NEED AND PLANNING FOR RAIN WATER HARVESTING & ARTIFICIAL RECHARGE TO GROUND WATER

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This Presentation Contains

- Prevailing situation of water
- Basic Principles RWH
- Need & Planning of RWH
- Methods of RWH
- Type of RWH structures
- Design of RWH structures
Global Water Scenario

Total 14000 Million BCM

OCEAN WATER 97.3%

FRESH WATER 2.7%

WATER SOURCES

- GROUND WATER (< 800m deep) 10%
- GROUND WATER (800-4000m deep) 13%
- OTHER SOURCES 2%
- POLAR ICE & GLACIER 75%
INDIA VS. WORLD

POPULATION

- HUMAN : 18%
- LIVESTOCK : 15%
- LAND RESOURCES : 2.6%
- WATER RESOURCES : 4%
- UTILISATION : 13%
Spatial and Temporal Variation of Rainfall in INDIA

<table>
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<tr>
<th></th>
<th>mm</th>
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<tr>
<td>Average</td>
<td>1,170</td>
<td></td>
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<tr>
<td>Max.</td>
<td>11,000</td>
<td>Meghalaya</td>
</tr>
<tr>
<td>Min.</td>
<td>100</td>
<td>Western Rajasthan</td>
</tr>
</tbody>
</table>

Precipitation during June to September  3000 BCM
Temporal Variation of Rainfall

Rainfall in mm

0 100 200 300 400 500 600 700 800 900 1000

Winter Monsoon (Jan-Feb) Pre Monsoon (Mar) May Monsoon (Jun-Sep) Post Monsoon (Oct-Dec)

All India
High Variability in Space and Time (> 1000 cm in north eastern region to <10 cm in parts of Rajasthan)

75% of annual rainfall in four months (June-Sept)
ANNUAL WATER AVAILABILITY IN INDIA

ESTIMATED ANNUAL PRECIPITATION (INCLUDING SNOWFALL) : 4000 Km$^3$

AVERAGE ANNUAL POTENTIAL (IN RIVERS) : 1869 Km$^3$
(after accounting for losses in the form of evaporation etc.)

ESTIMATED UTILISABLE WATER : 1123 Km$^3$
(the available water cannot be fully utilized due to topographical and hydrological constraints and the need for allowing certain amount of water to flow in the river for maintaining the river regime.)

SURFACE : 690 Km$^3$
Current Use : 450 Km$^3$ (62.21%)

GROUNDWATER : 433 Km$^3$
Current Use : 243 Km$^3$ (56%)

WATER DEMAND (NCIWRD)

\[
\begin{array}{|c|c|c|c|}
\hline
\text{YEAR} & \text{2010} & \text{2025} & \text{2050} \\
\hline
\text{IRRIGATION} & 557 & 611 & 807 \\
\text{DRINKING WATER} & 43 & 62 & 111 \\
\text{INDUSTRY} & 37 & 67 & 81 \\
\text{ENERGY} & 70 & 70 & 111 \\
\text{OTHERS} & 54 & 70 & 111 \\
\text{TOTAL} & 843 & 1180 & \\
\hline
\end{array}
\]
Looming Water Scarcity in India—Population Explosion
GLOBAL VS. INDIA'S PER CAPITA WATER AVAILABILITY

The graph compares the per capita water availability in various countries with the global average. Brazil has the highest per capita water availability at 41865 M³/year, followed by Australia at 21764 M³/year. The global average is represented by the red line. India and Pakistan have the lowest per capita water availability, with 1545 M³/year and 1396 M³/year respectively.
India : 61% (2009)  62% (2011)
GW Development - Status

- Delhi, Haryana, Punjab, Rajasthan, UT of Daman & Diu & Pondicherry >100%
- Gujarat, Tamil Nadu 75-100%
- Karnataka, Uttarakhand, U.P., Lakshadweep 50 - 75%
- Rest of India < 50%
There is a water crisis today.

But the crisis is not about having too little water to satisfy our needs.

It is a crisis of managing water so badly that billions of people - and the environment - suffer badly.
The owner of the land also owns the groundwater beneath it, equal to a de facto private good:

court precedents there is the doctrine that holds that a society’s water resources are held in ‘public trust’ by the state.

Accordingly, there may be an obligation of the state and its appointed agencies to restrict individual right-holders’ entitlements after due legislative process.

