Indian Rivers
Problems
And
Solutions

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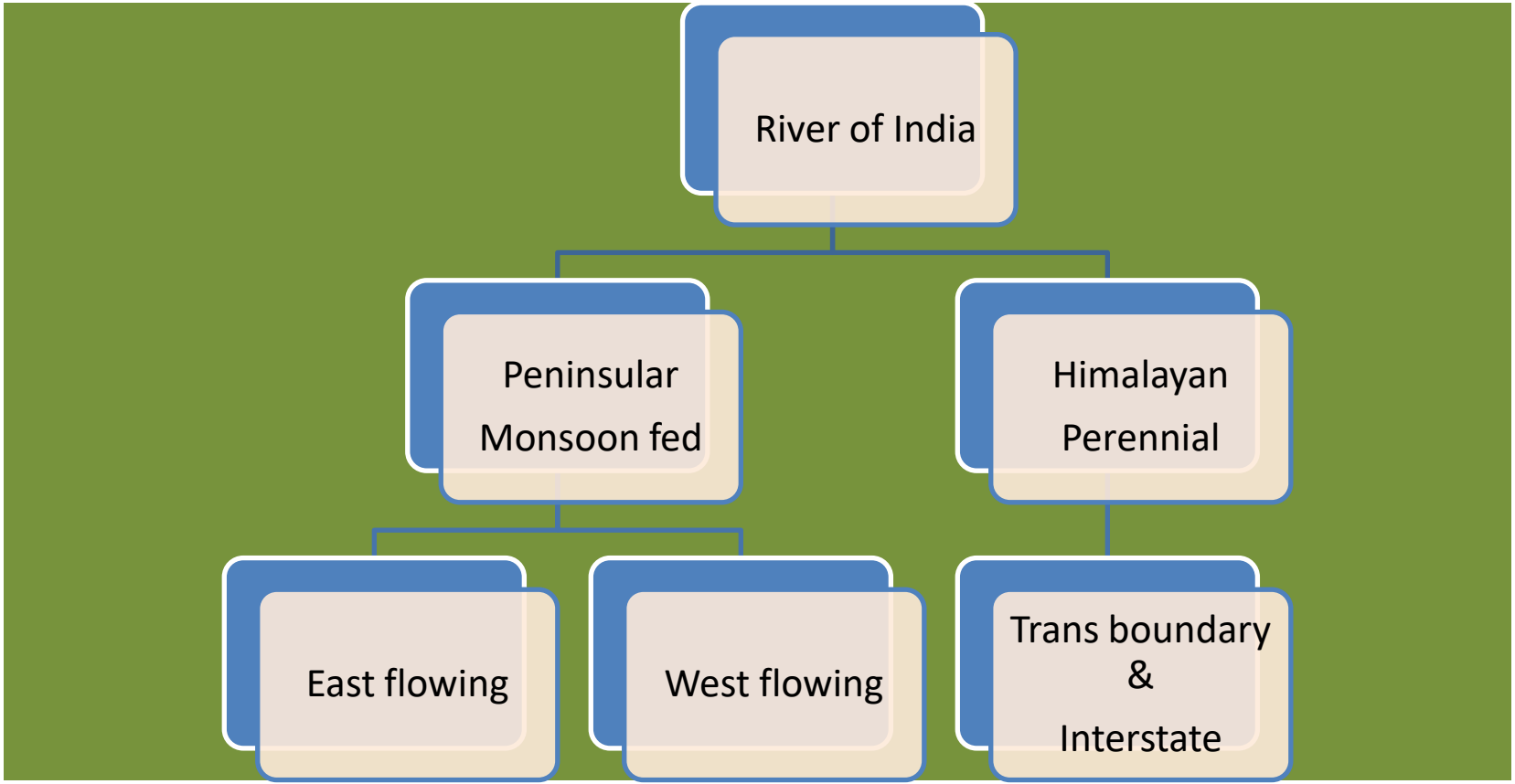

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Himalayan and Peninsular Rivers

