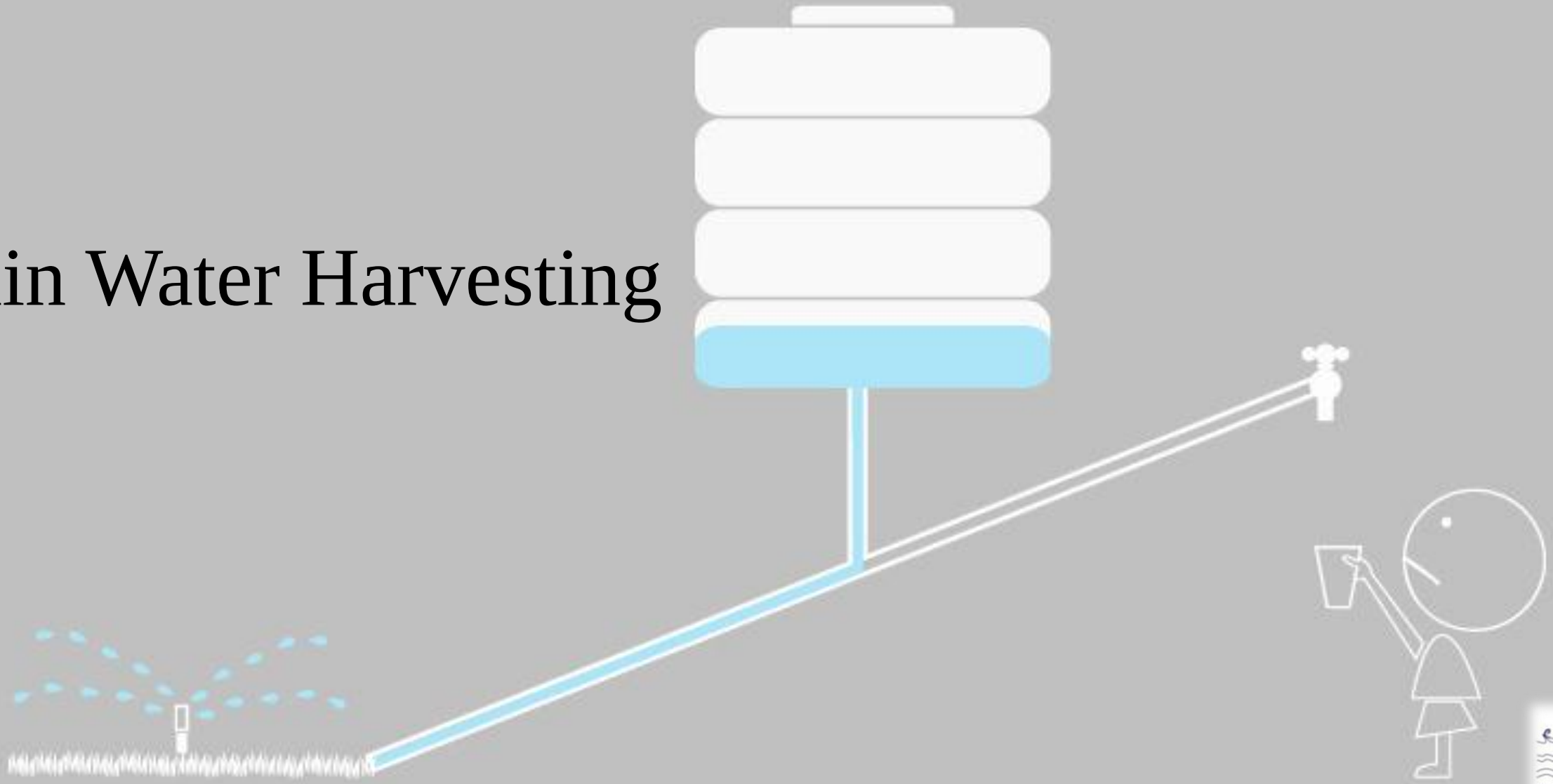
Rain Water Harvesting



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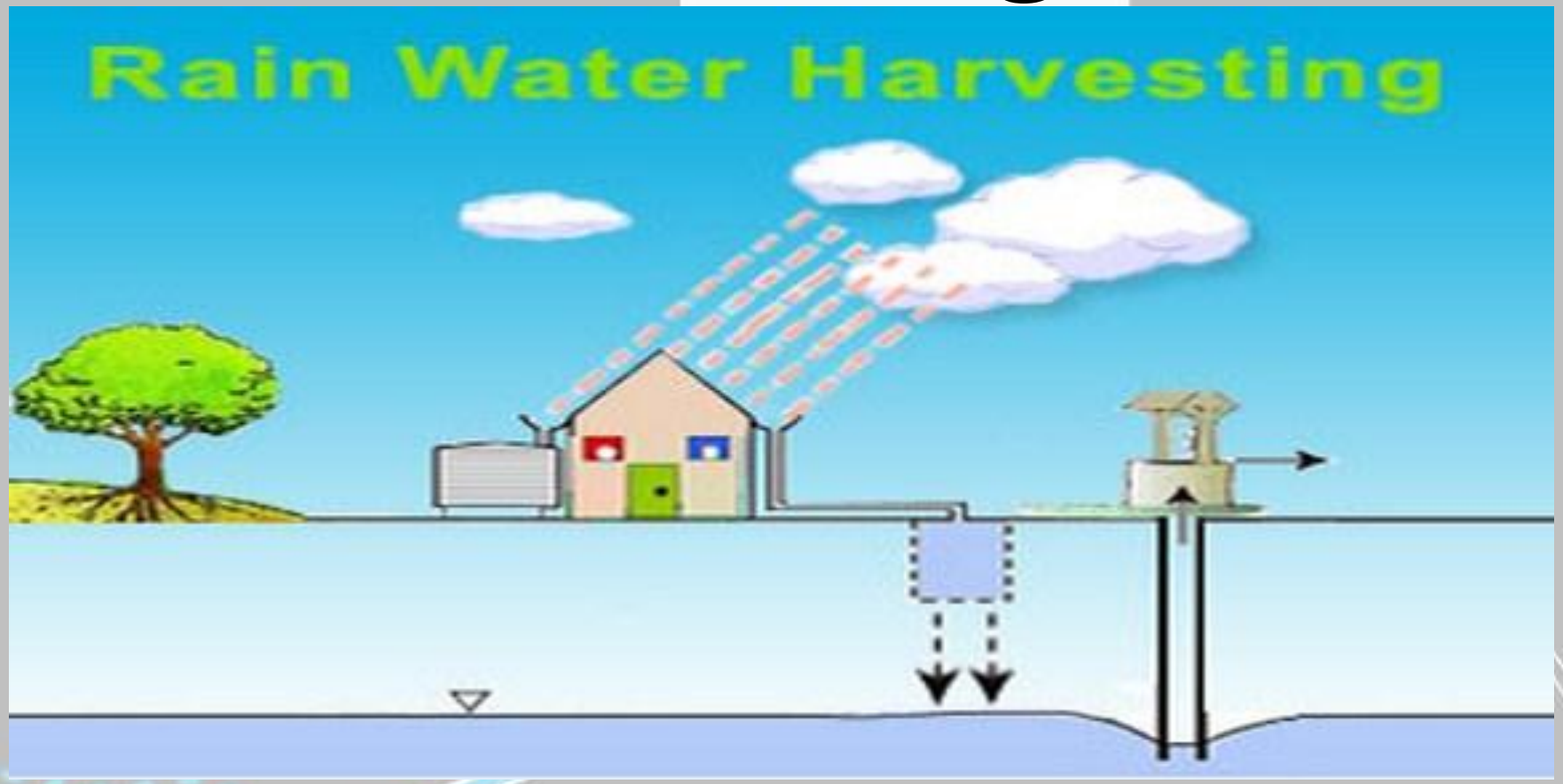
What is Rain Water Harvesting?



