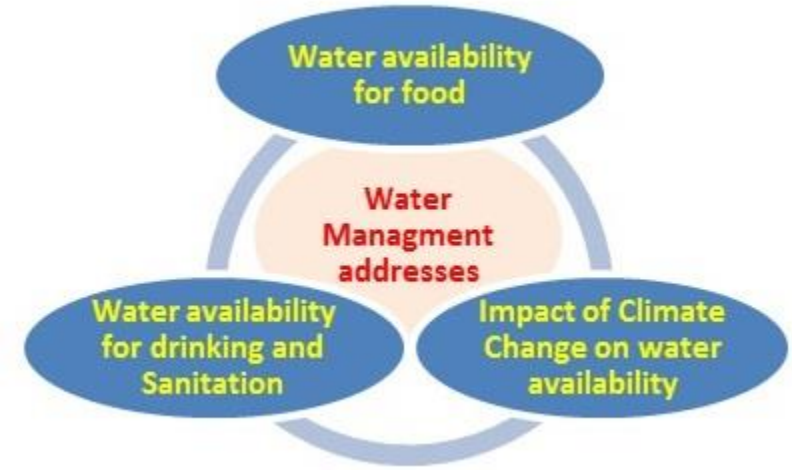
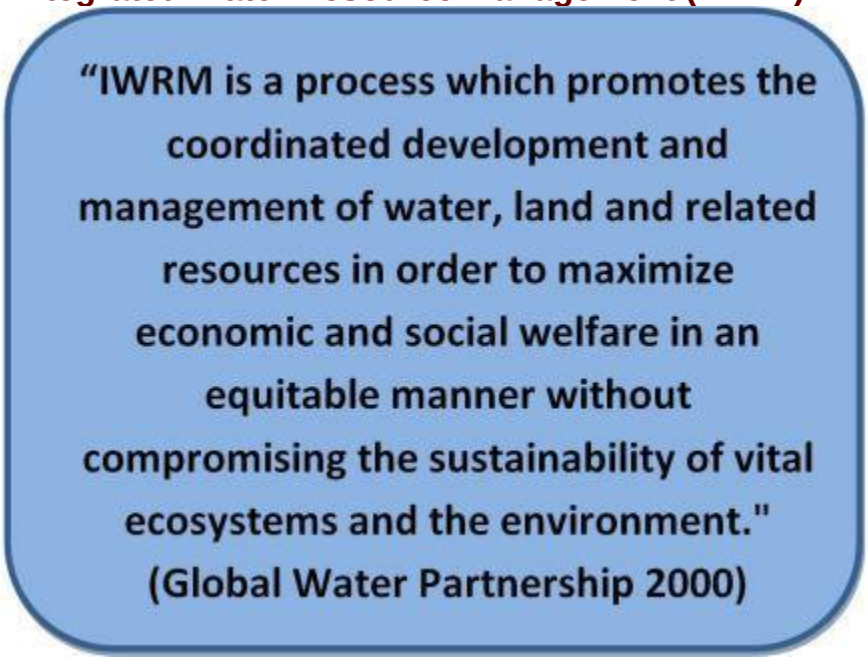
Water Management



Water management comprises of :

I. Integrated Water Resource Management (IWRM)



When the integration is done at the River Basin level it is called Integrated River Basin Management.

Every stakeholder wants their share of water resource. IWRM aims to satisfy them sustainably.

Five principles of IWRM :

(i) Water - A Finite and Vulnerable Resource

River Yamuna in Delhi

(ii) Participatory Approach

(iii) Role of Woman

(iv) Social and Economic Value of Water

(v) Integration of 3Es

The 3 Es refer to Economic Efficiency, Equity and Environment Sustainability

II. Water Governance

(a) Definition

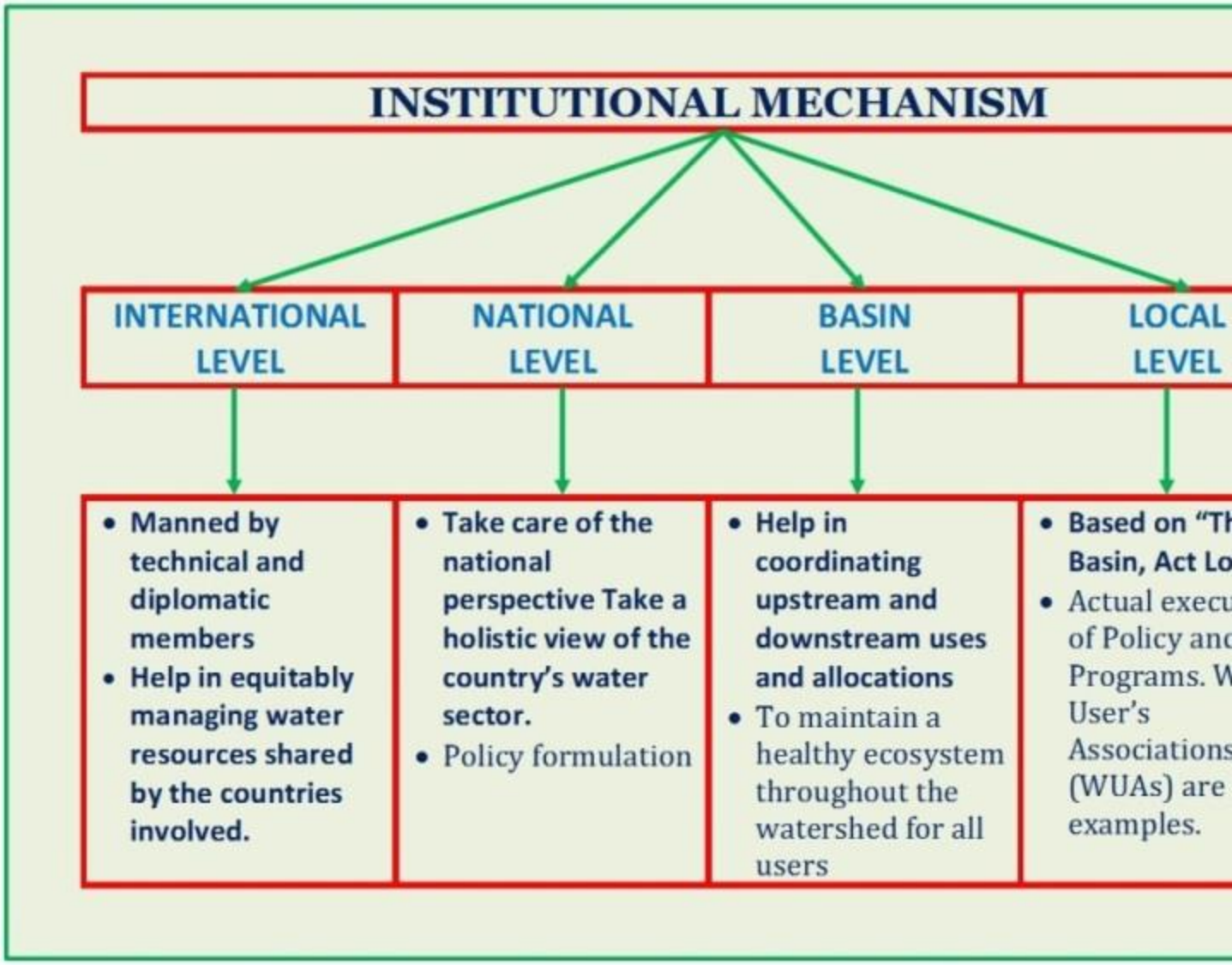
"Water governance refers to the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society."
(Rogers and Halls, 2003)

