TheWaterChannel Webinar #5

Urban Rainwater Harvesting Systems: Promises and Challenges

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Thanks for coming. The webinar will begin shortly.

www.TheWaterChannel.tv

What is rainwater harvesting ?

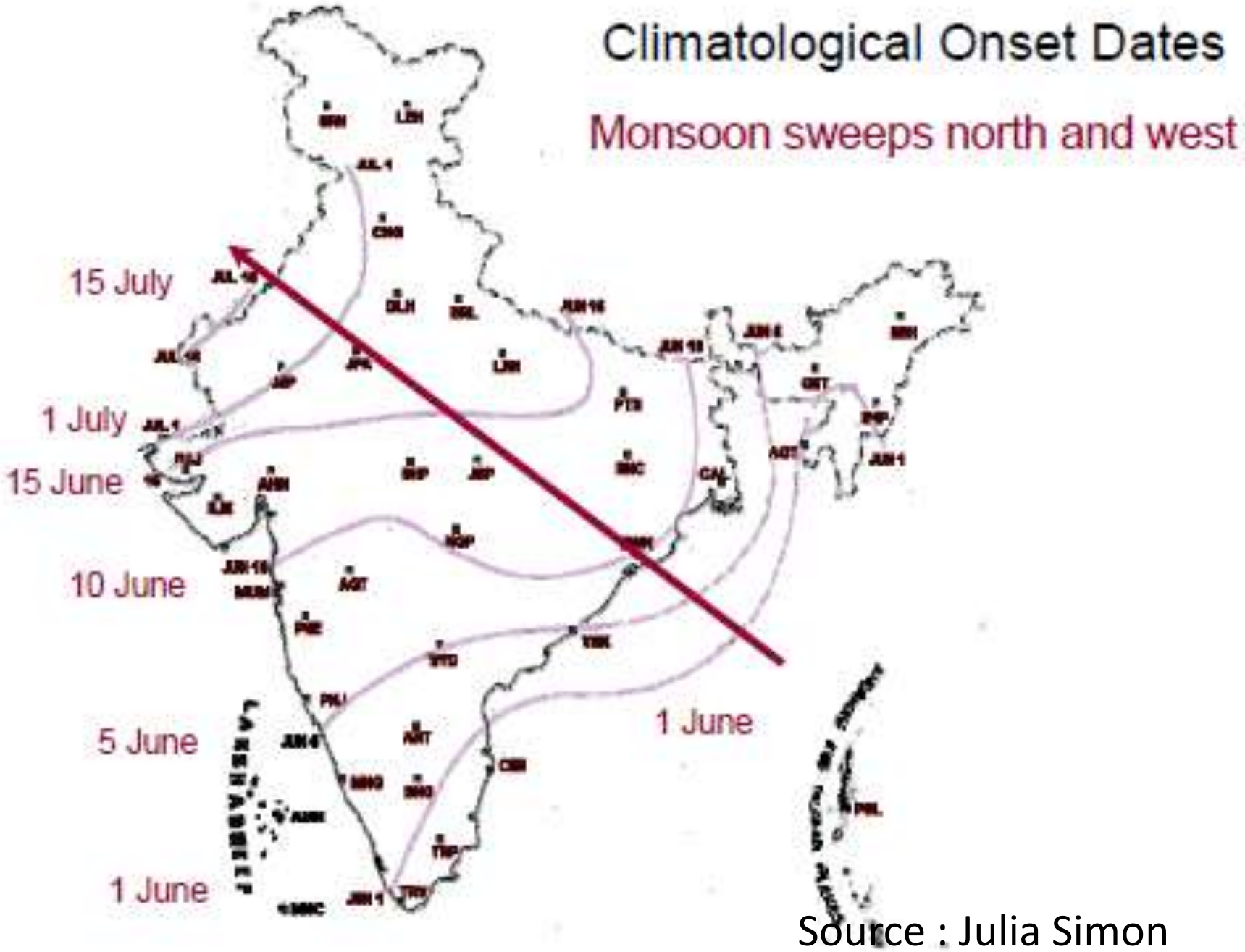
- Collecting and storing RAIN for future use. Usually from a purpose built catchment.

- In India storing is also understood as recharging the aquifer

- A small difference between rainwater and storm-water , once it hits the storm drains it is storm water

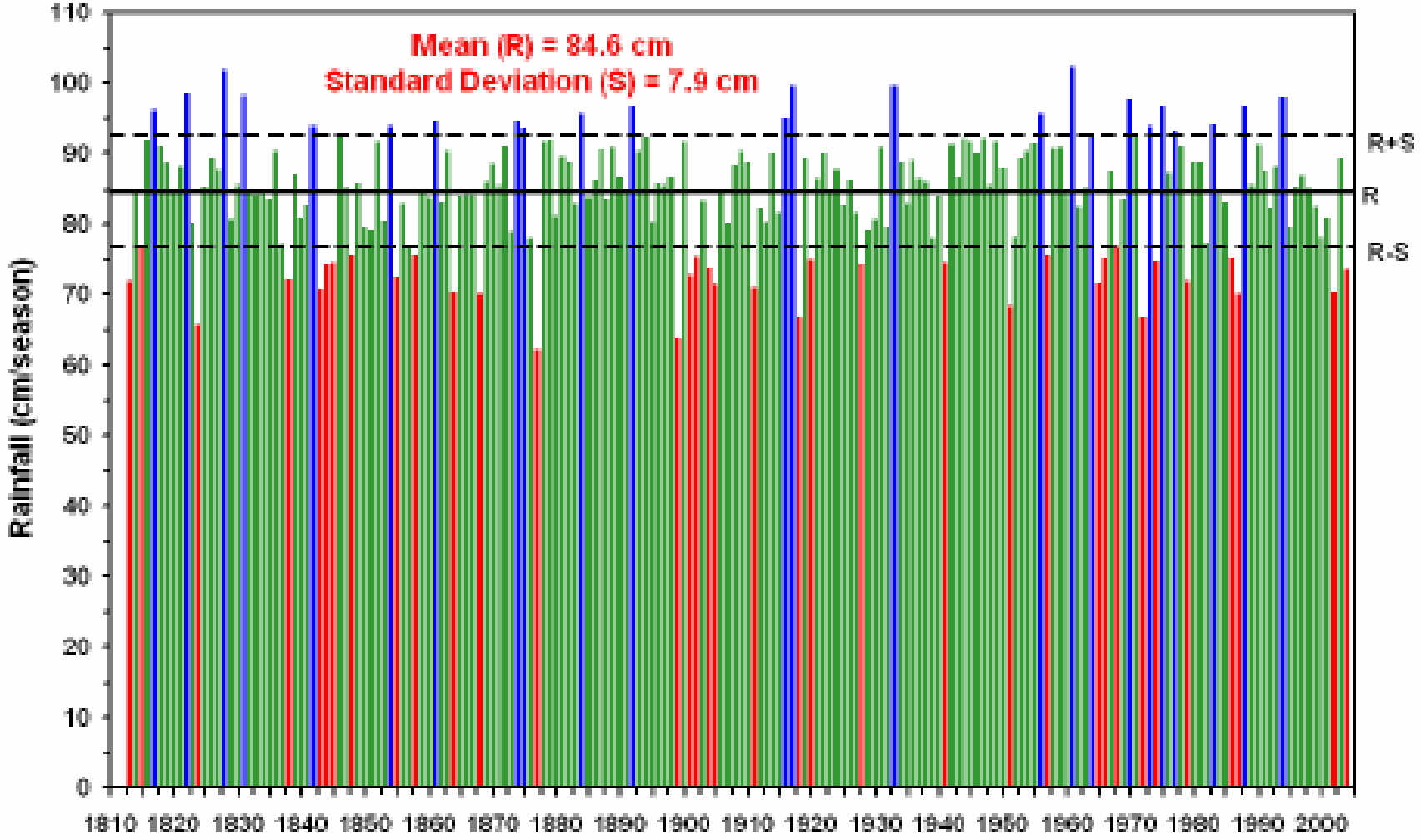
Why rainwater harvesting ?

