CLASS 10 · CONTEMPORARY INDIA II · CHAPTER 3

Water Resources

Every section of the chapter in one sentence, with the key terms highlighted. To test yourself, cover them with a strip of paper to test yourself. The figures and photos are taken from the chapter PDF.

One-liners Dams table Memory tricks Flashcards Quiz Revision plan

One line per section

1 **Water: a renewable resource**

Three-fourth of the earth is water but only a small part is **freshwater**, got from **surface run off** and **ground water** that is renewed through the **hydrological cycle**, so water is **renewable**; yet by **2025** nearly **two billion people** may live in **absolute water scarcity**.

2 Water Scarcity and the Need for Water Conservation and Management

Water availability varies with **seasonal and annual precipitation**, but scarcity is mostly caused by **over-exploitation**, **excessive use** and **unequal access** to water among different social groups; even **areas with ample water**, like many cities, can face scarcity.

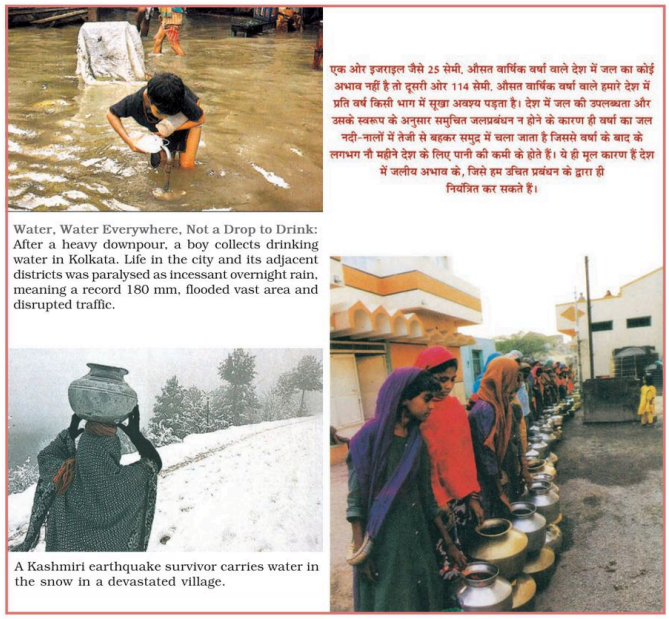


Fig. 3.1: Water Scarcity

Fig. 3.1: Water Scarcity

2.1 Population and irrigated agriculture

A **large and growing population** needs more water for homes and food, so water is **over-exploited** to expand **irrigation for dry-season agriculture**; **irrigated agriculture is the largest consumer of water**, and farmers' own **wells and tube-wells** cause **falling groundwater levels**, hurting food security; the answer is **drought resistant crops** and **dry farming**.

2.2 Industrialisation and urbanisation

Post-independence **industrialisation** (including **MNCs**) uses heavy water plus power from **hydroelectricity**, while **multiplying urban centres** with dense populations and urban lifestyles, and housing societies with their own **groundwater pumping devices**, have **over-exploited and depleted** city water.

2.3 Bad quality of water

Even with enough water, an area suffers scarcity if water is **polluted** by **domestic and industrial wastes**, **chemicals, pesticides and fertilisers**, making it **hazardous for human use**.

2.4 Jal Jeevan Mission and Atal Jal

The **Jal Jeevan Mission (JJM)** aims to give every **rural household** **potable piped water** at **55 litres per capita per day**; **Atal Bhujal Yojana (Atal Jal)** works in **8220 water-stressed Gram Panchayats** of **seven states** to change attitudes **from consumption to conservation**.

2.5 Why conserve and manage water

We must conserve water to **safeguard health**, ensure **food security**, continue **livelihoods and productive activities** and **prevent degradation of natural ecosystems**; over-exploitation will cause an **ecological crisis**.

3 Multi-Purpose River Projects and Integrated Water Resources Management

Since ancient times India has built **sophisticated hydraulic structures** like **dams of stone rubble**, **reservoirs or lakes**, **embankments** and **canals for irrigation**, and modern India continues this by **building dams in most river basins**.

