

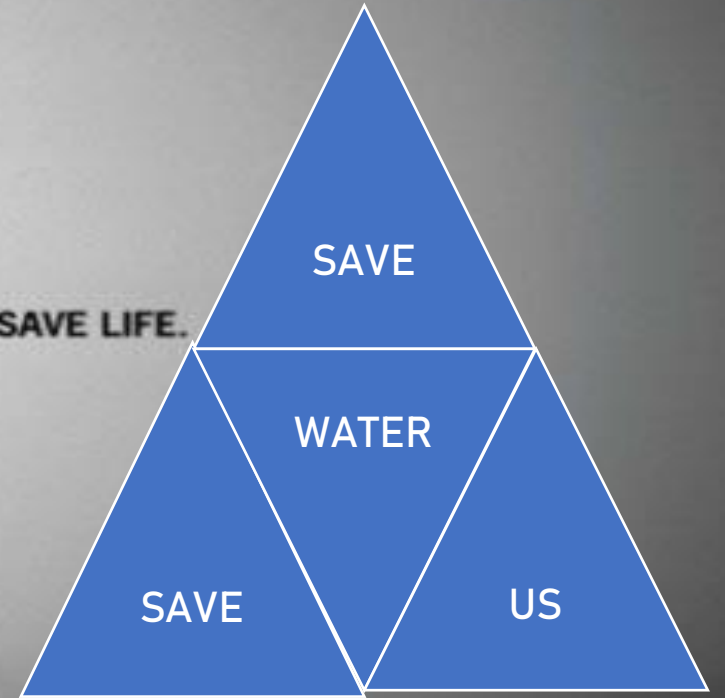
**“Integrated Water Resources Management(IWRM)  
towards  
Sustainable Water Resources”**

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**Welcome to Dignitaries, CVDB-Members, Belgavi Local Centre Committee Members & Corporate Members of IEL,**