- Provide drinking water
- Supplemental water for non –potable use
- Increase soil moisture
- Increase groundwater table
- Prevent and decrease salinity in wells
- Mitigate urban flooding
- ….many other reasons



Source : Julia Simon

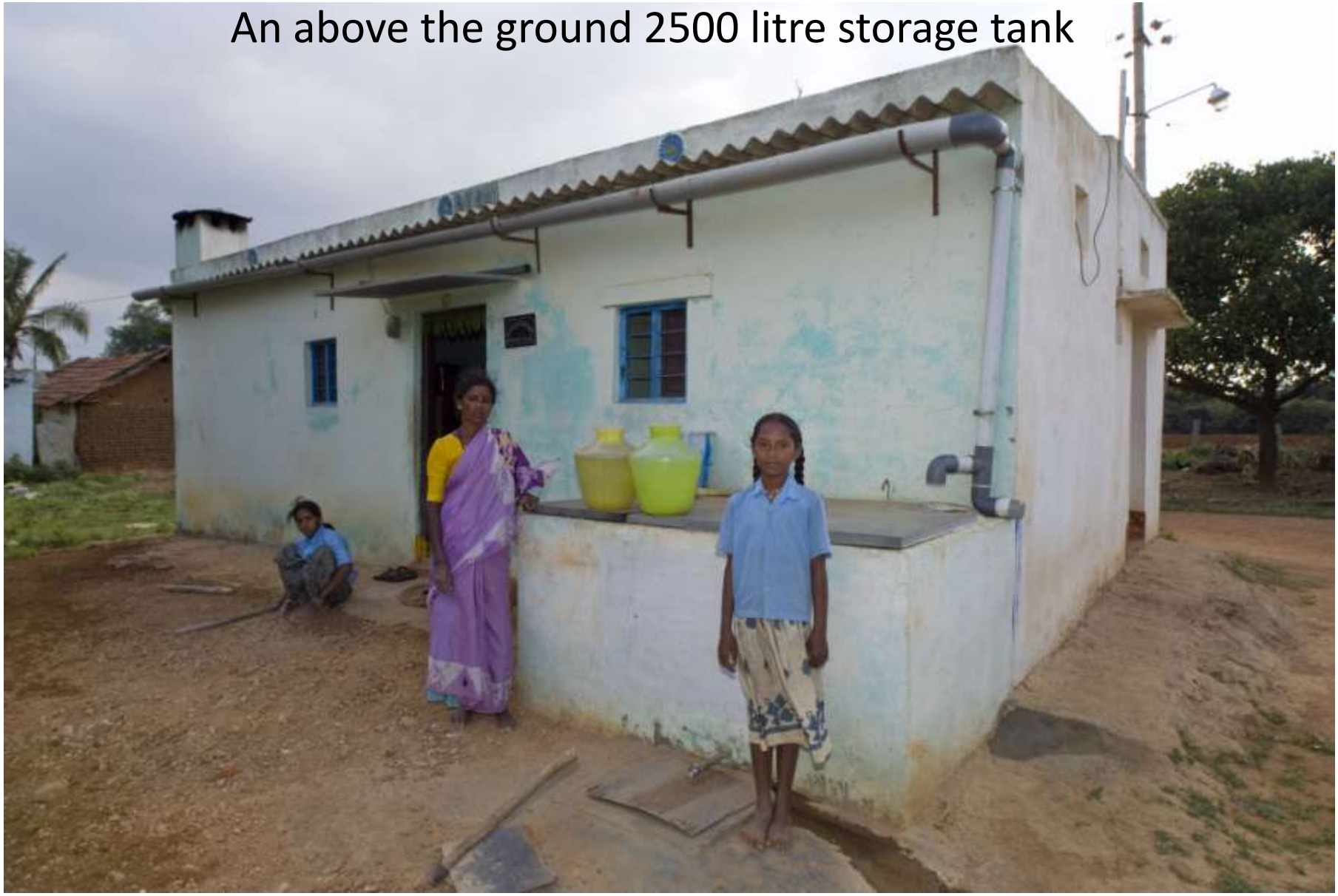
Long-Term Stability of the Indian Summer Monsoon



Source : Julia Simon

Area (sq. mt) x coefficient of run-off x rainfall (mm) =Rainwater harvestable (litres)

An above the ground 2500 litre storage tank



A 5000 litre storage tank note the white paint

Leaf separator detail


Good clean rainwater with a clean catchment and a good filter

A modern one with a capacity of 2500 litres storage. Implemented 20 structures in 1000 villages.

The rainwater tank is a great place to do homework

..and is multipurpose , other waters can be stored. Storage is access

Rainwater harvesting is especially relevant in Fluoride affected areas

- The ‘Sachetana’ project of the Government has put 5800 rainwater tanks in households across 105 villages. This provides drinking and cooking water for the whole year.
- The tank size is between 5000 litres and 8000 litres.