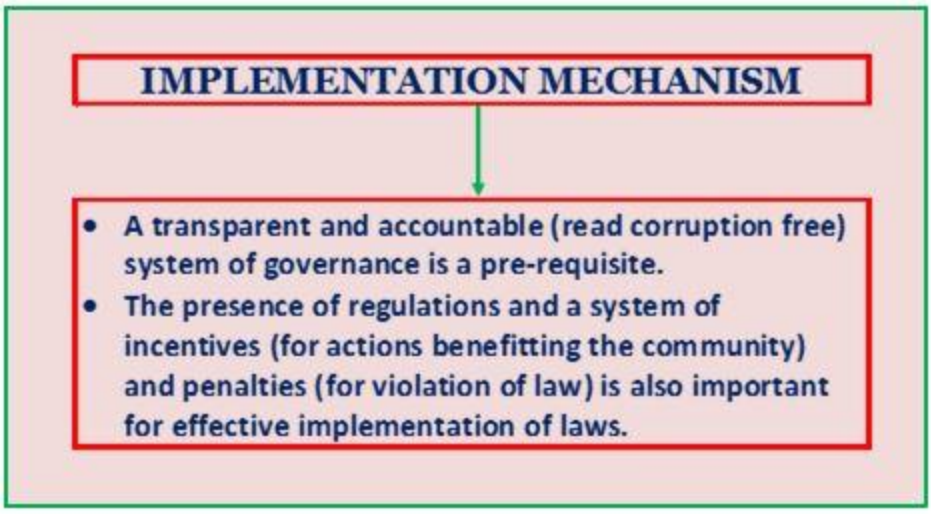
(b) Characteristics

(c) Ingredients

Legal instruments, Institutional Capacity and implementation mechanism


LEGAL INSTRUMENTS
WATER POLICY
WATER LAW
Guideline
Facilitate, instutional and legal reforms
Dynamic in nature
With Public consultation
Establishes and clarifies rights and obligations
Enforceable by courts.
Provides clear rules and procedures to transform policy into action


INSTITUTIONAL MECHANISM
INTERNATIONAL LEVEL
NATIONAL LEVEL
BASIN LEVEL
LOCAL LEVEL
Manned by technical and diplomatic members
Help in equitably managing water resources shared by the countries involved.
Take care of the national perspective Take a holistic view of the country's water sector.
Policy formulation
Help in coordinating upstream and downstream uses and allocations
To maintain a healthy ecosystem throughout the watershed for all users
Based on "Th
Basin, Act Lo
Actual execu
of Policy and
Programs. W
User's
Associations
(WUAs) are
examples.



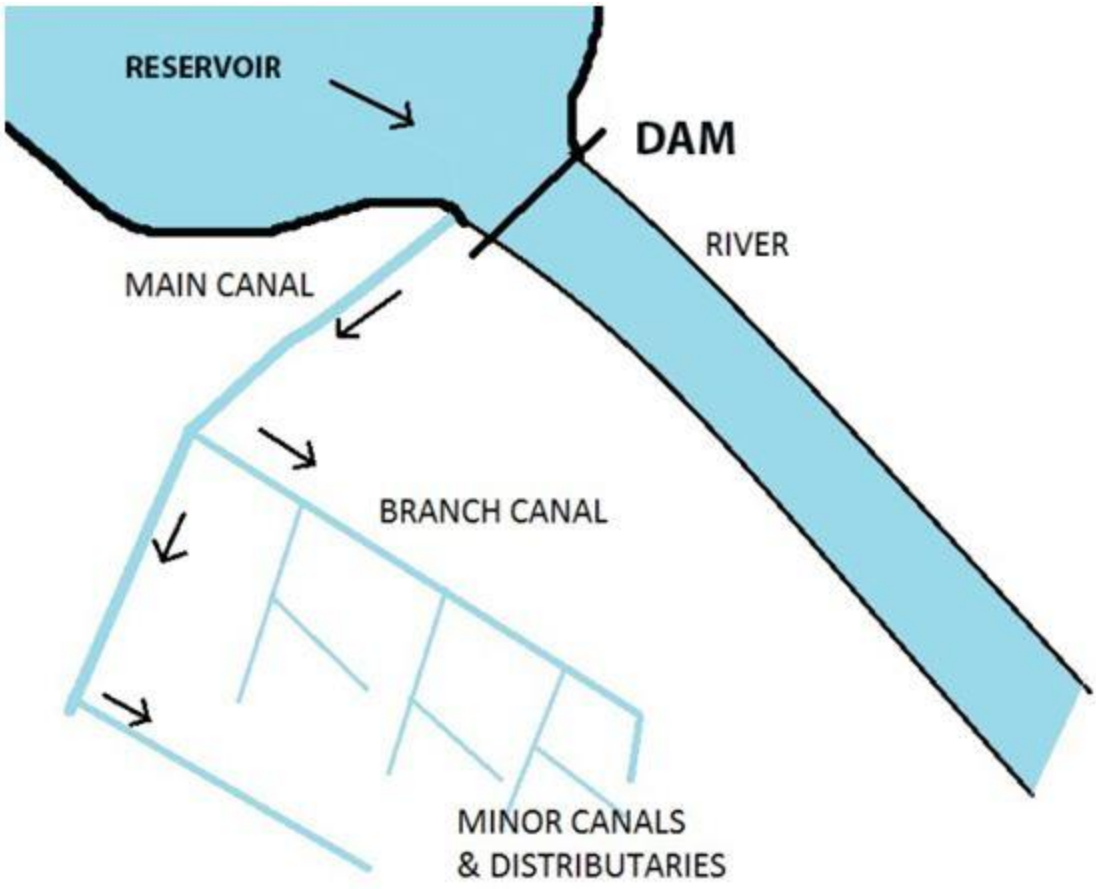
III. Water Supply and Waste disposal

(a) Agricultural Use

(i) Supply Infrastructure

River Water

The River is blocked by Dam to store and elevate the water level and create a reservoir.