Ganges in Himalayas

Problems at source

Mutha in Sahyadri

Geological Impacts

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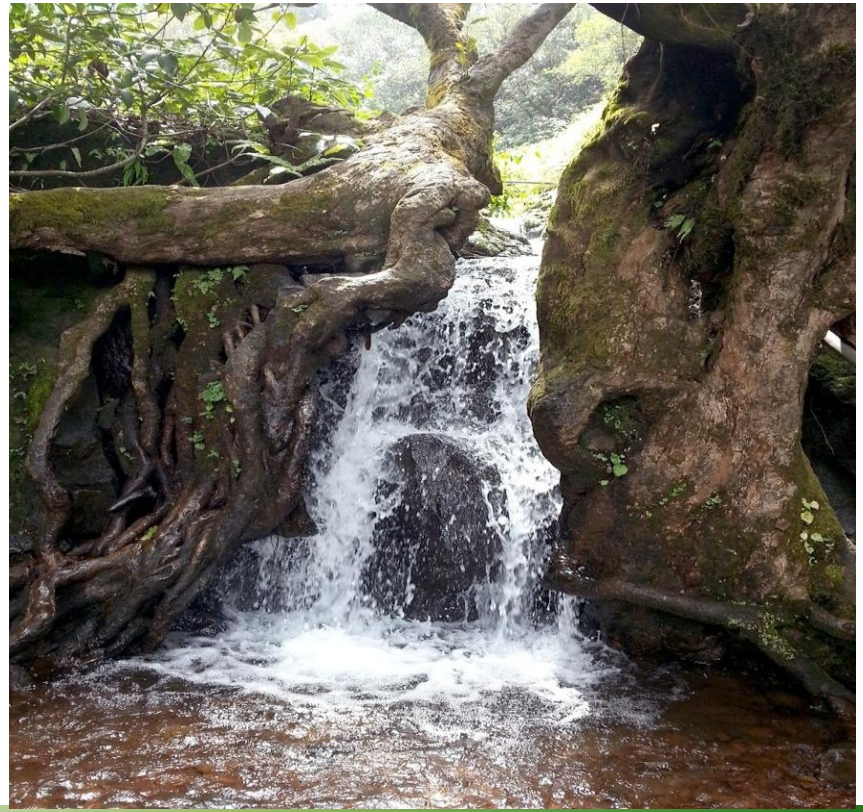
River at Source



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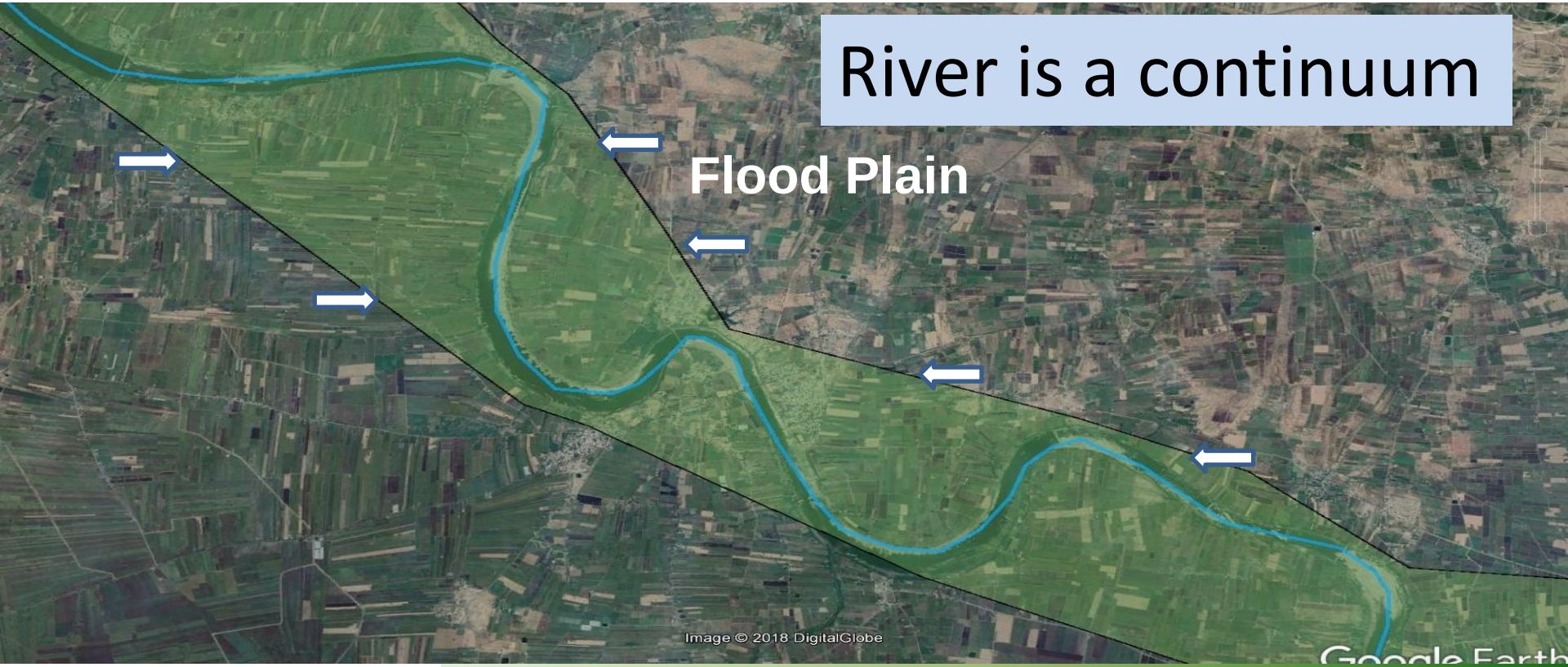
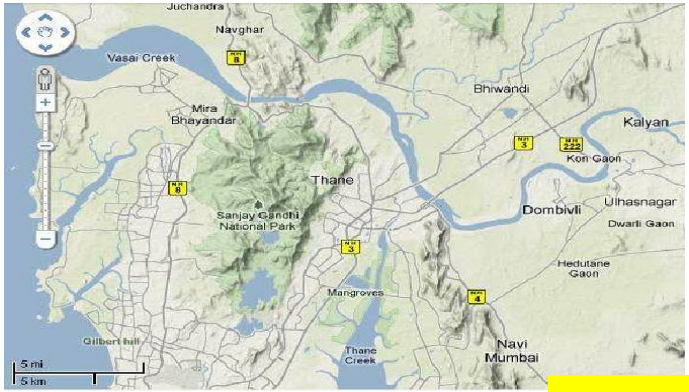
In flood plain



