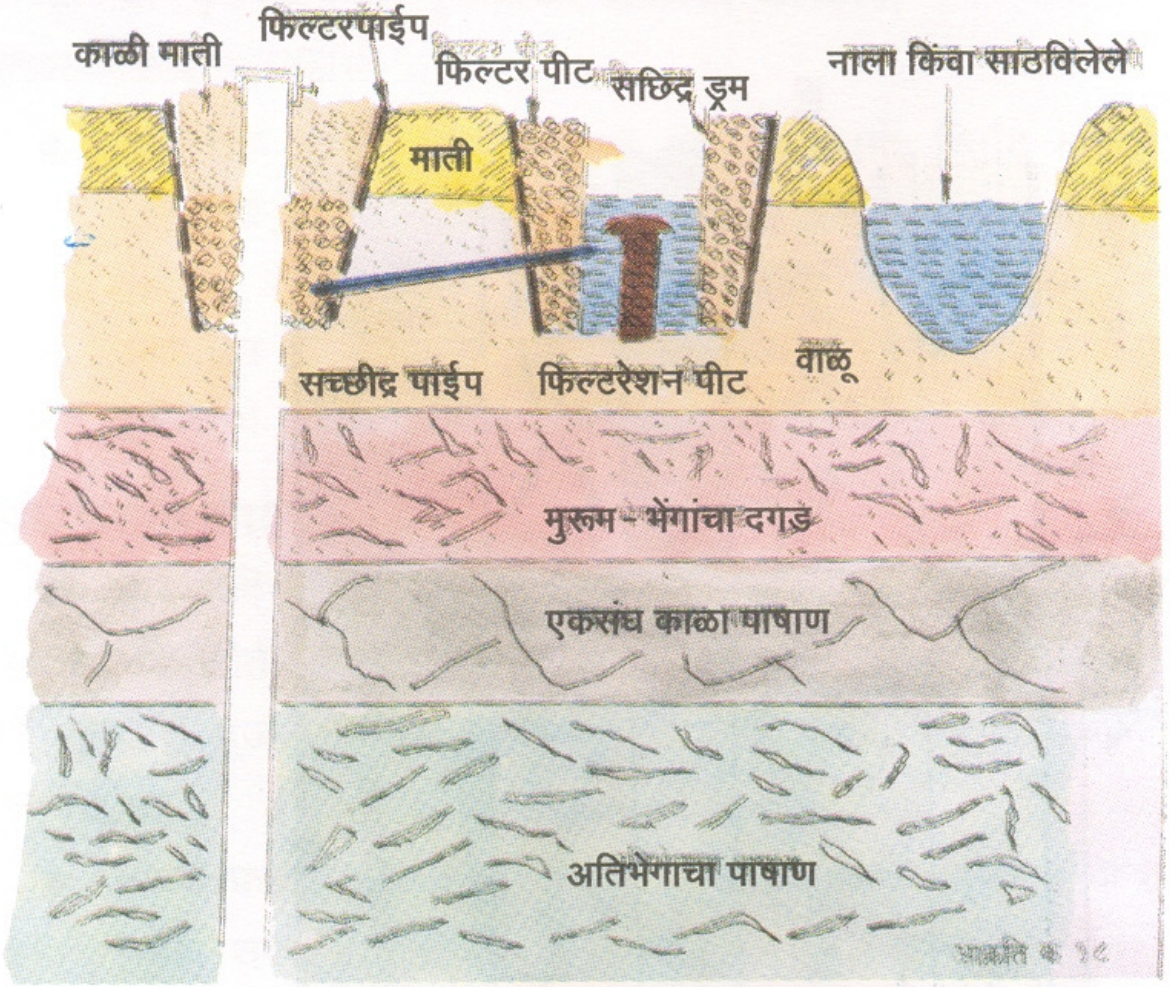
पंप वापरुन बोअरवेल फ्लडींग

पंप वापरून बोअरवेल फलडिंग