The water is carried from Dam to field through Canal Network.

Ground Water

Open Well.

Tube Well.

(ii) Treatment Infrastructure

Normally water treatment for river water is not required for Irrigation.

(iii) Waste Disposal

The methods of waste disposal are same irrespective of the source of water. The irrigation water that is not consumed by plants returns to either groundwater or rivers. They have three major pollution loads.

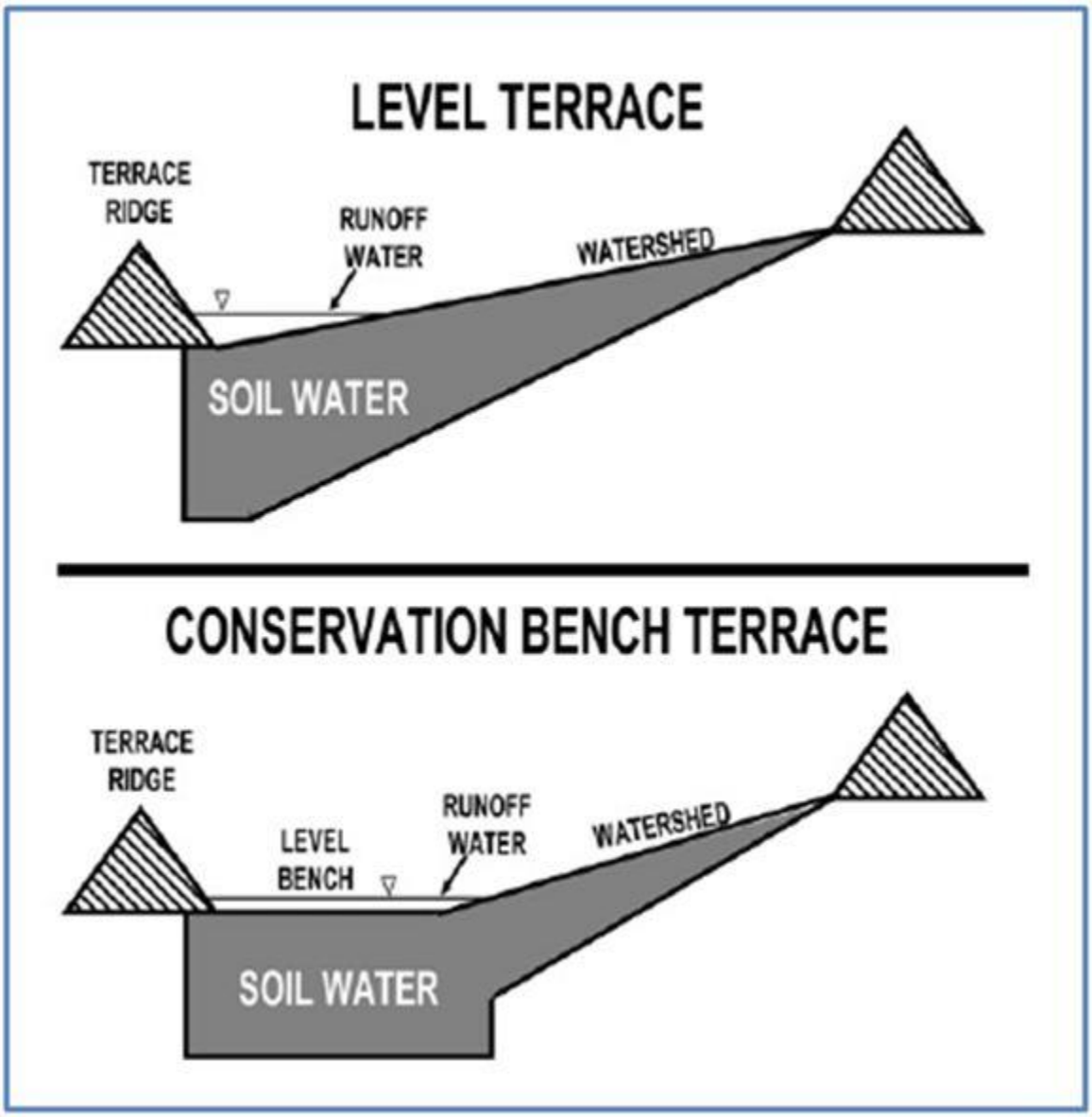
(1) Sediment (2) Nutrients (3) Pesticide

Runoff from crop irrigation can cause sediment, nutrients and pesticides to flow into surface waters, degrading their quality.
Source- University of California, Agriculture and Natural Resources

Sediment

Caused due to erosion of furrows. Few mitigation measures are :

- Using Micro Irrigation wherever possible.
- Reduce the slope of furrows and maintain vegetative cover.
- Provide runoff terraces.



- Provide Sediment traps

- Increase organic matter of soil to increase its strength.

Nutrient

Mainly Nitrogen and Phosphorus from fertilizers. Few mitigation measures (as per Environmental Protection Agency, USA) :

- **Nutrient management :** Applying fertilizers in the proper amount, at the right time of year and with the right method can significantly reduce the potential for pollution.

