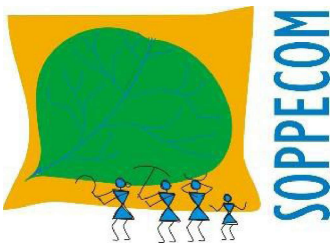
Knowledge Exchange:

River Bhima

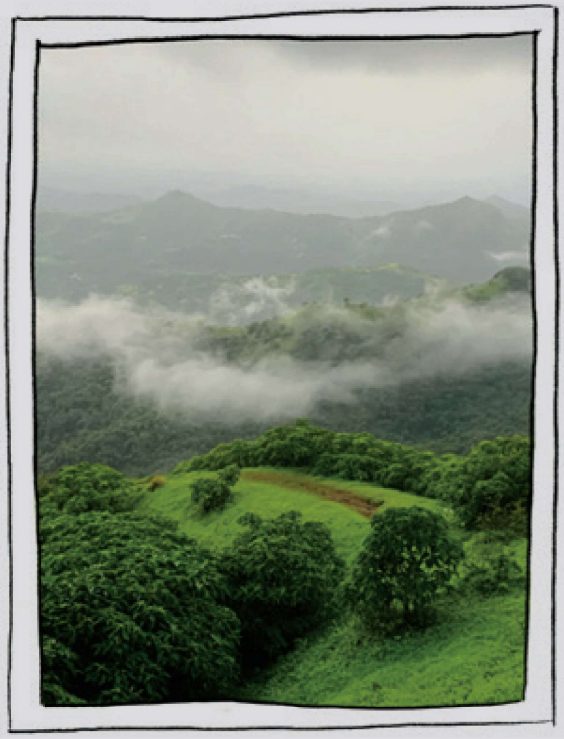

IISER KOLKATA


The Nature
Conservancy


SOPPECOM

When you think of
'Nature',
what comes to
your mind?

Forests, Trees, Mountains, Leaves, Greenery?



Me too!

Hi! I am Shekru.
You may know me as
Maharashtra's state
animal. I live in
the forests of the
Western Ghats.

I spend most of my time
scampering around treetops in
search of food. But when I get
a chance to peer beyond the
leaves, I realise that there is so
much more beyond the canopy!

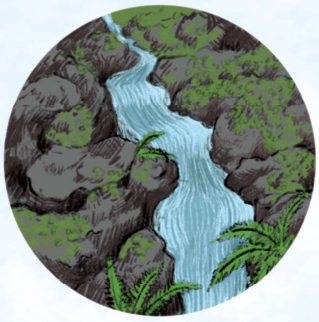
Like forests, our water bodies are an important part of nature!

- Unlike water found in oceans and seas, which is salty, the water in rivers, lakes and other water bodies on land is not salty. This is called freshwater.
- These water bodies don't just support life in nature, but are also ecosystems in themselves.

Lake

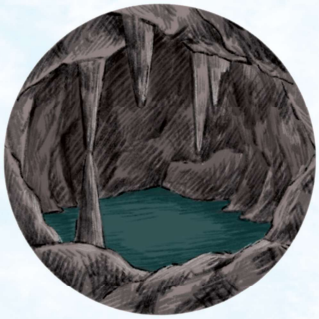
River

Pond



Stream

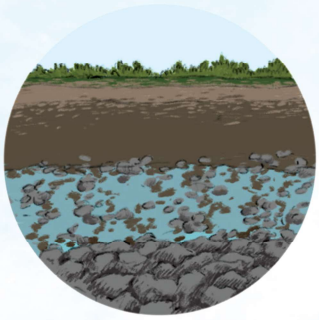
Floodplain



Cave waters

Wetlands
(bogs, swamps, marshes)

Spring



Groundwater

Freshwater Ecosystems

- There are many different kinds of freshwater ecosystems: lakes, rivers, ponds, streams, groundwater, springs, cave waters, floodplains, as well as bogs, marshes and swamps.
- Freshwater ecosystems make up ~2% of the Earth's surface, but are home to around ~12% of its species.
- Riparian zones, where water meets land, are also an important part of these ecosystems.

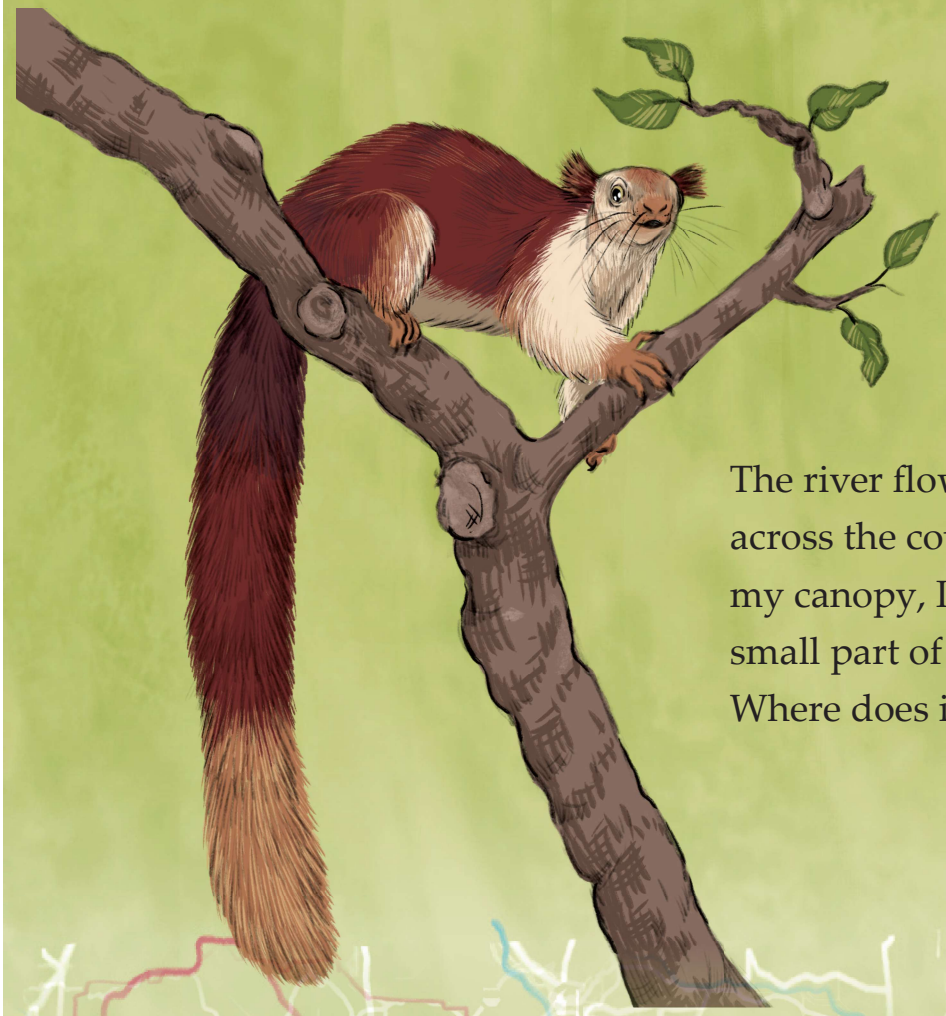
Water is Always Connected

- You may see an individual drop of water in your hand, but you can't tell drops of water apart in a glass.
- Similarly, freshwater ecosystems are connected. Water flows from land and groundwater into streams, lakes, and reservoirs, altogether called a drainage basin.
- As water moves, it carries sediments, nutrients, and living organisms with it - from upstream to downstream, between the river and its banks, between surface and groundwater.
- This means groundwater and rivers are connected and they affect each other. Similarly, what we do in one part of the river affects other parts of the river too.

The Bhima River

Our river starts near Bhorgiri, eventually joins with the Krishna river, and flows out to the sea in Andhra Pradesh.

So, you and I are also connected - by the river Bhima!