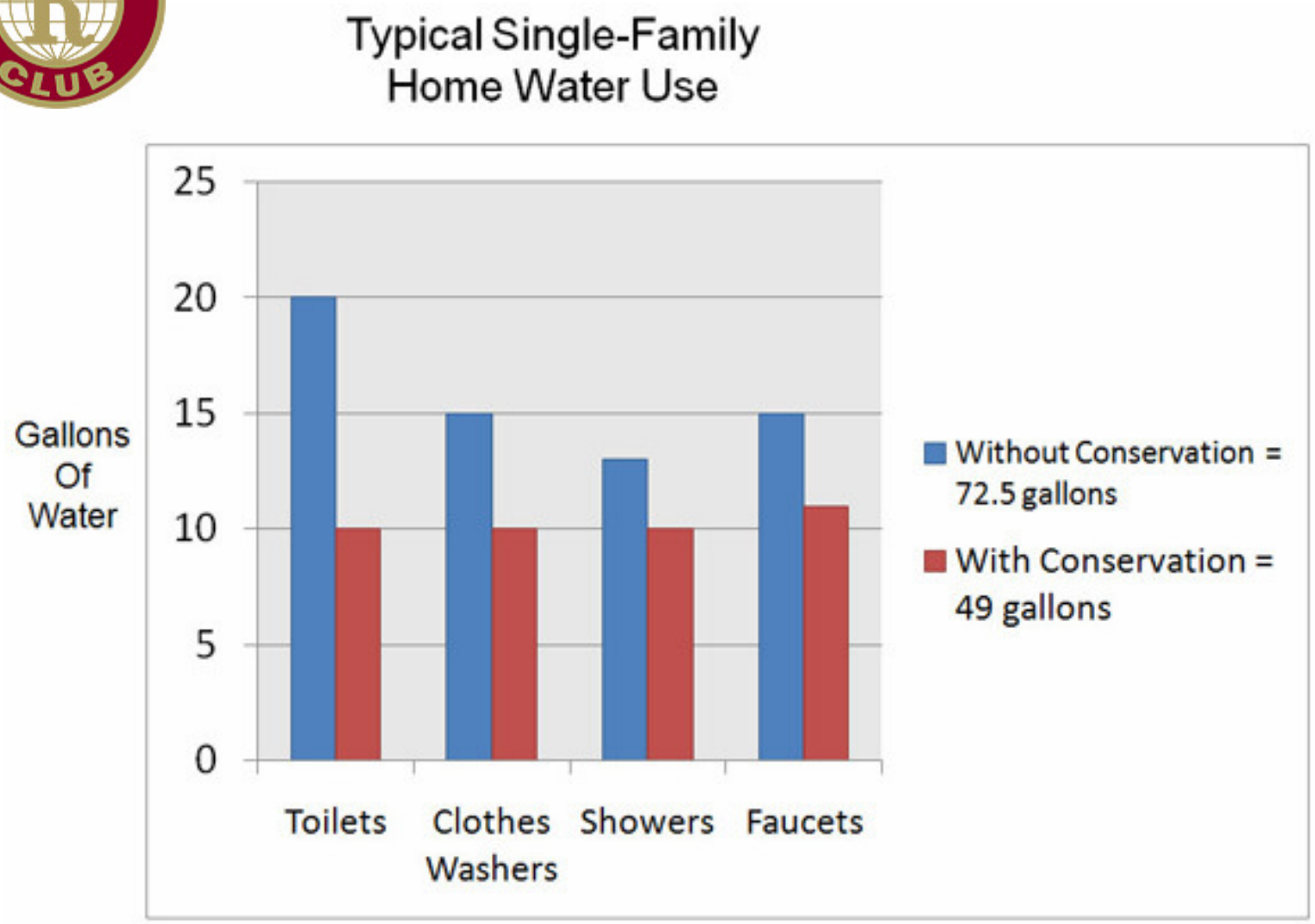


Initiative by: RC Chinchwad – Pune and RC Thane North

