Strategies for Karnataka

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Vision

To implement a sustainable decentralised and participatory water security plan for the state.

Need -Quality Issue

- Karnataka has the second largest drought prone area in India next to Rajasthan
- number of districts susceptible to drought - 20/28

Need –Rural Areas

- number of villages - 4500
- many villages have flouride in ground water
- many villages also have high salinity problems inI ground water

Need-Urban Areas

- Bangalore gets it's water from the Cauvery 95 kms and 500 metres below
- production cost of water is very high at Rs. 15 a kilo-litre . Will become Rs. 26 a kilo-litre.
- ceiling on the availability of water - 1500 mld - Good enough for 7 million people only i.e. By the year 2011.
- surface and groundwater on the decline

Need- Other Urban Area

- of the remaining 206 towns only 103 have water supply upto standards of 135 lpcd
- Hubli-Dharwad for example was reported to get water once in 10 days in September

What is Rooftop Rainwater Harvesting?

- Collection
- Filtration
- Storage
- Usage
- Recharge

Why…Harvest Rainwater ???

- a natural resource presently wasted
- prevents ground water depletion
- a good supplement to piped water
- positive cost benefit ratio
- relatively pollution free
- water conservation & self-dependance
- Reduces “ecological footprint”

About Bangalore

Location	:	12’ 58” N Latitude 77’ 35” E Longitude
Altitude	:	921 MSL
Population	:	6 Million
Planning area	:	1279 Sq.km
Rainfall	:	970 mm over the last 10 years

Characteristics with reference to water supply

- High altitude city
- No perennial river source nearby
- Rapidly growing population
- Increasing industrial demand
- Traditional sources neglected
- No pronounced aquifer
- Pollution of ground and underground sources

Water In The City

Lakes and Tanks

- 261 in 1960
- 81 in 1997
- 55 in 2000

Rainfall Pattern-BANGALORE

MONTH	DAYS	mm
JAN	0.2	2.70
FEB	0.5	7.20
MAR	0.4	4.40
APR	3.0	46.30
MAY	7.0	119.60
JUN	6.4	80.80
JUL	8.3	110.20
AUG	10.0	137.00
SEP	9.3	194.80
OCT	9.0	180.40
NOV	4.0	64.50
DEC	1.7	22.10
TOTAL	**59.8**	**970.00**

HOW much water do I get ???

Year	Rainfall (mm)	Rainy days	Possible Collection (litres/100sq. m)
1990	509.40	42	40,752
1991	1338.50	65	1,07,080
1992	844.60	56	67,568
1993	1059.70	65	84,776
1994	587.10	45	46,968
1995	1072.20	61	85,776
1996	1173.30	64	93,864
1997	717.40	52	57,392
1998	1431.80	68	1,14,544
1999	1009.40	52	80,720
Average	974.34	57	77,947

WHO can harvest Rainwater ???

- Rural and urban houses – 20 sq.m. 'Ashraya' house – 500 mm rainfall- 10,000 litres. Enough drinking and cooking water for a family of 5 for a year
- Industries & Institutions
- Apartments
- Paved & Unpaved ground for Ground water-recharge and surface collection

Technicalities

Roof	-Collector
Gutters & Down pipes	-Transmitters
First-rain separator	-Segregator
Drums	-Filters/Intermediate storage
Silt traps	-Filter chambers
Sumps & OHT	-Storage systems
Borewell, open wells & percolation pits	-Ground water recharge
Gutters & Downpipes	-Transmitters

Sizing of Rainwater Pipes for Roof Drainage

Sl.No	Dia of Pipe (mm)	Average Rainfall (mm) 50mm/hr	75mm/hr
I	50	13.4	8.9
II	65	24.1	16
III	75	40.8	27.0
IV	100	85.4	57.0
V	125	---	---
VI	150	---	---
		Roof Area	Sq.m

Capital Cost

Piped water supply:
1500 MLD -Rs.30,000 million

Rainwater:
3000 MLD -Rs. "0.00"(zero)

Water Tariff

Domestic: (Kl)	Rs/Kl
0-25,000	3.50
25,000-50,000	7
50,000-75,000	19
75,000-100,000	26
>100,000	33

Non-domestic:	Rs./Kl
0-10,000	32
10,000-20,000	39
20,000-40,000	44
40,000-60,000	51
60,000-100,000	57