A ‘Sachetana’ rainwater harvesting system with details painted on the wall

The rainwater filter has 45 cm. of coarse washed sand

A hand-pump to draw water from the rainwater sump tank

Quality check- using the H2S strip test for e.coli identification

Simple treatment using SODIS www.sodis.ch

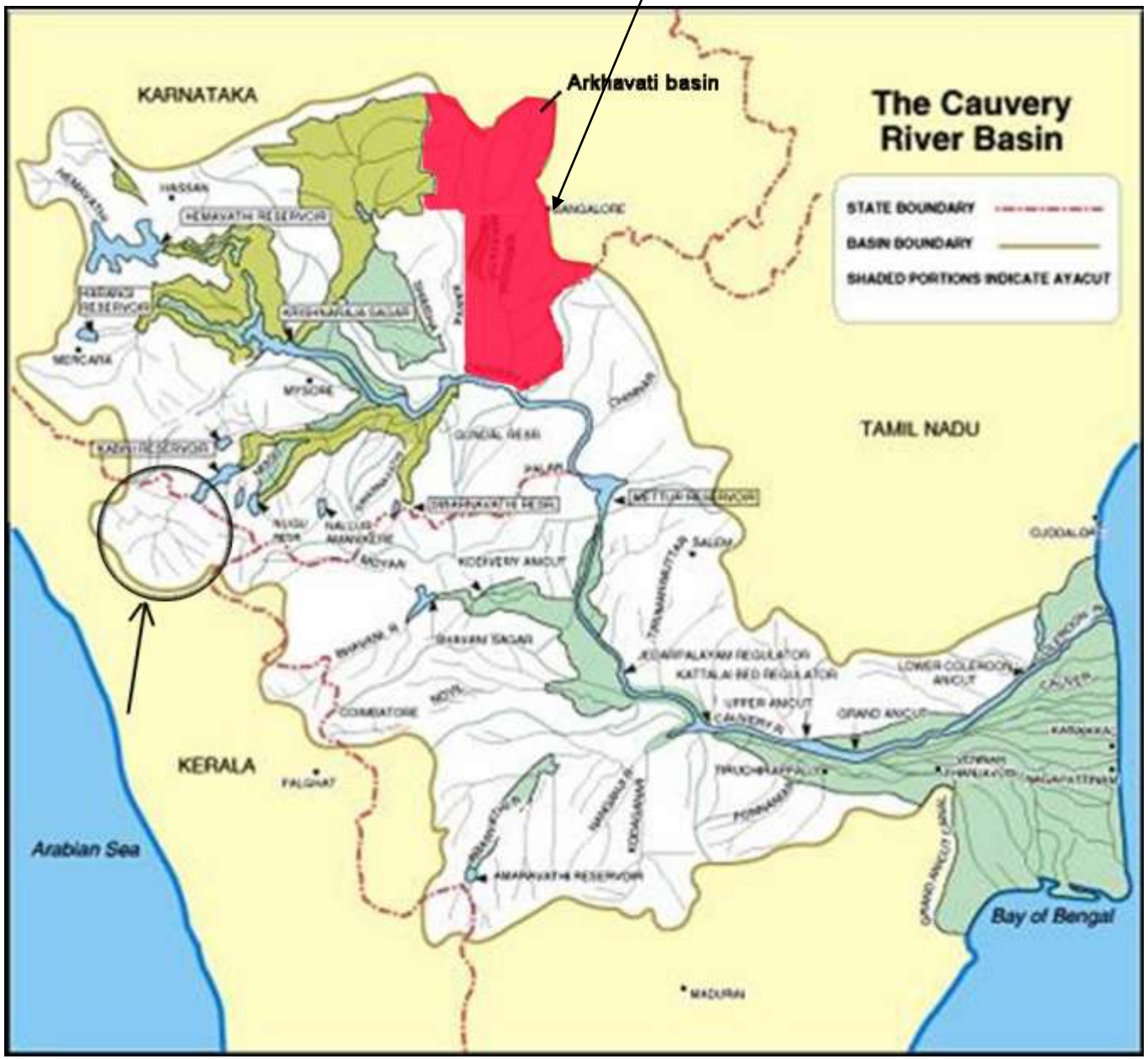
Urban Water

With very little catchment management

Rivers are drying up

The Cauvery river basin – rivers

Bangalore drying up

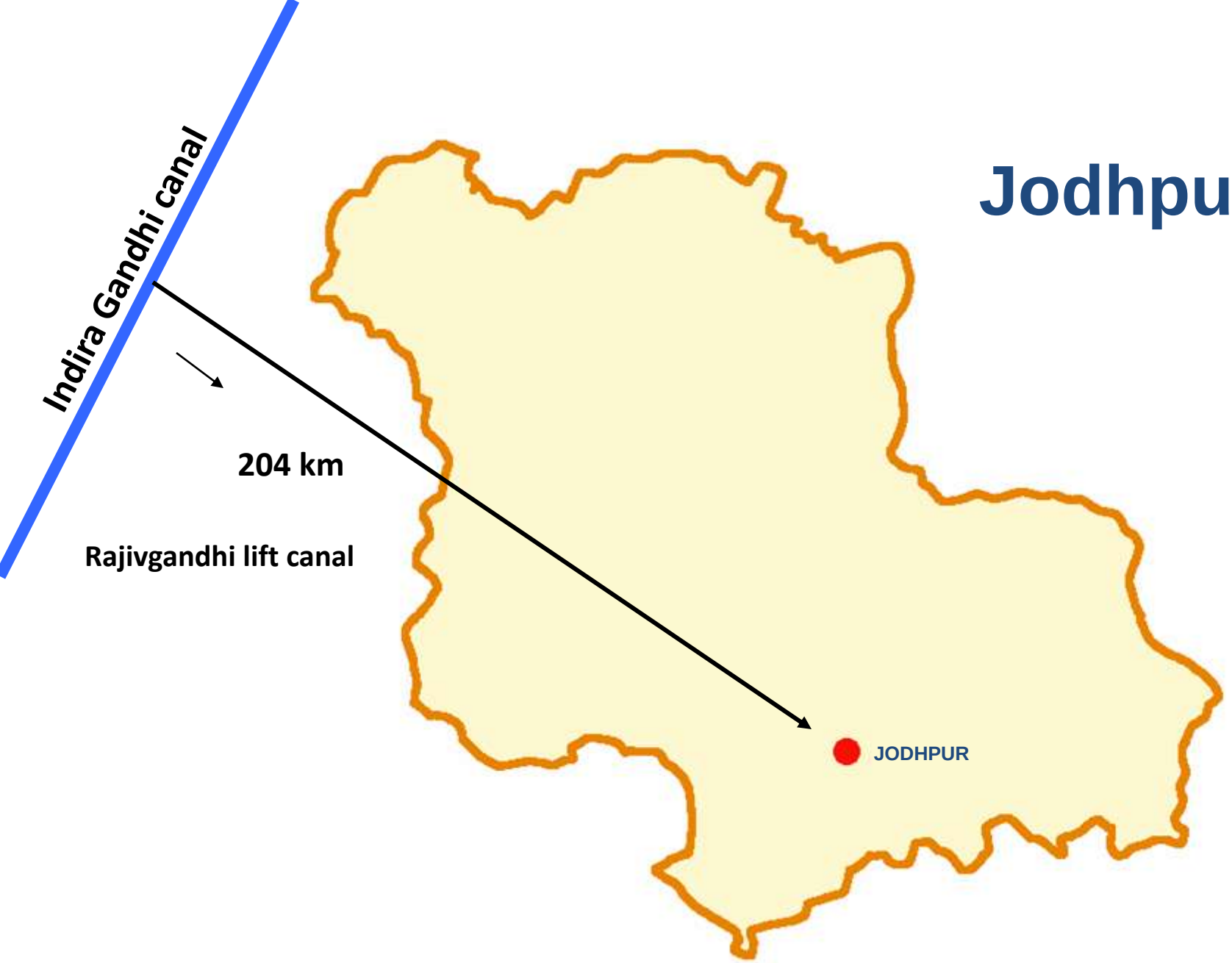


Cities search for water

- **Chennai:** 235 km (Veeranam lake) and now planning to go farther 300 Km (Veeranam extension project).

- **Bangalore: 95 km** (Cauvery) pumping 300 m elevation.

- **Delhi**: from **Tehri dam (450 km)**. Source : Gita Kavarana



Source: Gita Kavarana

The issue

- Exploding water demand in cities
- Problems of urbanization : water shortage , falling groundwater table and flooding
- Need to manage water in cities holistically

→ Case study of a city as an example- Bangalore 9 million

Realities

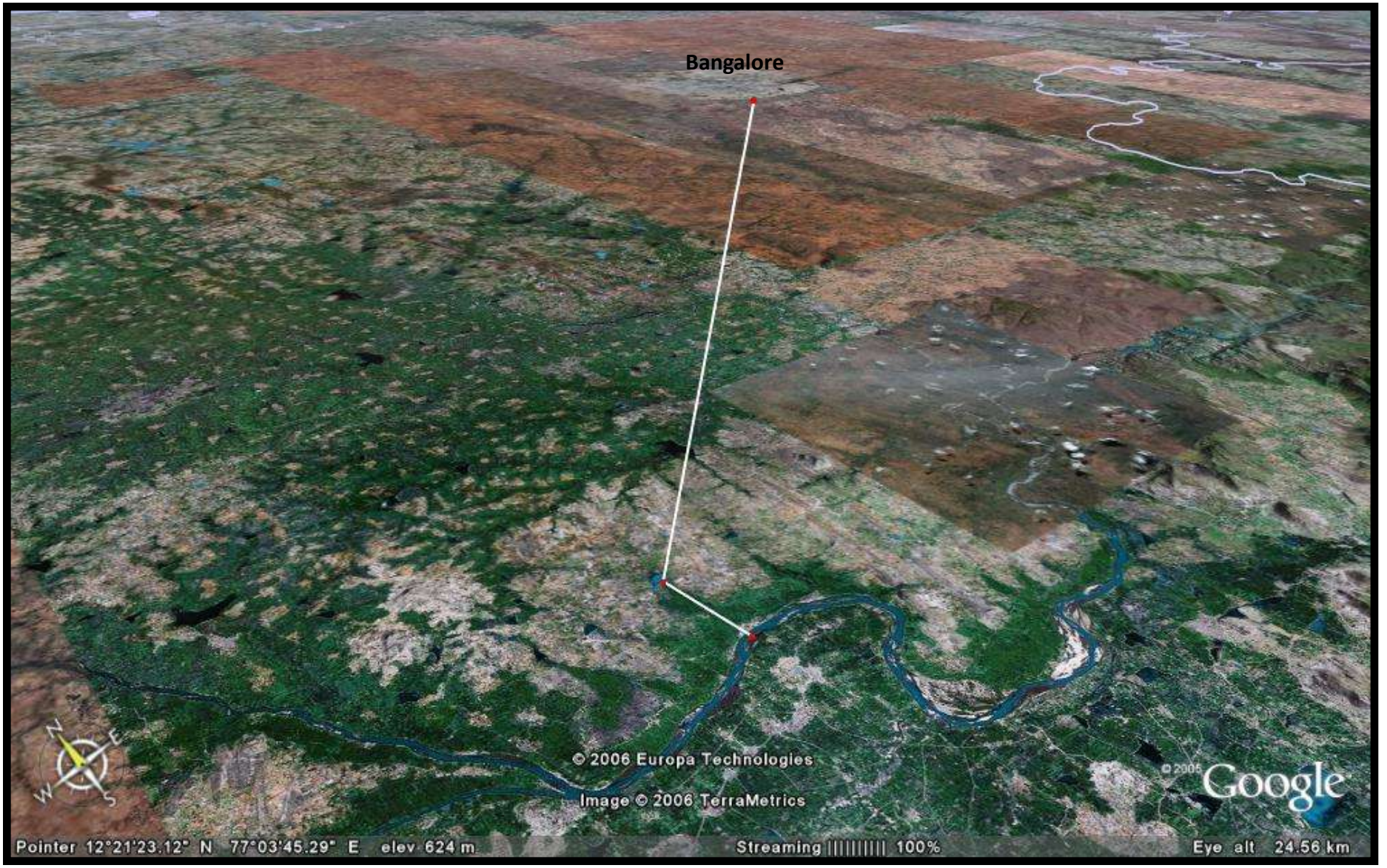
- New paradigm required
- Multiple sourcing of water
- Source control for flood management
- Institutional coordination
- People's participation in solution's
- More space for 'softer' solutions like education

