“Innovations and Technologies for Water Saving”

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“Even as life on earth cannot sustain without water, virtue too depends ultimately on rain”

Tiruvalluvar says in the Tamil Veda Tirukkural (verse 20),
Major Water Challenges in India

1. Hydrological Variability: Spatial & Temporal
2. Population-17.7%, Land-2.5%, Water-4% of World's resources
3. Deteriorating Water Quality - Surface Water & Ground Water
4. Limited Surface water storage & Falling Ground water table
5. Climate change impacts, Floods & Droughts
6. Inefficient Irrigation practices
   Lower Irrigation Efficiencies
7. Water-intensive agricultural practices
   Logging & Salinity & Reduced Agricultural Productivity
8. Inadequate Infrastructure and Technology
   Urban Management
Spatial & Temporal Variation of Precipitation

Even in monsoon season, the rainy days are limited. On an average there are about 20-30 rainy days for 120 days (June-Sep) resulting in rains for just 100-150 hours of the year.
**Water Availability - India**

- **Total Precipitation**: 3880 BCM
- **Total Water Availability**: 1999 BCM
- **Total utilizable water resource**: 1127.6 BCM
  - **Surface water**: 690 BCM
    - **Current Utilization**: 450 BCM (65%)
  - **Ground water**: 437.6 BCM
    - **Current utilization**: 239 BCM (54.6%)
Technological Innovations for Water Saving

**Smart Irrigation Systems**
Soil moisture sensors are integrated into farming systems.
Enable real-time monitoring and provide actionable insights for efficient irrigation management.

**Examples**
- Rajasthan - IoT-based Smart Irrigation:
- Tamil Nadu - Automated Micro-Irrigation Systems
- Punjab - ICT-based Smart Irrigation
- Maharashtra - Solar-Powered Precision Irrigation
- Andhra Pradesh - Smart Water Grid Project

**Rainwater Harvesting Systems**
Conserve rainwater by collecting, storing, conveying and purifying it.
Temporary structures, to recharge the aquifer.
Leads to crop diversification.

**Examples**
- Rajasthan's Traditional Tankas
- Auroville, Puducherry
- Delhi's Rainwater Harvesting Program
- Jal Shakti Abhiyan-Rainwater Harvesting Structures

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Technological Innovations for Water Saving

GIS and modeling tools
A complete Water bodies inventory is prepared by GIS mapping and remote sensing.

Leak Detection and Water Management Systems
Regular monitoring and maintenance can help identify leaks and fix them minimizing water losses.

Examples
- Automated Meter Reading (AMR) System, Maharashtra
- Real-Time Water Monitoring System, Karnataka
- Automated Water Distribution and Monitoring System, Tamil Nadu
- Intelligent Water Management System, Telangana

Revival of Water Bodies
Amrit Sarovars— to capture and store water from streams, rainfall, or canals during abundance
Loose Boulder Structures —to arrest excess erosion and water loss during the rainy season.
Porcupine Studds— River training and protection of Riverbanks

Examples
- Jalyukt Shivar Abhiya Maharashtra
- Krishna Bhagya Jala Nigam Limited (KBJNL) Projects (Karnataka)
- Neeru-Chettu Program (Andhra Pradesh)
- Jal Swavlamban Abhiyan (Rajasthan)
- Mission Kakatiya (Telengana)
Soak Pits
A soak pit is a covered, porous-walled chamber that allows water to slowly soak into the ground. Soak pits have helped in treating the wastewater and in recharging the ground water.

De-silting of Check Dams
Increased water storage capacity of the check dams. Provided protective irrigation to crops in kharif and in Rabi in areas which are predominantly rain fed earlier.

Recharge shafts & Removal of Encroachments and Illegal Infringements
Surplus water is now recharged to ground water. Tough measures were taken against illegal mining. - Demolition of Encroachments on Lakes, Karnataka - Eviction of Encroachments on Backwaters, Kerala - Removal of Riverbank Encroachments, UP

Role of Mass media
Awareness and Education Dissemination of Information Behaviour Change Policy Advocacy Knowledge Sharing and Expertise:
Watershed Development

- It is a holistic approach of managing natural resources including soil, water, vegetation, and biodiversity.
- Increases the availability and quality of water resources within the watershed, which in turn can have a positive impact on agriculture, livelihoods, and the environment.
- The implementation by:
  - Integrated Watershed Management
  - Soil and Water Conservation Measures
  - Afforestation and Agroforestry
  - Rainwater Harvesting
  - Participatory Approach and Capacity Building
  - Sustainable Agricultural Practices
  - Livelihood Diversification

The typical shape of a 
**WATERSHED** has a striking similarity with that of a **Banyan Leaf** — the most sacred tree in Indian mythology considered as God's abode.