West Coast – Estuaries



East Coast- Deltas

At Mouth

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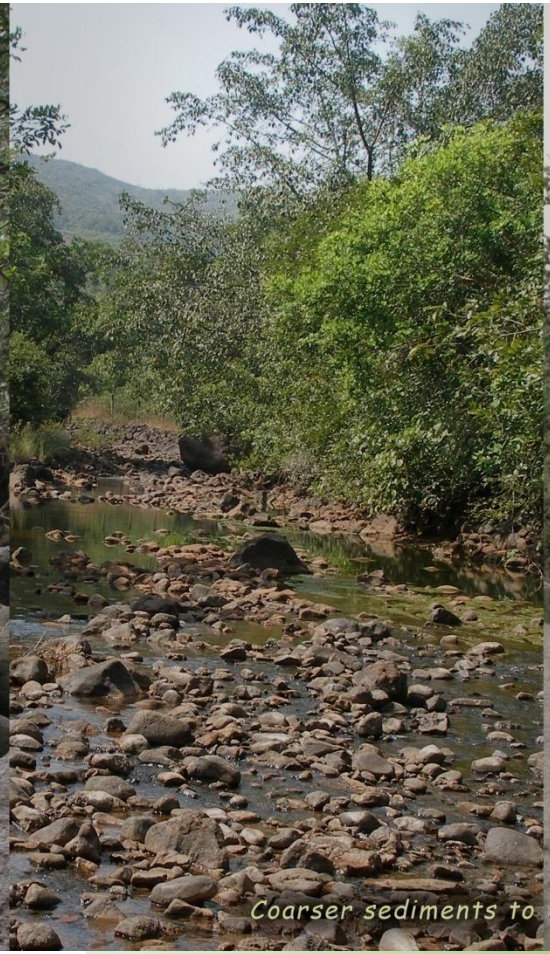
Sorting of sediments

Boulders at Source



Coarser sediments to sand in Plains

Silt at Mouth

RIVERINE SEDIMENTS

River does sorting of sediments during its entire course from large sized boulders to coarser sediments to silt etc. each of which has unique role and associations

Ecological Processes	Problems	Solutions
1. Highest deposition 2. Lowest velocity 3. Extremely diverse 4. Fertile lands 5. Habitats of aquatic and terrestrial life 6. Ideal for fishing 7. West coast more diversity due to shallow coastline 8. East coast more fertile	1. Rivers don't meet sea 2. Sea in grace 3. Loss of Mangroves 4. Loss of Biodiversity 5. Exposed to flood risk 6. Lands are becoming saline 7. Subsurface water entering cities	1. Ecological restoration of banks 2. Sensitive areas to be protected 3. Community based tourism could be introduced 4. Growing mangrove forests

Reasons?

- No Knowledge of River Ecosystem
  - Importance of Green zone of a river
  - Flows and floods of river
  - Water literacy – Surface and Subsurface water
  - Geography, History, Atmosphere, Climate.....
- We don't Own the responsibility
- Lack of River related Laws, rules, and Enforcement

Most Important Reason

Ignorance and no Knowledge

About

Where does our water come from

And

Where does our water go

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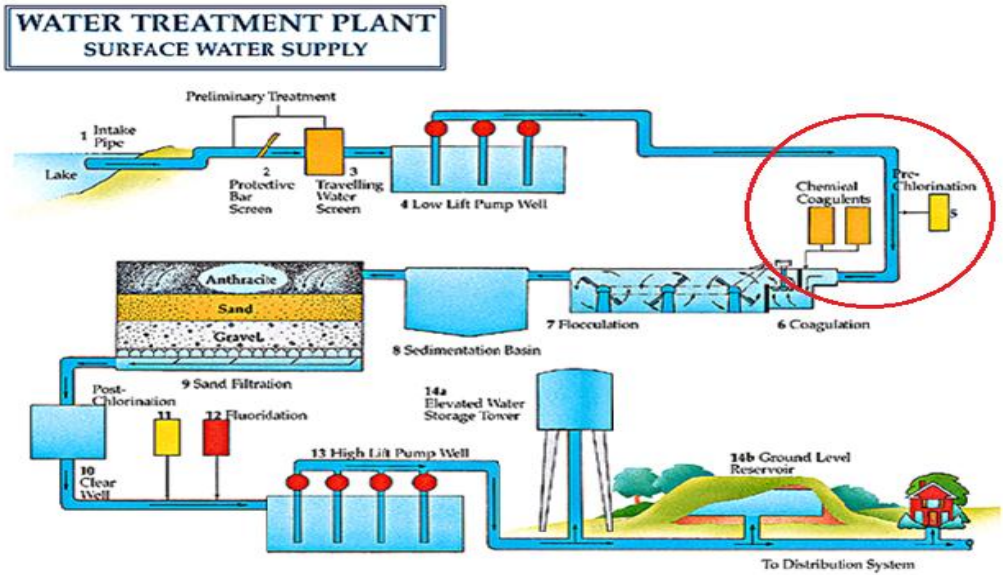
How does the water reach us?