Deemed to be acting as a trustee, the state also cannot grant exclusive rights over water to individuals such as landowners as this doctrine protects the public’s right of access.

It has been interpreted so that the public has a right to a clean environment, and to expect the state to fulfil certain duties including to exercise authority and to allocate and manage resources such as water, in the public’s general interest.

Among the doctrine’s implications in India, as interpreted by the Supreme Court, are that the state cannot abdicate responsibility over natural resources even in the absence of enacted legislation.

hydrological cycle should guide regulation of common water sources (M.C. Mehta v. Kamal Nath, 1997).
Water haves and have-nots will lead to social tension
California based hydrologist Water Scientist Jay Faminglietti
Times of India 1-5-2016

• Political unrest driven in part by food shortages caused by lack of water

• Increasing awareness of the prevailing critical situation—First Step
• Conservation and water use efficiency—second step

• Regional Governance in tune with the world’s current understanding how water occurs in the world i.e. water laws and associated rights are century old laws
• India should follow the technological innovations like micro irrigation-Israel, policy -Australia, to follow in Harsh conditions

• Changes in climate changes – change in water cycle so is availability of fresh water---floods and droughts are inevitable

• Haves and have nots will lead to social tension
Sustainability can be attained by Policy Embracing technology managerial adaptations
Stake Holders for Sustainable Management

- **Stake holder 1**: General Public, including those highly educated citizens, working in a highly specialized profession. They need to be sensitized on the different issues of sustainable development as a holistic approach.

- **Stake holder 2**: Policy makers and Planners, including politicians. They may need to be sensitized and educated about the holistic understanding of any of the issues and effective implementation of planning and the process to achieve a common goal.

- **Stake holder 3**: Academicians and scientists who bridge the gap between stakeholders 1 & 2. They need interaction among themselves and with other stakeholders. They need to share the common goal for sustainable development education.
Management of water/ground water resources

- Aquifer Mapping and Management
- Artificial recharge to Ground water
- Water conservation in all sector
- Exploiting advanced desalinization
- Conjunctive use of surface and ground water
- Regulations
- Virtual water trade
- Watershed management
- Waste Water Treatment and Re-Use
- Groundwater quality management
- Awareness programmes
- Ground Water governance
- GW data base management
Rain Water Harvesting & Artificial Recharge

• RWH is the technique of collection and storage of rain water at surface or in sub-surface aquifers, before it is lost as surface runoff.

• Artificial Recharge is a process by which the GW reservoir is augmented at a rate exceeding that under natural conditions of replenishment through suitable Artificial structures.
WHY AR

FLOODS IN RAINY SEASON.
- DRAUGHT LIKE CONDITIONS IN SUMMER
- WATER WASTED-RUN OFF INTO SEA
- SCARCITY OF WATER ALL THE SEASONS –SOME PARTS OR OTHER
- DUG WELLS DRY-DEEP WATER LEVELS
- INCREASED BORE WELLS IN NUMBER, DEPTH
- CRISIS IN AGRICULTURE & FARMERS DEATHS
- DECREASE IN FOREST, VEGETATIVE COVER
- SILTATION OF ALL DRAINS AND PONDS
Crisis

• Indiscriminate GW use has led to:
    • Decline in GW levels
  – Deterioration in GW quality.
  – Sea water ingress & intrusion in coastal areas.
ADVANTAGES

• Ground Water reservoirs are environment friendly and economically viable
• Free from adverse effects of inundation of large surface area.
• No loss of cultivable land
• No displacement of population
• Minimum or no evaporation losses
• No adverse effects like earthquakes
• No gigantic structures are needed to store water.
• No canal network is required for transport
ADVANTAGES

• The existing deeper water levels can be substantially raised.
• Elimination of evaporation losses and other undesirable effects associated with surface reservoirs
• Reduction in lifting cost, Saving in Energy For1M Rise 0.4kw
• Substantial quality improvement
• Reduction in water conveyance cost
• Mitigate the effects of drought & achieves drought proofing
  – Reduces the runoff which chokes the storm water drains.
  – Flooding of roads are reduced
  – Soil erosion will be reduced.
POTENTIAL AREAS FOR ARTIFICIAL RECHARGE

- Areas where ground water levels are declining on regular basis.
- Areas where substantial amount of aquifer has been de-saturated.
- Areas where availability of ground water is inadequate during lean months.
- Areas where due to rapid urbanization, infiltration of rain water into sub-soil has decreased drastically and recharging of ground water has diminished.
- Areas with Quality Problems.
POINTS TO BE CONSIDERED FOR TAKING UP AR IN AN AREA