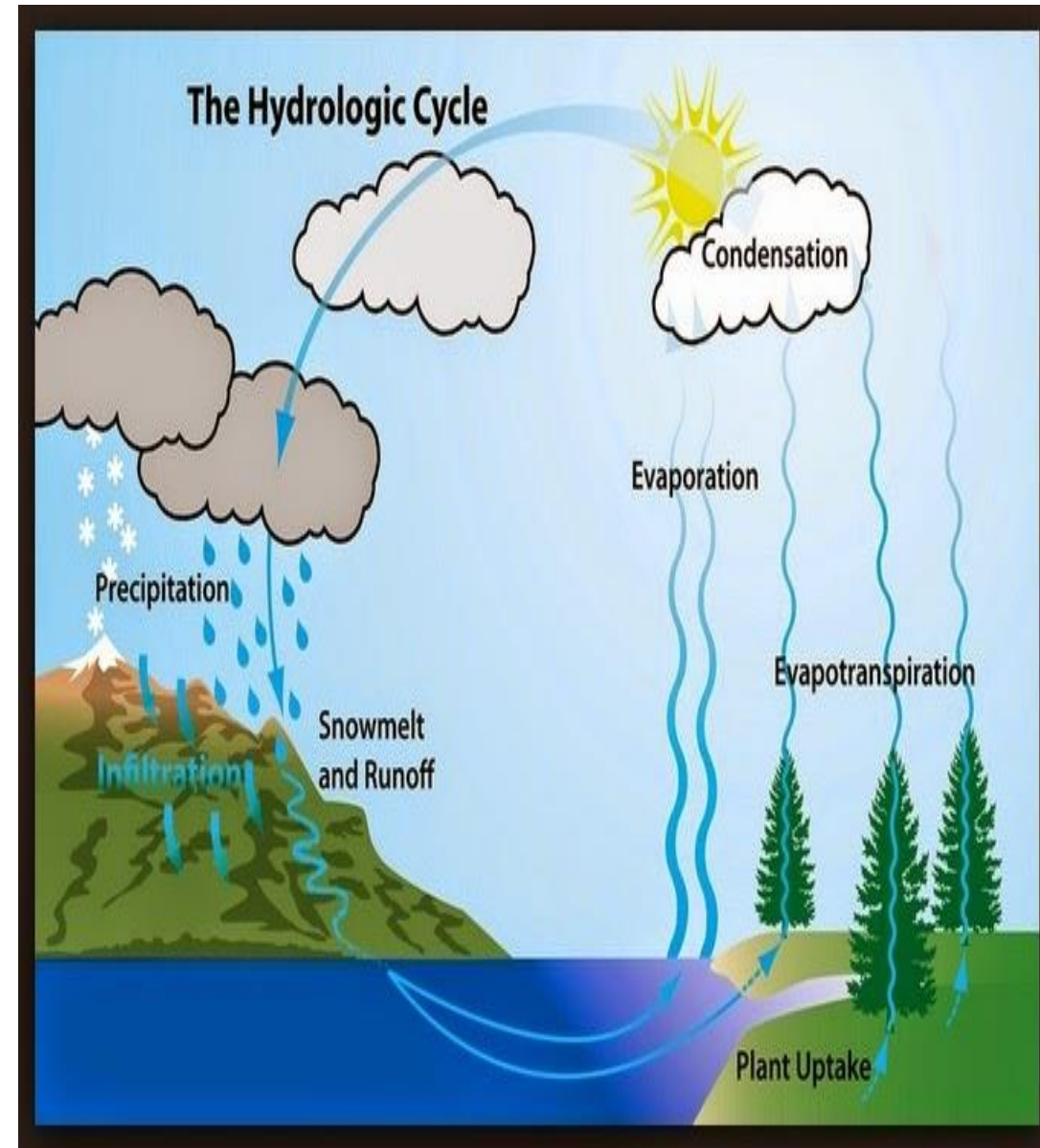


**SAVE WATER. SAVE LIFE.**

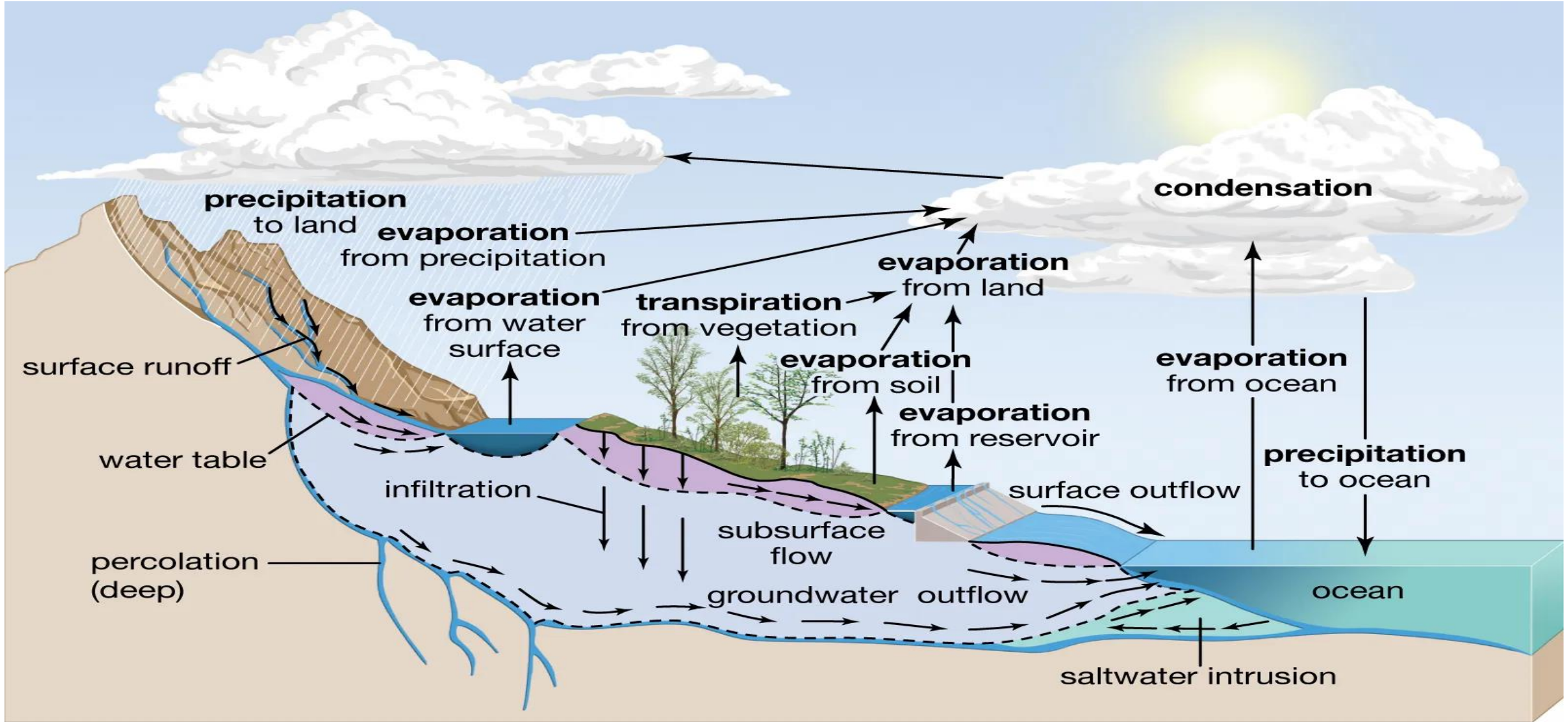


## Water Resources- A Renewable Natural Resource, One of Prime Pancha bhutha)

- Water is called 'Jivanam' in Sanskrit means, the way of life.
- Water is a priceless by nature as renewable Resource for sustenance of all kinds of life in the universe.
- Water plays an important role for Drinking water, Agriculture, Production of essential commodities, Hydro Power generation, Industrial production, Recreation, Transport, and Environment.
- Earth Planet contains 1386 million cubic kilometers of water in liquid and frozen forms of ground water; oceans; lakes; and streams.
- Salt water accounts for 97.5% of total water and rest 2.5% is fresh water.
- Even in this total fresh water, about 68.7% is locked up in Glaciers and 29.9% exists as fresh ground water.
- Ultimately only 0.26% of total amount of fresh water is accessible on planet earth as surface water in the reservoirs, lakes, water bodies and river systems.



# Hydrological Cycle



soil moisture

groundwater

ocean covers 71 percent of Earth's surface  
196,950,000 sq mi (510,000,000 sq km)

## India's Water Resources

- As per existing water resources per capita availability varies from 300 -13754 (Cum).
- National annual average per capita availability in 2001 is 1829 Cum.
- By 2021 this national average is expected to reach 1557 Cum (WATER STRESS)
- By 2050 it may further reduce to 1168 Cum (WATER SCARCE).
- Hence there is need for more Storage Dams to avoid WATER SCARCE SITUATION.

- ❑ Land Resources ----- : 02.45%
- ❑ Renewable Water Resources: 04.00%
- ❑ Population ----- : 17.00%.,

Land Resources



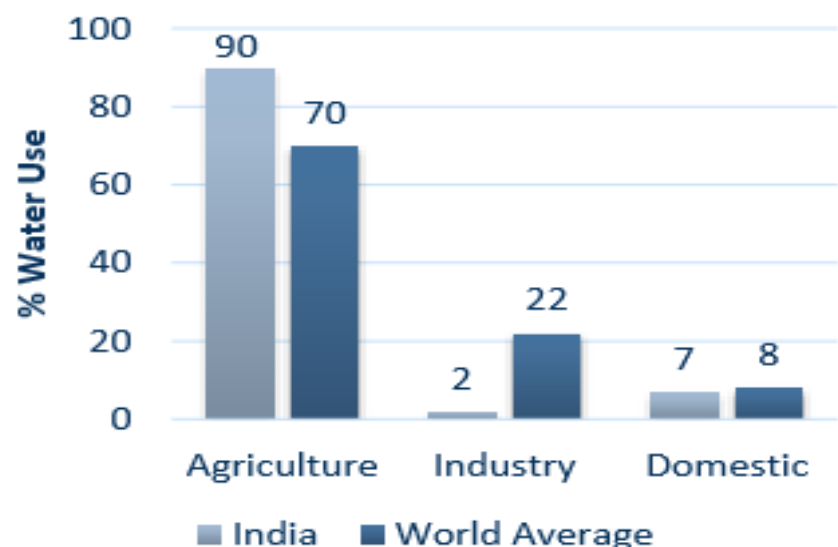
Renewable  
Water



Population



# Water Use by Sectors



- India uses maximum amount of water for agriculture in the world
  - 35% higher than the world average
- Where as in the industrial sector, India's consumption is marginal as compared to the global average