Water tanker

Bore well

Bangalore need

Bangalore gets its water from the Cauvery 95 kms and 500 meters below the city



Water in the city

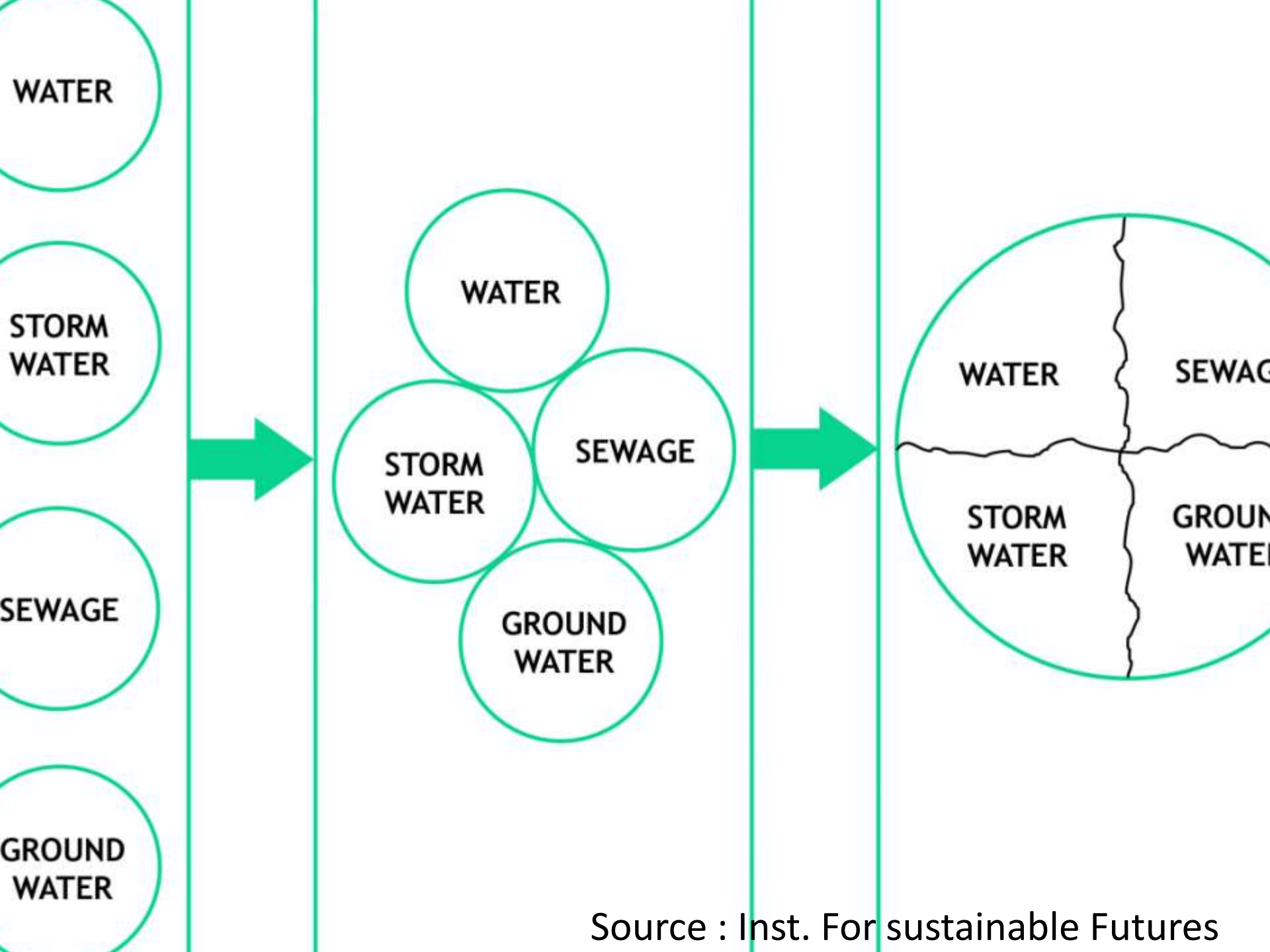
Lakes and tanks :

261 in 1960
81 in 1997
55 in 2000

Lake development authority created to preserve and enhance surface water bodies in city