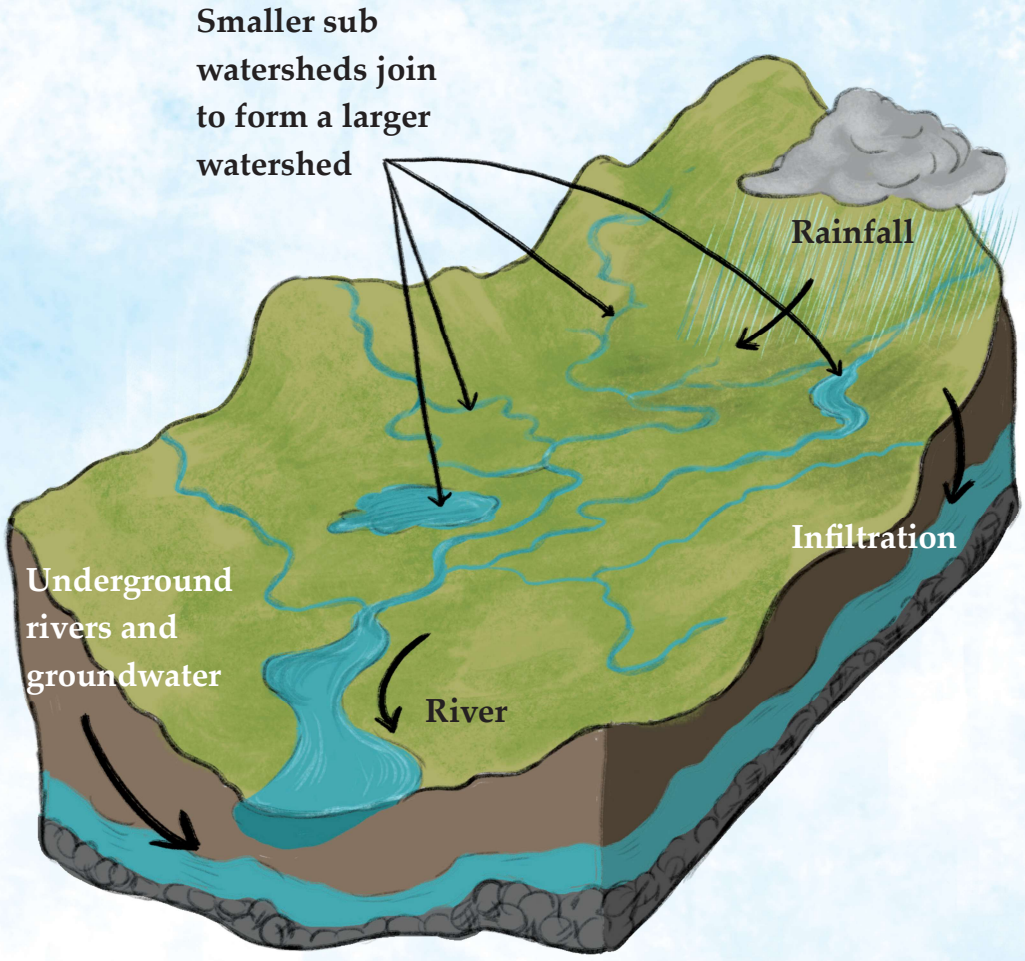


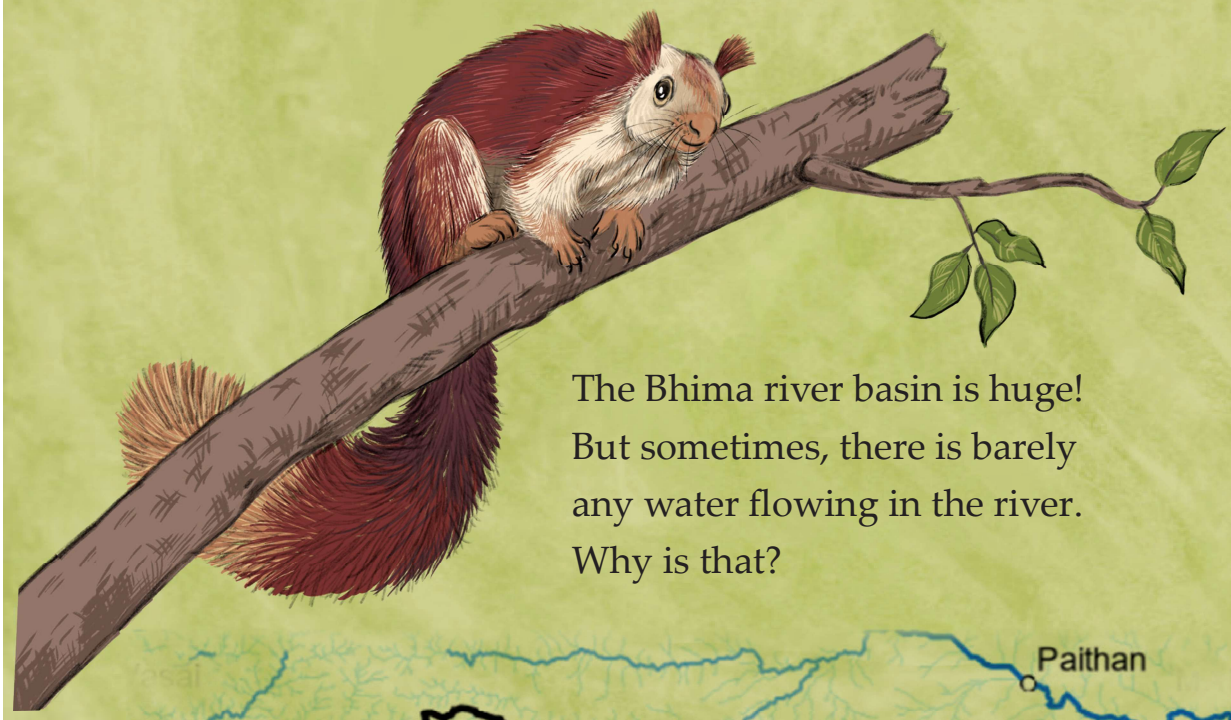
The river flows all the way across the country! From my canopy, I see only a small part of the river. Where does it begin?

The Watershed

A watershed is the land that channels rainfall into creeks, streams, and rivers, and eventually to outflow points such as reservoirs, bays, and the ocean.

- It can range from a small to very large area.
- Typically flows from higher ground (like a mountain ridge) to lower elevations.
- Not all water flows out to the sea - some of it seeps into the soil and underground reservoirs called aquifers.





The Bhima river basin is huge! But sometimes, there is barely any water flowing in the river. Why is that?

Types of Rivers

- There are two types of rivers:
  - **Perennial rivers** flow all year round.
  - **Intermittent rivers** flow only during certain seasons or climatic conditions.
- Most rivers in the Bhima basin are intermittent. Because they periodically dry up, they are home to many different kinds of creatures – some live in flowing water, some in still water, and some on land.

But this can change

- Due to dams, groundwater extraction, or droughts, perennial rivers may dry up or become intermittent.
- Due to the release of effluents and sewage or river connecting projects, seasonal rivers may become perennial.
- Both these shifts impact local ecology, and may contribute to the loss of native species or the spread of invasive species.

So, changes in the river lead to changes in our lives. What role does the river play in our lives?

The Role of Rivers

Supporting biodiversity: Rivers are home to a variety of plants and animals, and are an important ecosystem.

Pollution management: Certain plants and algae can absorb pollutants from the water.

Erosion and flood control: Plants growing on the banks of the river stabilise the land and prevent flooding as the river meanders.

Climate regulation: Rivers keep the surrounding areas cool and capture carbon.

Supporting ecosystems: By providing a crucial water source, rivers support other ecosystems such as forests, lakes, wetlands, intertidal zones, etc.

The Role of Rivers

Rivers also play a crucial role in human lives in several ways.