An artificial process of collecting and capturing rainfall, close to where it falls and using it with minimum loss or wastage , close to where it falls. The rainwater can be directly used by storing into tanks or can be recharged into groundwater

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Why we need rainwater harvesting?

- Provide drinking water
- Provide irrigation water
- Increase groundwater recharge
- Reduce storm water discharges, urban floods and overloading of sewage treatment plants

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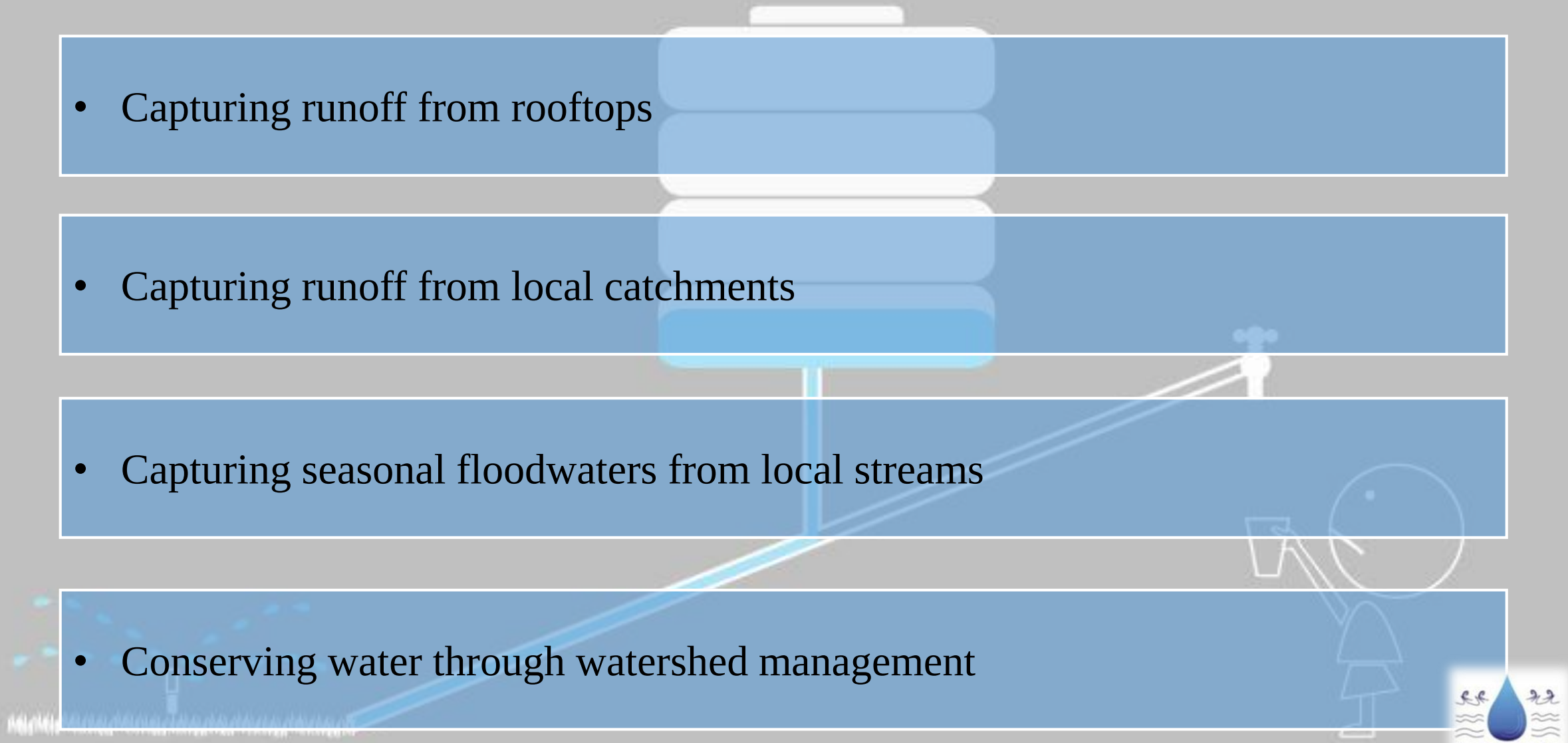
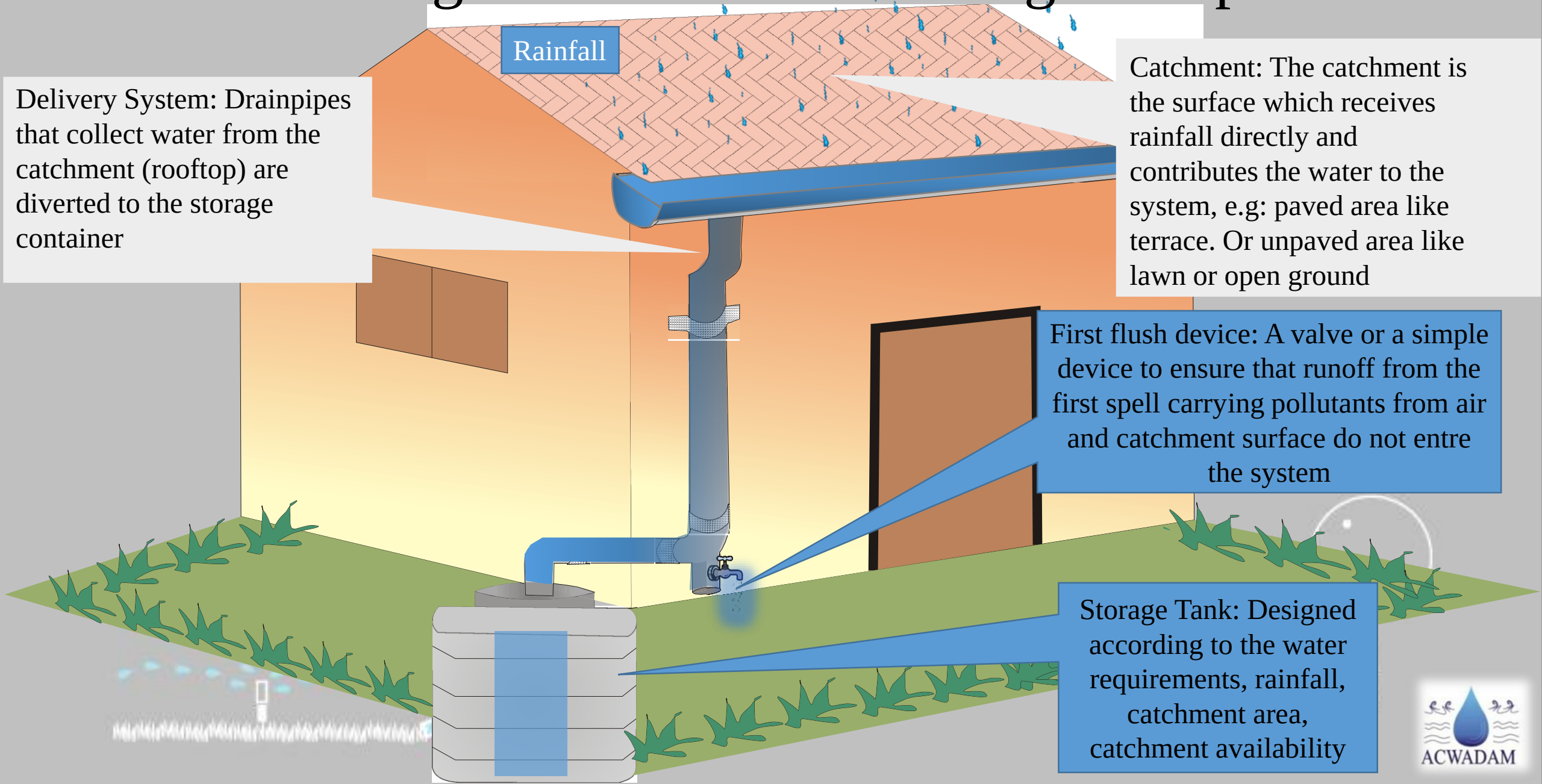
Ways of harvesting water