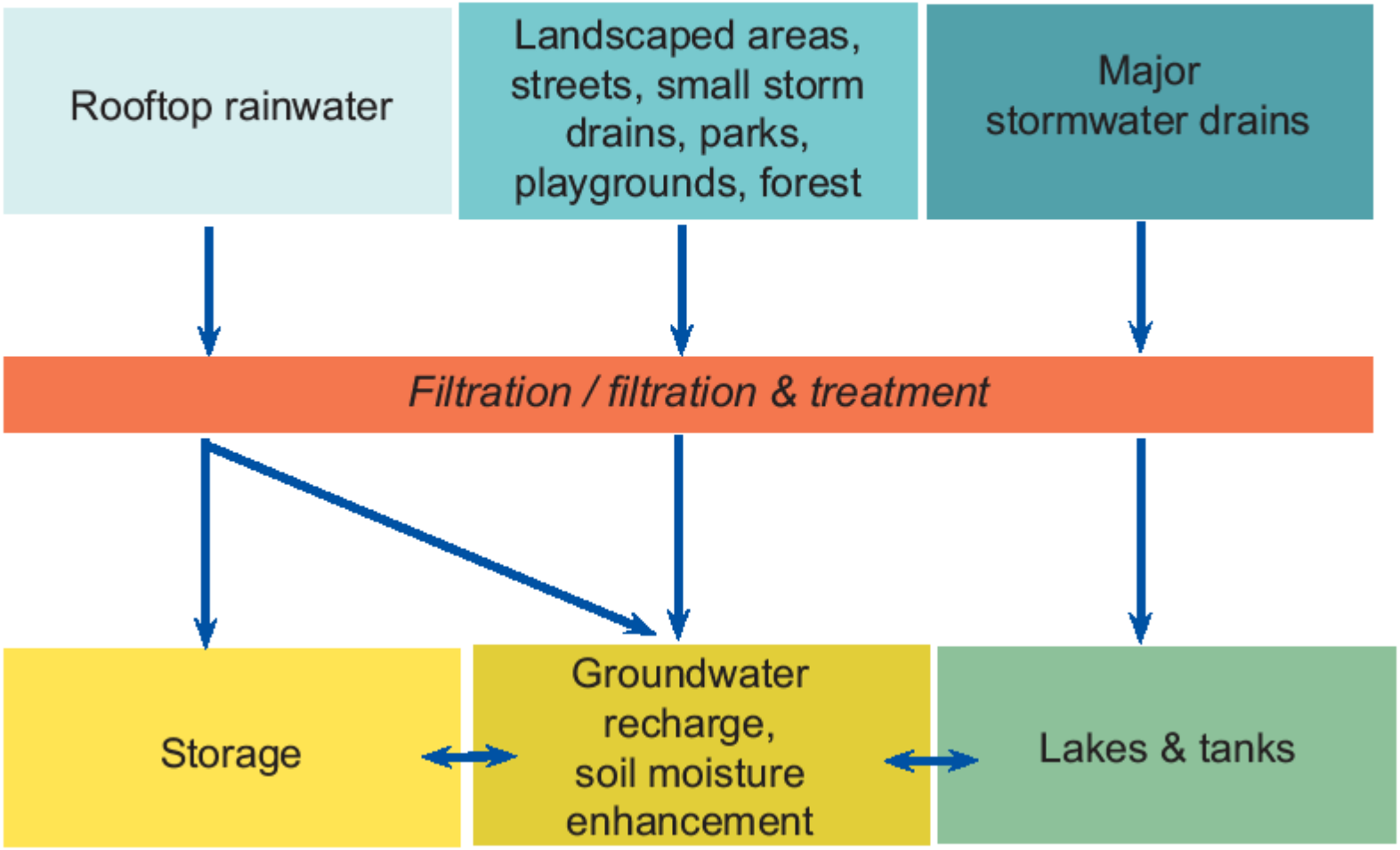
Bangalore need : limitations

Rainwater Harvesting

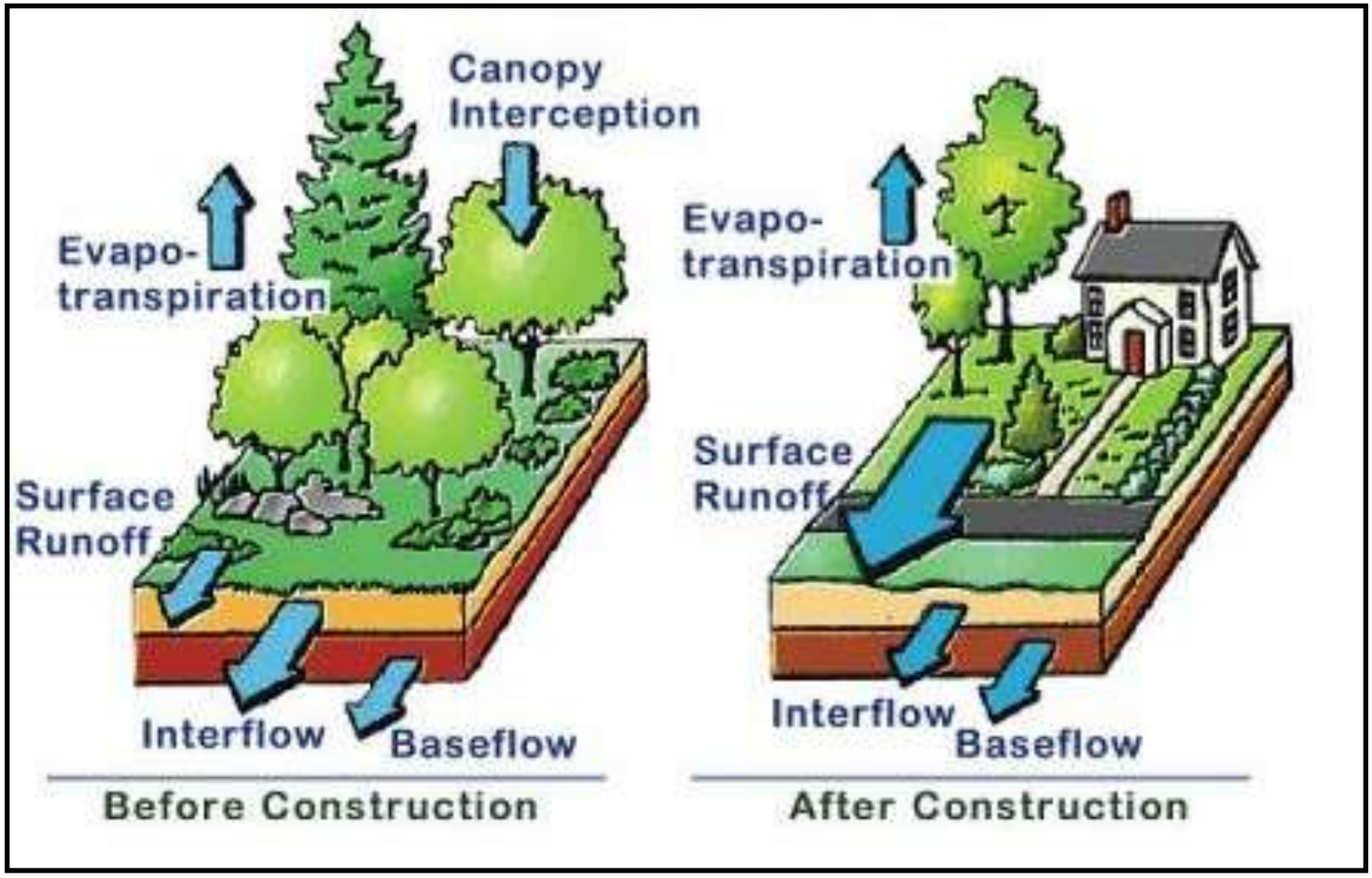


Source : Inst. For sustainable Futures

RAIN IN A CITY



Local hydrologic cycle – seeking bio mimicry with rainwater harvesting



Hydro-flows

• Surface runoff	15	90
• Recharge	10	5
• Evapo-transpiration	75	5

- The aim of rainwater harvesting is bio-mimicry.

How much water do I use in urban Bangalore?

Consumption range :
from 50 to 300 liters per person per day

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

What is rainwater harvesting ?

The collection and storage of rain for future productive use

Capital cost – *in Bangalore*

- Piped water supply :

  1,500 Million Litres per Day
  Investment Rs.80,000 million (*$ 1800 million*)

- Rainwater :

  3,000 Million Litres per Day
  Rs. "0.00"(zero) ?

Can a better balance be reached ??

The new rainwater harvesting bye-law

- For every plot create recharge or storage
  - @ 20 litres per square metre of roof area
  - @ 10 litres per square metre of paved area

  Minimum depth of recharge well 3 metres

How to harvest rainwater ?

- Understand rain (quantum/pattern/intensity)
- Cascade capture
- House/Apartment/Institution/Industry/Park
- Storm water harvesting in ‘tanks’/lakes
- Ground water recharge

Rainfall pattern in Bangalore

30 years data

MONTH	DAYS	QUANTITY (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**

EVERY ROOF CAN BE A CATCHMENT

Gutters

Gutter-for sloping roof transmitted through

- PVC
- Polycarbonate
- GI
- Aluminium
- Stainless steel

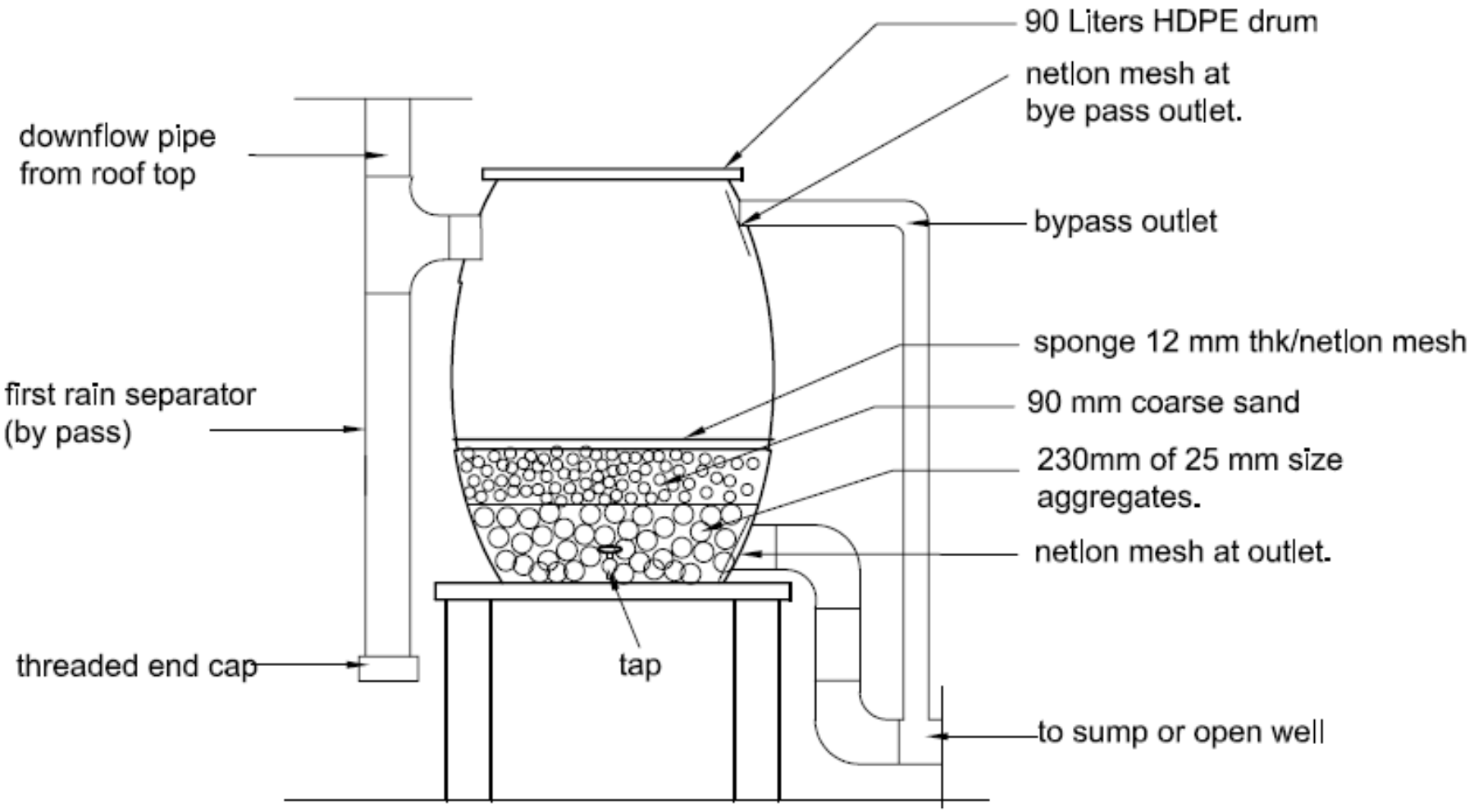
Downpipes

Down water pipes made of

- HDPE
- PVC
-AC PIPES ARE OK TOO

The aesthetics of rainwater harvesting

Filters


90 Liters HDPE drum
netlon mesh at
bye pass outlet.
downflow pipe
from roof top
bypass outlet
sponge 12 mm thk/netlon mesh
first rain separator
(by pass)
90 mm coarse sand
230mm of 25 mm size
aggregates.
netlon mesh at outlet.
threaded end cap
tap
to sump or open well

