

Chapter – 14: Water

- Water – liquid – forms rain – fills rivers, lakes, ponds, etc – present in ground and air
- Present everywhere – most common and useful
- All living things – need water

Uses of water

- Used in homes –
 - Drinking, cooking, washing utensils, etc
 - Domestic use of water
 - Usage – depends on living standards
- Used in agriculture –
 - Many crops – grown in farms
 - These crops – need water to grow
 - 1800 litres – required for 1 kilogram of Wheat
 - 4500 litres – required for 1 kilogram of paddy (rice)
- Used in industries –
 - Producing different items – requires different amounts of water
 - 1 piece of paper – around 2 glasses of water
- Used to keep things cool –
 - Many machinery – heat up during working
 - Cars, trucks, buses – radiators – use water to keep cool
- Used for transportation –
 - Water in rivers and seas – used for transportation of people and goods
- Used in disposal of seeds –
 - Plants – located near river banks
 - Seeds from these plants – fall on water – float to different places
 - Seeds – reach land – germinate and produce plants in that area
- Used to generate electricity –
 - Hydroelectric power plants –
 - Water – stored in high dams – allowed to fall
 - Falling water – rotates the turbine
 - Turbine – runs the generator – generates electricity
 - Thermal power plants –
 - Water – boiled to generate steam
 - Steam – rotates the turbine
 - Turbine – runs the generator – generated electricity

Where do we Get Water From?

- Places – supply water – sources of water
- Rivers, lakes, ponds, wells, springs
- Water from sources of water – first purified – then supplied to our homes
- Where does the water in lakes, rivers, etc come from?
 - Rivers – melting snow and rains

- Lakes, ponds, wells – rains
- Water from glaciers – pure in the beginning – gets contaminated (dirty) afterwards
- Rain water – purest form of natural water – not salty
- Some rain water – goes into the ground – taken out through wells
- Well-water – dissolved salts – may contain germs
- Water from deep well – fit for drinking
- Places – underground water comes out on surface naturally – spring
- More than 2/3rd surface of earth – covered with water
- Most of the water – inside oceans and seas
- Ocean-water – lots of dissolved salts – not fit for drinking – most impure
- Oceans – imp. role – supply fresh water – through water cycle

States of Water

- Various physical states in nature – different conditions
- Solid, liquid, gaseous states
- Ice – solid water – frozen water – water in solid state
- Snow – falls from sky – extremely cold conditions – also solid state of water
- Water in lakes, rivers, ponds, etc – liquid state
- Water vapour in air – gaseous state
- Very hot water vapour – steam – gaseous state
- State can be changed – heating or cooling –
 - Ice (snow) is heated – melts – forms water
 - Water is heated – evaporates – forms steam (water vapour)
 - Water vapour is cooled – condenses – forms water
 - Water is cooled too much – freezes – forms ice (snow)
- Water cycle – water goes through all the changes of state
- Heat energy – required for water cycle – provide by sun

Disappearing Trick of Water – Evaporation and Transpiration

- Change of water to water vapour – upon heating – evaporation
- Water around us – everywhere – evaporates – heat of sun
- Water in puddles (on roads) – dries up after sometime
- Wet clothes dry up when hung – dries up in some time
- Evaporation – made faster – heating water on a burner
- Common salt separated from saline water – evaporation
- Saline water in ocean – evaporates – salt left behind – pure water turns to water vapour

Loss of water by plants

- Plants – need water to grow – absorb water – through roots – continuously
- Part of this water – used by plants – rest water – released into air through leaves
- This loss of water – transpiration
- Transpiration – adds lots of water vapour to the atmosphere

Formation of Clouds – Condensation

- Change of water vapour to liquid water – upon cooling – condensation
- Water vapour – condenses – forms water droplets – collects together – forms clouds
- This is reverse of evaporation
- Place a cooled bottle of water on a table – water vapour around it – cools down – forms a puddle of water on the table
- Cold winter mornings – white cloud in the surroundings – fog – tiny water droplets – suspended in air
- Formation of dew – condensation
- Water around us – evaporates – forms water vapour
- These vapours – float up in the sky – rises to high altitudes (heights)
- Vapours cool down – condense to form tiny droplets
- These droplets – collect together – appear as clouds
- Droplets – combine together – form larger droplets
- These larger droplets – become heavier than air – falls down as rain
- Colder regions – falling drops freeze to form snow

Back to the Oceans

- Some rain water – found in rivers, lakes, etc
- Most of the rain water – goes to oceans
- Snow on mountains – melts slowly – form rivers
- These rivers – cover large distances on land – merge with the seas
- Some rain water – goes into the ground – ground water

Water Cycle in Nature

- Continuous flow – surface to atmosphere – from atmosphere back to surface – water cycle
- Steps of water cycle –
 - Water – around us (oceans, lakes, rivers, etc) – evaporates – heat of sun – forms water vapour – also formed by transpiration
 - Air containing water vapour – further heated by sun – becomes lighter – floats higher – high altitudes – much colder – water vapour condenses – form tiny water droplets – together they appear as cloud – droplets join together – heavier droplets – fall down as rain or snow
 - Snow on the mountains – melts – form rivers – rain water – falls directly into rivers – these rivers – flow on land – merge back into oceans – some rain water – goes into ground – ground water

Importance of water cycle in nature

- Source of fresh water –
 - Sea water – highly salty – not fit for drinking or growth of plants
 - Rain water – pure water – fit for drinking and other purposes
- Amount of water constant – water – evaporates – goes into air – comes back down as rain water

What if it Rains Heavily?