1. NATURE, THICKNES & CHARECTORS OF THE TOP SOIL
2. PHYSIOGRAPHY-SLOPE, RELIEF, SIZE etc
3. CLIMATE- ARID, HUMID, TROPICAL-- EVAPOTRANSPIRATION RATES
4. GEOMORPHOLOGY-LAND FORMS-MOUNDS, RIDGES,VALLEYS, DEPRESSIONS & ALLUVIAL
5. RAINFALL –NORMAL, ACTUAL, INTENCEITY, FREQUENCY, PATTERN & RAINY DAYS,
6. QUANTUM OF NON-COMMITTED SURFACE RUN OFF
7. INFILTRATION TO THE GROUND
8. SOURCE WATER AVAILABILITY & QUALITY
STUDIES REQUIRED

• SOIL SURVEYS-SOIL MAPS
• TOPOGRAPHIC SURVEYS-TOPOSHEETS, RLs
• HYDROMETROLOGICAL-RAINFALL, TEMPERATURE, INFILTRATION etc.
• GEOMORPHOLOGICAL-GEOMORPHOLOGY
• REMOTESENSING- CROPPING PATERN, SOILS, GEOMORPHOLOGY, LINEAMENTS AND OTHER STRUCTURAL FEATURES
• GEOLOGICAL- GEOLOGY, STRUCTURES,
• DRILLING-LITHOLOGS, ELECTRICAL LOGS Etc
• GEOPHYSICAL- BEDROCK, OVERBURDEN, FORMATION CHARACTORS
• HYDROGEOLOGICAL- WATER LEVEL, AQUIFER PROPERTIES,RESOURCES Etc
• HYDROCHEMICAL – WATER QUALITY
• DISCUSSIONS WITH THE LOCAL PEOPLE-NECESSITY OF AR, SOCIOECONOMIC CONDITIONS
• DATA COLLECTION FROM THE LOCAL OFFICES
Structures feasible

I. Direct Methods
   A) Surface Spreading Techniques
      Flooding
      Ditch and Furrows
      Recharge Basins
   Runoff Conservation Structure
      Bench terracing
      Contour Bunds
      Gully Plugs, Nala Bunds,
      Check Dams
   Percolation Ponds
   Stream Modification / Augmentation

   B) Sub-surface Techniques
      Sub surface dykes
      Injection wells (Recharge wells)
      Recharge wells –Dug/Bore wells

   c) Recharge pits and shafts

   II) Indirect Methods
      Induced Recharge from Surface Water Sources;
      Aquifer Modification
      Bore Blasting.
      Hydro-fracturing.

   III) Combination Methods
1. RECHARGE PITS
2. RECHARGE TRENCH
3. RECHARGE SHAFT
4. TRENCH WITH RECHARGE WELL
5. SHAFT WITH RECHARGE WELL
6. RECHARGE THROUGH ABANDONED DUG/BORE/TUBEWELL
7. PERCOLATION TANKS
8. CHECKDAMS
9. GABION BUND
10. SUB SURFACE DYKE
11. COMBINATION STRUCTURES
TYPICAL AQUIFER SYSTEM IN HARDROCK AREAS

LOWLAND IN WEATHERED GRANITE WITH GROUND WATER BODY

INSELBERG (FRESH ROCK OUTCROP)

TOR (FRESH ROCK)

LATERITE DURICRUST

RESIDUAL QUARTZ FLOAT

WATER TABLE AT HIGH STAGE

WATER TABLE AT LOW STAGE

RUBBLE LATERITE DURICRUST

WATER TABLE AT HIGH STAGE

WATER TABLE AT LOW STAGE

MASSIVE GRANITE

WATER-BEARING FRACTURE SYSTEMS

QUARTZ VEIN

ZONE (a) - High porosity but low permeability.

ZONE (b) - With stable primary minerals relatively high porosity high permeability.

ZONE (c) - Low porosity but appreciable permeability.

ZONE (d) - Fresh fractured rock with water-bearing fractures.
If no solution....