Double drums filter

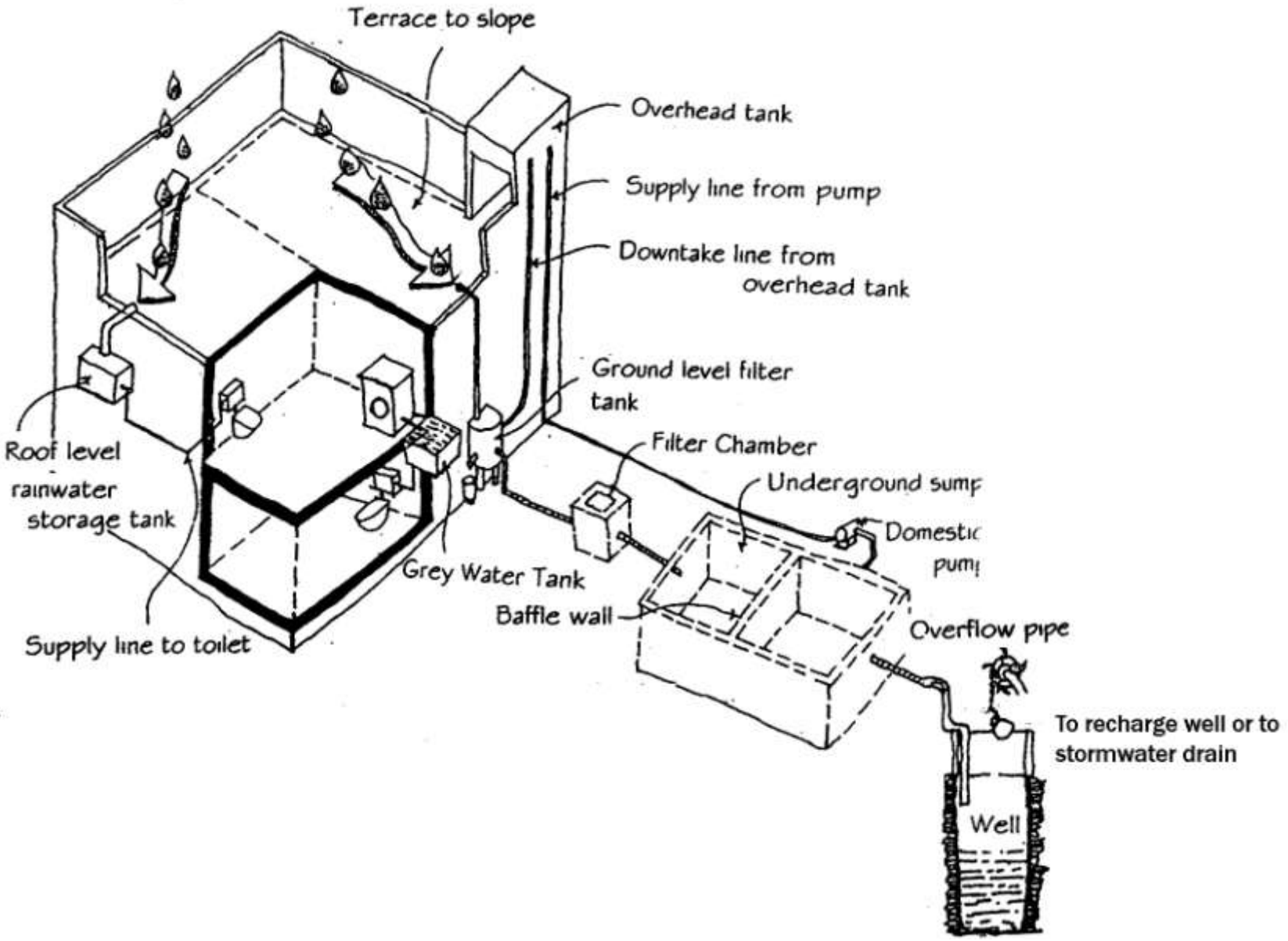
When the roof area is bigger than 100 m², it is possible to use two drums as filter.

Drum filter of the roof top harvesting system of an appartment


RAIN WATER
HARVESTING-IInd
Co ssioned On 19-11-2009


Rainy
"Patent Pending"
"Design Regn No. 238711"

Water harvesting and water reuse in a house



Rain barrel : easiest way to begin rainwater harvesting

Rain barrels at work

Details of a rain barrel

Plastic basket filter

Aluminium basket filter

Rainwater harvesting in an industry

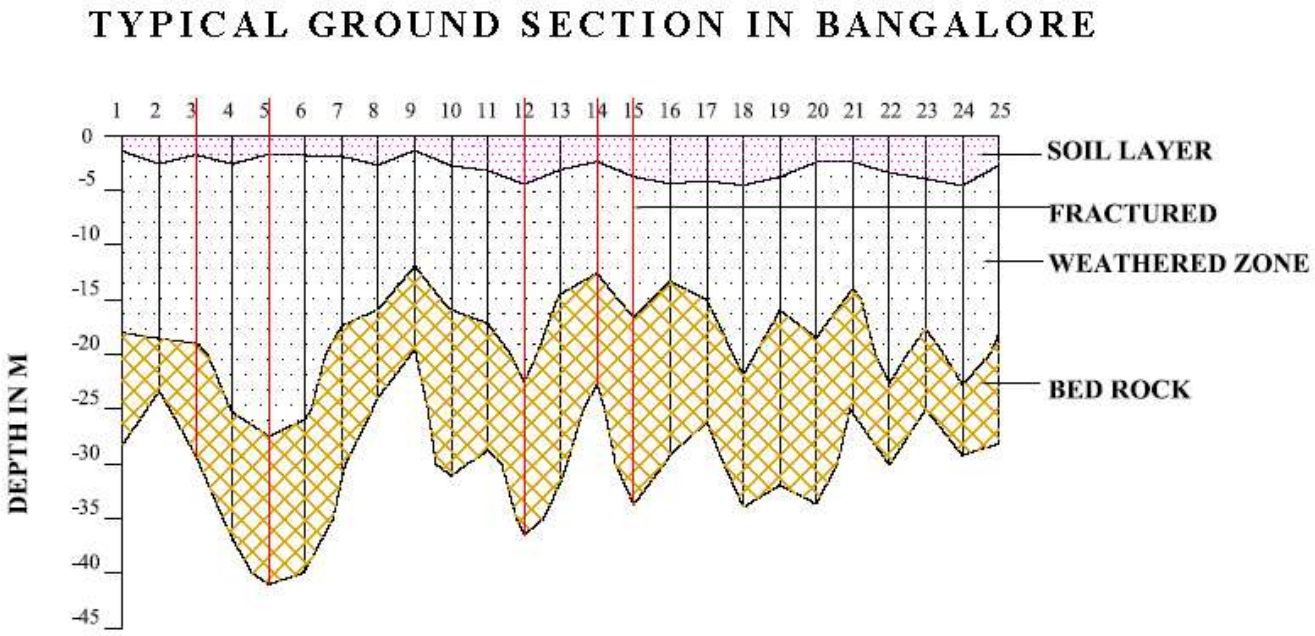
4 acres > objective 0% runoff

Rain Barrels harvesting rooftop rainwater

Site Selection for Infiltration and groundwater recharge with rainwater

Many factors affect the suitability of a site as an infiltration facility for the disposal of storm-water. Among these, the following are most important:

- Depth to groundwater
- Surface soil type
- Underlying soil type
- Vegetation cover of the infiltrating surface
- The uses of the infiltrating surfaces
- The ratio of tributary impervious surface to the infiltrating surface



The making of a recharge pit : locality

If the pit aims to recharge a borewell, it should be built as close to it as possible.
Ideally it should be in the valley of the surface layout.

Borewell and recharge pit

Site identification

The site should have a sufficient clean and large catchment.
It should also permit fast infiltration and percolation.

Excavation

The excavation should reach porous soil / weathered rock / fracture.