Material

Food: Provide silt for agricultural productivity and a habitat for animals that humans eat, like fish and crabs.

Water: Agriculture, drinking water, washing clothes and vessels, livestock, energy production.

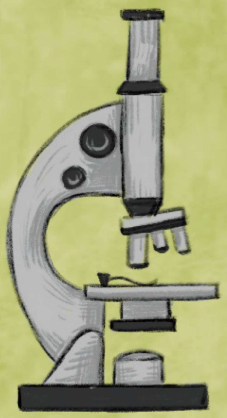
Materials: Sand to build houses, grasses for weaving and grazing, shells for decoration, medicines.

Non- Material

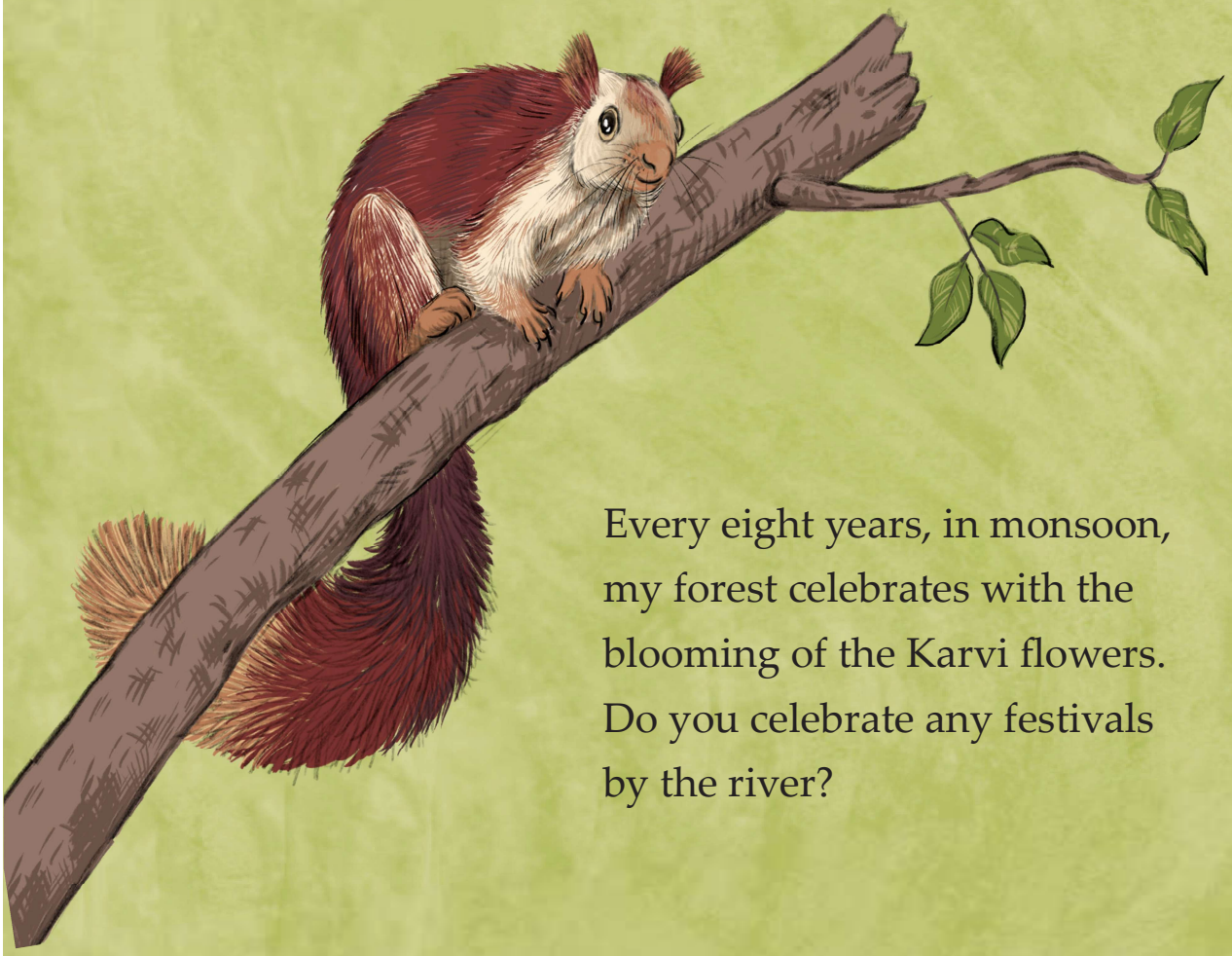
Recreation:
Swimming, travelling, and relaxation.

Cultural importance: Religion and spirituality, festivals, and tourism.

Historically, human civilisations have been built around rivers – and they play an important part in our history due to their role in transport and trade.



Knowledge:
Opportunities for study.



Every eight years, in monsoon, my forest celebrates with the blooming of the Karvi flowers. Do you celebrate any festivals by the river?

Know Your River: A Quiz

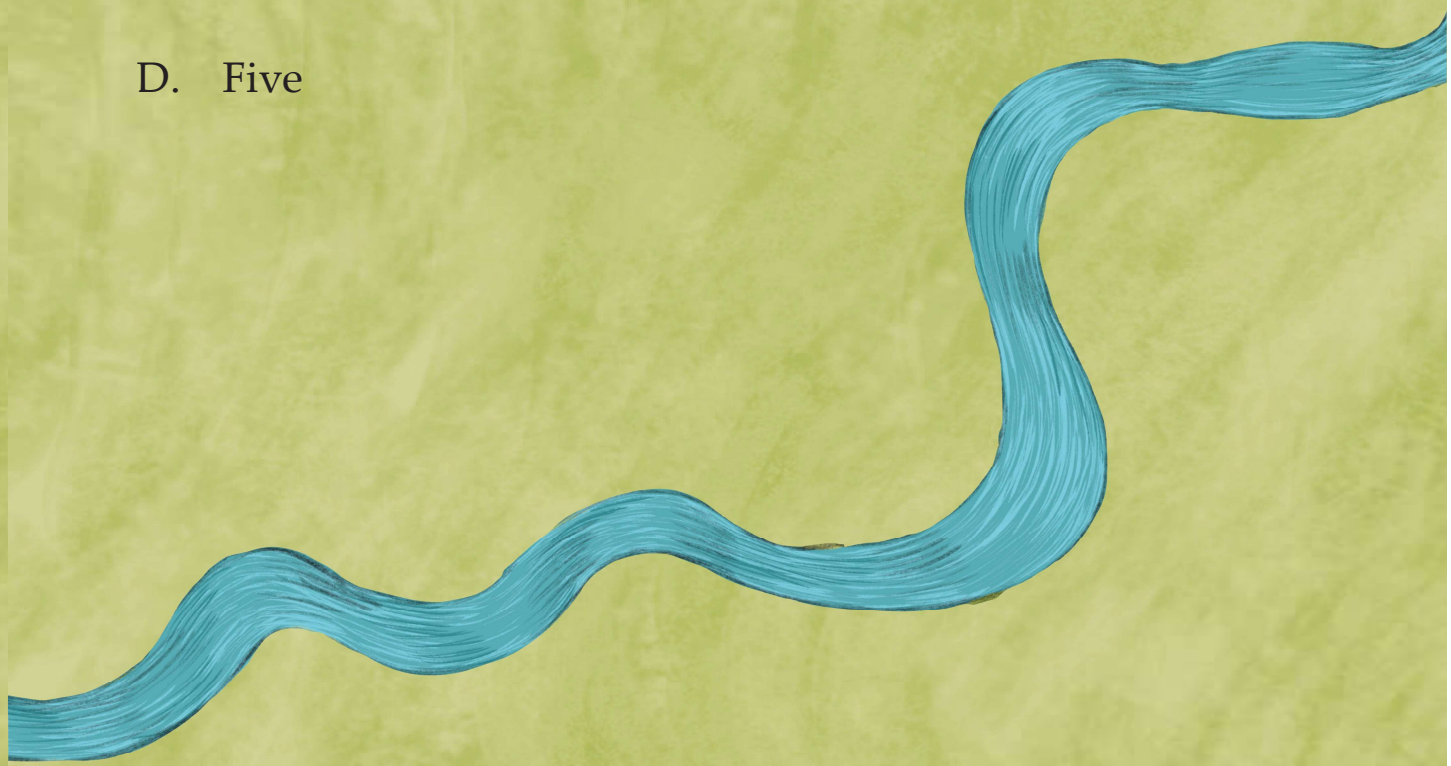
The Upper Bhima Basin includes Pune, Ahilyanagar (Ahmednagar), and Solapur districts. How many wildlife sanctuaries are part of the basin?

