Rainwater Harvesting
Rainwater - the answer

KARNATAKA STATE COUNCIL FOR SCIENCE & TECHNOLOGY

Indian Institute of Science
Bangalore - 560 012

Principal Investigator - RWH
Rainwater - the life

- Water is very much essential for life
- In the modern society water fulfills several needs
- Water for drinking, bathing and cooking food are among the important daily needs for human kind
Rain water - the answer

- Conventionally water is collected in vessels and stored for a days requirement
- In urban areas houses are built with water storing places like underground sump & overhead tank
Rainwater - the source

- Fresh water is made available for consumption in many ways
- Natural springs
- Step wells, Ponds & lakes
- Canals, Rivers
- Open wells & tube wells

(Bangalore 262 -> 82)

(1998, 1 lakh - modest estimate)
Lakes of Bangalore
Bellandur Lake, 1942

RWH Cell, Karnataka State Council for Science and Technology, Indian Institute of Science, Bangalore-12
A Sports Stadium today, Sampangi Tank earlier

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Koramangala Tank is today a Housing “Complex”
KGA Golf Course, Once Challaghatta Tank
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Bangalore City Bus Stand, Once Dharmambudhi Tank

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Rainwater - for Bangalore

- Water to Bangalore is being supplied from
  - Cauvery river
  - Tippagondanahalli and Hessaraghatta reservoirs
  - Tube wells
- Water is pumped from a distance of around 100km to a height of nearly a km

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Rain water - to/for electricity

* Precious electric energy is used to pump water to major storage places in Bangalore and also at individual destinations from ground level to overhead tanks

* UG Sump, electric pump, overhead tank etc., are integral part of an urban house

(since they have not approached nature for their requirement)

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Rainwater - to rely on

- Rain water would be the immediate resource to augment existing water supply system
- By Simply “Catching wherever it falls”
- Bangalore has around 60 rainy days and like a clock work 85% of the rain arrives between 4p.m. and 7p.m.
Rainwater - at all places

Three methods

- Roof top RWH
- Runoff RWH (landscapes, parks, storm water drains, roads, etc.)
- Natural storage and collection through lakes and tanks
## Rainwater - the availability

### Rainfall in mm for Bangalore

(Potential in liters for 40ft X 60ft site)

<table>
<thead>
<tr>
<th>Year</th>
<th>Average</th>
<th>Rainfall (mm)</th>
<th>Potential (liters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>917</td>
<td>1414</td>
<td>3,15,288</td>
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<tr>
<td>1999</td>
<td>1011</td>
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<tr>
<td>2000</td>
<td>1238</td>
<td>1238</td>
<td>2,76,024</td>
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<tr>
<td>2001</td>
<td>1060</td>
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<tr>
<td>2002</td>
<td>766</td>
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<td>2003</td>
<td>726</td>
<td>726</td>
<td>1,61,898</td>
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<tr>
<td>2004</td>
<td>1165</td>
<td>1165</td>
<td>2,59,795</td>
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<tr>
<td>2005</td>
<td>1508</td>
<td>1508</td>
<td>3,36,284</td>
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</tbody>
</table>

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Rain water - the need

- WHO / IS standard - water requirement of a family per day is around 500 lts
- Water requirement per year per family is around 1,80,000 lts
- Water supply by most urban bodies is far below this figure
- On an average a family spends around Rs. 250 Per month for water in Bangalore
Rainwater - the answer

Rainwater Harvesting in "Sourabha"

Month

Water in liters

Water requirement
Rainwater available
Average Rainwater

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# RAINWATER - availability

<table>
<thead>
<tr>
<th>RAINWATER MM</th>
<th>ROOFTOP AREA IN SFT</th>
<th>RAINWATER Lts</th>
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<tbody>
<tr>
<td>4000</td>
<td>2400</td>
<td>8,00,000</td>
</tr>
<tr>
<td>1200</td>
<td>4,00,000</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>2,00,000</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>1,00,000</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>2400</td>
<td>80,000</td>
</tr>
<tr>
<td>1200</td>
<td>40,000</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>20,000</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>10,000</td>
<td></td>
</tr>
</tbody>
</table>