- Capturing runoff from rooftops
- Capturing runoff from local catchments
- Capturing seasonal floodwaters from local streams
- Conserving water through watershed management



Direct Storage Rainwater harvesting: Components



Delivery System: Drainpipes that collect water from the catchment (rooftop) are diverted to the storage container

Catchment: The catchment is the surface which receives rainfall directly and contributes the water to the system, e.g: paved area like terrace. Or unpaved area like lawn or open ground

First flush device: A valve or a simple device to ensure that runoff from the first spell carrying pollutants from air and catchment surface do not entre the system

Storage Tank: Designed according to the water requirements, rainfall, catchment area, catchment availability

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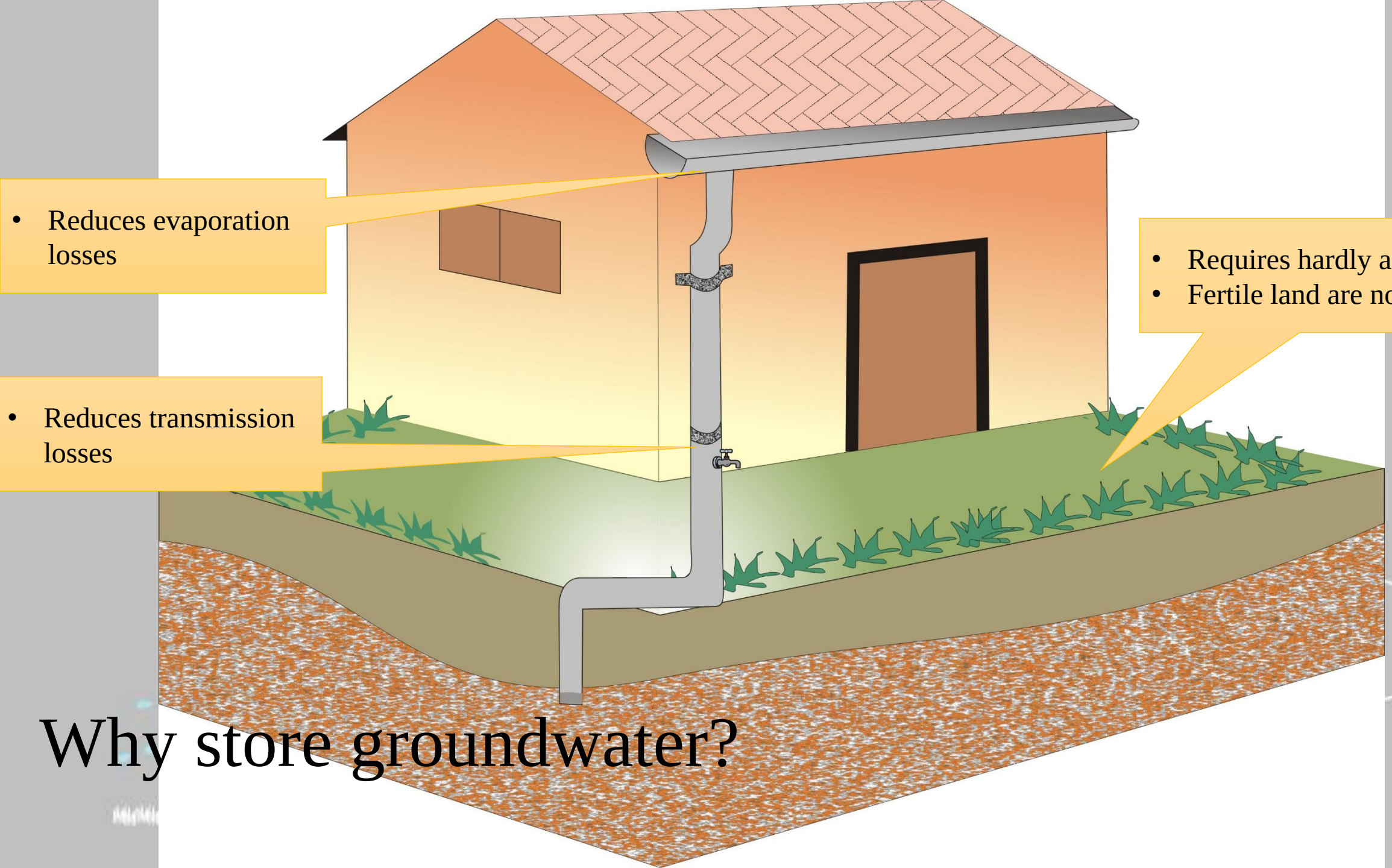
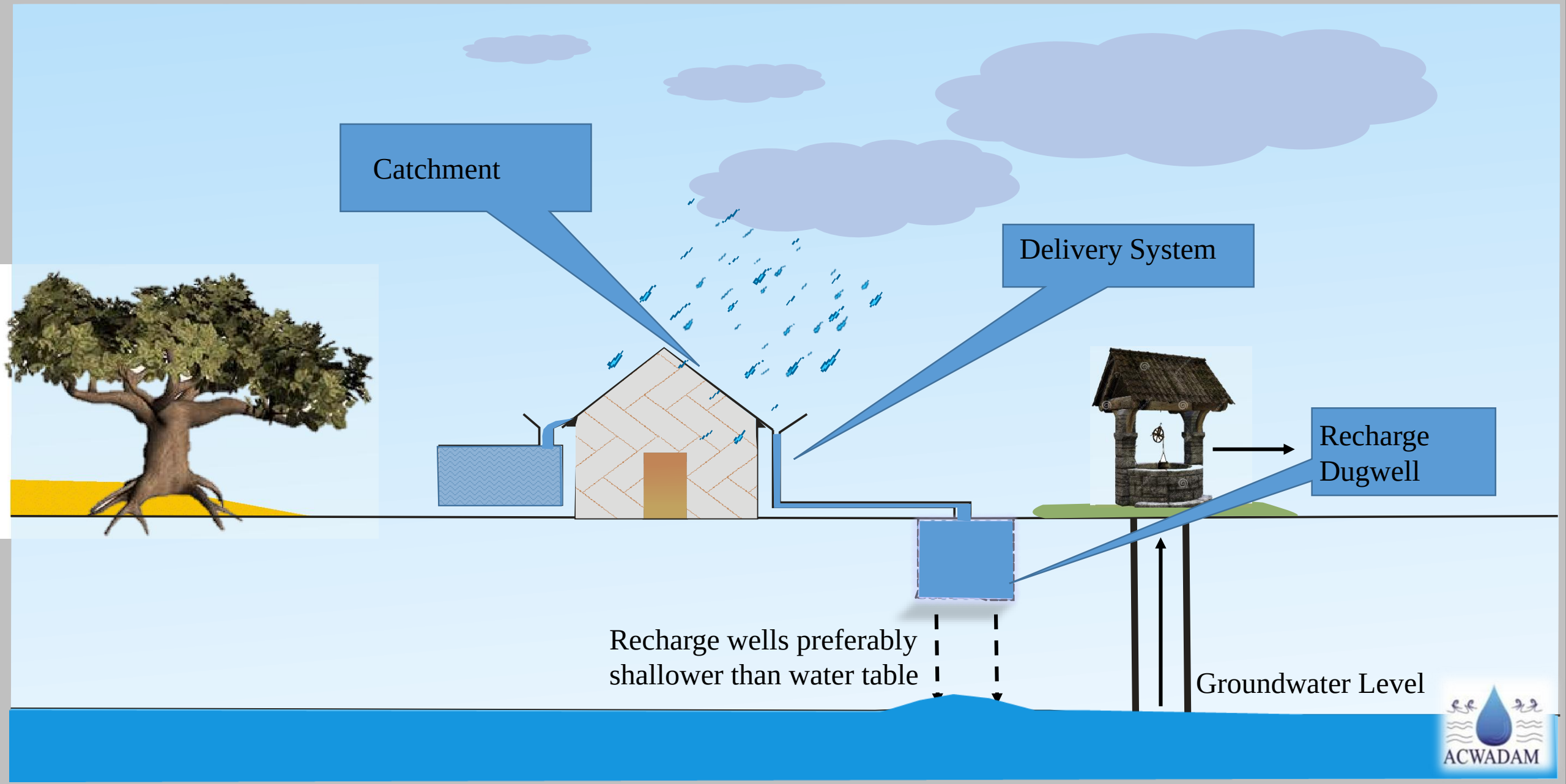
Why store groundwater?