NO WATER = NO CROPS
Methods suitable for Urban Area
RAINWATER HARVESTING

• Concept of rainwater harvesting lies in:
  – Tapping the rainwater where it falls
  – Techniques of rainwater harvesting involve
    • Catching the rainfall from localized catchments surfaces such as roof of a house, plain and sloping ground surfaces etc.
    • Rainwater collected is diverted into ponds, vessels, or under ground tanks to store for longer periods
    • Among the various techniques of rain water harvesting
      – Harvesting water from roof tops needs special attention
ADVANTAGES OF ROOF TOP RAINWATER HARVESTING

• Roof catchments are relatively cleaner and free from contamination compared to ground level catchments

• Losses from roof catchments are minimum due to small size and type of material of the roof
  – Collection of rainwater from roof top for domestic need is popular in some parts of India
  – Simplest method is keeping a vessel beneath the edge of roof during rainy season for immediate use
  – More systematic is to use big tanks for storing water.
PRECAUTIONS TO BE TAKEN FOR ROOF TOP RAINWATER HARVESTING

• Roof of the building must be maintained clean
• A grill or mesh has to be fixed at the entrance of the rainwater pipe in the terrace to arrest dust particles from entering the water
• A filter chamber has to be provided to filter small/minute particles before diverting the rainwater into the storage tank or open wells or bore wells
COMPONENTS OF ROOF TOP RAINWATER HARVESTING SYSTEM

• The system usually comprises:
  – A roof
  – A storage tank
  – Collection pit
  – Gutter arrangement to transport water from the roof top to the storage tank
  – First flush system to divert the dirty water
  – Filter unit to remove debris/silt etc
A typical Rooftop Rainwater Harvesting System
How much water can we get from roof area?

The volume of water can be calculated as:

$$\text{volume} = \text{rooftop area} \times \text{rainfall} \times 90\%$$

The storage tank can be designed to accommodate volume of water from longest single spell in last 30 or 100 years
<table>
<thead>
<tr>
<th>Land use</th>
<th>Existing Area (m²)</th>
<th>Proposed Area (m²)</th>
<th>Total of Existing and Proposed Areas (m²)</th>
<th>Run-off Coefficient (%)</th>
<th>Normal Annual Rainfall (mm)</th>
<th>Quantity of Runoff from Rainfall (m³)</th>
<th>Quantity of Rain Water (m³)</th>
<th>Peak Hourly Rain Water (mm)</th>
<th>Peak Hourly Quantity of Rain Water (m³)</th>
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<td>Roof Area</td>
<td>11043</td>
<td>11230</td>
<td>5528.35</td>
<td>0.90</td>
<td>952</td>
<td>5263</td>
<td>4737</td>
<td>50</td>
<td>249</td>
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<td>Road Area &amp; pavements</td>
<td></td>
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<td>3750</td>
<td>0.80</td>
<td>952</td>
<td>3570</td>
<td>2856</td>
<td>50</td>
<td>150</td>
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<td>Green Belt Area</td>
<td>11043</td>
<td></td>
<td>7886</td>
<td>0.30</td>
<td>952</td>
<td>7507</td>
<td>2252</td>
<td>50</td>
<td>118</td>
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<td>Open and Other Areas</td>
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<td></td>
<td>5108.67</td>
<td>0.15</td>
<td>952</td>
<td>4863</td>
<td>730</td>
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<td>Total</td>
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<td>22273.02</td>
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<td></td>
<td>21203</td>
<td>10575</td>
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<td>555</td>
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<td>Rain water equivalent to No of days @141.4m³/day</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>75</td>
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## Availability of Rain Water for Harvesting in Open Area in Hyderabad

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<tr>
<th>Area in Hectares</th>
<th>1 Ha</th>
<th>2 ha</th>
<th>3 Ha</th>
<th>4 Ha</th>
<th>5 Ha</th>
<th>10 Ha</th>
<th>15 Ha</th>
<th>20 Ha</th>
<th>30 Ha</th>
<th>40 Ha</th>
<th>50 Ha</th>
<th>100 Ha</th>
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</thead>
<tbody>
<tr>
<td>Area in Square meters</td>
<td>10000</td>
<td>20000</td>
<td>30000</td>
<td>40000</td>
<td>50000</td>
<td>100000</td>
<td>150000</td>
<td>200000</td>
<td>300000</td>
<td>400000</td>
<td>500000</td>
<td>1000000</td>
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<tr>
<td>Available Water for Harvesting in Cubic meters on maximum rainy day (30mm)</td>
<td>90</td>
<td>180</td>
<td>270</td>
<td>360</td>
<td>450</td>
<td>900</td>
<td>3600</td>
<td>1800</td>
<td>2700</td>
<td>3600</td>
<td>4500</td>
<td>9000</td>
</tr>
<tr>
<td>Available Water for Harvesting in Cubic meters/year (for total rainfall of the year -Annual average rain fall 800 mm)</td>
<td>2400</td>
<td>4800</td>
<td>7200</td>
<td>9600</td>
<td>12000</td>
<td>24000</td>
<td>36000</td>
<td>48000</td>
<td>72000</td>
<td>96000</td>
<td>120000</td>
<td>240000</td>
</tr>
</tbody>
</table>
Recharge Pit / Trench