Environmental losses- habitats, biodiversity,
Erosion, sedimentation
Flood risks, declining water quality

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Our Drinking Water

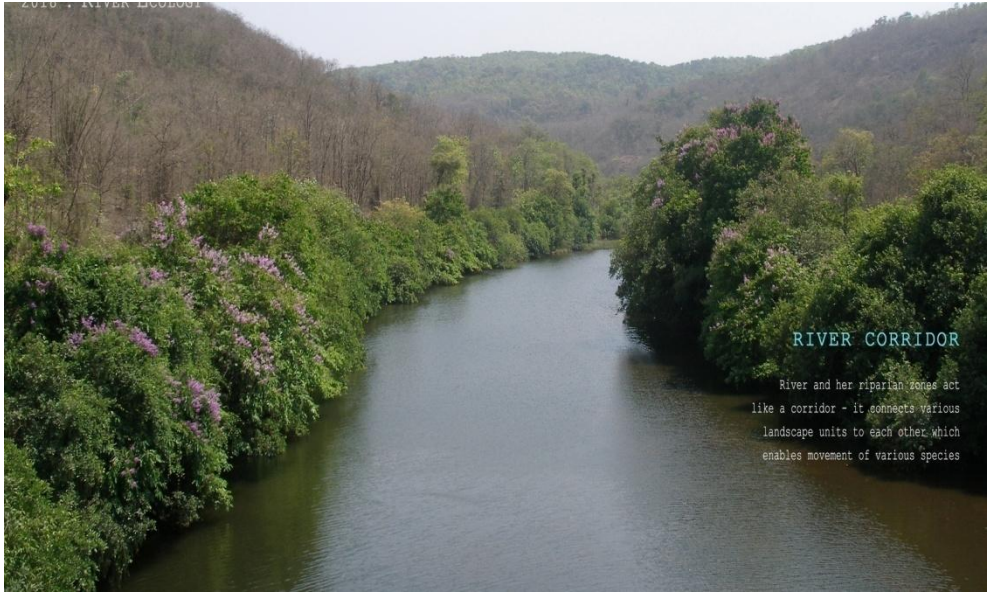
- Chemical substances used to purify water
  - Lime
    - Mining of lime results in pollution
  - Alum
    - Produced by mining of bauxite and further reaction with sulphuric acid
  - Chlorine
    - Mercury cells are used for production of chlorine from brine
    - Chlorination of water produces 4-5 trihalomethanes that are carcinogenic

Mining pollution at source

These substances add pollutants while purifying water

Symptoms of dying rivers

- **Extraction –** Dams near source, deforestation, Ground water
- **Encroachments –** within city and outside city- change in land use
- **Pollution -** Solid waste, Liquid waste, Untreated or partially treated waste water



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Pune receives

Fluvial Floods
- Flash floods
- Overbank floods

Pluvial floods
- Run offs
- Poor drainage

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Where does our water go?

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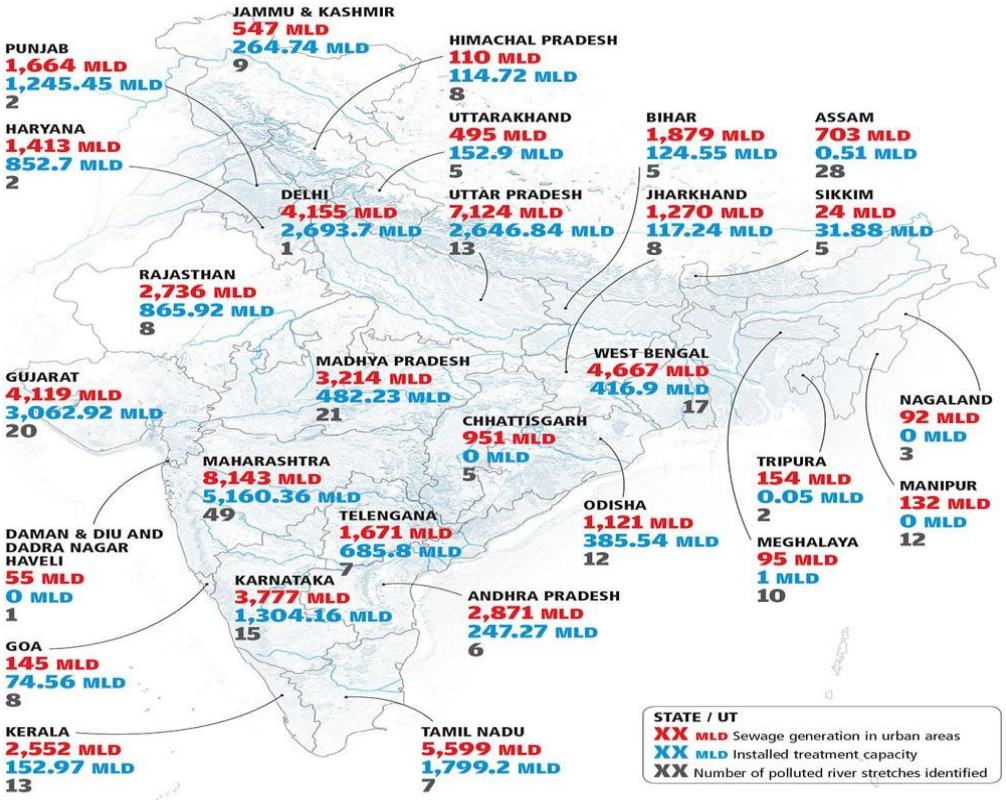
Pollution in our Rivers