A. One

B. Two

C. Four

D. Five



Answer: Five!

1. **Rehekuri Blackbuck Sanctuary:** Home to the famous blackbuck deer
2. **Mayureshwar Wildlife Sanctuary:** This and Rehekuri are some of the smallest sanctuaries in mainland India, but are critical wildlife habitats
3. **Nanaj Great Indian Bustard Sanctuary:** One of the last remaining habitats of the endangered Great Indian Bustard
4. **Ujani Wetland:** A bird biodiversity hotspot with 100-150 species of flamingos and cormorants
5. **Bhimashankar Wildlife Sanctuary:** Home to the state animal of Maharashtra, the shekru

Hey, that's where I live!

How many different types of aquatic/riparian plants are found in Upper Bhima river basin?

A. More than 50

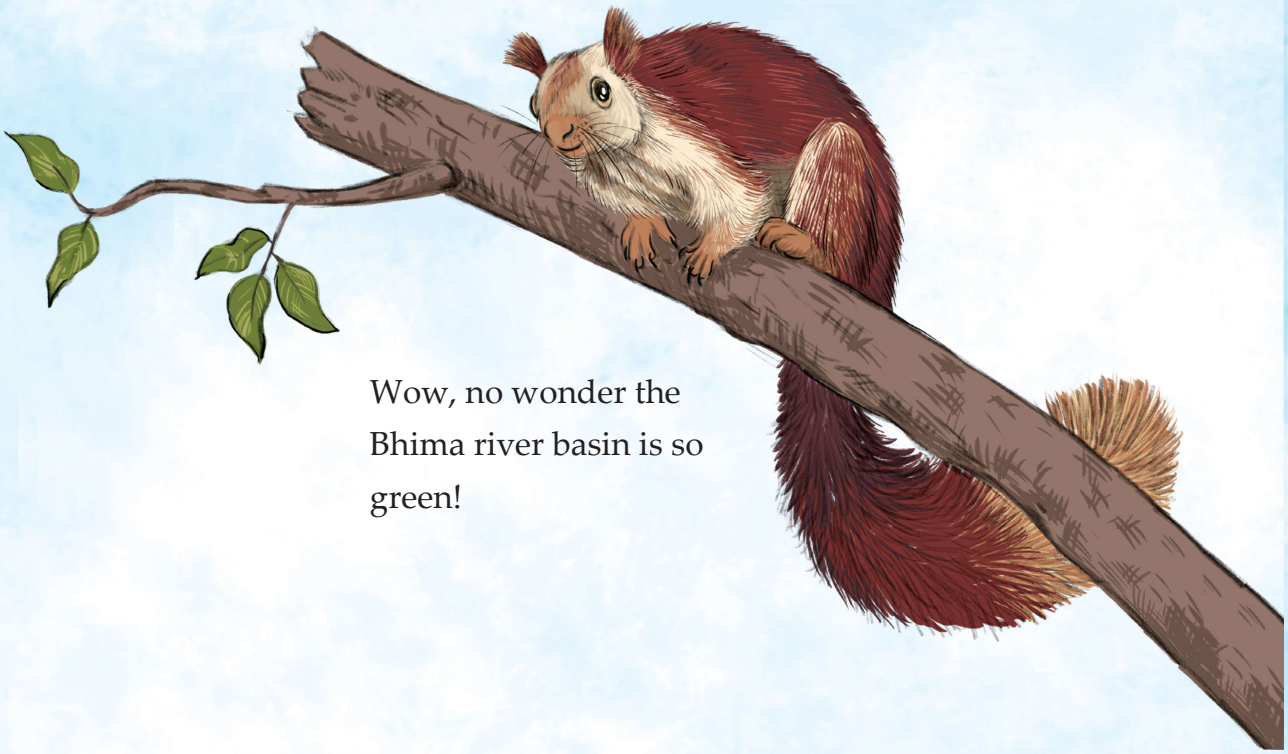
B. More than 100

C. More than 200

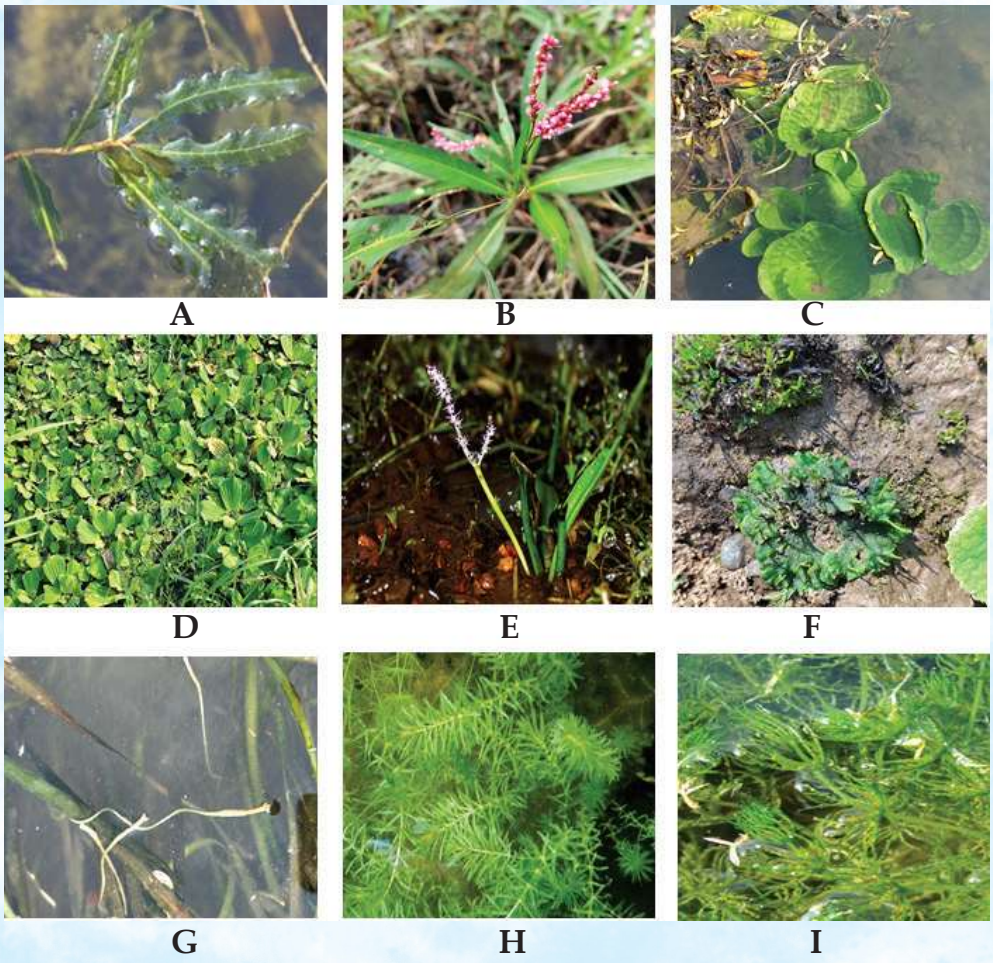
D. More than 500

Answer: More than 200 !