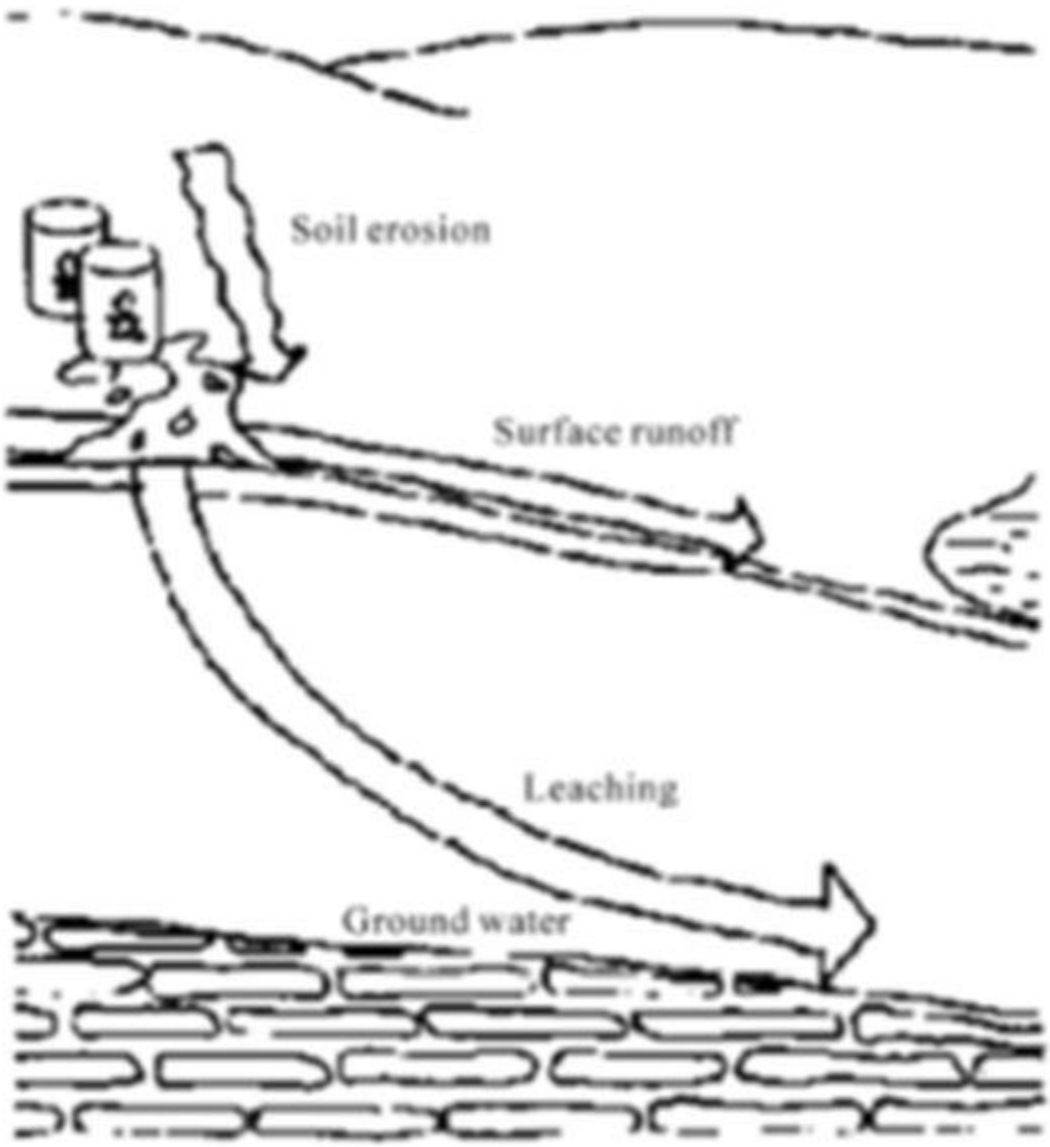
- **Cover crops :** Planting certain grasses, grains or clovers can help keep nutrients out of the water by recycling excess nitrogen and reducing soil erosion.

- **Buffers :** Planting trees, shrubs and grass around fields, especially those that border water bodies, can help by absorbing or filtering out nutrients before they reach a water body.

- **Conservation tillage :** Reducing how often fields are tilled reduces erosion and soil compaction, builds soil organic matter, and reduces runoff.

Pesticides

Unused Pesticides flows with the run off.



The pesticides can pollute water either though soil erosion, surface runoff or leaching. (Source: Texas agriculture extension service ,the Texas A&M university system, "pesticide characteristics that effect water quality", Jerry L.Cook, Paul Baumann, John A Jackmang and Doung Stevenson, Texas A&M university, college station, TX 77842 [5].

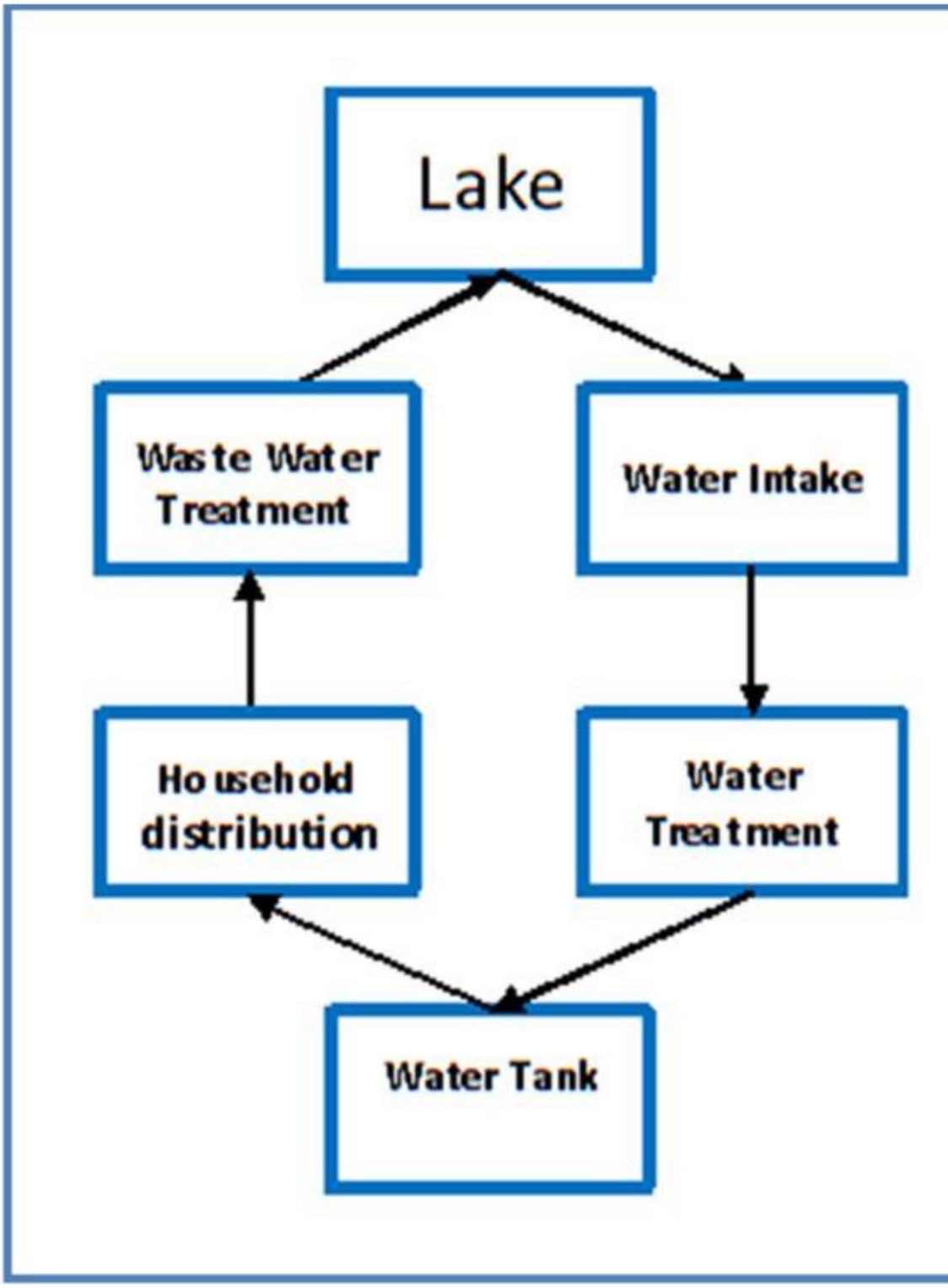
Few mitigating measures(FAO) :

- Reduction of dose and improved scheduling of pesticide application to more effectively meet crop needs and to reduce preventative spraying
- Environmental tax on pesticides.
- Promote the use of mechanical and biological alternatives to pesticides.
- Certification of pesticide users.