3.1 Hydraulic structures in ancient India

Sringaverapura near Allahabad (**1st century B.C.**) channelled **Ganga flood water**; **Chandragupta Maurya** built dams, lakes and irrigation; works are found in **Kalinga, Nagarjunakonda, Bennur, Kolhapur**; **Bhopal Lake** (**11th century**) and the **Hauz Khas tank** built by **Iltutmish** (**14th century**) for the **Siri Fort** area.

3.2 What is a dam?

A dam is a **barrier across flowing water** that obstructs, directs or retards the flow, often creating a **reservoir**; water passes over a **spillway or weir**; by structure dams are **timber, embankment or masonry**, and by height **large/major** or **low, medium, high**.

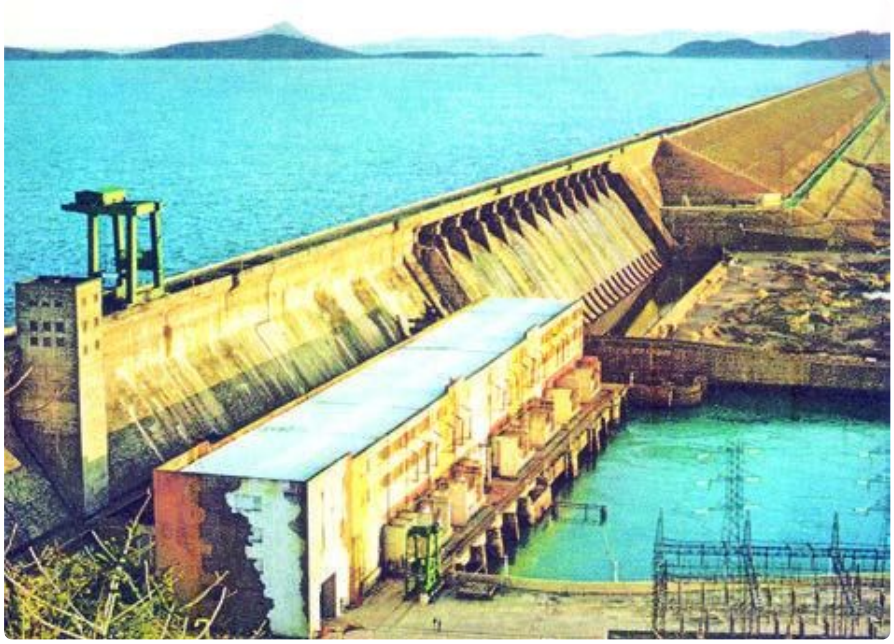


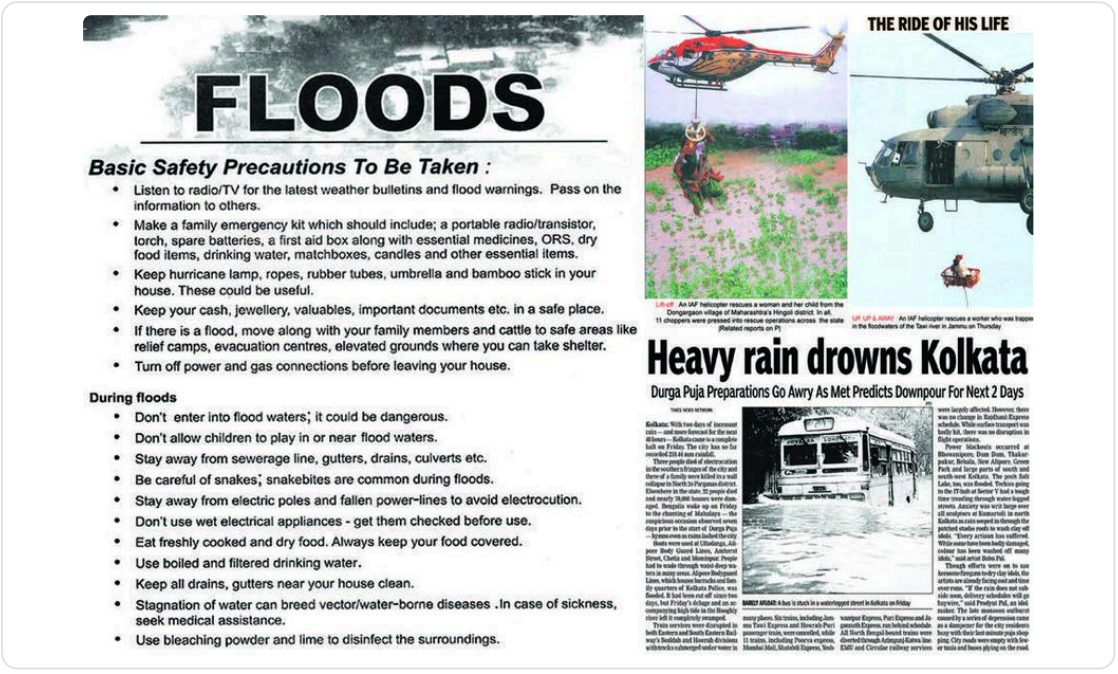
Fig. 3.2: Hirakud Dam

3.3 Multi-purpose projects

Dams now serve **irrigation, electricity, domestic and industrial water supply, flood control, recreation, inland navigation and fish breeding**, so they are **multi-purpose projects**: **Bhakra-Nangal** (**Sutluj-Beas**) gives **hydel power and irrigation**, **Hirakud** (**Mahanadi**) adds **flood control**, and **Jawaharlal Nehru** called dams the **'temples of modern India'**.

3.4 Why dams are opposed

Damming affects **natural flow**, causing **poor sediment flow** and **excessive sedimentation** in the reservoir, **fragments rivers** so fish cannot migrate for **spawning**, **submerges vegetation and soil**, triggers **floods**, deprives flood plains of **silt**, **induces earthquakes**, spreads **water-borne diseases and pests**, and shifts farmers to **water intensive commercial crops** causing **salinisation**.



FLOODS

Basic Safety Precautions To Be Taken :

- Listen to radio/TV for the latest weather bulletins and flood warnings. Pass on the information to others.
- Make a family emergency kit which should include; a portable radio/transistor, torch, spare batteries, a first aid box along with essential medicines, ORS, dry food items, drinking water, matchboxes, candles and other essential items.