INLET FOR RAIN WATER

Brick wall with 1:6 Cement mortar

Cement Plastering 1:6

Splash Pad

0.15 meter

0.30 meter

0.30 m Sand

0.40 m 20 mm Metal

2.00 m

1.00 m

40 mm Metal
RAIN WATER

RECHARGE TRENCH
(FILLED WITH PEBBLES, GRAVEL AND SAND)
RECHARGE PIT
(FILLED WITH PEBBLES,
GRAVEL AND SAND)

ABANDONED WELL
CONVERTED AS
RECHARGE PIT
ROOF TOP RAINWATER HARVESTING THROUGH STORAGE TANKS
Recharge through Bore Well in hand rock area
Low Permeable material

Permeable material

Diameter (D) = 2 to 3 m
Depth (D) = 10 to 15 m
Cost Rs. 60000 - 85000 /-

Recharge Shaft
ROOFTOP RAIN WATER RECHARGE

[Diagram showing the construction details of a rooftop rainwater recharge system, including layers such as 7 cm thick detachable slab, coarse sand, gravel, boulders, slotted pipe, and mesh.]
SCHEMATIC DIAGRAM
RAIN WATER HARVESTING
IN OSMANIA UNIVERSITY, HYDERABAD
FUNDED BY CENTRAL GROUND WATER BOARD

Scale: 1cm=132m.

LEGEN

RECHARGE PIT WITH RECHARGE WELL
PIEZOMETER WELL
SUMP
SETTLING CHAMBER
PITCHING OF THE POND
STRENGTHENING OF THE BUND
RAINGUAGE STATION

ARTS COLLEGE
LIBRARY
DESILTED POND
Recharge pit with Recharge bore well

In order to recharge deeper fractured aquifer, recharge well of 50 m depth is constructed in each pit.

Slotted pipe at the bottom-most part of the pit to allow clear water.
Slotted pipe covered with coir rope

Filling recharge pit with washed gravel
RECHARGE PIT AFTER CONSTRUCTION
Shaft with Bore well
RUNOFF CONSERVATION STRUCTURES suitable in large open areas in urban areas

1. Bench Terracing
2. Contour Bunds
3. Contour Trenches
4. Gully plugs, Nala Bunds and Check Dams
5. Percolation Tanks
Schematics of a Typical Contour Bund
Schematics of a Contour Trench
Gully Plugs, Nalah Bunds and Check Dams

- Constructed across gullies, nalah and streams to check the flow of surface water in the stream channel and to retain water for the longer duration.
- **Medium catchment area (40 to 100 Ha)**
- Rainfall 1000 mm
- Stream bed 10-15 m wide & at least 1 m thick.
- Check dams are 10-15 m long, 1-3 m wide and 2 to 3 m high
Manual Digging of Trench

Recharge well fitted with inclined slotted pipes

Trench being filled with coarse and fine gravel

Rectangular weir and flow of water in the trench during the monsoon
Gabion Structure
CEMENT PLUG / NALA BUND
Check Dam
CHECK DAM
Check Dam with overflow during 2005 monsoon

Check Dam with water during Mid-monsoon period of 2005

Check Dam with Silt After 28th Oct '05 Rainfall

Check Dam silted to the brim of axis after 28th Oct 05 rainfall

Check Dam breached due to heavy flow on 28th Oct 05
PERCOLATION TANKS

• Percolation tank is an artificially created surface water body, submerging in its reservoir a highly permeable land so that surface runoff is made to percolate and recharge the ground water storage.

• Percolation tank should be constructed preferably on second to third order steams, located on highly fractured and weathered rocks, which have lateral continuity down stream.
• The recharge area downstream should have sufficient number of wells and cultivable land to benefit from the augmented ground water.