(b) Drinking Use

(i) Supply Infrastructure

Lakes/Ponds



Schematic Diagram of water supply and waste water treatment.

A water intake withdraws water from lake and delivers to water treatment plant.

Dharoi (Gujarat) Intake Structure.

Rivers

The infrastructure is similar to that shown in lakes after the water is conveyed/pumped from canals to lakes/ponds.

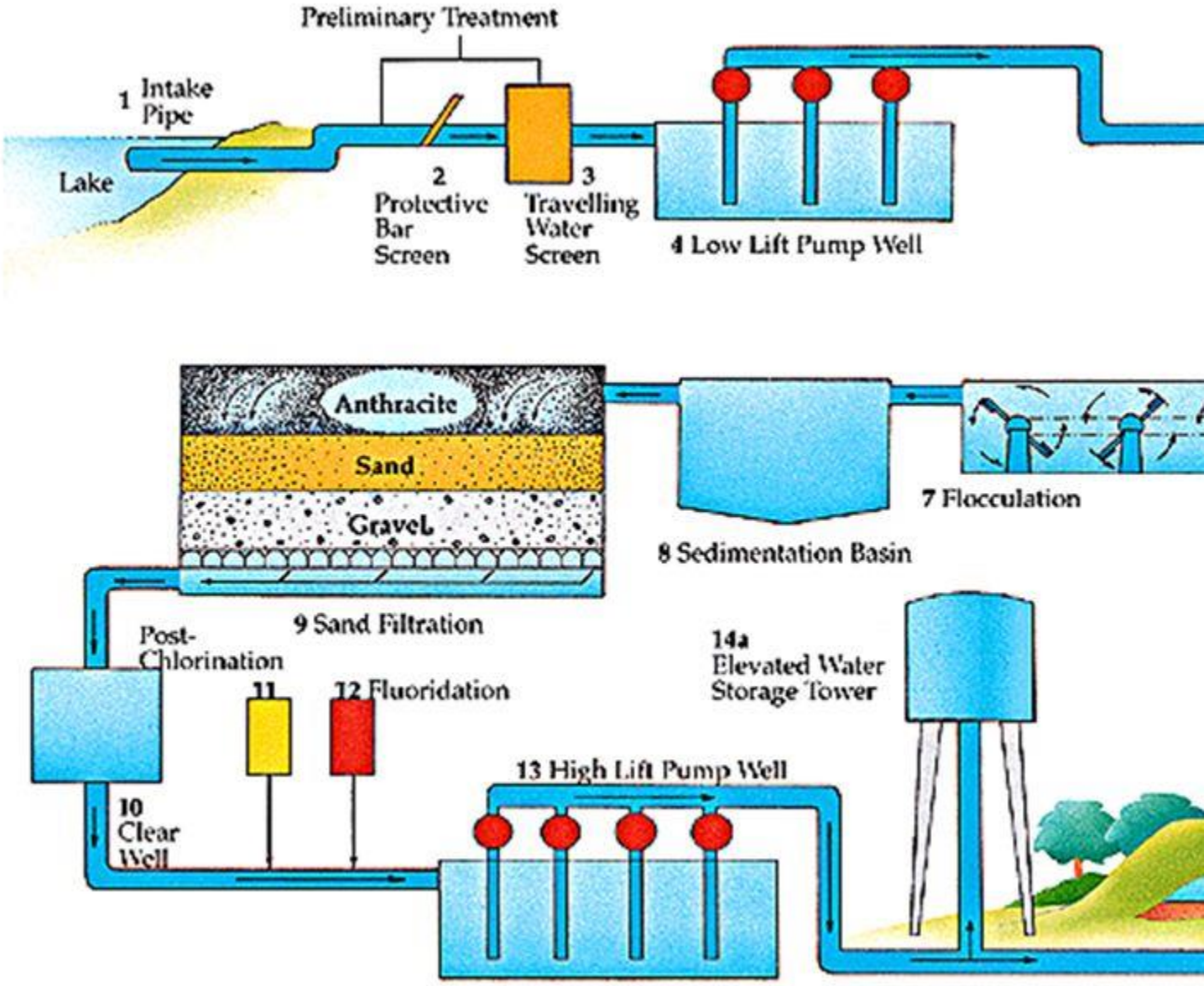
Ground Water

The groundwater extraction is done through open wells and tube wells in rural area and through boring wells in urban area.

(ii) Treatment Infrastructure

Lakes/Ponds

The infrastructure required depends upon the quality of raw water. The quality of treated water must be as per the Government prescribed limits. In India the standards are prescribed in the Environmental Protection Act.