The main vein in the leaf signifies the main river and the smaller veins signify tributaries and the very tiny ones signify small rivulets, all contributing to the main river, likewise a watershed is like a living entity encompassing all forms of life human resources, flora and fauna.
Canal Irrigation Reforms in India

- **Command Area Development and Water Management (CADWM)**

- **Participatory Irrigation Management (PIM)**

- **Information Technology and Monitoring Systems**

- **Modernization of Canal Infrastructure**

- **Efficient Water Pricing**

- **Water Users' Associations - WUAs**

- About 85,000 WUAs in the Country
- Effective for managing distributaries & minors

Projects:
- Upper Ganga Canal Automation Project, UP
- Indira Gandhi Canal Automation, Rajasthan
- Bhakra Canal Automation Project, Punjab & Haryana
- Sardar Sarovar Narmada Project, Gujarat
- Lower Bhavani Project, Tamil Nadu
Underground Pipelines for Irrigation - Advantages

- Increased irrigation water productivity
- Reduced Water Loss
- Improved Crop Health and Yield
- Flexibility in Water Delivery
- Reduced Energy Consumption
- Minimized Land and Soil Disturbance
- Reduced Weed Growth and Erosion
- Longevity and Durability

**EXAMPLES:**
- Gujarat: Saurashtra Narmada Avtaran Irrigation Yojana
- Maharashtra: Krishna Valley Development Corporation
- AP: Handri-Neeva Sujala Sravanthi
- Karnataka: Krishna Bhagya Jala Nigam Limited
Micro Irrigation in India

Micro-irrigation technologies deliver water directly to the root zone of plants in a controlled manner, reducing water wastage and optimizing water use.

- Precision Irrigation
- Solar-powered Systems
- Mulching
- Remote Monitoring & Control
- Water-use efficiency, crop productivity, and sustainability in Indian agriculture
In India, at present, 20 states have enacted new acts or amended the existing irrigation acts to make provision for participatory irrigation management through WUAs.

- Ministry circulated Model PIM Act
- Most of the States formulated their PIM Act
- Moving towards Member-Centric Water Users Associations
- It is a major shift in the approach of irrigation system management.
- PIM leading to Water Users Associations
- The WUAs play a key role in improving the efficiency of an irrigation system and ensuring equitable distribution of water by creating a sense of ownership among farmers and facilitating their participation in the operation and maintenance (O&M) of the canal network.
Use water-efficient fixtures
Fix leaks promptly and regularly check for any water wastage.
Practice mindful water use habits, such as turning off taps when not in use and reducing water-intensive activities.

Implement RWH systems to collect and store rainwater for various purposes.
Treat and reuse grey-water from sources like sinks, showers, and laundry for non-potable purposes like irrigation, toilet flushing, or industrial processes.

Implement advanced water treatment technologies in Industries and Business to recycle and purify wastewater for potable reuse.
Recycle industrial process water by treating and reusing it within the same or different production process.
IoT (Internet of Things)-based Irrigation System

- Sensor Deployment
- Data Collection and Transmission
- Data Analytics and Decision Making
- Automated Control and Actuation

**Benefits:**

- Improved Water Efficiency
- Enhanced Crop Health and Yield
- Cost Savings
- Remote Monitoring and Control
- Data-Driven Decision Making
- Soil moisture sensors are integrated
- Enable real-time monitoring

- Telangana - Mission Bhagiratha
- Karnataka - Smart Water Management in Bengaluru
- Maharashtra - Jal Yukta Shivar Abhiyan
- Tamil Nadu - IoT-based Smart Irrigation in Coimbatore
- Rajasthan - IoT-based Water Management in Udaipur
GIS integrates spatial data, such as soil types, land topography, crop patterns, water sources, and weather information, with advanced analytical tools.

- Irrigation Planning and Design
- Water Resource Mapping
- Water Distribution Network Management
- Crop Water Requirement Analysis
- Water Use Efficiency Assessment
- Decision Support Systems
- Water Conservation and Waterlogging Management

- Implemented widely in India in the States of Punjab, Andhra Pradesh, Gujarat, Karnataka, Tamil Nadu etc.
- Identifies water-stressed regions, monitor groundwater levels & plan irrigation activities to make informed decisions about irrigation scheduling and water usage
Strategies for Water Saving

- Efficient Irrigation Techniques
- Rainwater Harvesting
- Water-efficient Fixtures
- Wastewater Treatment and Reuse
- Integrated Water Resource Management
- Micro Irrigation
- IoT based Irrigation System
- Water Users Association
"The rivers and oceans are the arteries of the Earth, carrying the life-giving waters that sustain all creatures. Let us honor and protect these sacred lifelines." - Atharva Veda