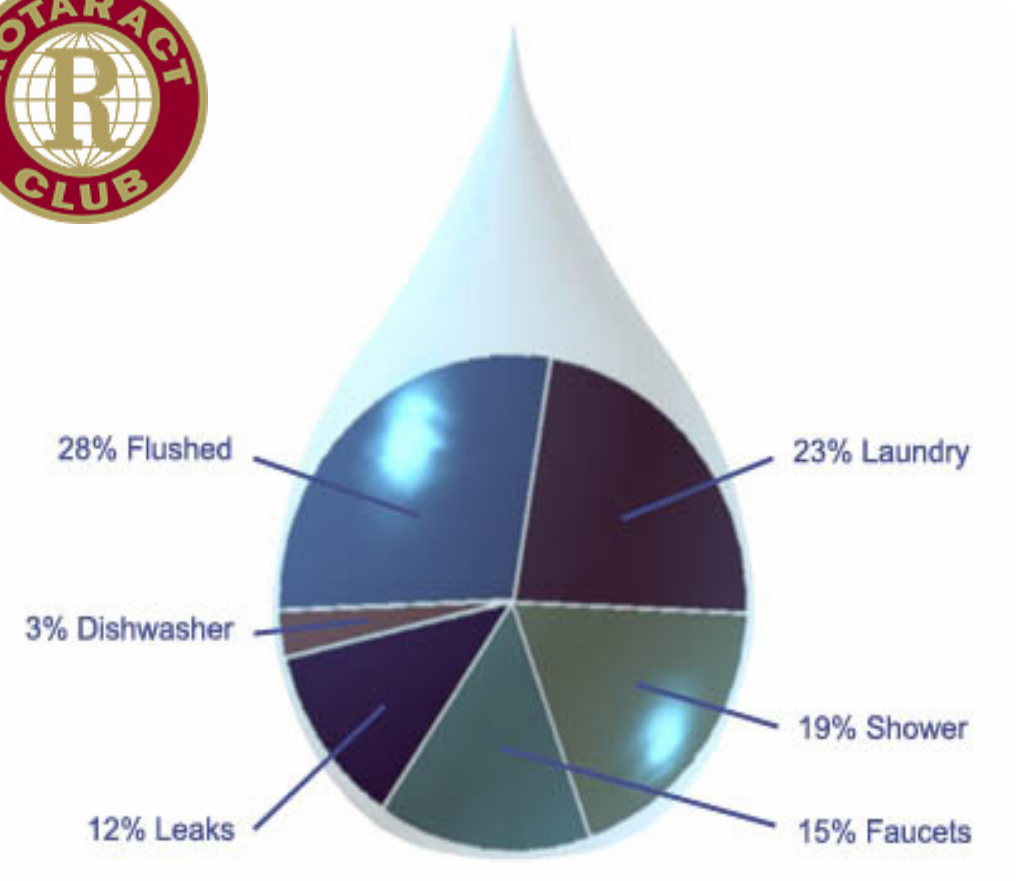
फिल्टर पीटच्या माध्यमातून गुरुत्वाकर्षणाने फ्लडींग