Industrial : 60

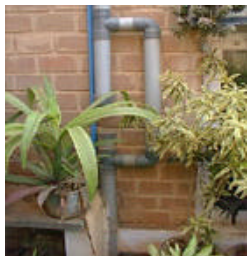
Note: Production cost- Rs 15/Kl highest in the country

- **Roof** - Collectors
  - Optimum slope
  - Flat roofs
  - Sloping roofs

- **Gutters & Downpipes-** Transmitters
  - Down water pipes - HDPE/PVC
  - Gutter-for sloping roof

First-rain separator - Segregator

- Simple
- Easy to maintain

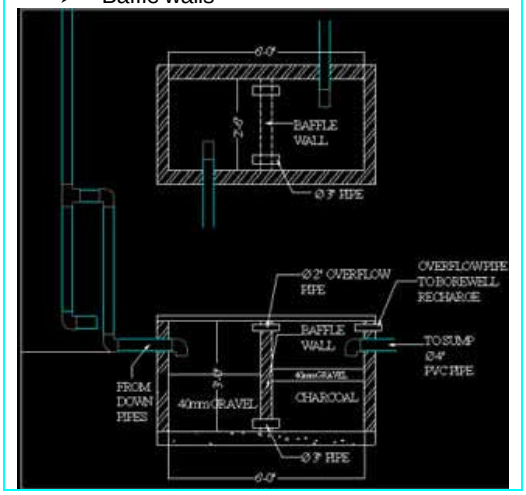



Drums – Filters & Intermediate storage / Segregator



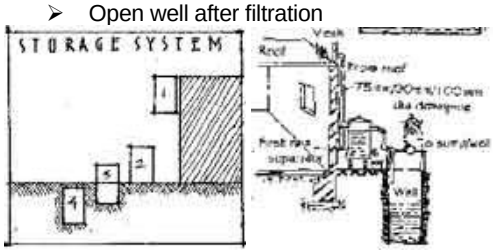

Silt Traps - Filter Chambers

- 25mm to 40mm gravel
- Charcoal
- Baffle walls

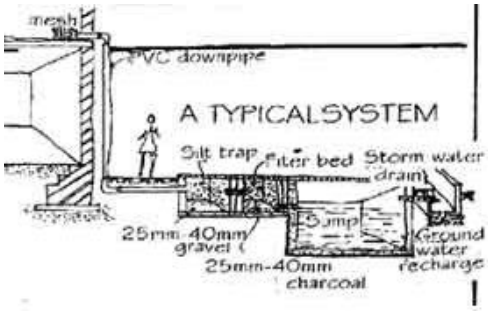


Sumps & OHT - Storage Systems

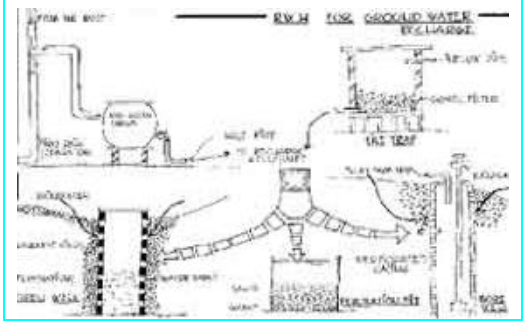
- Underground storage tanks/sumps
- 6000 litres capacity -100 sq.m roof area
- Overhead tank
- Open well after filtration



A Typical System



Rainwater Harvesting for Ground water recharge



How Much water do I use?

Use	Litres/person
Drinking	3
Cooking	4
Bathing	20
Flushing	40
Washing-clothes	25
Washing Utensils	20
Gardening	23
Total	**135**

Sustainability of harvested rainwater

Conservative use 90-100 ltrs per capita per day

Family size of 5 demands 450 ltrs per day

Harvested rainwater can suffice 173-192 days on an average (50% of yearly requirement)

USE of harvested rainwater

Non-potable:

- Gardening
- Flushing
- Washing clothes/cars

Potable Purpose:

after ensuring quality (SODIS treatment)

Storage for a "SUNNY DAY"

Rains : Harvest it, Use it

3 conditions to go bad –

- Air
- Sunlight
- Organic Matter

Proper filtration & closed container Treatment needed

Do's & Dont's

- Clean-roofs and terraces
- Provide adequate storage systems
- Pollution free storage systems
- Store—insecticides, rusting iron, manure, detergents
- Use Pets on terrace
- Use chemically polluted water to charge ground water