- Time, duration, amount – varies – place to place
- Some parts – rains throughout the year – other parts – only a few days in a year
- Advantages –
 - Cools the environment
 - Sowing of crops – depends on monsoon
 - Water in rivers and dams – provided by rain
 - Fill lakes and ponds – sources of water
 - Responsible for increasing ground water
- Sometimes it rains heavily – many problems occur –
 - City area – roads and streets – waterlogged – disrupts the traffic
 - Cause flood – heavy rains – level of water in rivers increase – overflows over the banks of river – damage fields, forests, property, etc
 - Water animals – carried away by flood water – trapped on land – dies there
 - Animals living in soil – dies – not enough oxygen for them

What Happens if it Does Not Rain for a Long Period?

- No rain for longer periods – shortage of water – causes dryness – drought
- Soil is moist – contain water – does not rain for longer – soil loses water
- Even lakes and ponds – dry up
- Ground water level – decreases
- Problems –
 - Soil – not sufficient moisture for growing crops – shortage of food
 - Vegetation or other fodder – does not grow well – shortage of fodder
 - People – may migrate to other places – some might die

How can we conserve water?

- Earth – lots of water – most of it salty (saline)
- Small fraction of water – fit for drinking – fresh water
- This fresh water – very less – decreasing day by day
- We need to conserve (save) water – use it carefully – prevent wastage
- Ways to conserve –
 - Turn off tap after use – repair leaking taps
 - While washing utensils – fill the basin – instead of – running tap
 - Wash vegetables, pulses – use that water to water the plants
 - Flush smartly – use half-flush when full-flush is not required
- Everyone – conserve water – minimize wastage

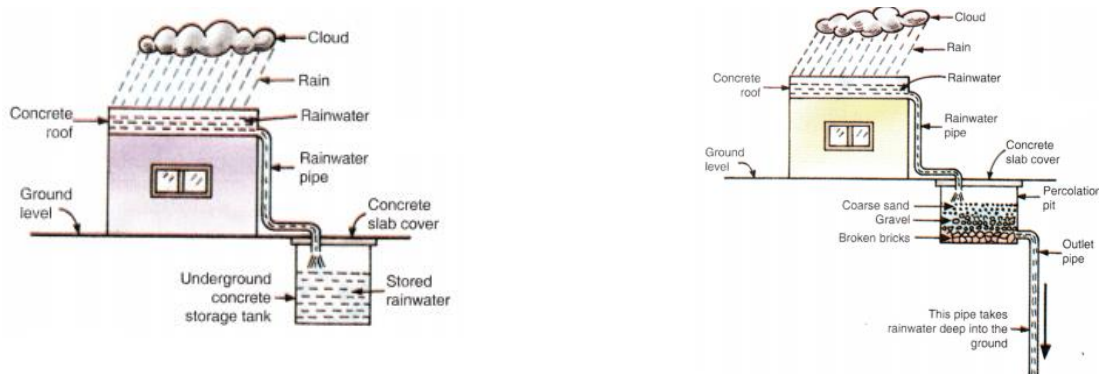
Rainwater Harvesting

- Process – collecting rainwater – use it later OR recharge rainwater – rainwater harvesting
- 2 techniques for rainwater harvesting –

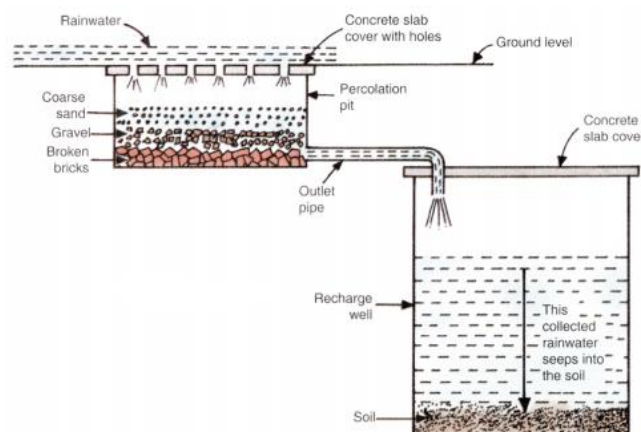
- Collect and store rain water – big tanks – use later
- Percolate (move through a surface) into ground – more efficiently – percolation pits and recharge wells – recharge groundwater
- Ground water – taken out through wells, hand-pumps, etc – used too much – water level goes down drastically (too much) – shortage of ground water
- Rural areas – most of the ground – open soil – lots of rain water goes into ground naturally
- Urban areas – most of the ground – covered with concrete (roads, buildings, etc) – very little rain water goes into ground naturally – rainwater harvesting – necessary
- 2 ways –
 - Rooftop rainwater harvesting
 - Rainwater harvesting from open spaces around building

Rooftop rainwater harvesting

- 2 purposes –
 - Collecting rainwater for future use –
 - Water collected on roofs – brought down through pipe – collected in concrete tanks
 - This water – may contain other particles – need to be filtered before use
 - Collecting rainwater to recharge groundwater –
 - Water collected on roofs – brought down through pipe – collected in percolation pit
 - Percolation pit –
 - Layer of broken bricks – bottom
 - Layer of gravel – middle
 - Layer of coarse sand – top
 - Water – filtered out in percolation pit – taken deep into ground – outlet pipe
 - Outlet pipe – must be deep inside the ground (at least 3 metres)
- This method – collects small amounts of water



Rainwater harvesting from open sources around buildings



- Construct percolation pits – covered with concrete slab with holes
- Rain water – collects into percolation pits – filtered out
- Filter water – passes into recharge well – 1metre diameter – 3 metre deep
- Recharge well – covered with concrete slab – soil at the bottom
- This well is required – percolate large amounts of water into ground