**How efficiently do we use our water?**

Sectors	Billion M <sup>3</sup> /year
Agricultural water withdrawal	688
Industrial water withdrawal	17
Municipal water withdrawal	56
Total water withdrawal	761

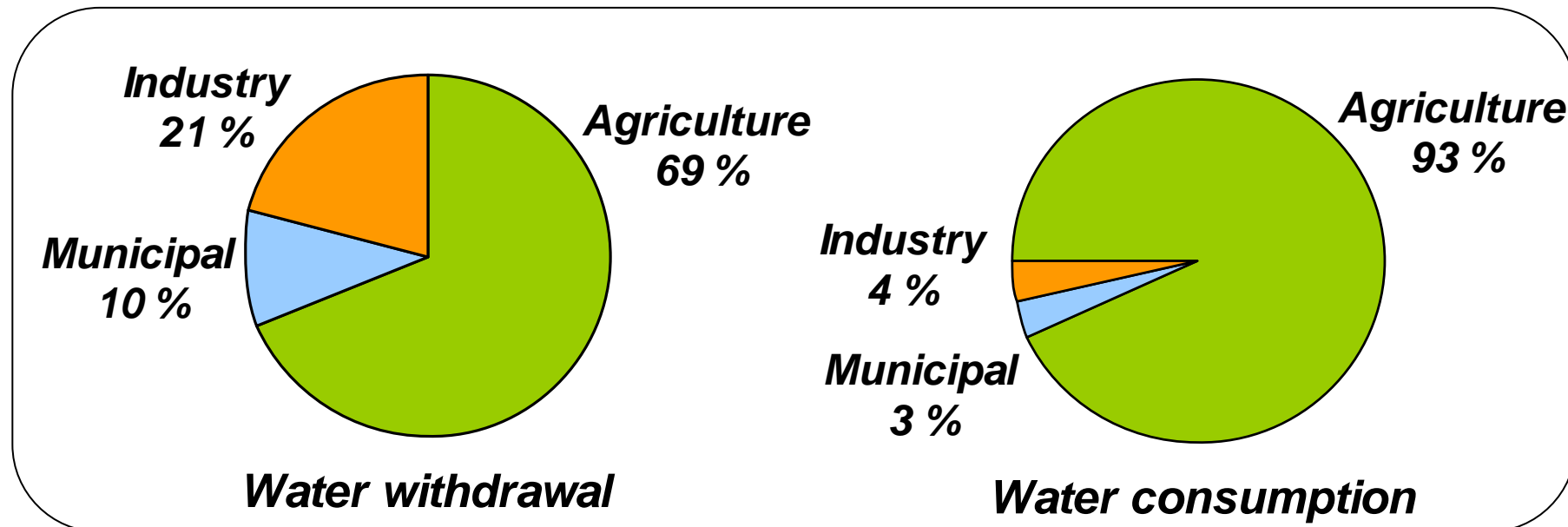
Parameters	China	India	Brazil	Russia	USA	Germany
Total water withdrawal per capita (M <sup>3</sup> /inhab/yr)	409.9	621.4	330.8	454.9	1583	391.4
Municipal water withdrawal per capita (total population) (M <sup>3</sup> /inhab/yr)	50.0	45.7	67.0	92.1	216.5	62.2
Water used per Agricultural Produce in 100 M <sup>3</sup> /US\$	4.86	22.68	2.19	1.70	10.62	0.03
Water used per Industrial Produce in 100 M <sup>3</sup> /US\$	0.38	0.39	0.15	0.58	6.61	0.27

Source : Central Water Commission of India, Food & Agriculture Organization of UN and Frost & Sullivan Analysis

Note: Industrial Water includes water for power generation

## Water Use Sectors

- About 50% of *accessible* water resources are currently mobilized for human use.
- Agriculture represents 69% of all water use (85 to 95% in developing countries) but are the largest consumer.
- Irrigation represents less than 20% of cultivated land but contributes 40% to overall food production.



# Challenges of Water Sector for the Future

## Increased Water Demand for food production

- Water demand for food is expected to increase by 2% every year.

**Challenge** : Meet the increased demand from existing resource.



## Increased Water Demand for industrial growth

- More water for Power Generation
- Higher effluent generation from industries including power generation

**Challenges** :

1. Effluent Recycle and sludge disposal
2. Increase Water Productivity
3. Adoption of Modern Technologies

## Increased Water Demand from Urbanization

- Higher Sewage Generation

**Challenges** :

1. New sources for Water Supply
2. Prevention of wastages
3. Water Pricing & Metering
4. Sewage Treatment





## **List Of Challenges of India in Water Resources**

### **Water Availability:**

- ✓ Per Capita Availability – 1545 Cum (2011) against stress condition being 1700 Cum

### **Irrigation Development:**

- ✓ 113 Mha potential created against ultimate potential of 140 Mha
- ✓ 88 Mha potential utilised against 113 Mha created potential

### **Storage Creation:**

- ✓ Creation of 253 BCM Storage against desired potential of 450 BCM.