- 229 different kinds of plants, including many that are endangered.
  - Floating: Float on the surface of the water
  - Aquatic: Grow underwater
  - Riparian: Grow on the banks of the river
- This includes a special type of plant named Vallisneria (Vallisneria), which can absorb different kinds of pollutants from the water.



Wow, no wonder the Bhima river basin is so green!



A - Potamogaton crispus (Lapwate) [Submerged]

B - Persicaria glabra (Sheral) [Emergent aquatic plant] {Riparian}

C - Ottelia alismoides (Bhat-kamal or Olek-alsem) [Submerged]

D - Pistia stratiotes (Pani Kombadi) [Floating aquatic plant]

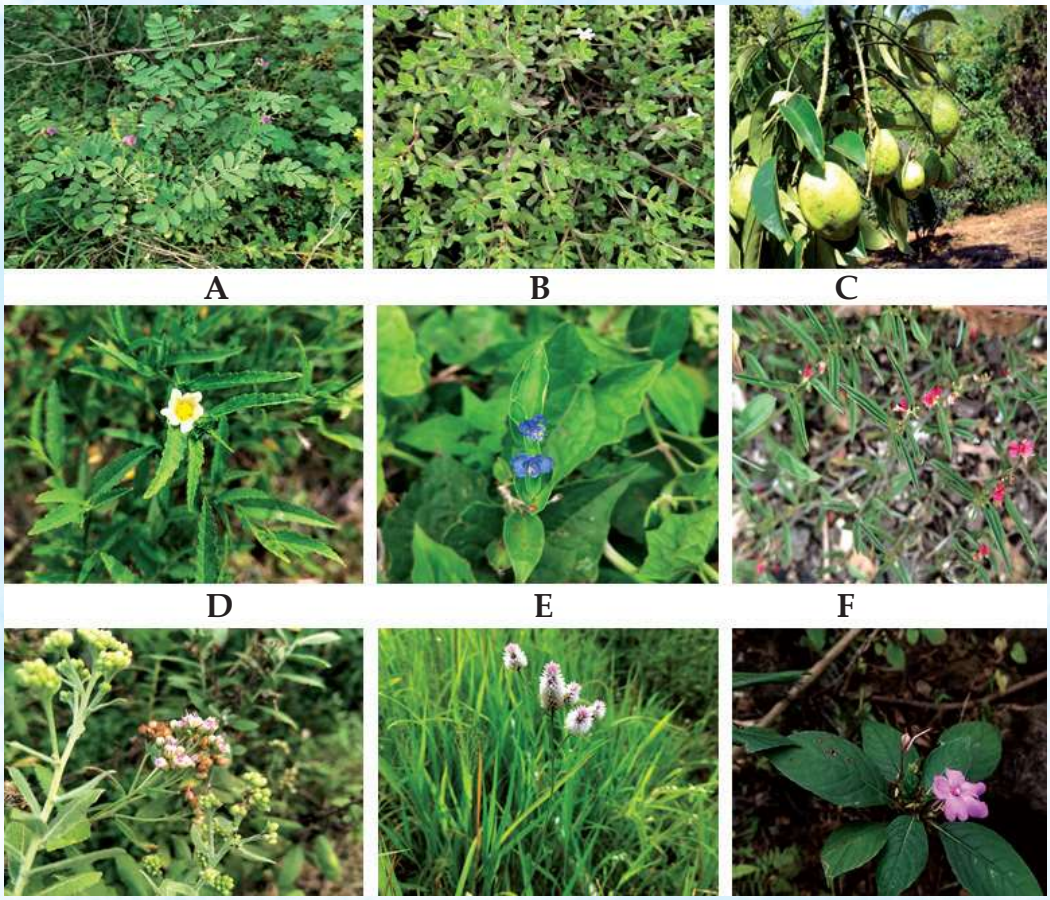
E - Aponogeton satarensis (Satari Paantura) [Partially submerged] {Endemic}

F - Anthoceros sp. (Shingada Shaivala)

G - Vallisneria sp. (Jal Shaivala) [Submerged]

H - Hydrilla verticillate (Seval or Shakharisheval) [Submerged]

I - Chara globularis (Shivnari Shaivala) [Submerged]



A - Tephrosia purpurea (Unhali)

B - Bacopa monnieri (Brahmi)

C - Ormosia travancorica (Malamanchadi) [Endemic]

D - Sida acuta (Bala) {Riparian}

E - Commelina diffusa (Gandologi) {Riparian}

F - Indigofera linifolia (Pandherphalli)

G - Pluchea indica (Raan Gendaa) {Riparian}

H - Celosia argentea (Kurdu)

I - Impatiens daisysprema [Endemic]

How many different groups of animals live around river Bhima?

A. Groups: fish and birds

B. Groups: fish, crabs, and birds

C. Groups: fish, crabs, birds, and insects

D. More than 6!

Answer: More than 6 !

1. **Fish:** 39 different species
2. **Birds:** 38 different species
3. **Mammals:** Mouse deer, civet cats, leopards and more
4. **Bivalves:** Clams
5. **Crustaceans:** Crabs, prawns
6. **Amphibians:** Frogs
7. **Gastropods:** Snails
8. **Insects:** Dragonflies, damselflies, and other water breeders

Bonus question:
which one am I?

A

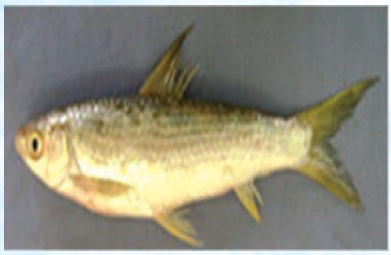
B

C

D

E

F



G

H

I

Other taxa

A - Laubuka laubuca (Ulkut)

B - Amblypharyngodon mola (Mola)

C - Garra mullya (Mullya)

D - Puntius chola (Khavli)

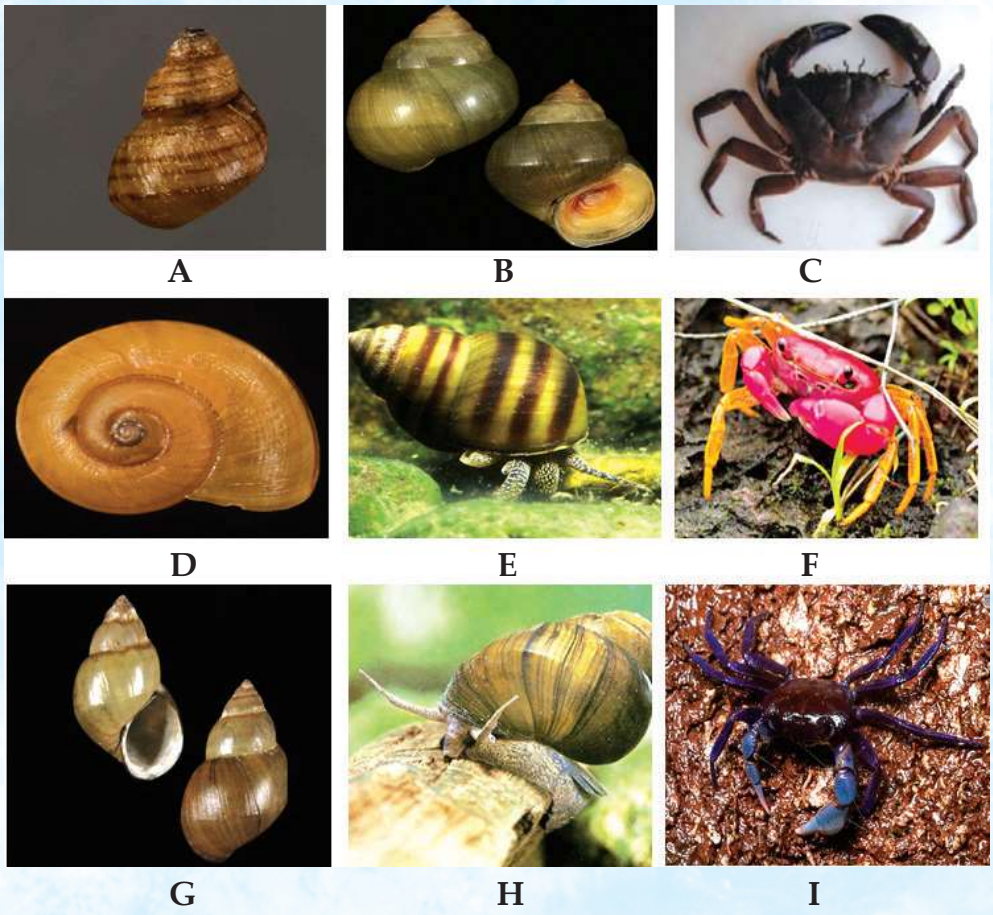
E - Osterobrama cotio (Bhongi)