- Keep hurricane lamp, ropes, rubber tubes, umbrella and bamboo stick in your house. These could be useful.
- Keep your cash, jewellery, valuables, important documents etc. in a safe place.
- If there is a flood, move along with your family members and cattle to safe areas like relief camps, evacuation centres, elevated grounds where you can take shelter.
- Turn off power and gas connections before leaving your house.

During floods

- Don't enter into flood waters; it could be dangerous.
- Don't allow children to play in or near flood waters.
- Stay away from sewerage line, gutters, drains, culverts etc.
- Be careful of snakes; snakebites are common during floods.
- Stay away from electric poles and fallen power-lines to avoid electrocution.
- Don't use wet electrical appliances - get them checked before use.
- Eat freshly cooked and dry food. Always keep your food covered.
- Use boiled and filtered drinking water.
- Keep all drains, gutters near your house clean.
- Stagnation of water can breed vector/water-borne diseases .In case of sickness, seek medical assistance.
- Use bleaching powder and lime to disinfect the surroundings.

THE RIDE OF HIS LIFE

Heavy rain drowns Kolkata

Durga Puja Preparations Go Awry As Met Predicts Downpour For Next 2 Days

Floods: newspaper clippings and safety precautions (page from the chapter)

3.5 Pradhan Mantri Krishi Sinchayee Yojana

PMKSY ensures **protective irrigation for all farms**, with the aims **"har khet ko pani"** (assured irrigation for every field) and **"per drop more crop"** (water use efficiency), plus **sustainable water conservation**.

3.6 Sardar Sarovar Dam

Built on the **Narmada** in **Gujarat**, one of India's largest projects covering **Maharashtra, MP, Gujarat and Rajasthan**; it will irrigate **18.45 lakh hectares** in **3112 villages of 15 districts** of Gujarat and the desert districts **Barmer and Jalore**, making **drought-prone** land **drought proof**.