Extent of contamination

Spending enormous money, creating awareness and building sewage treatment plants have not helped cleanse India's polluted river stretches. The estimated polluted riverine length is 12,363km, about 5 times the length of Ganga main stem



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Impact on River by every individual

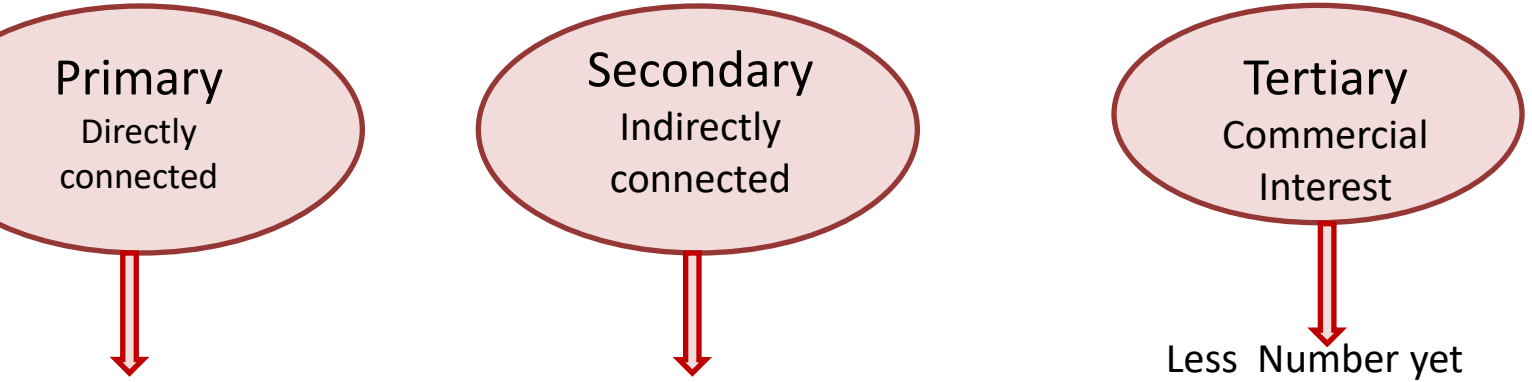
Research by NCL- Sr. Scientist, Dr. P. Moghe

Products	Chemicals	Gms
Toothpastes	Including phosphates, fragrances, detergents etc	4
Shaving creams	Foaming chemicals, sulphates, carbonates etc	5
Bath accessories	Phenol, Edible Oils, , fragrances, colors, organic solvents etc.	5-8
Floor cleaners & toilet cleaners	Carbonates, Diff Acids, Phenyl	10
Utensil cleaner	Silica, carbonates, sodium solvents	10
Detergents	Non edible oils, phosphates, carbonates, colours etc.	10
Cooking		5
	Approximate Per day per person use of Chemicals	22-40

Total Chemicals dumped into Rivers in a city like Pune from Domestic use

- Average person uses about 40gms.of different chemicals
- Population of Pune about 50 lacs
- Untreated chemicals dumped into River waters per day 2,00,000 kgs

Roadmap – Understanding stake holders – Strategies



Small Number
Assured support
Dedicated
Need to create sustainability

More Numbers
Limited support
Huge awareness required Planned programs and Developing associations- catchment & command collaborations