F - Chanda nama (Kachki)

G - Cirrhinus reba (Reba)

H - Pethia ticto (Ticto)

I - Gambusia affinis (Machhar Masa)



A B C D E F G H I

Other taxa

A - Filopaludina sumatrensis

B - Cipangopaludina cathayensis

C - Barytelphusa cunicularis

D - Cryptozona bistrialis [Endemic]

E - Viviparus Viviparus

F - Ghatiana pulchra [Endemic]

G - Bellamya dissimilis

H - Cipangopaludina chinensis

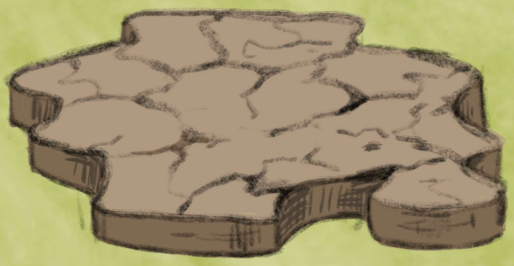
I - Ghatiana atropurpurea [Endemic]

Cryptozona bistrialis, Ghatiana pulchra and Ghatiana atropurpurea aren't found anywhere else in the whole world!

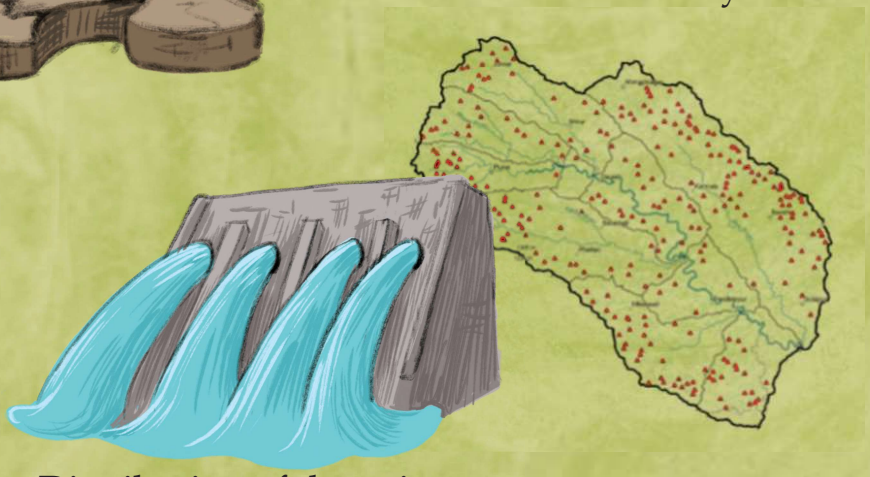
Challenges

With the increasing urbanisation and climate change, rivers today face a lot of challenges.

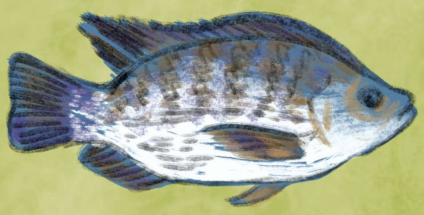
Changes in rainfall:
Increased droughts affect the flow of the river.



Dams: One of the mostly densely dammed river basins in the country.



Distribution of dams in Upper Bhima Basin



Invasive species:
e.g. Tilapia, water hyacinth.

Challenges

Land use change:

- Expansion of cities and built-up areas reduce groundwater recharge
- Increases in agriculture lead to more demand for irrigation
- Loss of forests affects flow of water

I have seen plastic bottles flowing down the river. Why are they there, and what impact can they have on us?

Pollution:

- Toxic substances enter water bodies such as rivers, lakes, groundwater and so on. They either get dissolved in them, lie suspended in the water, or deposit on the riverbed.
- Bhima river and many of its tributaries feature in Central Pollution Control Board (CPCB)'s list of critically polluted rivers.

Exploitation of resources:

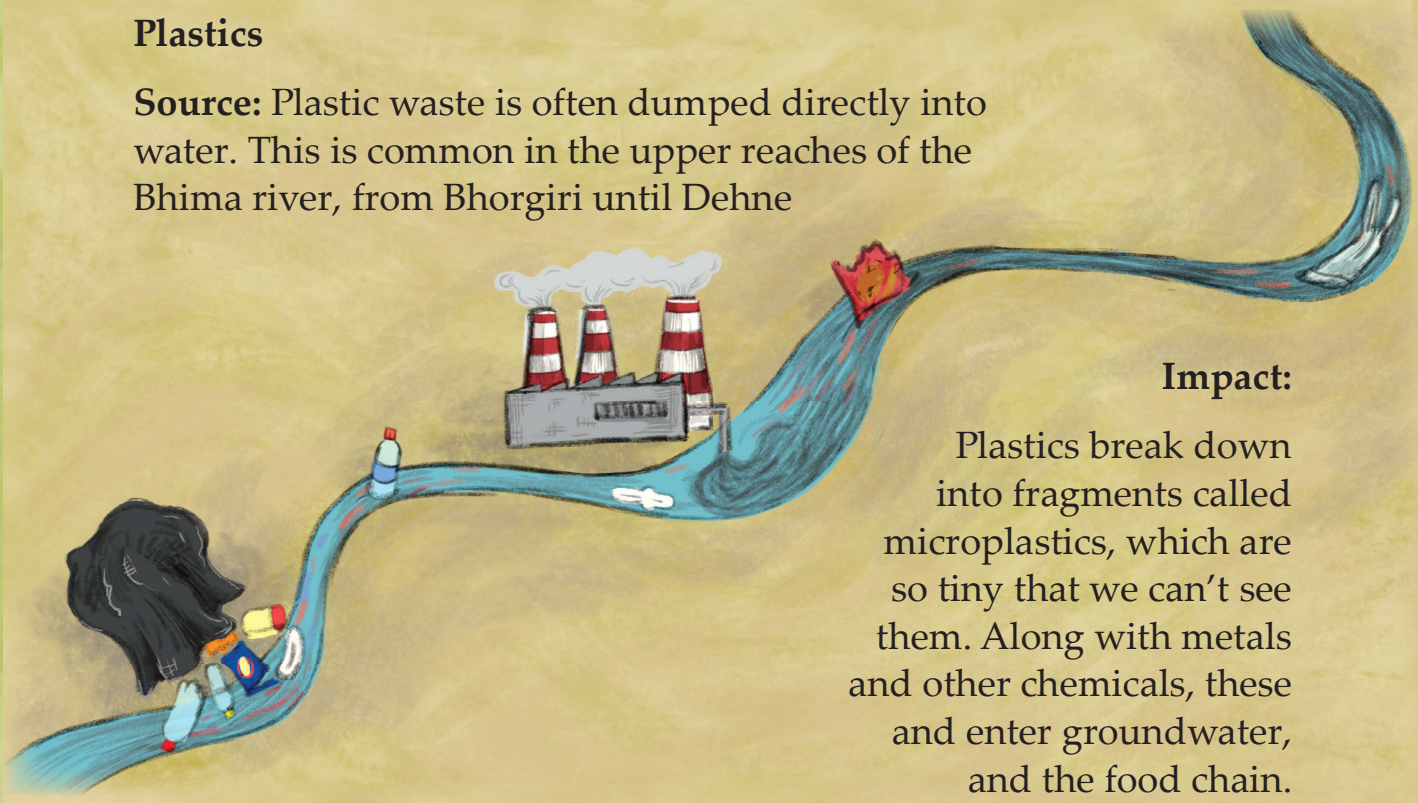
Overuse of groundwater and surface water, overfishing, sand mining, etc.