3.7 Krishna-Godavari dispute

Karnataka and Andhra Pradesh objected to Maharashtra diverting more water at Koyna for a multipurpose project, because it would reduce downstream flow for their agriculture and industry.

3.8 The Bhadu song of the Damodar

A Bhadu song of the Damodar valley begs the flooding Damodar, the "river of sorrow", to reduce its floods so that boats can sail.

4 Rainwater Harvesting

With rising resistance to multi-purpose projects, water harvesting was seen as a socio-economically and environmentally viable alternative; ancient Indians knew rainfall regimes and soil types and harvested rainwater, groundwater, river water and flood water to suit local ecology.

4.1 Traditional methods by region

Hills had diversion channels, the 'guls' or 'kuls' of the Western Himalayas; Rajasthan had rooftop rainwater harvesting; Bengal flood plains had inundation channels; arid fields became rain-fed storage, the 'khadins' of Jaisalmer and 'Johads' elsewhere in Rajasthan.

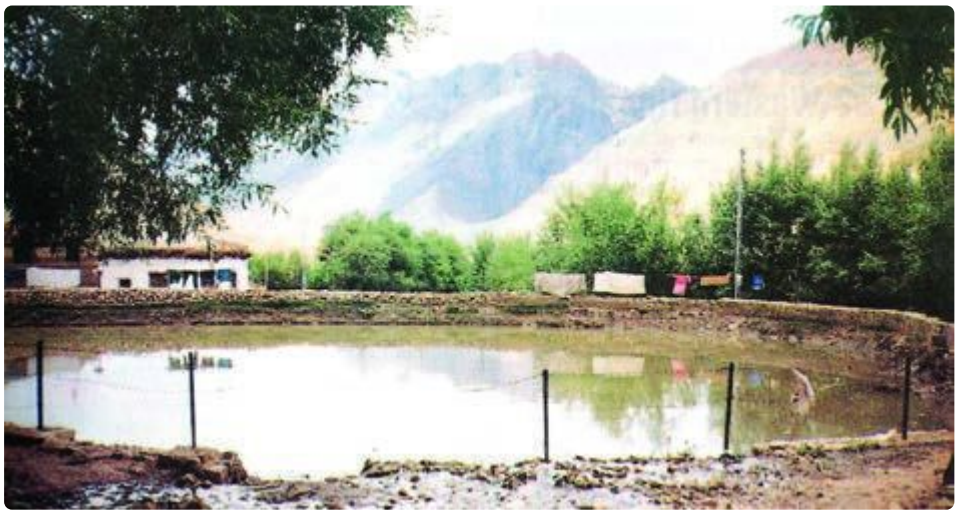


Fig. 3.5: Traditional method of rainwater harvesting (a kul leads to a village tank in Kaza)

4.2 Tankas of Rajasthan

In **Bikaner, Phalodi and Barmer**, houses had underground **'tankas'** (one in Phalodi was **6.1 m deep, 4.27 m long, 2.44 m wide**) fed by a pipe from **sloping roofs**; the **first spell of rain was not collected** as it cleaned roofs and pipes, and the stored rainwater, **'palar pani'**, is the **purest form of natural water**; rooms beside the tanka stayed **cool in summer**.



Fig. 3.6: Rooftop harvesting in the Thar (pipe from a neighbour's roof into a tanka)

4.3 Decline in western Rajasthan

Rooftop harvesting is **declining in western Rajasthan** because the **perennial Indira Gandhi Canal** supplies plenty of water, though some keep tankas as they **dislike the taste of tap water**.

4.4 Modern rooftop rainwater harvesting

In **Gendathur** (Mysuru, Karnataka) about **200 households** harvest rooftop rain (**1,000 mm** rainfall, **80%** efficiency, about **50,000 litres** per house a year); **Shillong** uses it widely though **Cherapunjee and Mawsynram** (55 km away) get the **highest rainfall in the world** (**15–25%** of household needs); **Tamil Nadu** is the **first state to make it compulsory** for all houses.