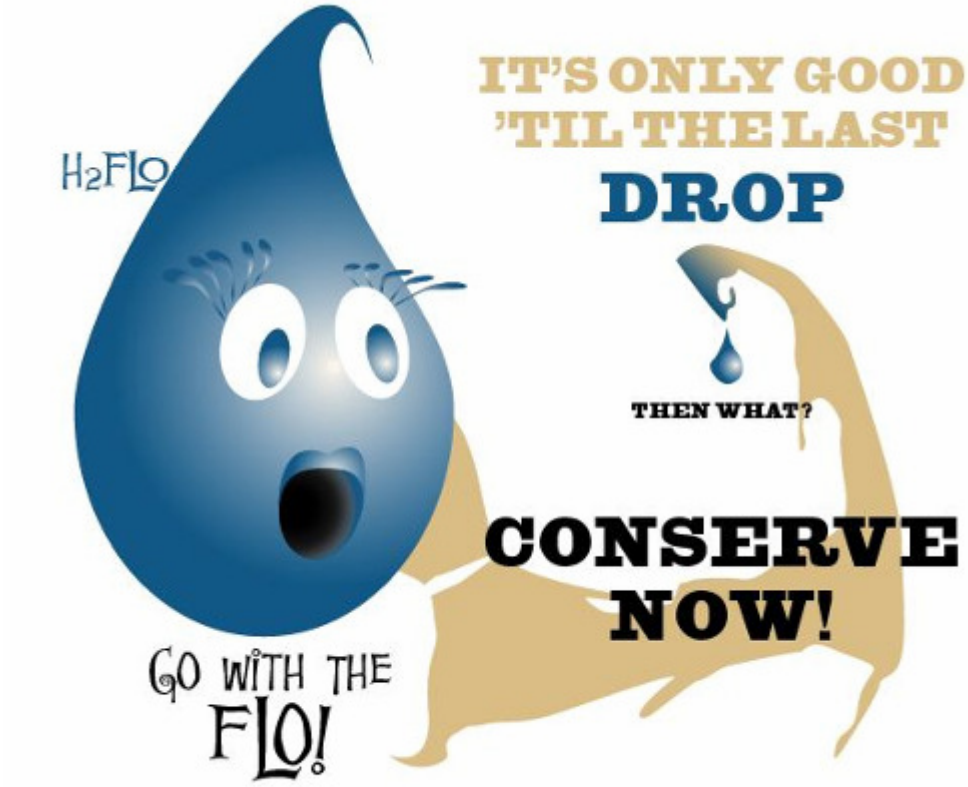
Initiative by: RC Chinchwad – Pune and RC Thane North

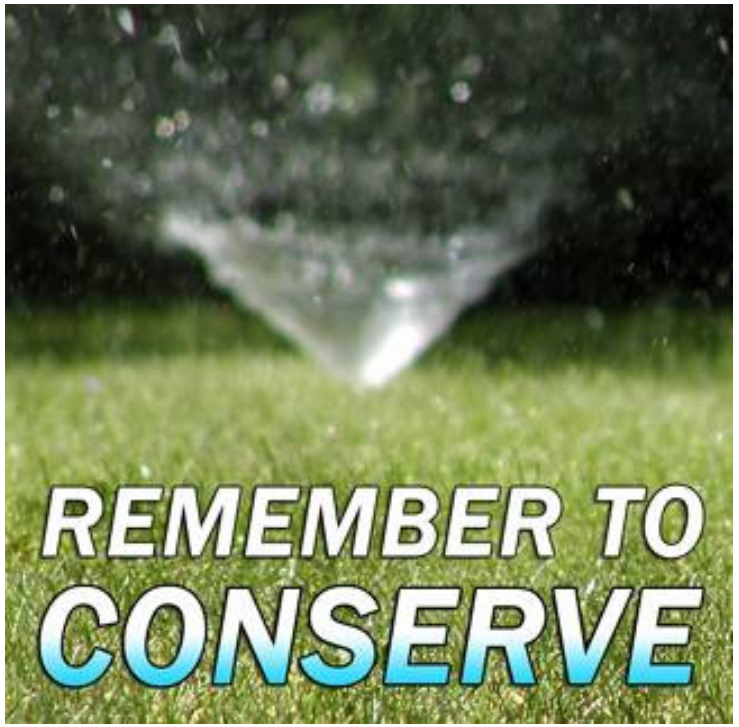


Initiative by: RC Chinchwad – Pune and RC Thane North



Initiative by: RC Chinchwad – Pune and RC Thane North





Initiative by: RC Chinchwad – Pune and RC Thane North

Every DROP counts

Initiative by: RC Chinchwad – Pune and RC Thane North

Manage your watershed
... provide right quality of water
... in right quantity
...at right time
...in right place
...through involvement of village community

Initiative by: RC Chinchwad – Pune and RC Thane North

Thanks

Initiative by: RC Chinchwad – Pune and RC Thane North