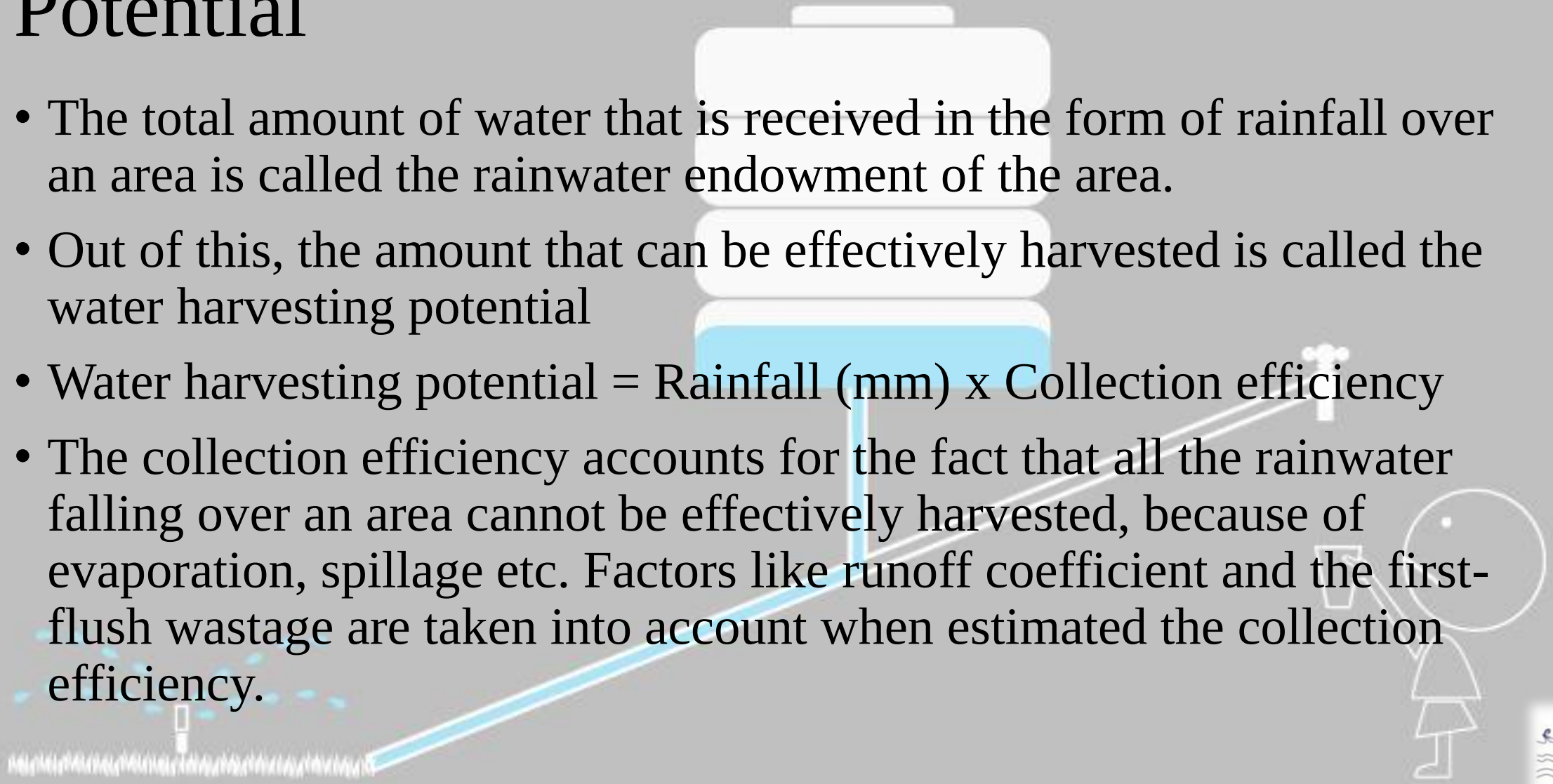


Groundwater storage rainwater harvesting: Components



Rainfall Endowment and Water harvesting Potential

- The total amount of water that is received in the form of rainfall over an area is called the rainwater endowment of the area.
- Out of this, the amount that can be effectively harvested is called the water harvesting potential
- Water harvesting potential = Rainfall (mm) x Collection efficiency
- The collection efficiency accounts for the fact that all the rainwater falling over an area cannot be effectively harvested, because of evaporation, spillage etc. Factors like runoff coefficient and the first-flush wastage are taken into account when estimated the collection efficiency.