Digging the pit

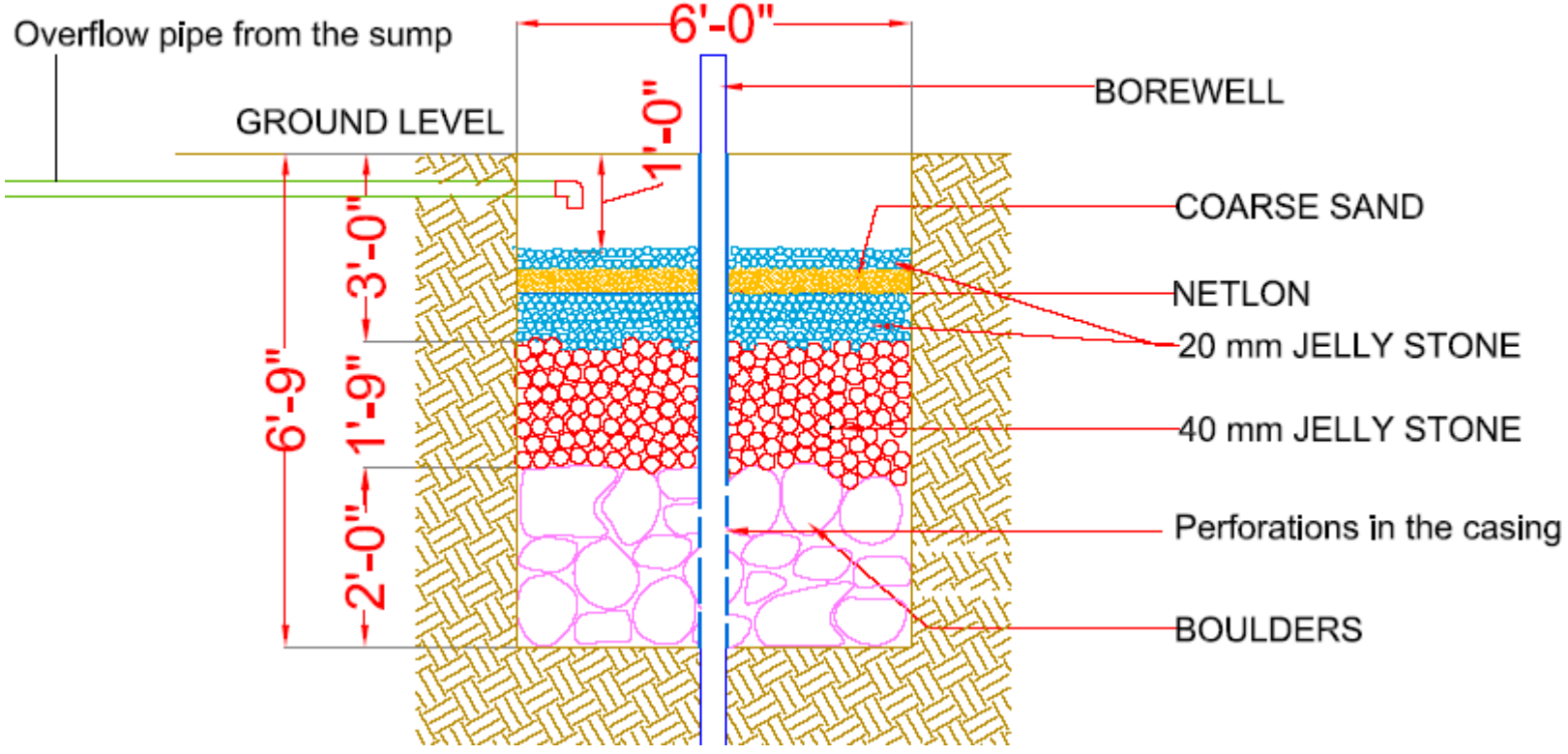
Filling of the pit

Backfilling. Round hard material.

Smaller stones on top

Finished recharge pit

Recharge pit around bore wells



The making of a recharge well

The pit has reach the silt layer

Pit and concrete rings

Placing of the rings

Recharge wells details

Covers : grilled or perforated RCC

Silt and leaves trap in a stormwater drain

Recharging a bore well

Outlet pipe in recharge well

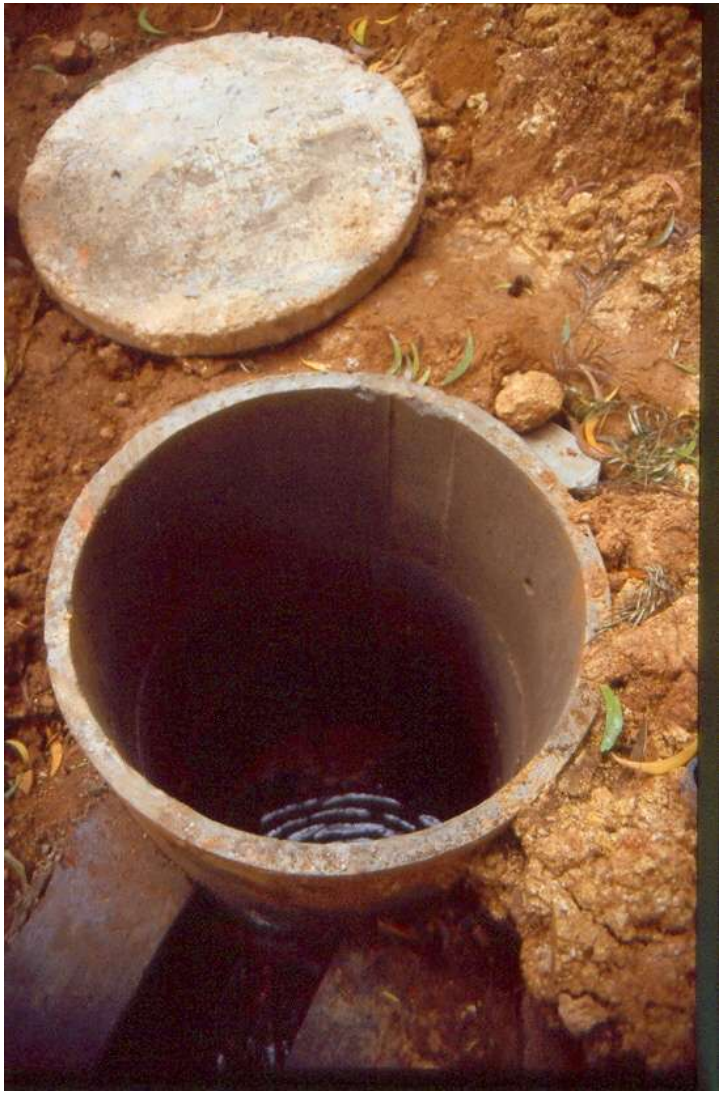
Rainwater sent for recharge

Storm-water harvesting

Leaky well

- Locate recharge well in the channel or off the channel
- Make arrangements to remove silt and leaves before water enters recharge well
- Monitor the rate of recharge and decide on the number of recharge wells necessary for the catchment

Don’t forget the maintenance



Recharge wells in storm-water drains

Storm-water designs

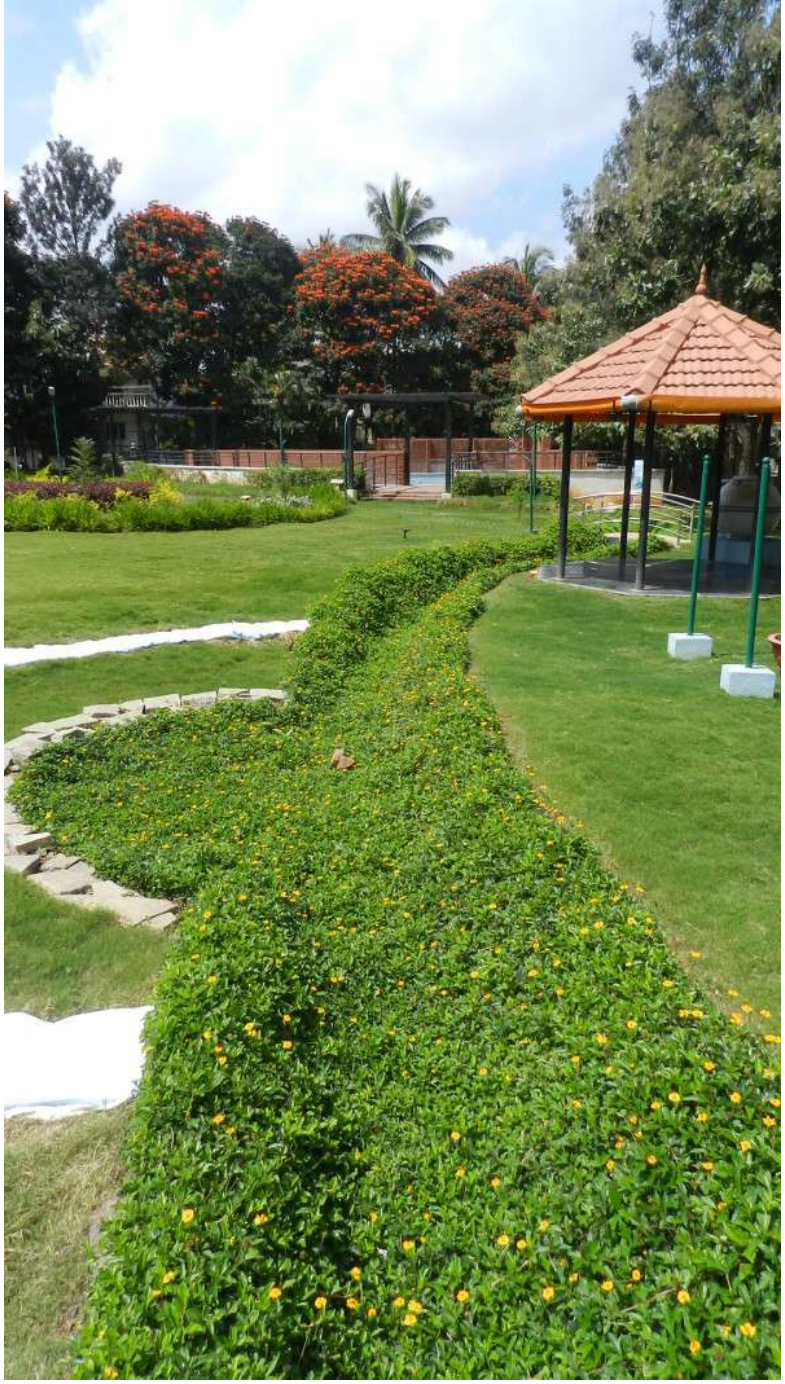
Chikkabettahalli .....wells provide for the poor. Recharge helps the poor