### **Hydropower Development:**

- ✓ Installed capacity of 36000 MW against potential of 148700 MW

### **Efficiency in Irrigation:**

- ✓ Surface Water – presently at about 40% against possibility of 60%
- ✓ Ground Water – presently at about 70% against possibility of 75%

### **Flood Management:**

- ✓ Ensuring protection to 18.8 Mha against<sup>9</sup>Flood Prone Area of 40.0 Mha

# 1. Water Resources Management & Integrated Water Resources Management(IWRM)

2. *Water resource management is the activity of planning, developing, distributing and managing the optimum use of water resources.*
3. The concept of Integrated Water Resources Management (IWRM) emerged around the 1980s in response to increasing pressures on water resources from competition amongst various users for a limited resource, the recognition of ecosystem requirements, pollution and the risk of declining water availability due to climate change.
4. IWRM addresses the “three E’s”: Economic efficiency, Environmental sustainability and social Equity, including poverty reduction.
5. The three basic “Pillars” of IWRM are the *enabling environment* of appropriate policies and laws, the *institutional roles* and framework, and the *management instruments* for these institutions to apply on a daily basis.
6. IWRM addresses both the management of water as a resource, and the framework for provision of water services to all categories of users, and it addresses both water quantity and quality.
7. The basin /Sub-basin must be recognized as the basic unit for planning and management, and a firm societal commitment and proper public participation must be pursued. India has not yet reached the level of Water Resources Development as has already been achieved by many developed countries; therefore, there is a need for India to undertake developmental measures along with management measures.
8. A central goal of IWRM at the river basin level is to achieve water security for all purposes, as well as manage risks while responding to, and mitigating disasters.

## IWRM:

- The path towards water security requires trade-offs to maintain a proper balance between meeting various sectors' needs, and establishing adaptable governance mechanisms to cope with evolving environmental, economical and social circumstances.
- Well-developed, well-tested, scientifically robust, socially acceptable and economically viable approaches to implement IWRM at the river basin level are still not widely available.
- IWRM strives for effective and reliable delivery of water services by coordinating and balancing the various water-using sectors – this is an important part of sustainable water management.

### □ What is Water Resource Management?

*“ IWRM is a process which promotes the coordinated development and management of land, water and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems .”*

**--- Global Water Partnership (GWP-2000).**

# **Guiding Principles of IWRM**

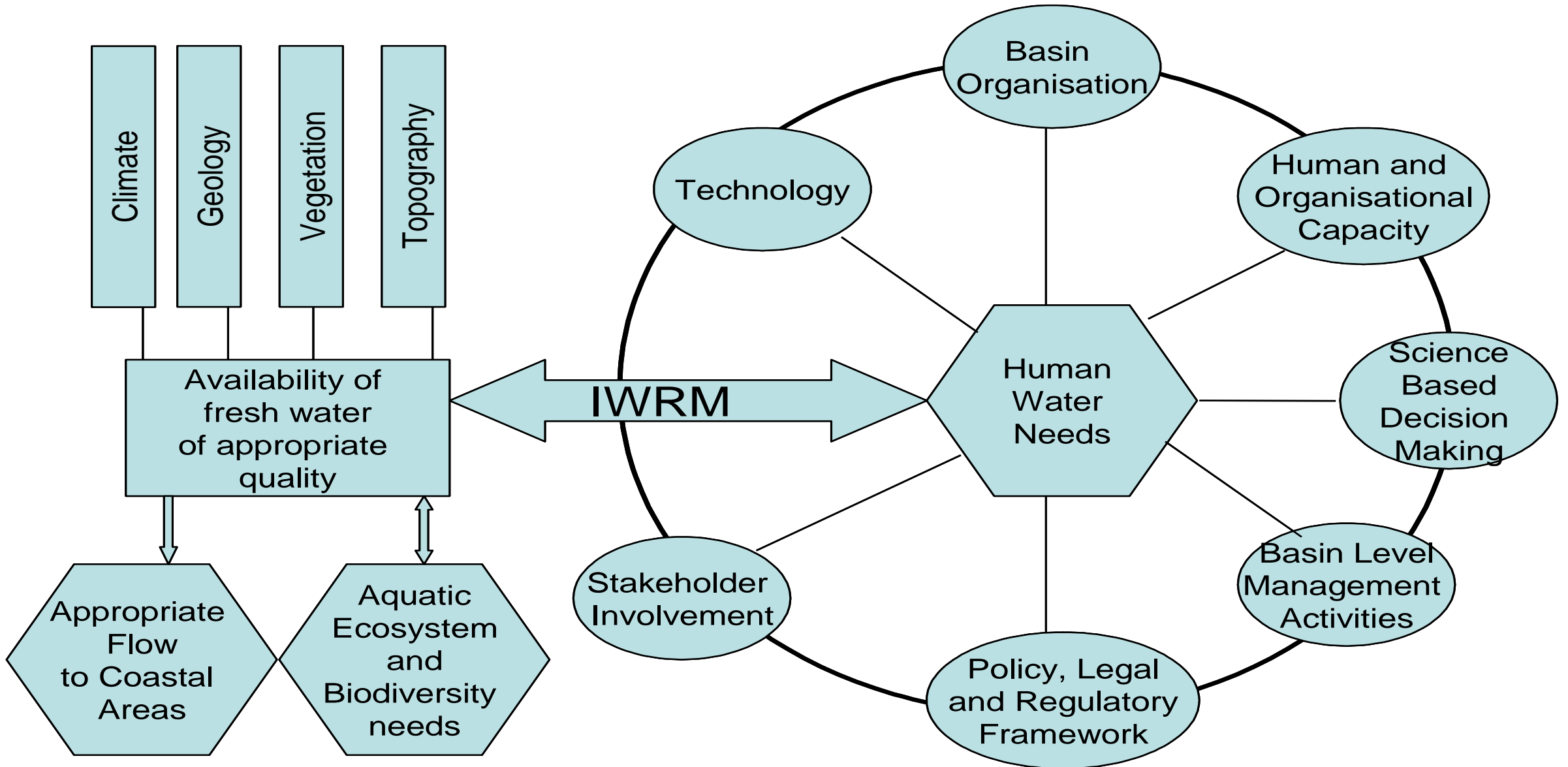
## **□ The guiding principles of IWRM are-**

1. Fresh Water is finite and Vulnerable resource, essential to sustain life, development and environment.
2. Water development and management should be based on a Participatory Approach involving users, planners and policy makers at all levels.
3. Women play a central part of provision ,management and safeguarding of water.
4. Water has an economic value in all its competing uses and should be recognized as an economic good.