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Rainwater harvesting
Abandoned well as recharge pit

Recharge pit Filled with pebbles, gravel and sand

Ground water recharge
Groundwater table hits rock bottom in City

BY MADHUPRASAD
DH News Service

BANGALORE: Groundwater in Bangalore has been utilised beyond the critical limit, with more than 85 per cent of groundwater being used. The groundwater utilisation is far higher (1997-2003) when compared to previous assessments (1994-1997), the Department of Mines and Geology has found out.

In its latest five-year systematic groundwater resource status report, the Department has found out that 21 watershed areas in the State, including Bangalore, have been categorised as over-exploited areas.

The report analyses groundwater availability, utilisation and the balance potential available for utilisation.

According to the report recent, about 296 watershed areas in the State are ‘safe’. The report covers and assesses all 380 watershed areas in the State.

The groundwater in Karnataka is usable as far as irrigation is concerned. However, certain pockets in different parts of the State have been identified as problem areas with regard to potability of drinking water, the report says.

The report points to increase in fluoride, nitrate and total dissolved solids (TDS) content due to over-exploitation, contamination and drought. Urbanisation and industrialisation have also affected the quality of water.

Lack of proper underground drainage and sewerage systems add to the increase in the nitrate content. Parts of
An old dry well in Lingsugur taluk tells the story of the plight of villagers and the drought situation in the village.

Empty wells: Villagers cupful of woes

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Oh sweet water!
Various stages of rainwater Harvesting

Collection

Channelisation

Filtering

Storage  G.W. Recharge
Storage of water

Overhead tank

Underground

Ground level

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Fero-cement Tank

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RWH at BWSSB Office Banashankari

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FIXING OF POPUP FILTER ON WALL SURFACE

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RWH at KSCST, PopUp Filter Flush Cap

RWH Cell, Karnataka State Council for Science and Technology, Indian Institute of Science, Bangalore-12
RWH at KSCST, PopUp Filter - Filter Element
RWH at BMP, PopUp Filter Filter Element Cleaning

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Sand bed filter

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Rainwater Harvesting in a village house at Chitradurga District
RWH in a village school for drinking water
Roof top rainwater harvesting for tile roof building
Bambo gutter
Ground water recharge pit
Excavation

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GROUNDWATER RECHARGE THROUGH BARREL SYSTEM
GROUNDWATER RECHARGE THROUGH BARREL SYSTEM
Recharge pit with barrels
Underground after installation
Ground water recharge
Rainwater soak pit

- Similar to IG with excavated pit lined with size stone without using mortar
- Soak pits are generally not filled with any filler material
- Soak pits are covered at the top by a RCC or stone slabs
- Rainwater is channeled to the soak pits after filtration for ground water recharge
Ground water recharge
Trenches

- Narrow excavated trenches of around 2 ft. wide and 2 ft. depth
- Filled with pebbles or aggregates with a top layer of coarse sand
- Rainwater from open spaces, parks, payments, roads etc. can be channeled to these trenches for ground water recharge

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Ground water recharge – road side trench

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Pavers with holes for ground water recharge
Ground water recharge
Open well or bore well

- Combination of PopUp filter and Infiltration gallery with aggregates and sand can be used
- Needs close monitoring of filtration system
- Site specific
- Cooperative efforts yields good results

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Infiltration gallery around perforated bore well
RWH for Open Well

RWH Cell, Karnataka State Council for Science and Technology, Indian Institute of Science, Bangalore-12
RWH for Open Well
RWH at Kengeri Beedi Workers Housing
RWH at Kengeri Beedi Workers Housing
RAINWATER HARVESTING THROUGH CLOTH OR SAREE

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RAINWATER HARVESTING AND GROUND WATER RECHARGE - MODEL

RWH Cell, Karnataka State Council for Science and Technology, Indian Institute of Science, Bangalore-12
Thank you

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