Surface Water Treatment Plant – Flow Diagram

An Overhead Water Tank

Rivers

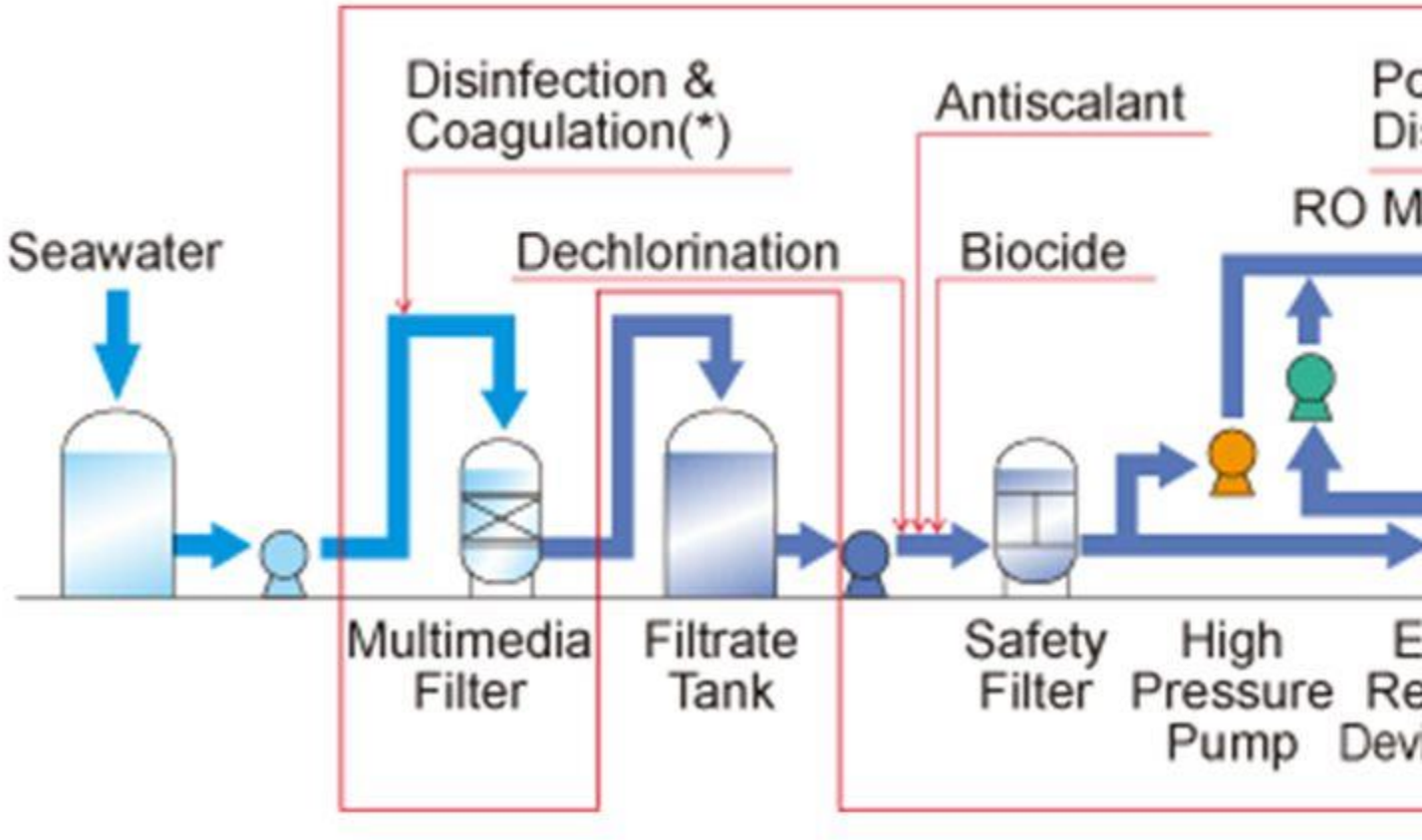
The treatment infrastructure remains the same.

Ground Water

The treatment required for groundwater is generally limited to chemical treatment depending upon raw water quality.

Ocean/Sea

The Ocean water is desalinated to make it worth drinking.



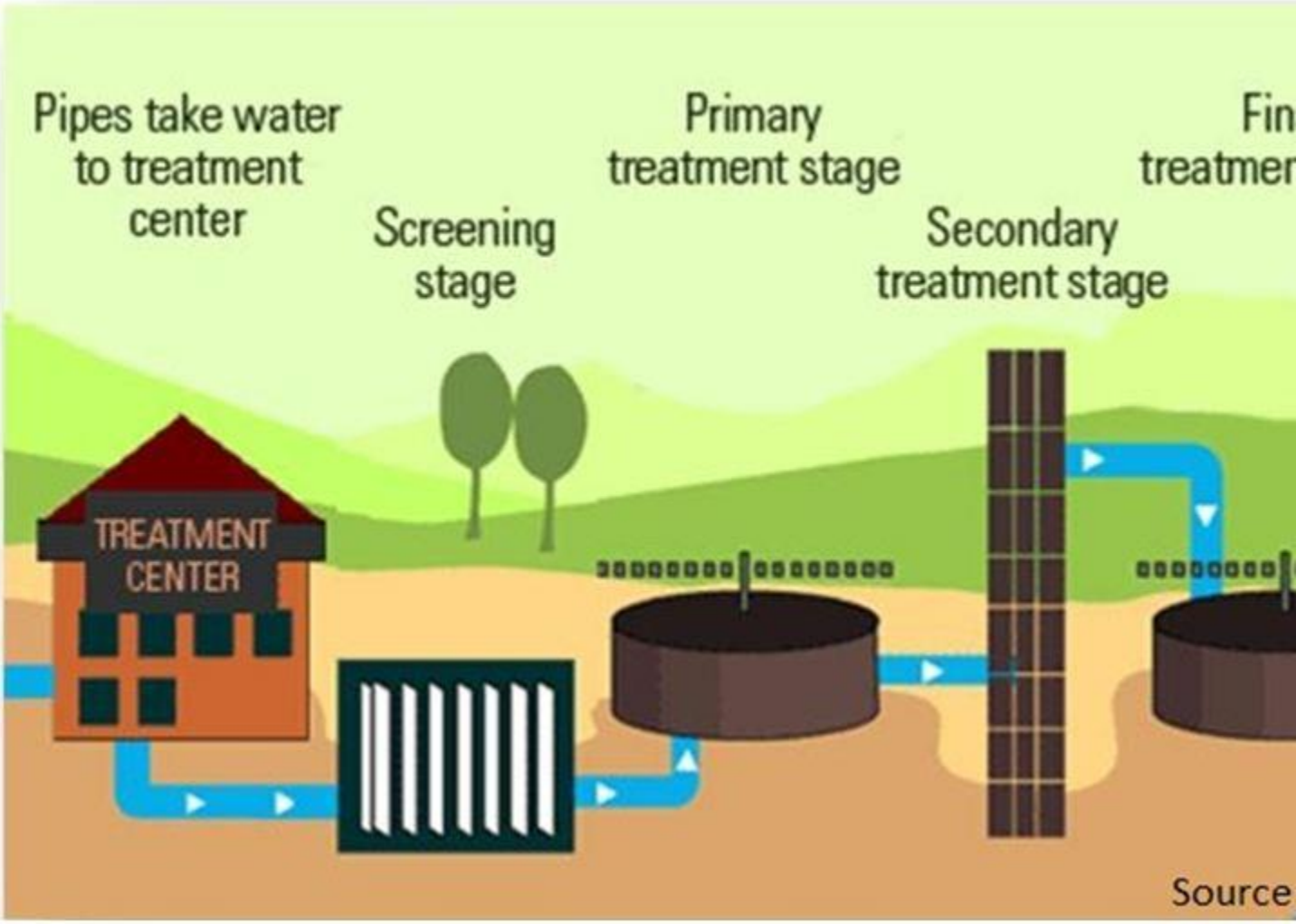
Desalination Plant – Flow Diagram

Minjur Desalination Plant, Chennai

The desalination of ocean water is energy intensive and hence costly. However, the technology is improving to make it cheaper and environment friendly.

(iii) Waste Disposal

A waste water treatment plant treats the water before disposal so that it is not environmentally damaging.



Waste Water Treatment Plant – Flow Diagram

(c) Industrial Use

Four main industrial sectors require water for production :

- Mining and Quarrying
- Manufacturing
- Generation of electricity
- Construction and other industrial activities

(i) Supply Infrastructure

- The source of water supply to industries is mainly the rivers and groundwater.
- Internationally, groundwater is more used than surface water. The infrastructure is also mainly built by industries themselves except where the water is abstracted from Dams.
- The infrastructure required is same as discussed in preceding sections.