• The size of percolation tank should be governed by percolation capacity of strata in the tank bed. Normally percolation tanks are designed for storage capacity of 0.1 to 0.5 MCM. It is necessary to design the tank to provide a ponded water column generally between 3 & 4.5 m.
The percolation tanks are mostly earthen dams with masonry structure only for spillway. The purpose of the percolation tanks is to recharge the ground water storage and hence seepage below the seat of the bed is permissible. For dams up to 4.5 m height, cut off trenches (COT) are not necessary and keying and benching between the dam seat and the natural ground is sufficient.
SUB-SURFACE DYKE
PERCOLATION TANK WITH RECHARGE BORE
Field Pond
Locations of Existing buildings and proposed Rainwater Harvesting Structures along with layout of the Campus
Built-up area and other particulars related to artificial recharge under consideration

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Description of Item</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Built-up area</td>
<td>11,339 m²</td>
</tr>
<tr>
<td>2</td>
<td>Normal yearly rainfall</td>
<td>810 mm</td>
</tr>
<tr>
<td>3</td>
<td>Maximum water can be harvested in a normal year</td>
<td>7347.67 m³</td>
</tr>
<tr>
<td>4</td>
<td>Max rainfall in a day</td>
<td>70 mm</td>
</tr>
<tr>
<td>5</td>
<td>Maximum water can be harvested on a maximum rainfall day</td>
<td>635.0 m³</td>
</tr>
</tbody>
</table>
MAINTENANCE

- The periodic removal of the fine material deposited on the surface
- If possible filter may be installed and periodically replaced
- Turbid water should be avoided from entering the structure-By constructing settling chambers
- Recharge water should be introduced into the structure at its lowest point
- Aquatic vegetation should be minimised to prevent biological clogging
- Infiltration–increasing organic matter or chemicals may be added to the ground surface
- Waters containing high mineral content should not be used for recharge
- Use of chlorinated water will improve the infiltration rates by inhibiting the clogging effect of bacteria
APREHENTIONS

• COSTLY
• BUILDING STABILITY
• VASTU
• IF WE HARVEST- WATER WILL GO TO OTHERS
• LACK OF EASY SUPPORT & ADVICE
• LACK OF AWARENESS
CONCLUSIONS

• AR-TO BE TAKEN UP ON SCIENTIFIC LINES
• TECHNOLOGY IMPROVES FURTHER
• CASE STUDIES – GOOD EXAMPLES
• COST –BENEFIT RATIOS
• MAINTENANCE –TOP PRIORITY
• FOR SUCCESS- INDIVIDUAL, COMMUNITY, GOVT. PARTICIPATION
• AWARENESS CAMPAIGN IN A BIG WAY
CONCLUSIONS

• STRICT IMPLEMENTATION OF GOVT. POLICIES
• STINGENT RULES & PENALITIES
• MINIMISE WASTAGE
• DIRECT USE OF RAIN WATER
• RE-USE ALONG WITH AR
• GRAY WATER HARVESTING
Some Adages for all

........But to follow
Many in the world had lived without love, none without water

*Whisky is for drinking-water is for fighting over……..Mark Twain*

If you cannot save water cycle - it will not save your life cycle

*Life depends on water-but reservoir depends on you*

One who conserve water deserves two noble prizes, one for peace, other for science.....John F Kennedy

One does not understand the value of water until the well dries ............Benjamin Franklin
Water drives from womb to tomb

Water is driving force for living beings……..Leonardo Da Vinci

Be the part of solution , but not pollution

Aaharam mitanga teesukunte manishi shareeram baaguntundi- neetini mitanga viniyogiste desham baguntundi

Ninnati poratam rajyalakosam- Repati poratam neetikosam
Paravallu tokke cheruvulu vunte-prakruti parugulu palle vente

Maatanu podupu cheyyi- neekumelu
Dabbunu podupu cheyyi neepillalaku melu
Neetini podupu cheyyi deshaniki melu

Pranadharam neeru, podupu cheste panneru
Vrudha cheste kanneeru
Great Grand Father...... Drinking Water from Lakes
Grand Father ............... Drinking Water from wells
Father ........................ Drinking Water from Taps
I am................................Drinking water from bottles
THE SENSE AND SENSIBILITY

Why_Cant_We.wmv
CONSERVE AND PRESERVE WATER THAN REPENT AND REPAIR

THANK YOU