Fig. 3.3 (a): Rooftop Rainwater Harvesting, recharge through hand pump



Fig. 3.3 (b): Rooftop Rainwater Harvesting, recharge through abandoned dugwell (PVC pipe → sand and brick filter → sump → well → groundwater)



Fig. 3.4: "Are you a water harvester? This monsoon, join us in counting the raindrops"

4.5 Bamboo drip irrigation

In **Meghalaya**, a **200-year-old** system uses **bamboo pipes** to carry **stream and spring water** downhill by **gravity**; about **18–20 litres** enter the pipes and reach the plant as **20–80 drops per minute** near the roots.

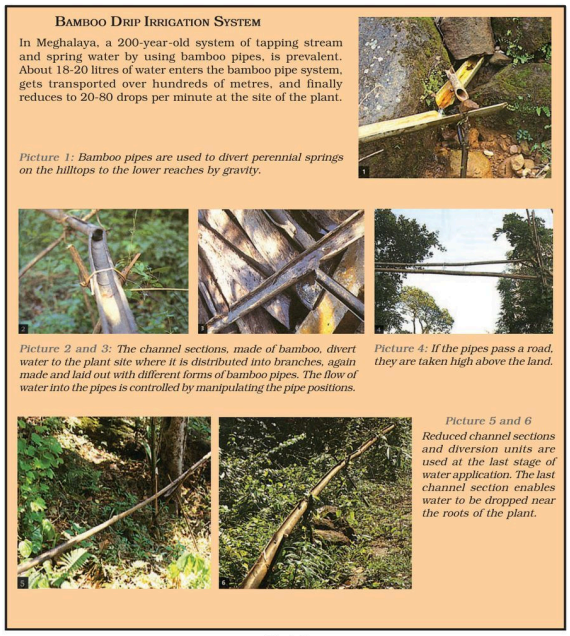


Fig. 3.7: Bamboo drip irrigation system

Major dams and their rivers



India: Major Rivers and Dams (map from the chapter)

REGION	DAM	RIVER (AS ON THE MAP)	WHAT THE CHAPTER SAYS
North	Salal Project	Chenab	Northernmost dam on the map (J&K)
North	Bhakra Nangal	Sutlej (Sutluj-Beas basin)	Hydel power + irrigation
North	Tehri, Narora	Ganga basin	On the map only

REGION	DAM	RIVER (AS ON THE MAP)	WHAT THE CHAPTER SAYS
Central	Gandhi Sagar, Rana Pratap Sagar, Kota Barrage	Chambal	On the map only
Central	Rihand	Rihand (Son basin)	On the map only
East	Tilaiya, Konar, Maithon, Panchet	Damodar valley	Damodar = "river of sorrow" (Bhadu song)
East	Hirakud	Mahanadi	Water conservation + flood control (Fig. 3.2)
West	Sardar Sarovar	Narmada	Gujarat; covers 4 states; 18.45 lakh ha irrigated
West	Koyna, Pravara	Koyna (Krishna basin), Pravara (Godavari basin)	Koyna diversion → Krishna-Godavari dispute
South	Nagarjuna Sagar, Tungabhadra	Krishna, Tungabhadra	On the map only
South	Mettur, Periyar	Kaveri, Periyar	On the map only

Memory tricks

CAUSES OF WATER SCARCITY

P-A-I-U-Q

"Please Avoid Increasing Unsafe Quantities": Population, Agriculture (irrigation), Industrialisation, Urbanisation, Quality (pollution). Plus unequal access.

USES OF A MULTI-PURPOSE DAM

F-FRIEND

"A dam is your **F-FRIEND**": **F**lood control, **F**ish breeding, **R**ecreation, **I**rrigation, **E**lectricity, inland **N**avigation, **D**omestic & industrial water supply.

PROBLEMS WITH DAMS

FLOODS

Fragmented rivers (no fish spawning), **L**and and vegetation submerged, **O**ver-sedimentation, **O**utbreaks of diseases and pests, **D**isplacement of people, **S**alinisation and seismic (induced earthquakes).