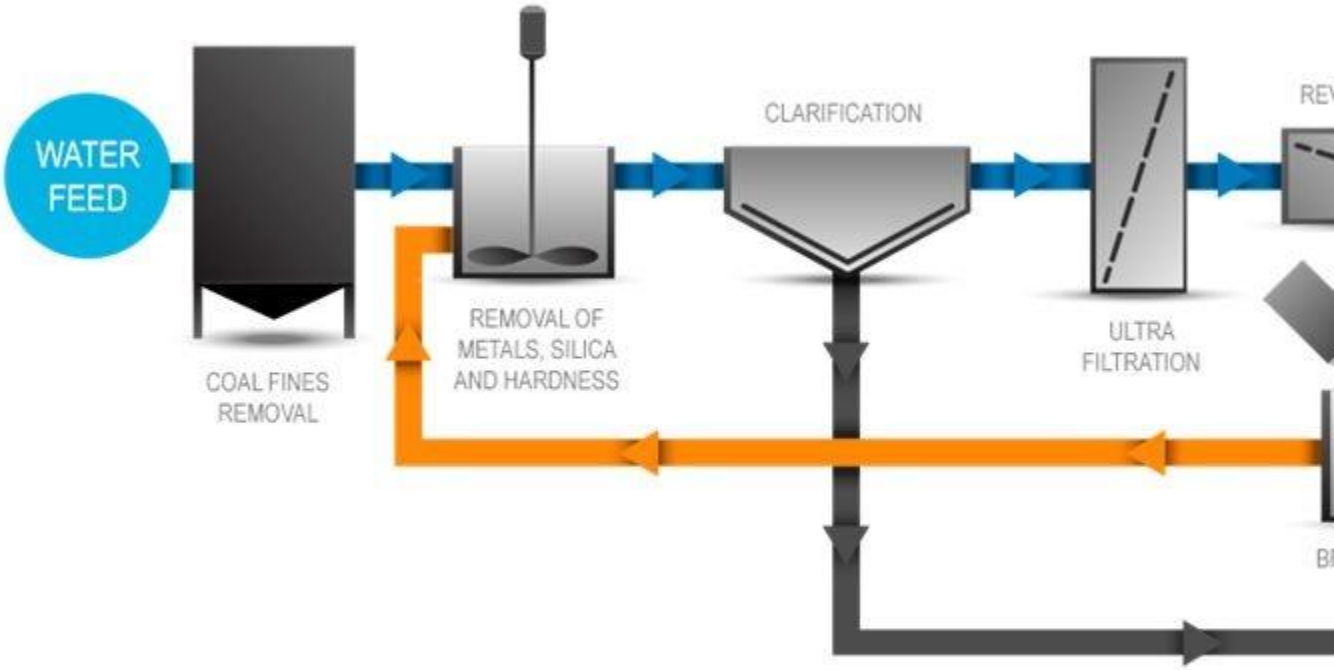
(ii) Treatment Infrastructure

- The raw water treatment is required to reduce operational cost and avoid damage of industrial infrastructure.
- The treatment required cannot be generalized and would vary according to the different sectors of industry.
- The infrastructure required would be same as that of domestic water supply.
- Generally industries themselves build the infrastructure to treat the raw water.

(iii) Waste Disposal

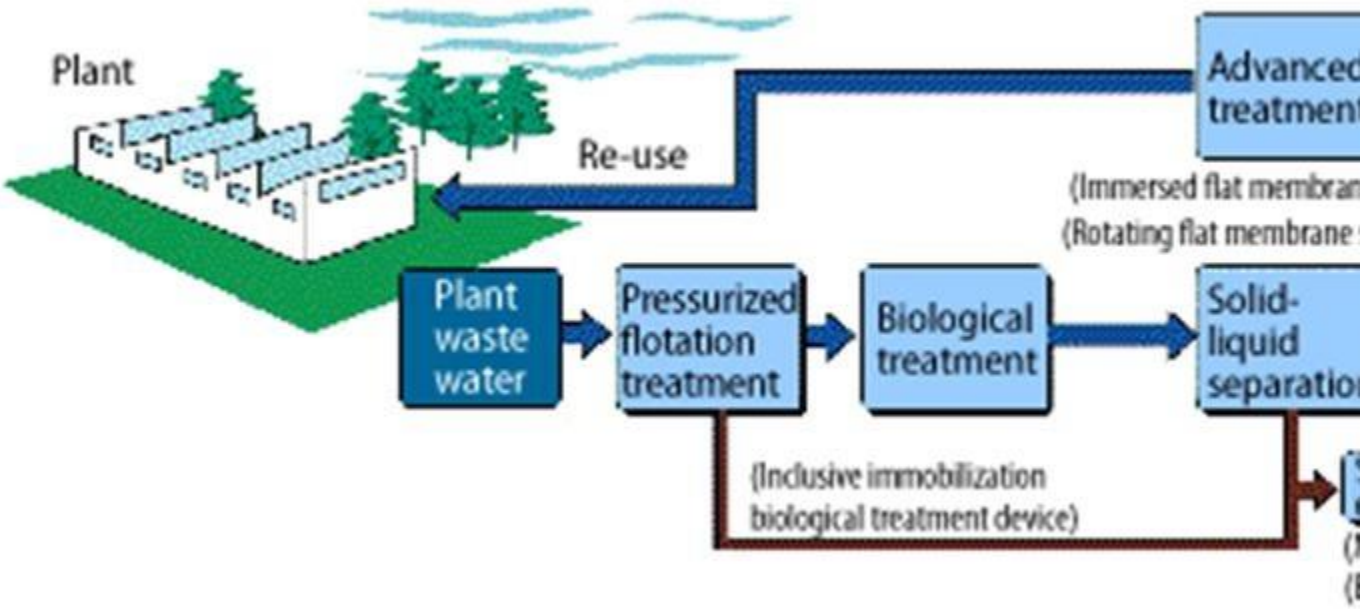
The waste water discharge from industries i.e. effluents have to comply with the Government standards. In India the standards are prescribed in the Environmental Protection Act.