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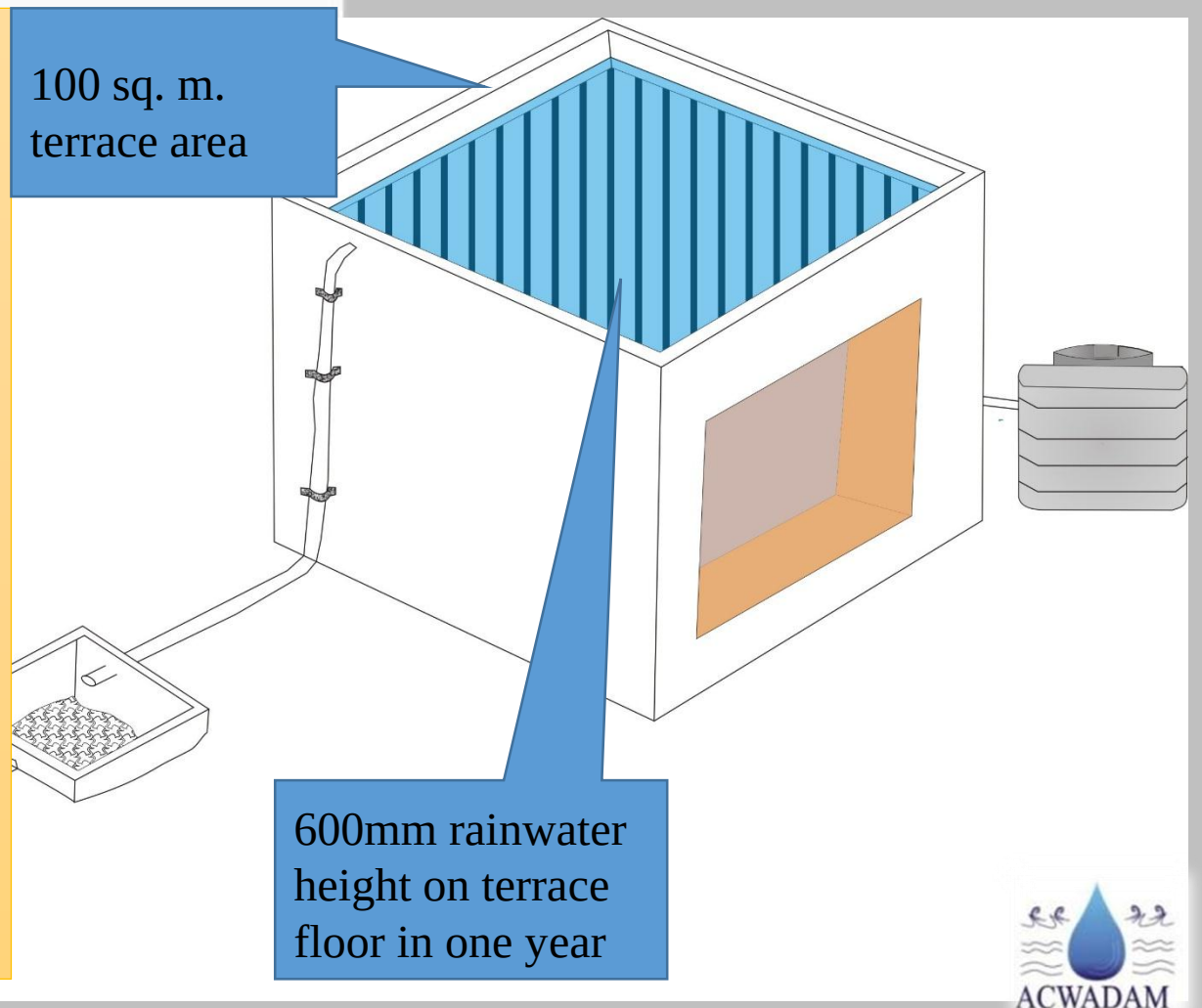
The following is an illustrative theoretical calculation that highlights the potential for water harvesting.

- Consider your own building with a flat terrace area of 100 sq m. Assume the average annual rainfall in your area is approximately 600 mm (24 inches). In simple terms, this means that if the terrace floor is assumed to be impermeable, and all the rain that falls on it is retained without evaporation, then, in one year, there will be rainwater on the terrace floor to a height of 600 mm.
  Area of plot = 100 sq. m. (120 square yards)
  Height of the rainfall = 0.6 m (600 mm or 24 inches)
  Volume of rainfall over the plot = Area of plot x height of rainfall
  Assuming that only 60 per cent of the total rainfall is effectively harvested
  Volume of water harvested = 36,000 litres (60,000 litres x 0.6)



Rainfall Endowment

- Rainfall endowment is the total annual rainfall over an area
- All over the world, rainfall varies from place to place

Place	Rainfall Endowment
Cherapunji	1177 cm
Port Blair	289 cm
Bengaluru	196
Pune	104
Shri nagar	66
Jaisalmer	22

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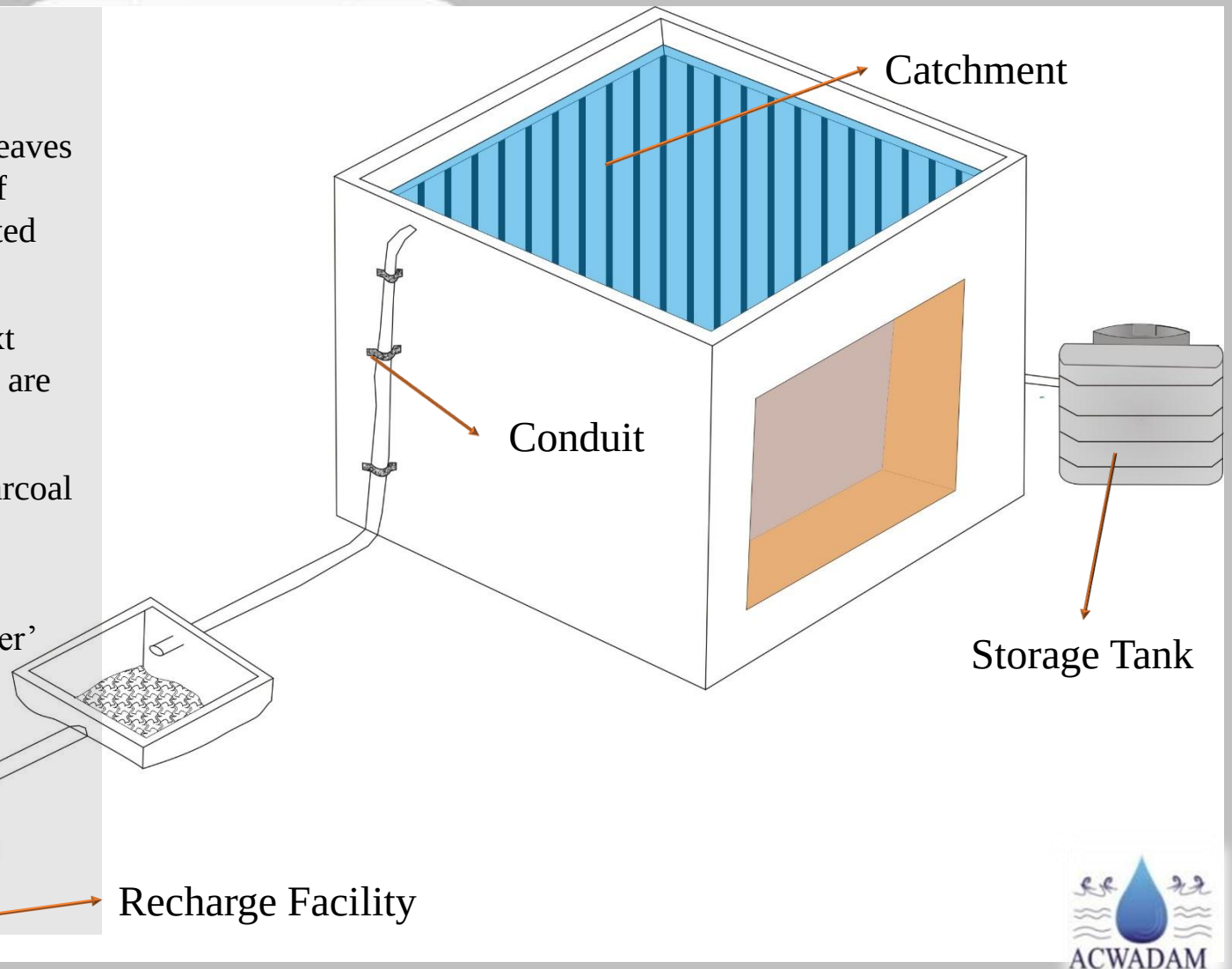
Water harvesting systems consists of….