TWO FAMOUS DAMS

B = Both, H = Hold

Bhakra-Nangal does **B**oth jobs: power + irrigation (Sutluj-Beas). **H**irakud **H**olds back floods (Mahanadi).

NEHRU'S PHRASE

Dams = Temples

Nehru: dams are the **"temples of modern India"**, joining farms and villages with industry and cities.

TRADITIONAL HARVESTING MAP

Guls · Tankas · Channels · Khadins

Go west to east: **Guls/kuls** in the Himalayan hills, **Tankas** and **Johads** in Rajasthan, **Khadins** in Jaisalmer, **inundation Channels** in Bengal, **Bamboo drip** in Meghalaya.

PALAR PANI

Palar = Pure

Palar pani = rainwater = the **P**urest natural water. The **first** rain is thrown away to clean the roof.

PMKSY SLOGANS

Khet + Drop

"Har khet ko pani" (every field gets water) and **"Per drop more crop"** (use each drop well).

ATAL JAL STATES

G-H-K-M-M-R-U

"Go Home Kids, Mom Makes Rajma Usually": Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh.

SARDAR SAROVAR STATES

M-M-G-R

Narmada project covers **M**aharashtra, **M**adhya Pradesh, **G**ujarat, **R**ajasthan: "Many Mangoes Grow Ripe".

NUMBERS TO KNOW

55 · 2025 · 200

JJM: **55** litres per person per day. **2025**: two billion in absolute scarcity. Bamboo drip is **200** years old; Gendathur has about **200** harvesting houses.

BAMBOO DRIP

18–20 → 20–80

18–20 **litres** go in at the top, 20–80 **drops per minute** come out at the roots. Same digits, smaller unit.

Hydraulic structures timeline: read it as a story

- `Maurya era` Chandragupta Maurya builds dams, lakes and irrigation systems.
- `1st c. B.C.` Sringaverapura near Allahabad channels the flood water of the Ganga.
- `11th c.` Bhopal Lake, one of the largest artificial lakes of its time.
- `14th c.` Iltutmish builds the tank in Hauz Khas, Delhi, for the Siri Fort area.
- `2025` Predicted: nearly two billion people in absolute water scarcity.

Trick: "Sita Cooks Brinjal Halwa": Sringaverapura, Chandragupta, Bhopal, Hauz Khas. Other ancient irrigation sites: Kalinga, Nagarjunakonda, Bennur, Kolhapur.

Which place, which water fact

Western Himalayas	Guls or kuls: diversion channels for agriculture (Kaza village tank, Fig. 3.5)
Bikaner, Phalodi, Barmer	Underground tankas fed by rooftop rainwater; Phalodi tank 6.1 × 4.27 × 2.44 m
Jaisalmer	Khadins: fields turned into rain-fed storage. Johads in other parts of Rajasthan
Bengal flood plains	Inundation channels to irrigate fields
Western Rajasthan	Rooftop harvesting declining due to the perennial Indira Gandhi Canal

Gendathur, Mysuru (Karnataka)	About 200 houses with rooftop harvesting; "rich in rainwater"
Shillong, Meghalaya	Water shortage despite Cherapunjee and Mawsynram 55 km away; rooftop gives 15–25% of needs
Meghalaya	200-year-old bamboo drip irrigation
Tamil Nadu	First state to make rooftop rainwater harvesting compulsory, with punishment for defaulters
Damodar valley	"River of sorrow"; Bhadu song about floods

Rajasthan appears most often: tankas, khadins, johads, Indira Gandhi Canal, and Barmer & Jalore in the Sardar Sarovar command.

Flashcards

Cover the answer line, say the answer out loud, then check.

How is water a renewable resource?

→ It is renewed and recharged through the hydrological cycle

Two billion people in absolute water scarcity by...

→ 2025

Three main causes of water scarcity?

→ Over-exploitation, excessive use, unequal access among social groups

Largest consumer of water?

→ Irrigated agriculture

How can a region with plenty of water still face scarcity?

→ Bad quality: water polluted by wastes, chemicals, pesticides, fertilisers

JJM water target per person?