## **□ United Nation's Sustainable Development Goals (SDGs) & Goal-6 related to Water Sanitation and Hygiene(WASH):**

- The **United Nations- 17, Sustainable Development Goals (SDGs)** came into effect in January 2016, and they will continue to guide UNDP policy to achieve by the year 2030 Globally across 170 partnership Countries and territories. The 17- SDGs cover social and economic development issues including poverty, hunger, health, education, climate change, gender equality, WATER, sanitation, energy, urbanization, environment and social justice.
- The **SDG-6** has eight targets and 11 indicators that will be used to monitor the progress towards the targets that otherwise related to water resources management.
- **The Goal 6: "Ensure availability and sustainable management of water and sanitation for all."** The target 6.5., also relates to Integrated Water Resources Management(IWRM) to achieve by the year 2030 across transboundary with support and funding among countries especially through hand holding support of those developed countries with coordinated efforts of UNDP as specified by UN.

# Various Components of IWRM & Interaction:



## **National Water Policy on IWRM**

- The National Water Policy-2012, has enumerated the integrated perspective of water resources planning, development and management.
- One of the basic principles of the policy is that planning, development and management of water resources need to be governed by common integrated perspective considering local, regional, State and national context, having an environmentally sound basis, keeping in view the human, social and economic needs.
- Need for comprehensive legislation for optimum development of inter- State rivers and river valleys to facilitate inter-State coordination ensuring scientific planning of land and water resources taking basin/sub-basin as unit with unified perspectives of water in all its forms (including precipitation, soil moisture, ground and surface water) and ensuring holistic and balanced development of both the catchment and the command areas.
- The legislation needs, inter alia, to deal with and enable establishment of basin authorities, comprising party States, with appropriate powers to plan, manage and regulate utilization of water resource in the basins.
- Having highlighted IWRM, the policy states that Integrated Water Resources Management (IWRM) taking river basin / sub-basin as a unit should be the main principle for planning, development and management of water resources.
- The departments / organizations at Centre / State Governments levels should be restructured and made multi-disciplinary accordingly.

## IWRM-An Evolutionary Process at River Basin Level

### □ Important Conditions:

- Basin Management Plan and Vision
  - Participation and Coordination Mechanisms, Fostering Information Sharing and Exchange
  - Capacity Development
  - Well defined Flexible and Enforceable Legal Framework and Regulation
  - Water Allocation Plans
  - Adequate Investment, Financial Stability and Sustainable Cost-recovery
  - Good Knowledge of Natural Resources Present in a Basin
  - Comprehensive Monitoring and Evaluation
  - Political Will and Commitment.
- 
- A fully integrated approach to manage water in a basin is an ongoing process.
  - Various water-related sectors or users should be considered in a well coordinated manner, highlighting the interactions among them, their activities and associated infrastructure.
  - The conditions laid down for IWRM aims to create sustainable water security within the present constraints and through improving conditions incrementally in each basin.
  - Water managers should seek and recognize which conditions are essential to effective management, which cannot be readily instituted, and which can be developed wholly or partially over time to progressively move up the spiral.

## **Role of River Basin Organizations (RBO):**

- RBOs are basin/sub basin level multi-disciplinary organizations comprising of various co-basin State governments and central government so as to promote integrated water resources development and management in the basin/sub-basin.
- River Basin Organisations (RBOs) support the integrated and physical and technical management of water resources, and, if developed adequately, can respond to the growing competition for water among various State governments and among agricultural, industrial, domestic, and in-stream uses within the basins.
- RBOs can help recognize the environmental impacts of water uses and water development at the basin scale and can effectively take appropriate adaptation measure to climate change.
- RBOs offer a mechanism to achieve such integrated management by providing the framework for water allocation following efficiency and equity principles and also for resolution of disputes between various stake holders .
- The integrated approach is widely endorsed and promoted by international organizations as well as by NGOs and scientists though there are few examples of truly integrated RBOs.



## Water Availability-Requirements& Priority Rights

- There is a need to develop uniform guidelines for assessing water resources potential and assessing water requirements for various uses.
- Impact of climate change on water resources availability has to be determined along with finding best possible solution in each River Basin.
- Activities should also be focused on improvement of ground water estimation methodology and estimation of ground water withdrawals, based on a total hydrologic system balance.
- Safe Water for drinking and sanitation should be considered as pre-emptive need, followed by high priority allocation for other basic domestic needs (including needs of animals), achieving food security, supporting sustainable agriculture and minimum eco-system needs.

## **Policy, Legal & Institutional Framework**

- There is a need to evolve a National Framework Law as an umbrella statement of general principles governing the exercise of legislative and/or executive powers by the Centre, the States and the local governing bodies.
- There is a need for comprehensive legislation for optimum development of inter-State rivers and river valleys to facilitate inter-State coordination ensuring scientific planning of land and water taking basin/sub-basin as unit.
- State Governments need to expedite the Enactment and Implementation of the Bills for Ground Water Legislation and legislation for Participatory Irrigation Management.
- The extraction of groundwater in any manner in any area shall be regulated through community based institutions with due regard to the hydro-geological and ecological characteristics and features of the aquifer as a whole.
- The State Irrigation Acts should be farmer friendly.

## Project Planning, Implementation and Prioritization:

- Optimal utilisation of waters within a river basin shall be ensured, with due regard to the reasonable present and future needs for life and livelihoods, appropriate economic activity, social justice and equity, and ecological sustainability.
- Considering the heavy economic loss due to delay in implementation of projects, all clearances, including environmental and investment clearances, be made time bound.
- A project should be considered as having commenced, only after the issue of formal administrative and technical approval by the Government and after clearance by the Technical Advisory Committee.
- The approval and implementation of medium projects may be left to the States. It may be laid down that in all such cases, the State proposing the project shall notify it in the Gazette with full details of the parameters laid down by the CWC.
- If there are objections, within the prescribed period, they should be sorted out mutually or through the Basin Organisations.