Less Number yet Powerful
Least bothered for river
Strategy
Legal
Governance

Bottom to top Approach

Provide sustainable solutions

Top to bottom

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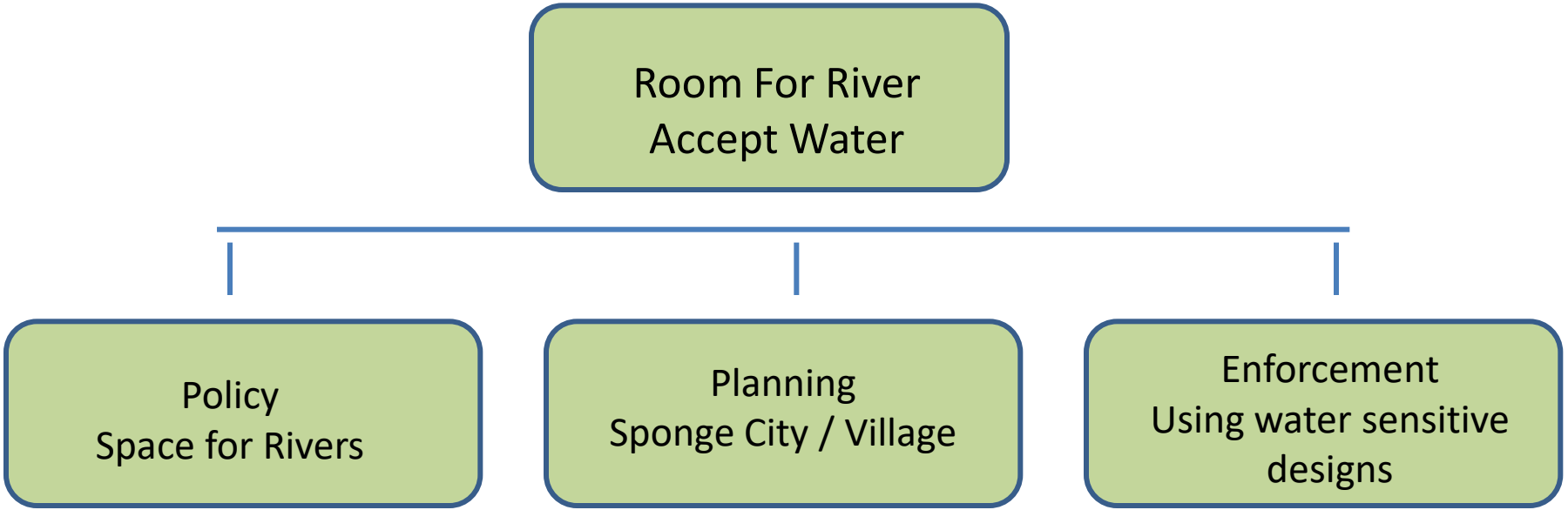
Scientific and Holistic Approach



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Scientific, holistic approach towards ecological restoration

Policy Space for river	**Planning** Routes and ways	**Enforcement / Implementation**
• River Regulation Authority to come in force • Define Urban River & Rural zone • Development as per zones of River & not by Administrative zones • Change in land use as restrictive zones regulation • Introduce Bonds for source protection • Creating revenue model for Climate adaptation	•Water security • Water safety • Water quality • Restoration of water bodies	• Flood maps, zoning etc in public domain • Large development project impacts in public domain •River monitoring committee • CSR funding for Mitigation and preventive measures

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Pune case study for Urban Rivers

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My River, My Responsibility

This Beauty and Serenity will be lost forever

Awareness Strategy

Convey what is good for river and citizens.

1. Data, Documents & Proofs of floods, draughts, Climate Change etc
2. Understanding River ecosystem & its watershed
3. Ground water facts
4. Water quality facts

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Awareness Campaign for commons

We do not inherit earth from ancestors, we borrow it from our children

Do rivers have to die for cities?

- **River Festival**
- **Mobile Exhibitions**
- **Events by the River**
- **River walks**
- **Clean Rivers**

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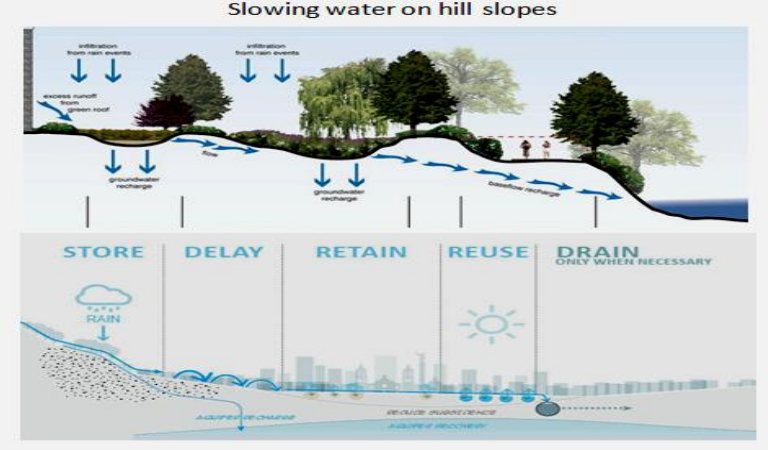
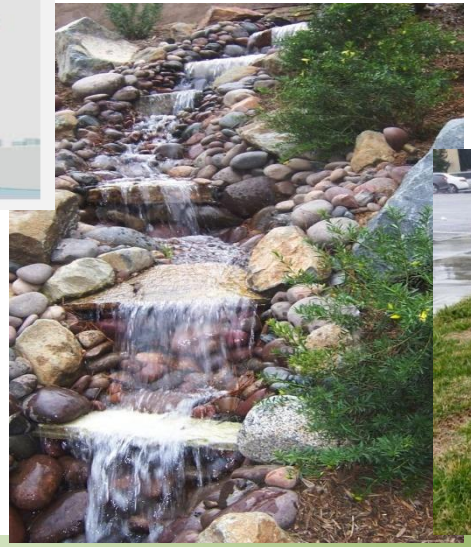
At Source

Combination of structured and Non structured
Reducing run offs
Slowing water on slopes
Increase infiltration
Permeable surfaces
Proportion of softscape to hardscape





How?
Creating close canopy forests
Restoration of mines
Avoid concrete and embankments