- Catchment area: This is the area from which the run-off can be collected for harvesting. It can be roof, paved, unpaved, etc.
- Filtering system: It is usually necessary to use mesh to prevent leaves and other debris from entering the conduits or subsequent part of water harvesting system. Simple sand filter and more sophisticated filters are used to remove contaminants wherever possible .
- Conduits: For carrying the run-off from the catchment to the next water harvesting system. Usually 4 inches PVC pipe or CI pipes are the main elements of the conduit system
- Filtering System: There are number of filtering systems, e.g. charcoal filter, Sand filter or ceramic filters.
- Storage Tanks: There are two ways of harvesting water which is ‘storing water in suitable containers’ and ‘recharging groundwater’

a. Impervious tanks e.g.. Concrete, masonry which are usually below ground level

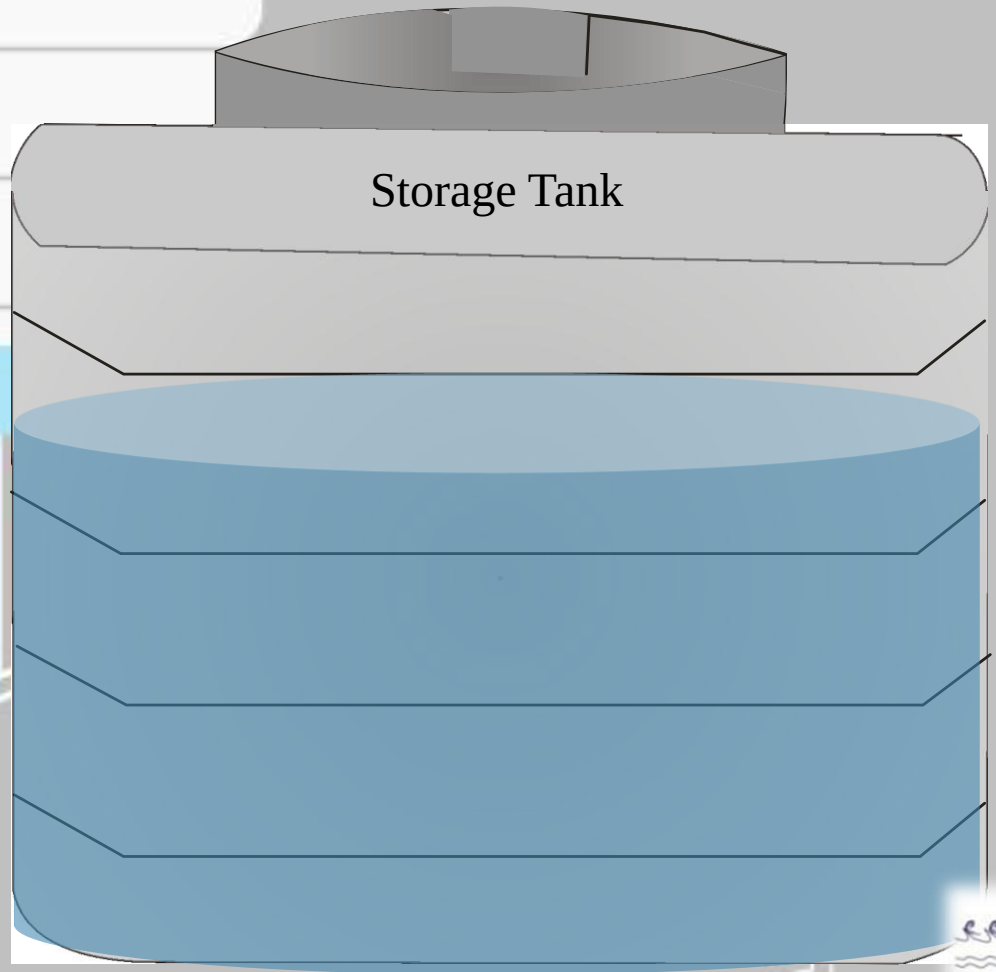
b. PVC or similar types: usually kept above ground referred as ‘Sintex Tanks’



Design Parameters for storage tanks

To meet domestic requirements of the beneficiaries:

a. Water harvesting Potential: amount of rainfall that can be harvested
b. Water required to meet the basic requirements of the beneficiaries
c. Size of containers: capable enough to meet requirements so as to satisfy the basic necessities like drinking, cooking water, etc.



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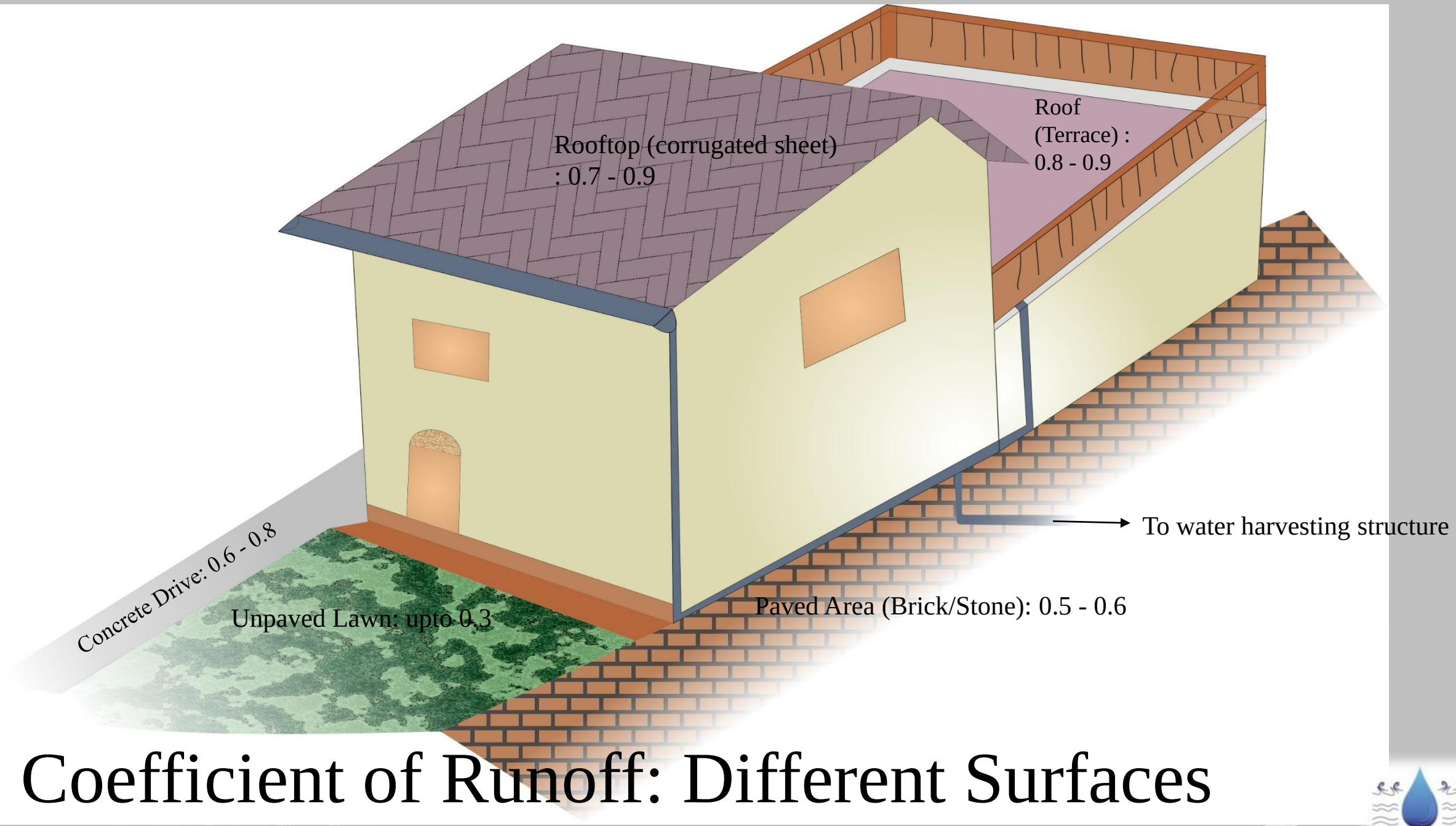