→ 55 litres per capita per day of potable piped water (rural households)

Aim of Atal Bhujal Yojana?

→ Change attitude from consumption to conservation in 8220 water-stressed Gram Panchayats of 7 states

Who built the Hauz Khas tank and why?

→ Iltutmish, 14th century, to supply water to the Siri Fort area

Bhopal Lake was built in...

→ The 11th century

What is a dam?

→ A barrier across flowing water that obstructs, directs or retards flow, often creating a reservoir

Three types of dams by structure?

→ Timber, embankment, masonry

Who called dams 'temples of modern India'?

→ Jawaharlal Nehru

Bhakra-Nangal is used for...

→ Hydel power and irrigation (Sutluj-Beas basin)

Hirakud integrates water conservation with...

→ Flood control (Mahanadi basin)

Cause of the Krishna-Godavari dispute?

→ Maharashtra diverting more water at Koyna; Karnataka and AP objected

What are 'guls' or 'kuls'?

→ Diversion channels of the Western Himalayas for agriculture

What is 'palar pani'?

→ Rainwater stored in tankas; the purest form of natural water

Why did rooftop harvesting decline in western Rajasthan?

→ The perennial Indira Gandhi Canal supplies plenty of water

First state to make rooftop rainwater harvesting compulsory?

→ Tamil Nadu

Where is bamboo drip irrigation used and how old is it?

→ Meghalaya, about 200 years old

Quick quiz

Correct answers are marked in green. First four are from the textbook exercise (MCQs and the false statements).

1. Region with high annual rainfall and large population: is it suffering from water scarcity?

- Suffering from water scarcity
- Not suffering from water scarcity

2. Region with high annual rainfall but highly polluted water: is it suffering from water scarcity?

- Suffering from water scarcity
- Not suffering from water scarcity

3. Which statement is NOT an argument in favour of multi-purpose river projects?

- They bring water to water-scarce areas
- They control floods by regulating water flow
- They lead to large scale displacement and loss of livelihood
- They generate electricity for industries and homes

4. Correct the false statement: regulating and damming of rivers ___ the river's natural flow and its sediment flow.

does not affect | **affects**

5. The largest consumer of water is...

Industry | Domestic use | **Irrigated agriculture** | Hydel power

6. Hirakud project is in the basin of the...

Narmada | **Mahanadi** | Sutluj-Beas | Krishna

7. Sardar Sarovar Dam is built over the...

Narmada | Tapi | Godavari | Chambal

8. 'Khadins' were found in...

Bengal | **Jaisalmer** | Western Himalayas | Meghalaya

9. First state to make rooftop rainwater harvesting compulsory?

Karnataka | Rajasthan | Meghalaya | **Tamil Nadu**

10. Shillong faces water shortage although which nearby places get the highest rainfall in the world?

Cherapunjee and Mawsynram | Gendathur and Mysuru | Phalodi and Barmer | Kaza and Kolhapur

Revision plan

Day 1
Read the one-liners aloud twice. Then cover the highlighted words and recall them.

Day 2
Write the "which place, which water fact" list and F-FRIEND / FLOODS from memory. Check and fix in red.

Day 4
Flashcards + quiz. Re-read only the sections you missed.

Day 7
Explain the chapter to someone in 5 minutes without looking.

Day 14
Answer the 120-word textbook questions (Rajasthan harvesting, modern adaptations) using the key terms.

MAP METHOD

On a blank India outline map, mark the dams from the table with their rivers, then add the harvesting places: kuls in the Himalayas, tankas and khadins in Rajasthan, Bengal channels, Shillong, Gendathur, Tamil Nadu.

MEMORY PALACE

Walk through your home: the **tap** is water scarcity (PAIUQ), the **bathroom** is the dam (F-FRIEND and FLOODS), the **roof** holds the tanka and palar pani, the **garden** has bamboo drip pipes, the **gate** shows Tamil Nadu's compulsory rule.

BLURTING

Close the book, set a 5-minute timer and write every key term you remember. The gaps show you what to revise.