Pollutants

Organic matter, such as silt, rocks and plant debris, along with living plants and animals are a natural part of rivers. But when water flows through human habitats, other substances enter the river as well:

Plastics

Source: Plastic waste is often dumped directly into water. This is common in the upper reaches of the Bhima river, from Bhorgiri until Dehne



Impact:

Plastics break down into fragments called microplastics, which are so tiny that we can't see them. Along with metals and other chemicals, these and enter groundwater, and the food chain. Microplastics have been found in the stomachs many fish caught in this region, which means that humans may be consuming microplastics as well. These pollutants may cause significant health issues in humans and other animals.

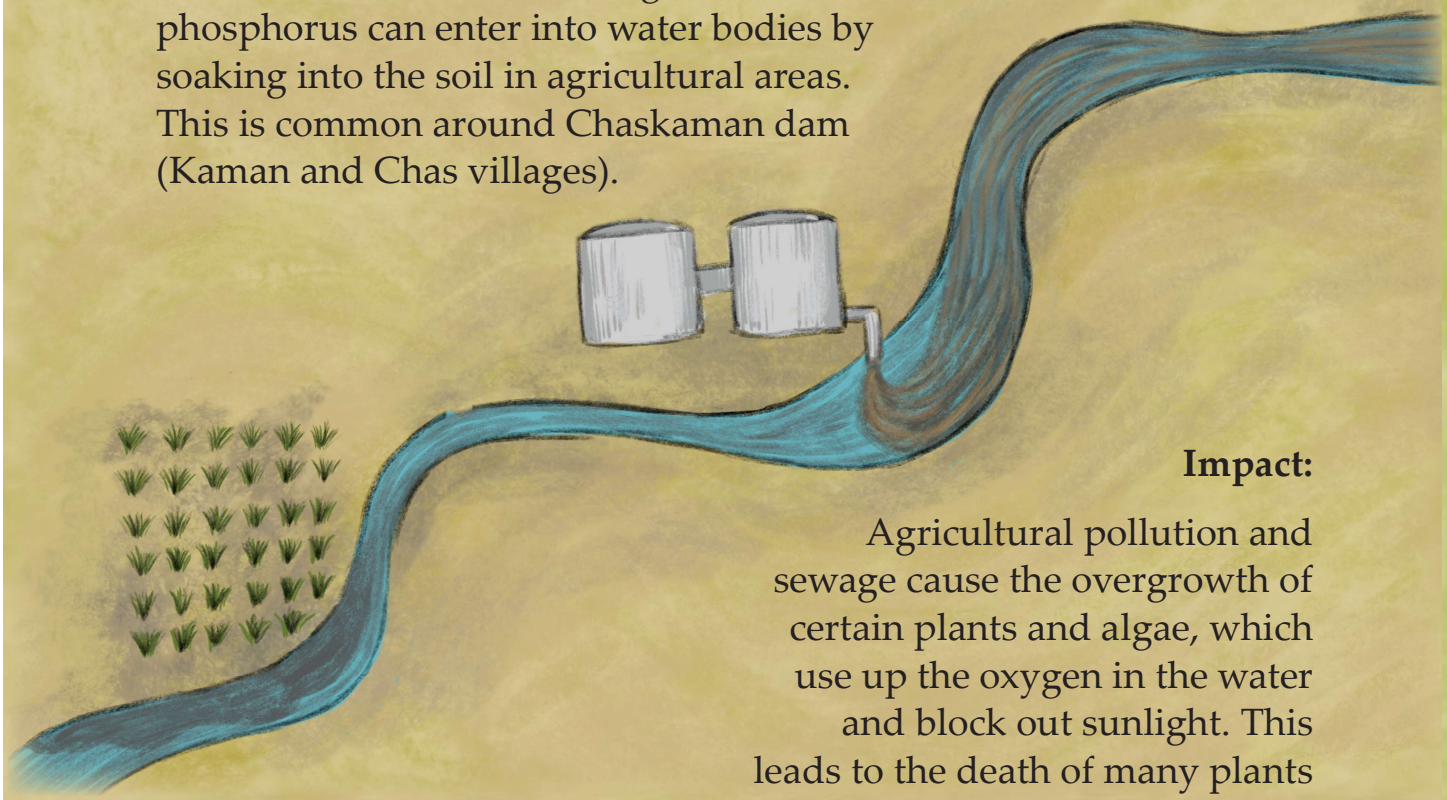
Heavy metals, dyes and chemicals

Source: Unregulated dumping of industrial and other waste into water bodies. Flowing rainwater from roads and other urban spaces may also carry these pollutants.

Pollutants

Agricultural runoff

Source: Fertilisers, pesticides, herbicides, and other elements like nitrogen and phosphorus can enter into water bodies by soaking into the soil in agricultural areas. This is common around Chaskaman dam (Kaman and Chas villages).



Untreated sewage

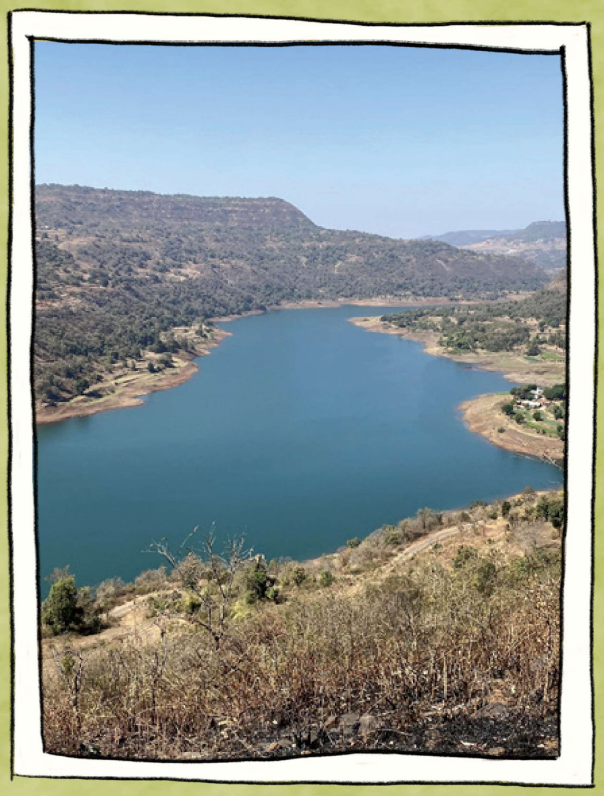
Source: Poorly treated sewage water from treatment plants, and sewage dumping from urban and semi-urban areas. This occurs in the Bhima river in areas near Rajgurunagar.

Impact:

Agricultural pollution and sewage cause the overgrowth of certain plants and algae, which use up the oxygen in the water and block out sunlight. This leads to the death of many plants and animals in water bodies. Even detergents can do this – researchers found less dissolved oxygen (DO) around Navratri, likely due to washing clothes in the river.

These pollutants also contain toxins and pathogens that can cause serious health issues in humans and other animals.