Coefficient of Runoff: Different Surfaces

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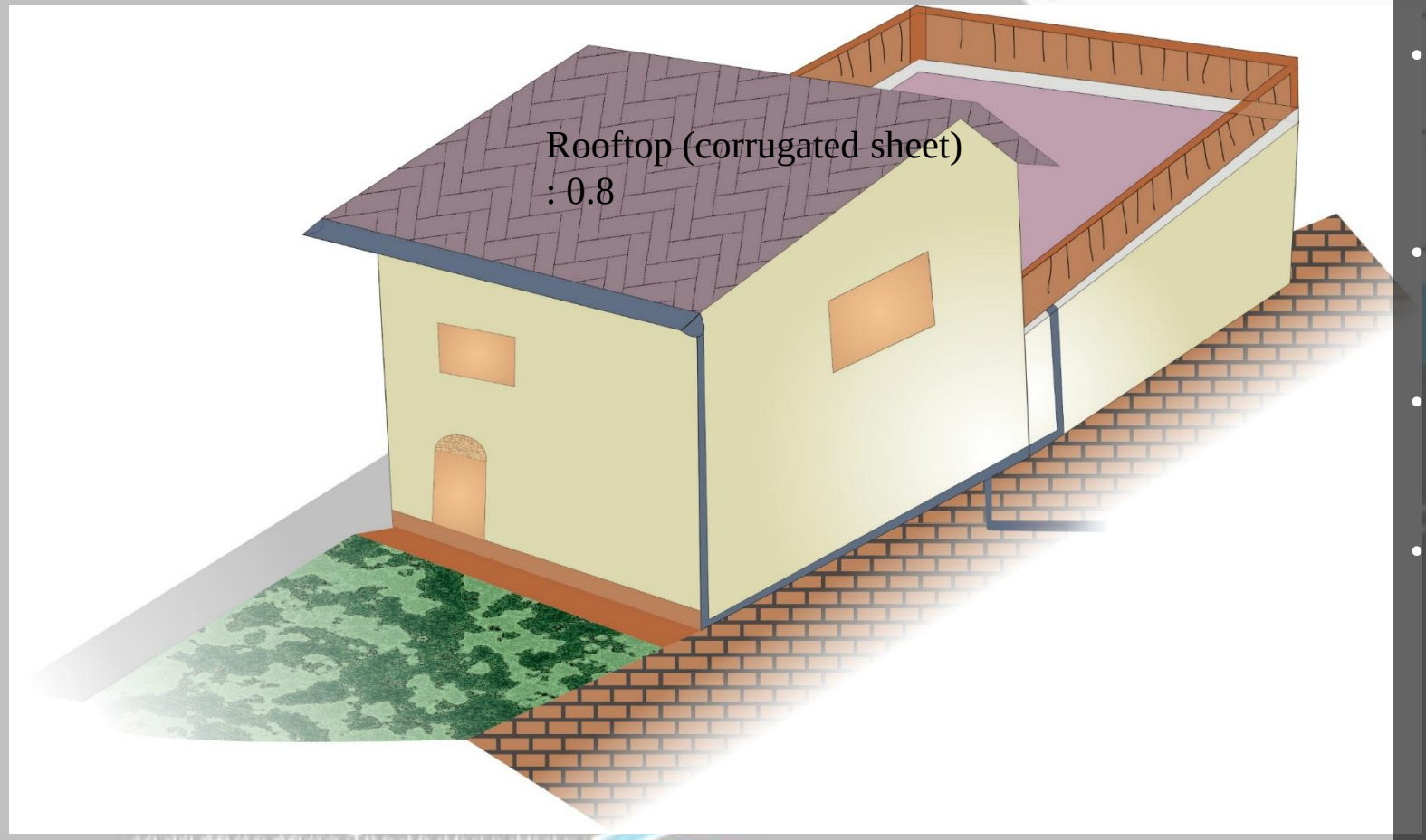
Annual water harvesting potential



- Consider an area of a house, 60 sq. m. built in Pune which has around say 1040 mm average annual rainfall.
- The amount of rainfall on this is

  60 sq. m. x 1040/1000 m = 48 cubic meter

  = 48000 liters
- Since the catchment is roof top with co-efficient 0.8, the harvestable volume is 48000x0.8 = 38400 liters
- If this is used over 365 days it would be at the rate of 101 liters/day equal to the drinking water requirements of 10-11 persons.
- And if over 250 days i.e. dry spell, would be adequate for 16 persons

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Recharging Groundwater

- Various types of recharge structures can be used to converge the water deep below the surface- sometimes to groundwater table itself.