## Sectoral Issues of IWRM:

### □ Domestic Use:

- Urban and rural domestic water supply should preferably be from surface water in conjunction with groundwater and rainwater. Where alternate supplies are available, a source with better reliability and quality needs to be assigned to domestic water supply.
- Water supply quantity may be seen more as a human development index and made uniform in rural and urban areas.
- The problem of drinking water in tribal areas are more acute, therefore, to provide accelerated coverage of drinking water to all habitats in tribal areas, an appropriate mechanism should be devised.
- Water resources projects and services shall be managed with community participation. For improved service delivery on sustainable basis, the State Governments / urban local bodies may associate private sector in public private partnership.

## Sectoral Issues of IWRM:

### □ Irrigation:

- Integrated and coordinated development of surface water and groundwater resources and their conjunctive use should be envisaged right from the project planning stage and should form an integral part for optimum utilisation of water resources.
- For better water application efficiency, proper design of field application methods as well as new methods, like drip and sprinkler need, to be used.
- Awareness should be raised among Agricultural Water users in a command area on economical use of precious water, land planning, integrated farming, crop diversification, harvesting, storage in scientific method and its marketing etc.
- There is a need to provide training and skill development of farmers in enhancing effective rainfall for crop production through various agronomic and mechanical measures like adoption of Resource Conservation Technologies, such as land Leveling, Terracing and contour farming, Mulching, Fertigation, water harvesting etc.
- Planning and execution of all components of irrigation projects including command area development works shall be carried out in a pari-passu manner.

## Irrigation & Hydro-Power

- Appropriate guidelines may be laid down for reporting the figures of potential created and the utilization achieved so that there is uniformity in the figures reported .
- Heavy subsidies in electricity consumed for agriculture have tended to encourage wasteful use of energy and also wasteful use of water. Therefore, it is necessary to gradually reduce the subsidy on power for agriculture.
- Canal automation is a new technology, which is being introduced in some projects in our country. The performances require to be watched carefully and the modifications, if any, to be incorporated in the future canal automation project identified.

### □ Hydro-Power:

- There is an urgent need to evolve suitable strategies for accelerating the pace of hydropower development
- Unlike other water uses, the planning for power cannot usually be restricted to the demand within a basin alone. The demand for a region or the nation, as a whole, is important rather than demand in a basin. Therefore, the planning should attempt to generate hydroelectric power wherever feasible
- All water resources projects, including hydro power projects, should be planned to the extent feasible as multi-purpose projects with provision of storage to derive maximum benefit from available topology and water resources

# **Sectoral Issues of IWRM:**

## **Flood Control and Management**

- Dams have played a vital role in moderating the inflow flood peaks and also absorbing the floods. Adequate flood-cushion should be provided in water storage projects, wherever feasible, to facilitate better flood management. In highly flood prone areas, flood moderation should be given overriding consideration in reservoir regulation policy even at the cost of sacrificing some irrigation or power benefits.
- In addition to structural measures, non structural measures also need to be simultaneously taken.
- There should be proper coordination between the co-basin states during release of water from upstream states so as to manage flood effectively for the benefit of the inhabitants of the entire basin.
- Possibility and feasibility to divert and store the flood water for later use may be explored

# Flood Disasters

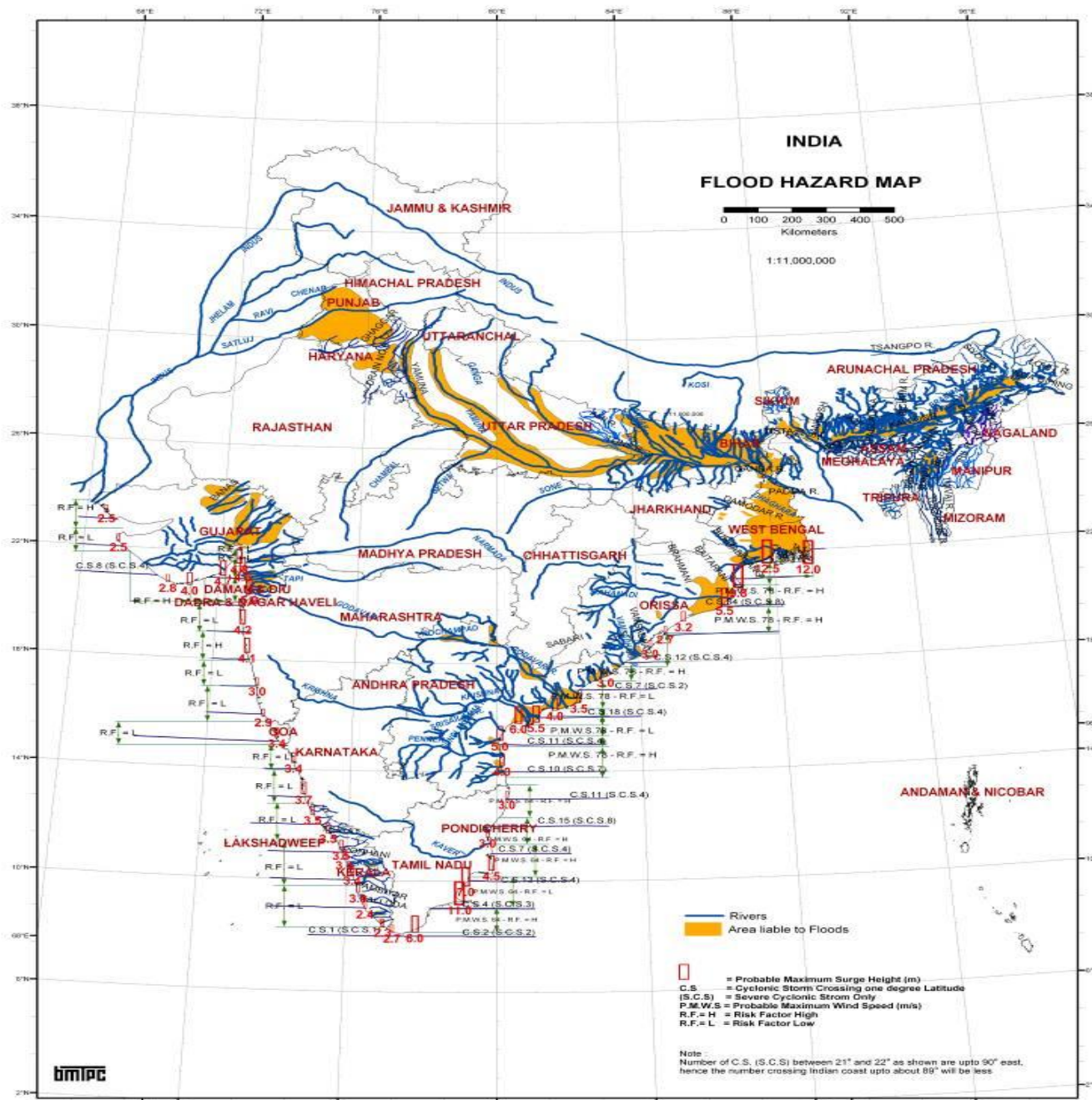
- 40 -million hectares are prone to flood
- 8 -million hectares affected by flood every year
- Brahmaputra and Gangetic Basin are most flood prone areas
- North-west region of west flowing rivers – Krishna, Cavery and Mahanadi – are other flood prone areas