A recharge well in an IT office

Rainwater Harvesting Theme Park

Aerial View of Theme Park

Porous Pathways



Green storm-water drains

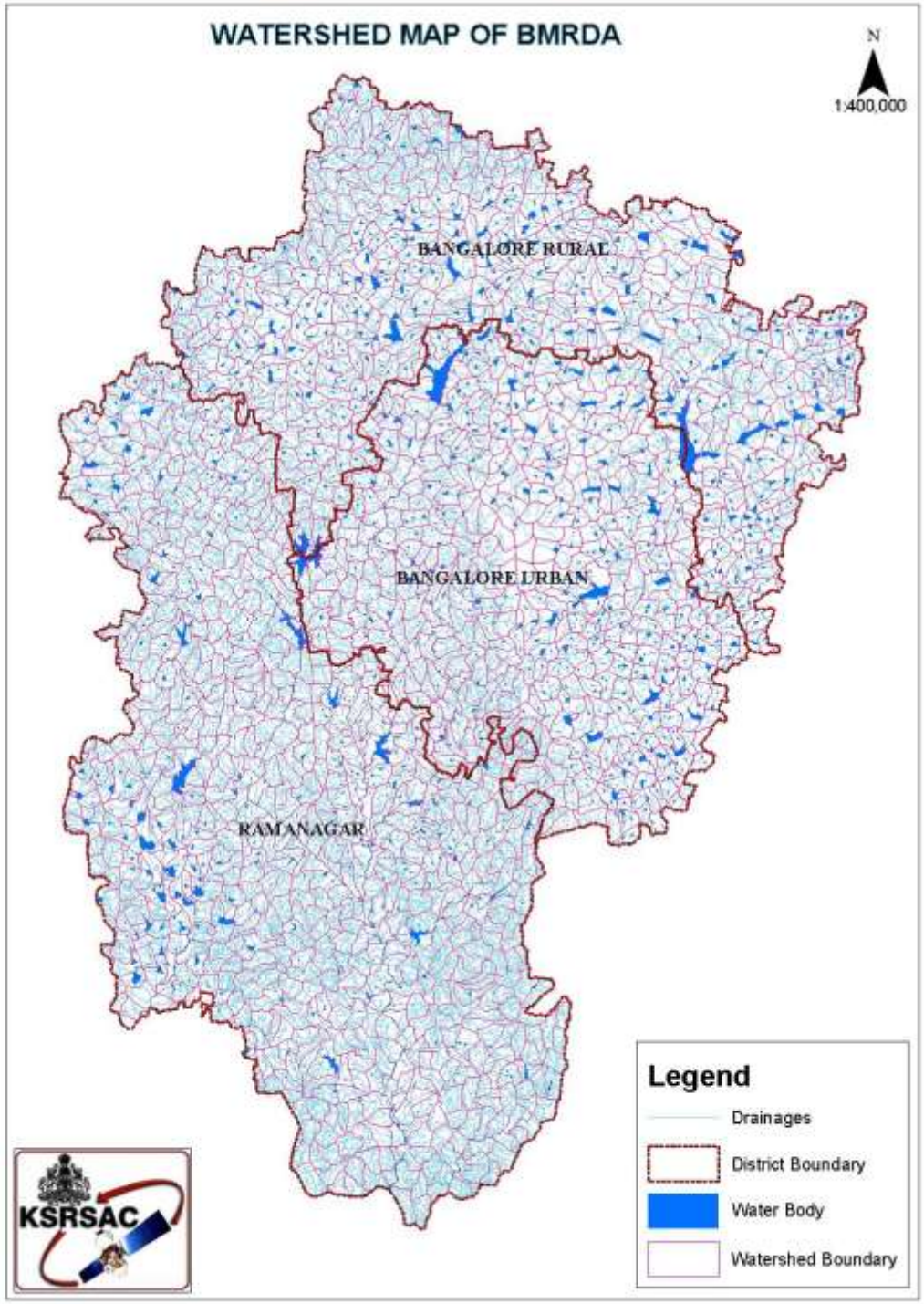
The Lake Ecosystem

What has been achieved ?

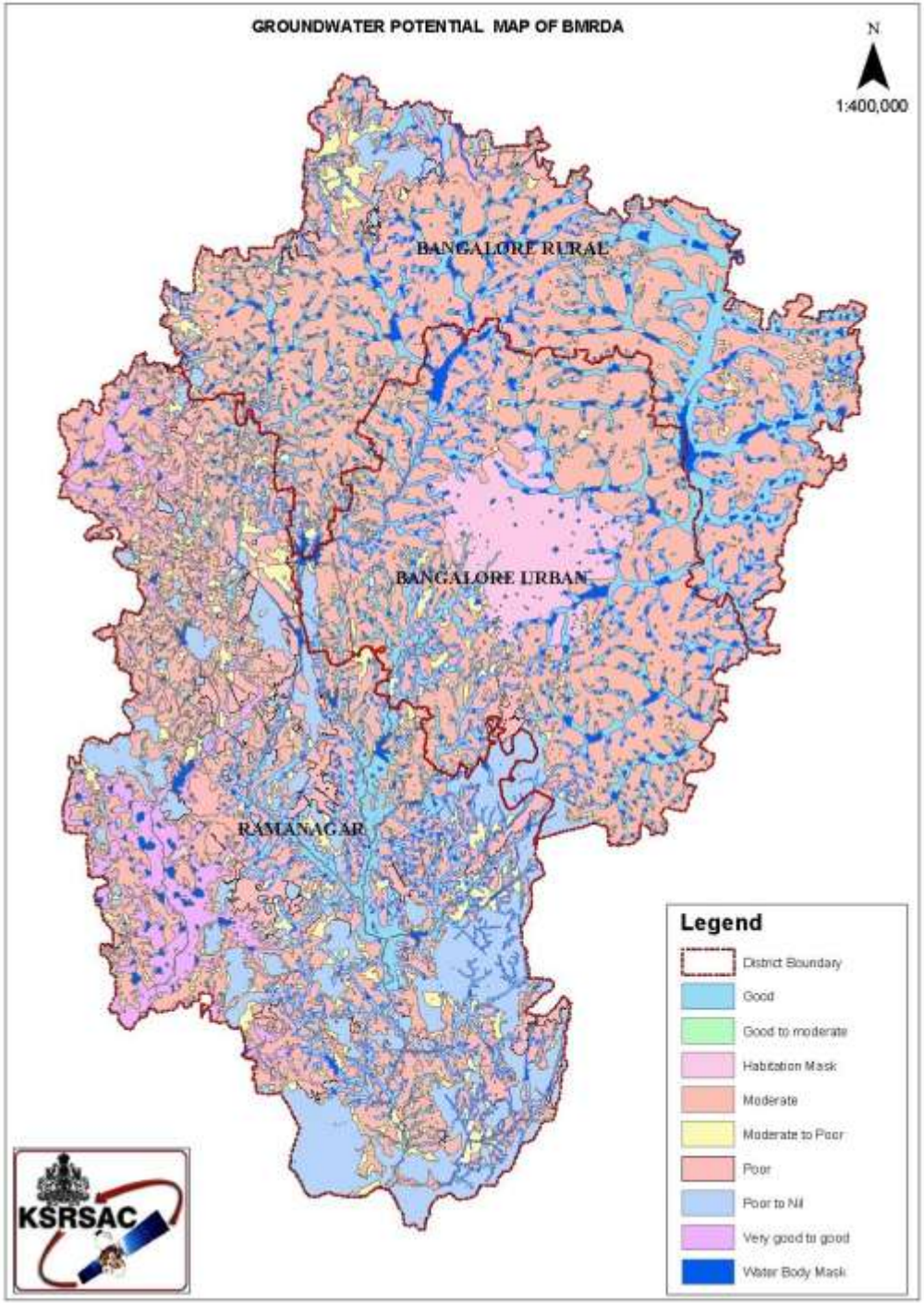
- 100,000 buildings with rainwater harvesting systems
- The metro rail having rainwater harvesting
- All parks and gardens with rwh
- Over 1000 trained plumbers
- A bye-law making it mandatory for new buildings
- A robust industry such as filter making for rwh

The challenge

- Air Pollution
- Catchment management
- Sewage management
- Solid Waste management
- Land use Planning
- Information and knowledge
- Capacity Building


WATERSHED MAP OF BMRDA
N
1:400,000
BANGALORE RURAL
BANGALORE URBAN
RAMANAGAR
KSRSAC
Legend
Drainages
District Boundary
Water Body
Watershed Boundary

GROUNDWATER POTENTIAL MAP OF BMRDA

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