The infrastructure would depend upon the type of industry. Some examples are given :

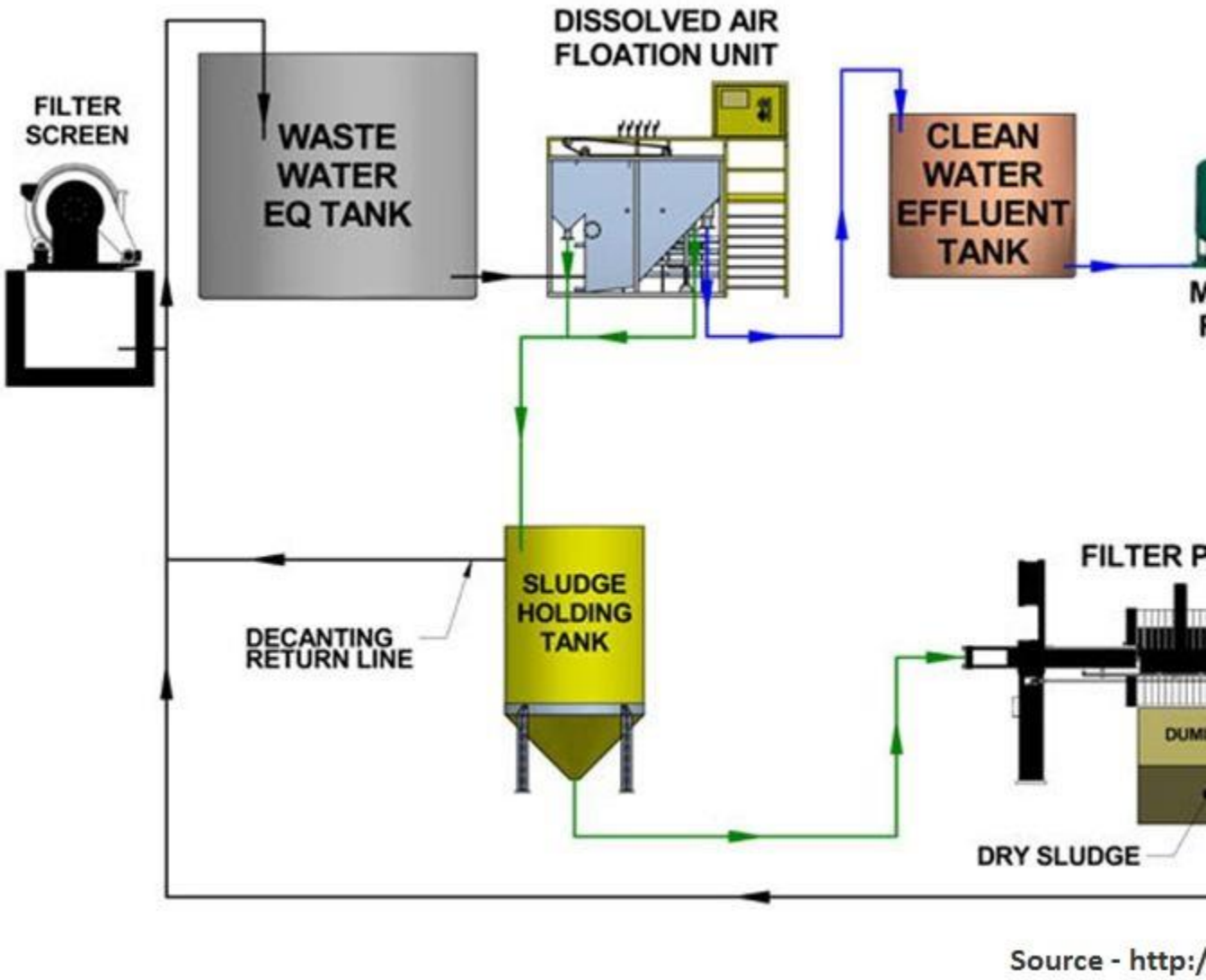


Source - Miwatek, Water

Coal Mine Water Treatment

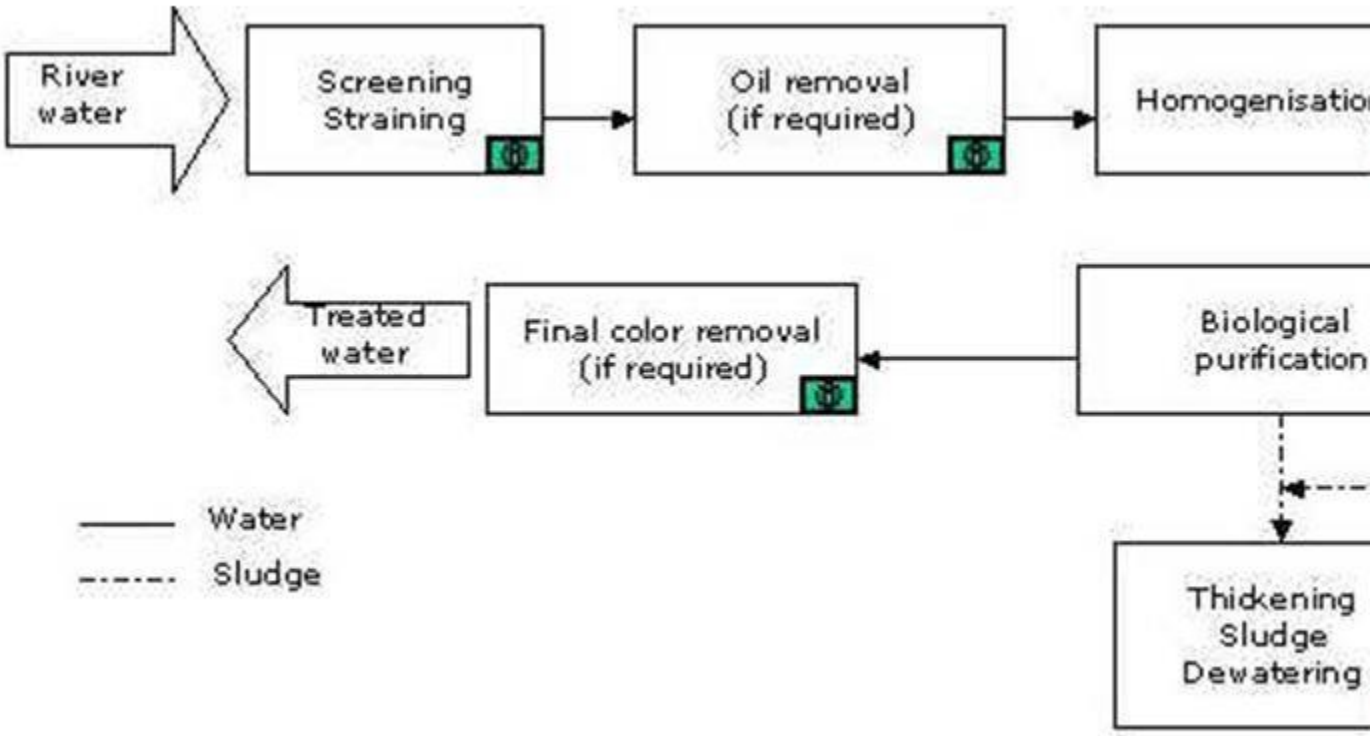


Paper and Pulbp Industry



Meat and Poultry Industry

Automobile industry



Textile Industry