## **Floods-Indian Scenario**

- **India is having a geographical area of 329 million hectares,**
- **About 40 million hectares is flood prone.**
- **Governments have tended to react spasmodically whenever floods occurred in disastrous form.**
- **The initial response to flood damage was to try to `control' floods through structural means such as dams or embankments.**
- **Flood Prone Area in Country: 40.00 Mha.**
- **Area Protected so far: 18.80 Mha.**
- **Length of Embankment Constructed:35200 Km**
- **Length of Drainage Channels Constructed:39700 Km.**



# Sectoral Issues

## □ Industrial Use

- Actual quantity of water utilized by the major industry should be monitored by government agencies
- Recycling and reuse of water, after treatments to specified standards, should be incentivised through a properly planned tariff system
- Private sector participation would be practicable in projects mainly intended for supply for industrial use and urban water supply
- The concerned State Government and other local bodies should have a coordinated approach in selecting and locating industries of a specific nature with respect to their water requirement and facilities for wastewater disposal.

## □ Ground Water Usage:

- The approach for groundwater management needs to be multidisciplinary and strongly participatory
- Aquifers should be identified and mapped at micro level to quantify the available ground water resources and make plans appropriate to the scale of demands and aquifer characteristic.
- Artificial recharge of ground water is one of the most efficient ground water management tools for ensuring sustainability of ground water resources and should therefore be resorted to wherever possible/feasible. It is essential to ensure the quality of recharge to prevent possible contamination/pollution of aquifer.

## **Sectoral Issues of IWRM**

### **Ecology and Other Uses**

- The appropriate Government shall take all measures to protect the ecological integrity necessary to sustain ecosystems dependent on waters
- Riparian rights of the inhabitants along the river sides should be preserved as prevailed from the ancient times.

### **Environmental Aspects:**

- The environmental protection plan, including cumulative environment impact assessment, for an area shall form part of the Master river basin management Plan
- A catchment treatment programme for arresting the degradation of the catchment areas and restoring ecological balance needs to be planned as part of a project
- Integrated Watershed development and Management, compensatory afforestation, bio-diversity conservation, wild life conservation, fishery management etc. need to be given due importance.

## **Demand Management, Water Pricing and Participatory Management**

- An Independent statutory Water Regulatory Authority shall be established by every State for ensuring equitable access to water for all and its fair pricing, for drinking and other uses
- The principle of differential pricing for water for drinking and sanitation; and for ensuring food security and supporting livelihood for the poor may be adopted
- Water charges should be determined on volumetric basis in order to meet equity, efficiency and economic principles.
- Water Users Associations (WUAs) should be given statutory powers to collect and retain a portion of water charges, manage the volumetric quantum of water allotted to them and maintain the distribution system in their jurisdiction. Government should progressively transfer management of irrigation command areas to WUAs .
- Urban and rural water supply as well as supply for other sectors shall be 100% metered and priced on volumetric basis.
- The rates should be so rationalized that the water intensive crops are charged proportionately more as compared to less water consuming crops.

# Rehabilitation and Resettlement & Inter-basin Water transfer

## □ Rehabilitation and Resettlement Issues:

- Much of the criticism against major developmental projects including water projects emanate from poor R&R, and therefore, R&R of PAPs should receive due attention and should be done in accordance with the provision of the relevant policies/Acts in force.
- The R&R plan should receive sufficient funds and should be implemented by an independent authority. Implementation of R&R should also be monitored and evaluated by an independent agency.
- Tribals must be given special attention. They should as far as possible be settled in habitats, closer to the ones left behind by them and without breaking their group identity.

## □ Inter Basin Water Transfer:

- The approach to inter-basin transfer is that optimal utilization of land and water should first be aimed at, in basins with possible surpluses.
- Water balance study of the source basin should be undertaken including existing and planning water uses, downstream and interstate requirement, environment needs to decide availability of supply water. Likely impact of climate change may also be considered.
- Potential conflicting interests in interstate river basins can be overcome through mutual trust and understanding between the States, appropriate legal and institutional frameworks, joint approaches to planning and management, and sharing of the ecological and socio-economic benefits, and related costs.

# Benefits of IWRM

## □ Ecological benefits:

- Allocation of water resource to ecosystems to sustain terrestrial and aquatic biodiversity.,
- Maintenance of the flow of the natural water cycle and other natural nutrient cycles.,
- Role of ecosystem in erosion regulation.,
- Role of ecosystems in recharge of underground and surface water resources.,
- Role of ecosystems in water purification and pollution regulation (ecosystem cleansing, of polluted water, carbon sequestration, etc.)
- Role of ecosystems in flood regulation.,
- Role of ecosystems in climate regulation.,
- Role of ecosystems in air quality regulation.,

## □ Economic benefits:

- Efficient and equitable supply of water for industry and agriculture.,
- Water recycling, reuse and waste reduction.,
- Sustainable sanitation (minimization of pollution and waste reduction).,
- Efficient irrigation systems.,
- Fishing and other natural resources for economic activities.

## □ Social Benefits:

- Provision of quality water for human consumption, health and sanitation needs.,
- Transportation of waste by water.

## □ Cultural Benefits: Natural and cultural heritage: water resources and ecosystems for recreation, tourism and sports.