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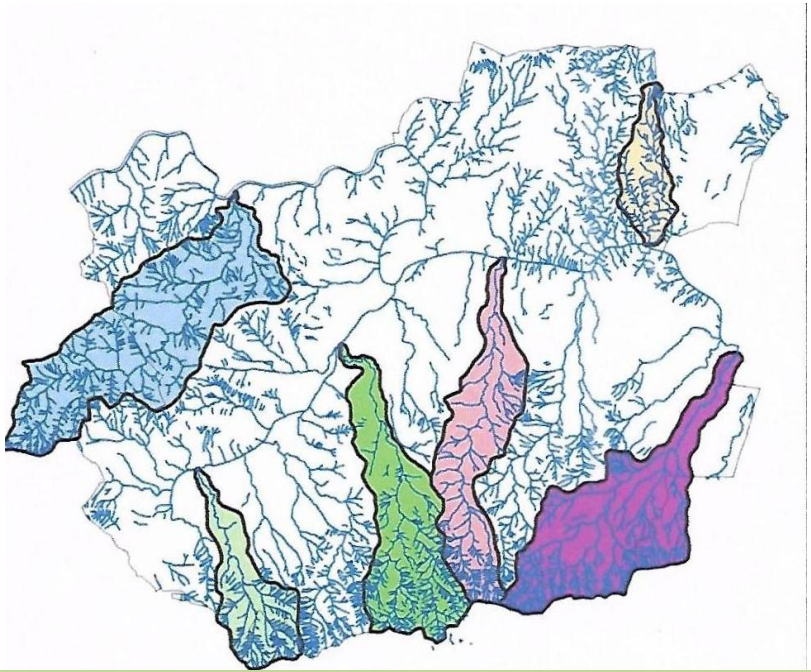
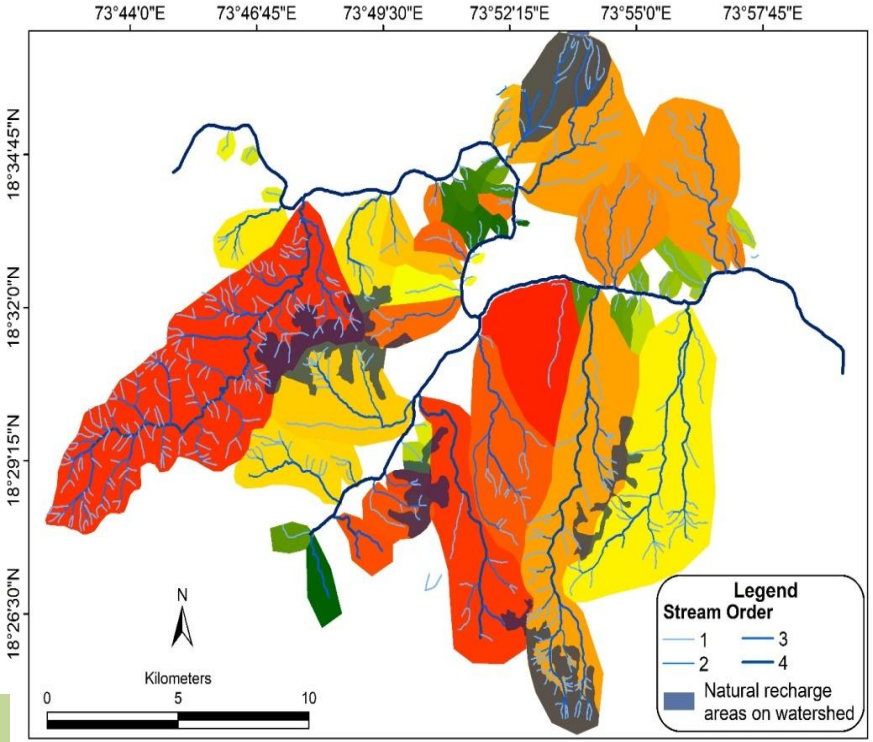
MAR- Managed Aquifer recharge





Research credit- Dr. Gabale and ACWADAM

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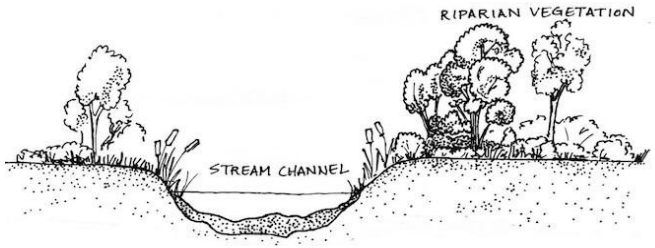
In flood plains

flood mitigation & water quality improvement techniques-
Green zones
protection of live springs along river