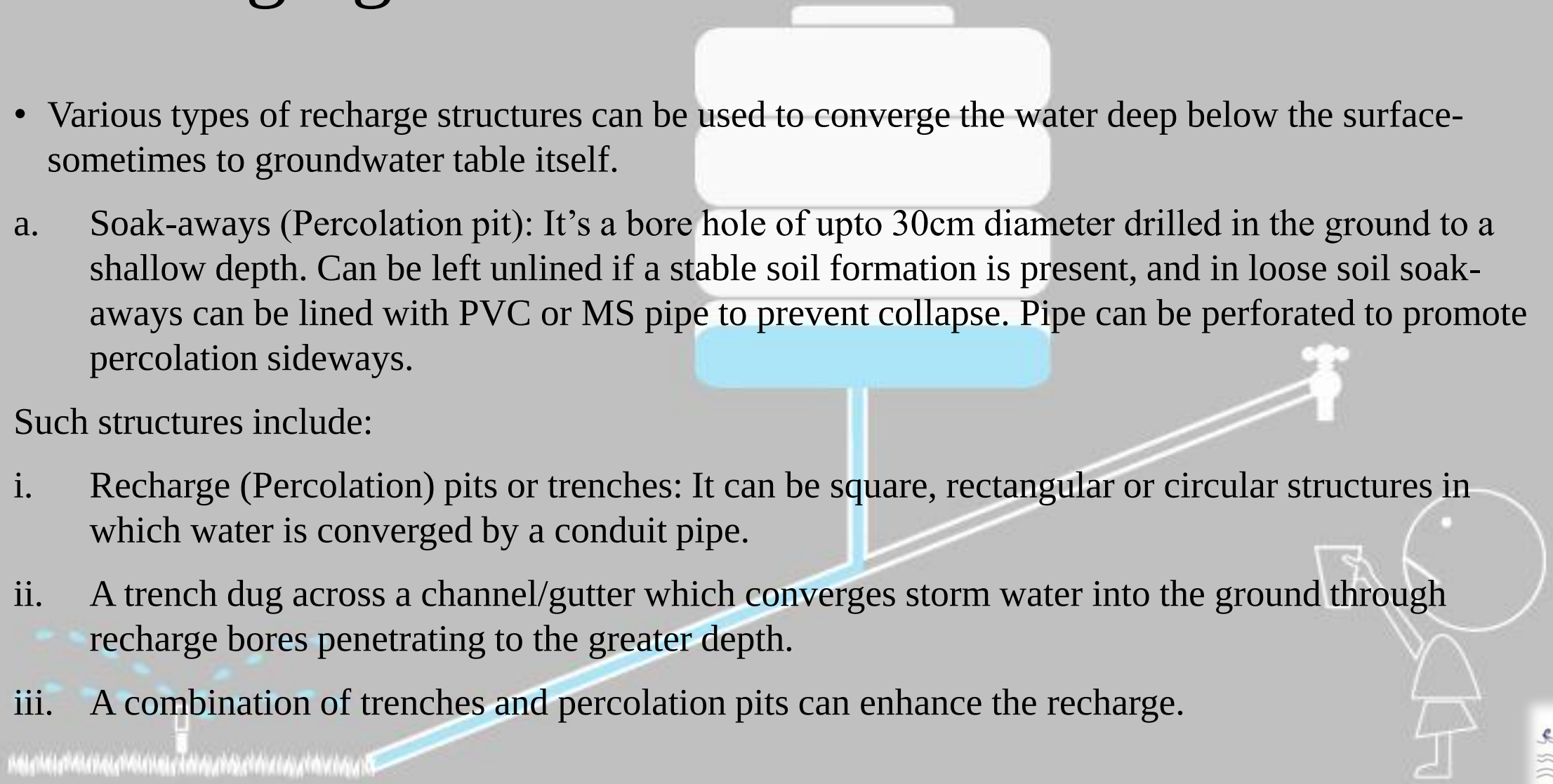
a. Soak-aways (Percolation pit): It's a bore hole of upto 30cm diameter drilled in the ground to a shallow depth. Can be left unlined if a stable soil formation is present, and in loose soil soak-aways can be lined with PVC or MS pipe to prevent collapse. Pipe can be perforated to promote percolation sideways.

Such structures include:

i. Recharge (Percolation) pits or trenches: It can be square, rectangular or circular structures in which water is converged by a conduit pipe.

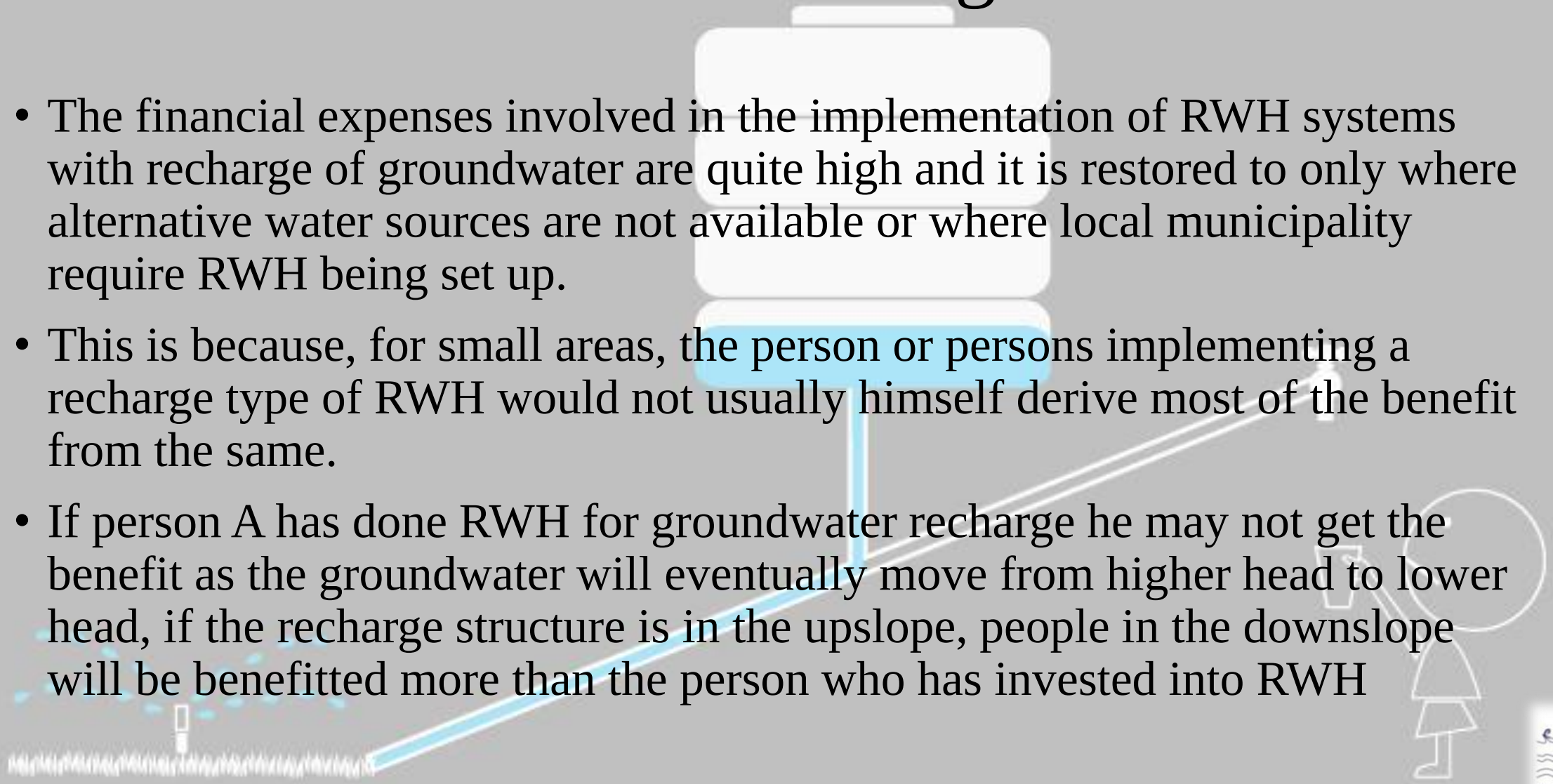
ii. A trench dug across a channel/gutter which converges storm water into the ground through recharge bores penetrating to the greater depth.

iii. A combination of trenches and percolation pits can enhance the recharge.



Cost of Rainwater Harvesting

- The financial expenses involved in the implementation of RWH systems with recharge of groundwater are quite high and it is restored to only where alternative water sources are not available or where local municipality require RWH being set up.
- This is because, for small areas, the person or persons implementing a recharge type of RWH would not usually himself derive most of the benefit from the same.
- If person A has done RWH for groundwater recharge he may not get the benefit as the groundwater will eventually move from higher head to lower head, if the recharge structure is in the upslope, people in the downslope will be benefitted more than the person who has invested into RWH



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Thank you

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