## □ Spiritual Benefits: Conservation of sacred sites and rare species.

## □ Political Benefits:

- Democratic processes to ensure equitable participation and distribution of water rights and responsibilities.,
- Inclusion of women in water resources planning and decision-making.,
- Stakeholder cooperation and collaboration in water resource development, use and management

## Research and Development (R&D) & IWRM

- Surface water availability studies need to be reformed through the modelling of the hydrological cycle using modern technology like Remote Sensing and GIS
- Research and Development should be closely linked with the needs of the water resources managers and users
- More research effort needs to be directed towards environmental, legal, socio-economic aspects of irrigation and water resources development and management in general
- There are several fields where further research is needed for technological innovations such as in environmental flows, sedimentation studies, river morphology, forest hydrology, designs and model studies for specific structures, construction technologies, new materials etc.
- It is extremely important that all research results are properly documented and published
- Benchmarking and performance evaluation of the projects should be given due importance for increasing the performance of existing and future projects
- Most of the big States have got institutions for research such as Irrigation Research institutes and WALMIs. These need to be made autonomous organisations in order to ensure the continuity of the persons and to give them flexibility in their functions.



# Information –Management & Integration Aspects of IWRM

## □ Information & Management Aspects:

- It is necessary to build systematically a data and information system, scientific in approach and comprehensive in coverage, simultaneously with a system of data exchange and information dissemination
- Data should be shared between departments and levels of government freely other than for the costs of data transfer and made accessible to the public consistent with national security require

## □ Integration aspects of IWRM:

- An inter-sectoral approach requires commitment by the different sectors, cooperation to work together, multi-sectoral coordination and an understanding of the water resource needs of all stakeholders in order to be most effective. This encompasses:
  - Integration of environmental (ecological) and socio-economic sustainability objectives.,
  - Integration of water uses, functions and values.,
  - Integration of all significant management aspects.,
  - Integration of all stakeholders in decision-making processes.

# SDG PYRAMID



# GOAL 6

6 CLEAN WATER  
AND SANITATION



ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT  
OF WATER AND SANITATION FOR ALL

**SUSTAINABLE DEVELOPMENT GOALS**

More at [sustainabledevelopment.un.org/sdgsproposal](https://sustainabledevelopment.un.org/sdgsproposal)

## Water Sanitation and Hygiene (WASH)-Sustainable Development Goal-6

- **Sustainable Development Goal 6** is one of 17 Sustainable Development Goals established by the United Nations General Assembly in 2015.
- It calls for clean water and sanitation for all people.
- The official wording is: "Ensure availability and sustainable management of water and sanitation for all."
- By 2030, achieve universal and equitable access to safe and affordable drinking water for all
- By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.
- By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.
- Between the years 2000 to 2015, the percentage of global population using safely managed drinking water serviced has increased from 61 to 71 per cent.
- But this remained unchanged in 2017 and 785 million people around the world still lacked basic drinking water service.

## **SDG-6 Targets**

- **SDG 6** has eight targets. Six of them are to be achieved by the year 2030, one by the year 2020, and one has no target year.
- **Target 6.1: Safe and affordable drinking water:** "By 2030, achieve universal and equitable access to safe and affordable drinking water for all. Indicator 6.1.1 is the "Proportion of population using safely managed drinking water services.
- **Target 6.2** : "By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations. Indicator 6.2.1 is the "Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water.
- **Target 6.3:** "By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally".<sup>[2]</sup> This is also a sanitation-related target, as wastewater treatment is part of sanitation.
  - Indicator 6.3.1: Proportion of domestic and industrial wastewater flows safely treated.
  - Indicator 6.3.2: Proportion of bodies of water with good ambient water quality.
- **Target 6.4:** "By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.
  - Indicator 6.4.1: Change in water-use efficiency over time.
  - Indicator 6.4.2: Level of water stress: freshwater withdrawal as a proportion of available freshwater resources.

## **SDG-6 Targets**

- **Target 6.5** : "By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate". The two indicators –
  - Indicator 6.5.1 Degree of integrated water resources management.
  - Indicator 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation.
- **Target 6.6** : "By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.
  - Indicator 6.6.1 is the "Change in the extent of water-related ecosystems over time.
- **Target 6.a** : "By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling, and reuse technologies "Indicator 6.a.1 is the "Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan".
- **Target 6.b** : "Support and strengthen the participation of local communities in improving water and sanitation management."
  - Indicator 6.b.1 is the "Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management".

## Conclusion

- The Sustainable water resources are global phenomenon for positivity of mankind, safe environment-biodiversity, ecology balance and economic growth of the nation as well as the globe.
- The water resources experts across the world are predicting the alarming situation of Water Stress by 2050 in terms of per-capita water availability against the prevailing ever-growing population with constant availability of world fresh water.
- The Integrated Water Resources Management (IWRM) that promotes the coordinated development and management of water, land and related resources for optimal-equitable economic and social welfare without compromising the sustainability of vital eco-system is the only way out for sustainable water resources.
- The IWRM approach combines the aspects of integration, sustainable water use and inter-sectoral stakeholder participation in the use and management of water resources in a basin or sub-basin.
- The United Nations Sustainable Development Goals (SDGs) of 17 nos. are interdependent for overall global development programmed to achieve by 2030 among 170 partnership countries to further strengthen the cause of sustainable water resources being the need of the hour especially through Goal-6 "Ensure availability and sustainable management of water and sanitation for all".
- The target 6.5., of **SDG-6 envisages Integrated Water Resources Management(IWRM)** to achieve by the year 2030 across transboundary with support and funding among countries especially through hand holding support of those developed countries with coordinated efforts of UNDP as specified by UN.
- Water users' participatory management of Water Resources is one of the solutions to overcome and upkeep cause of sustainable water resources as a global phenomenon.
- Integrated Water Resources Management (IWRM) is ultimately a way forward for SUSTAINABLE WATER Resources to keep India away from arising contingency of WATER SCARCE in future.

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**“APPO DEEPO BHAVA”**

*(Be a Light unto Thyself)*

- **“THE BUDDHA”**



*Thank You*

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