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Reducing siltation

Erosion & sediment Control

Bank Stabilization

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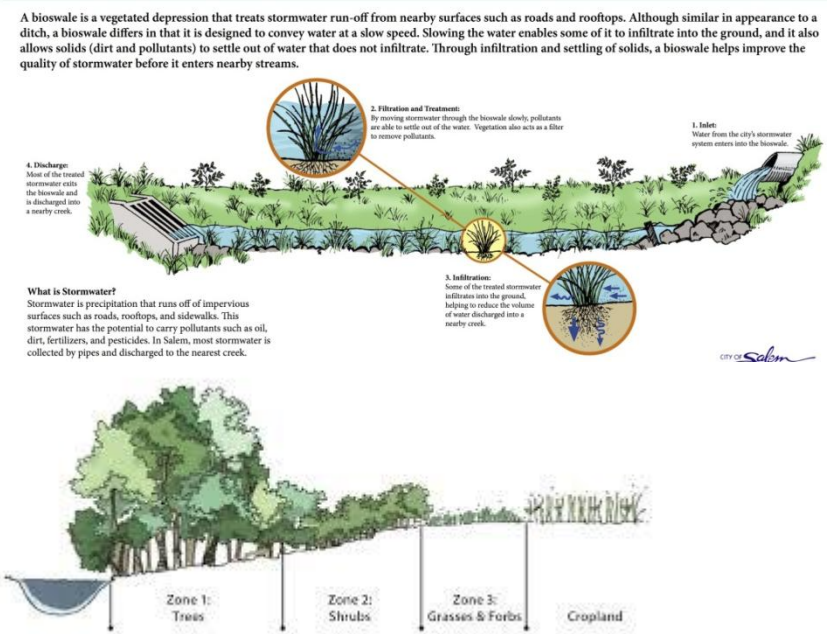
At mouth

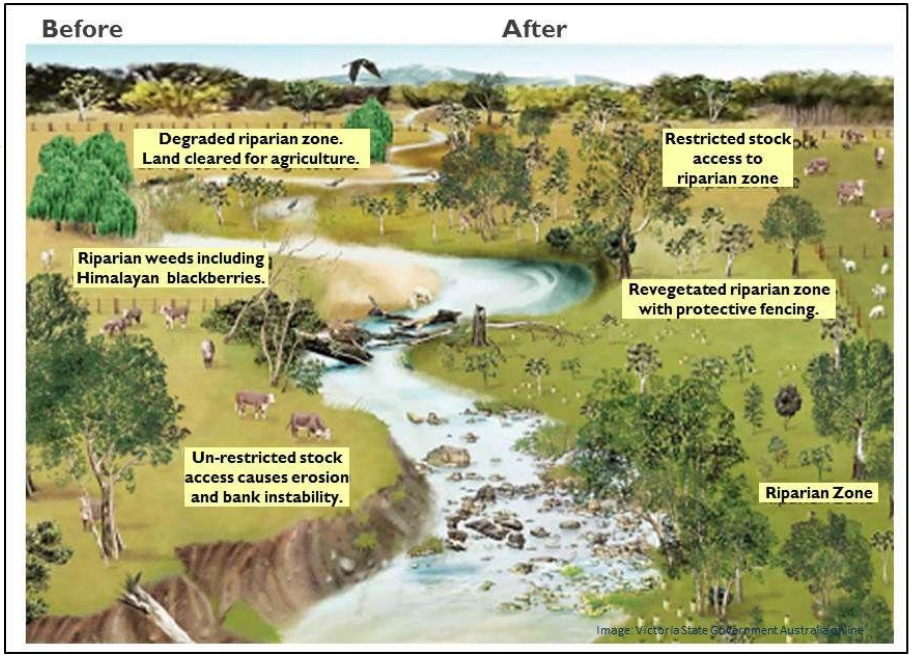
Creating buffer zones

By Riparian forests

Bio swales

Permeable protection





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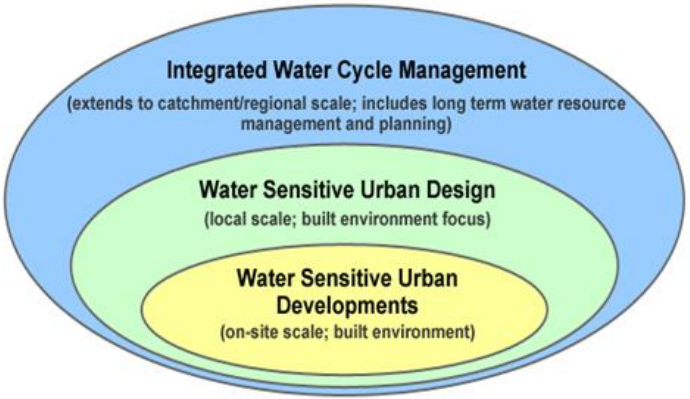
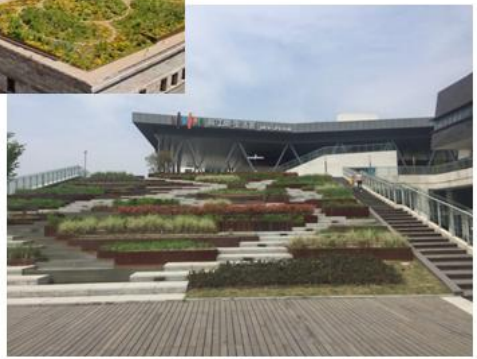
Some more options for Urban- New and retrofitting existing



For Commercial Buildings



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My Water, My Responsibility

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Some Environment Measures in Rural areas

1. Utilization of forests to optimum

2. Using fallow lands for restoration & flood control

3. Use of retention and detention ponds

4. Public awareness and active participation in cropping pattern & land use

5. Retaining water through natural media -soil, vegetation cover etc

6. Reducing sediment - creating mosaic of forests in a landscape and

Riparian woodlands and meadows should be encouraged

7. Restore River's natural flood zones

Thank You !

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