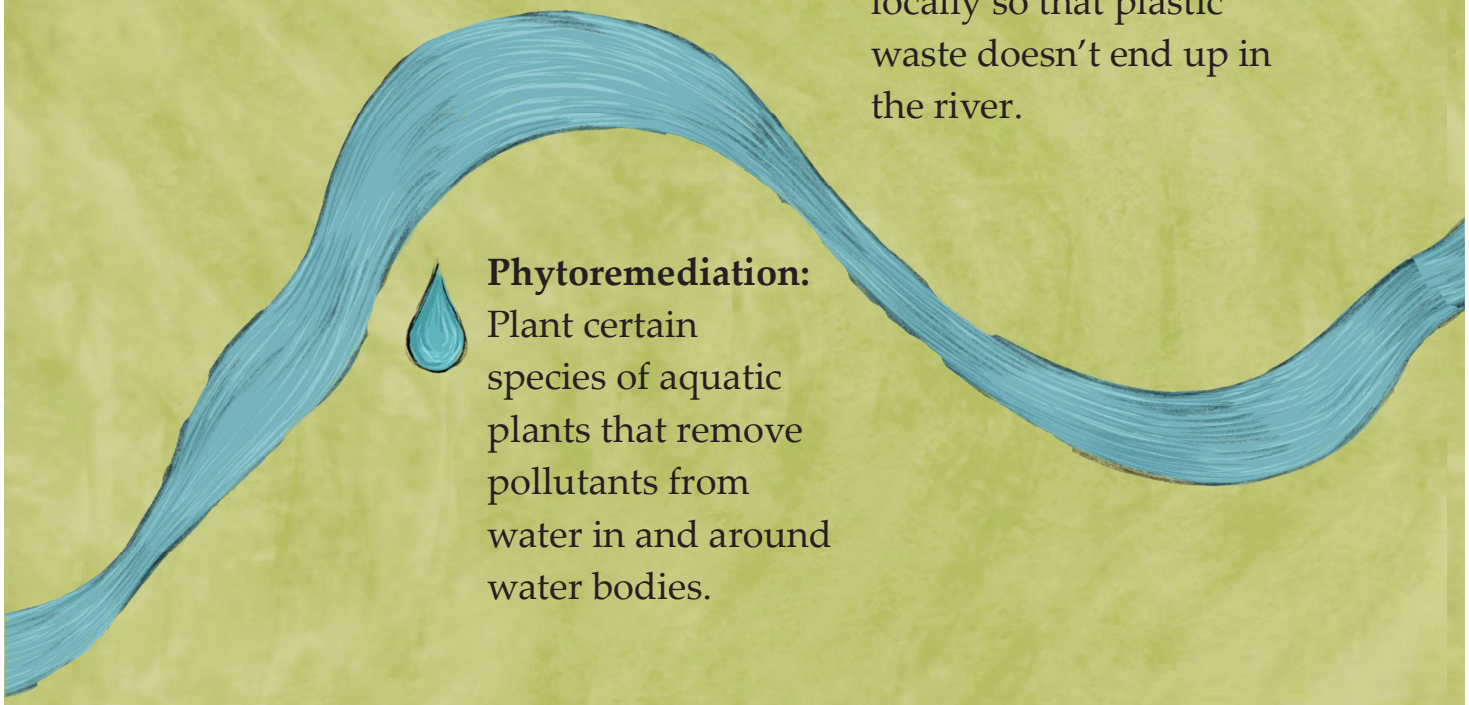
What can we do to prevent our whole river from looking like this…



…and keep it looking like this?

Solutions

A lot of the challenges faced by rivers and water bodies are linked to human actions. By considering the following solutions, we can keep our river healthy:



Better management of plastics: Reduce, re-use and manage plastics locally so that plastic waste doesn't end up in the river.

Phytoremediation: Plant certain species of aquatic plants that remove pollutants from water in and around water bodies.

Reduce synthetic agricultural inputs: Reduce the usage of synthetic fertilisers, pesticides and herbicides.

Avoid chemical products: Use natural soaps and detergents to prevent chemicals from leaching into the river.

Sewage treatment: Regularly maintain soak pits and toilets to prevent leakage.

Become a citizen scientist: Help monitor biodiversity and water pollution and stand up for the health of the river.

Remember that all water is connected. So, healthy rivers lead to healthy people, forests and land!

We need your help to save our river.

If you want to get involved,
let us know!

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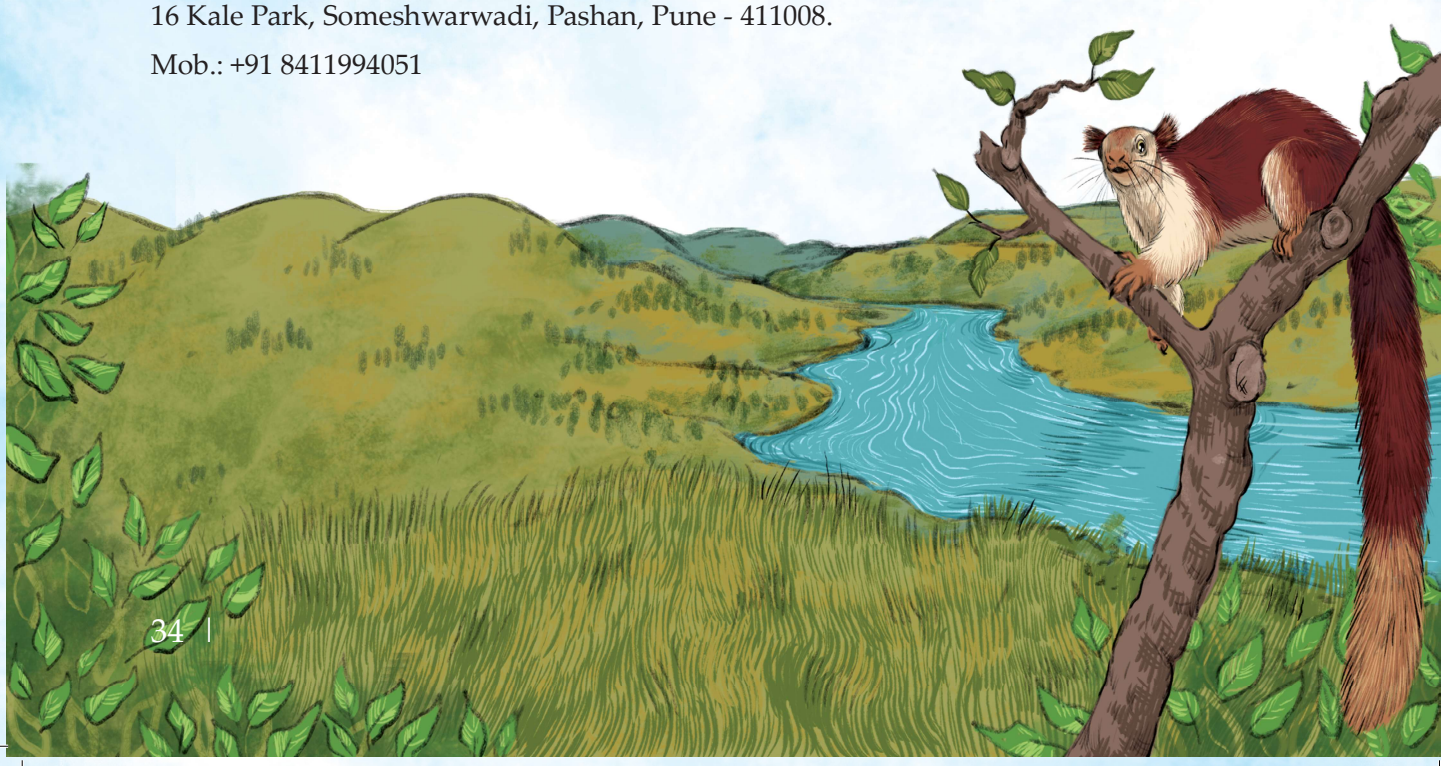

Notes

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