



Module 5 – (L19 – L21): “Socio-economic Aspects of Watershed Management”

Social Aspects of Watershed Management: Community participation, Private sector participation, Institutional issues, Socio-economy, Integrated development, Water legislation and implementations, Case studies

WATERSHED MANAGEMENT

Prof. T. I. Eldho

Department of Civil Engineering,
IIT Bombay

Lecture No - 21

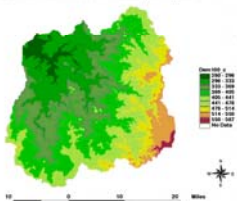
Integrated Development,
Water Legislation &
Implementation Issues

WATERSHED MANAGEMENT

L21 – Integrated Development, Water Legislation & Implementations Issues

- **Topics Covered**
- Integrated watershed development, Water management policy, Water Legislation, National water policy, Watershed plans & appraisal, Implementation issues.
- **Keywords:** Integrated development, water legislation, watershed plans.

Digital Elevation Model Anas river watershed (Jharkhand, India)



Prof. T I Eldho, Department of Civil Engineering, IIT Bombay

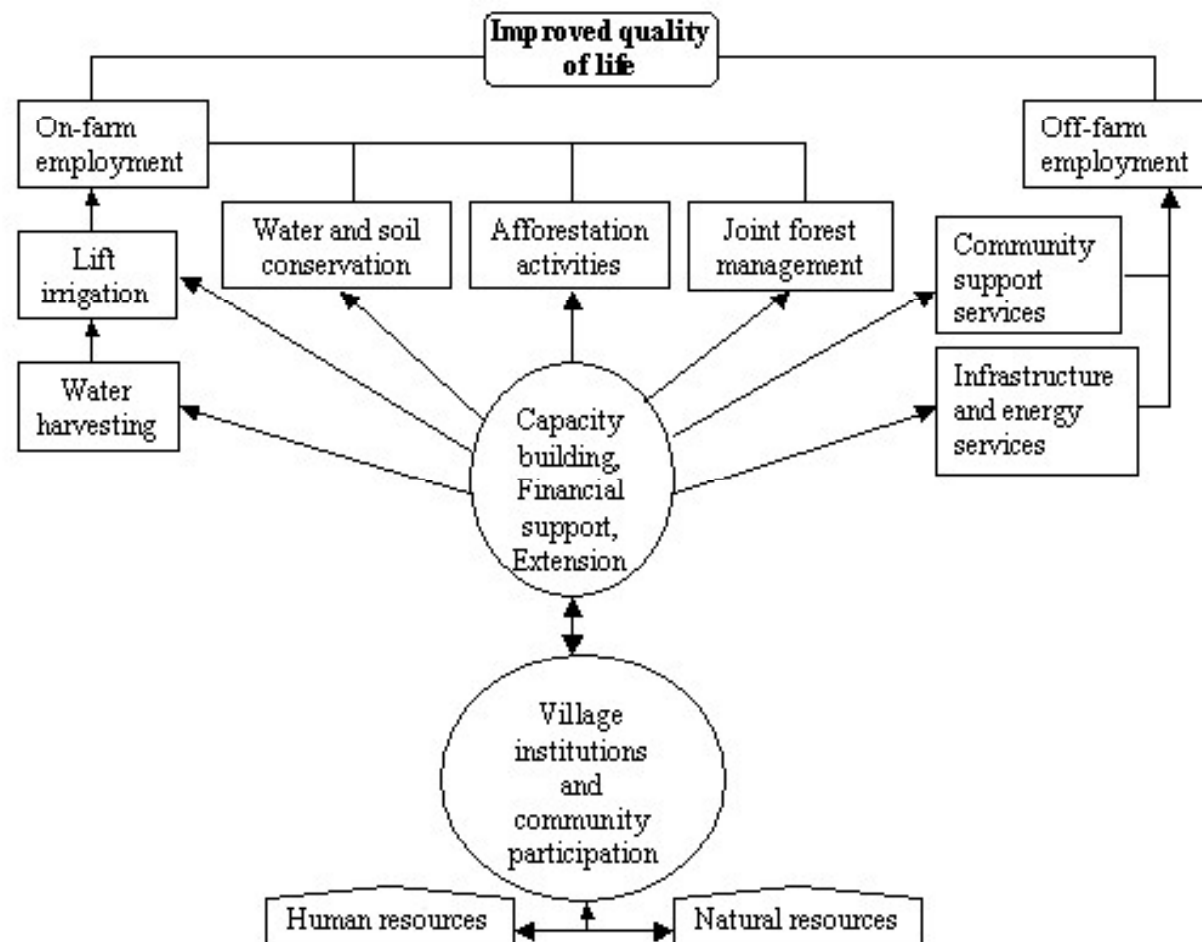


Integrated Watershed Development & Management (IWRDM)

- **IWRDM** - effective means for conservation & development of land & water resources. It integrates the socio-cultural, economic, biophysical & technological aspects of development.
- Major concern of **IWRDM** is the improvement of the livelihoods of local communities on a sustainable basis. It requires balancing economic needs and expectations with environmental concerns - to avert degradation of the natural resource base, in particular soil and water components.
- **IWRDM & Community participation** – long term changes – better adoption
- **Sustainability**, Efficient use of local resources, indigenous knowledge

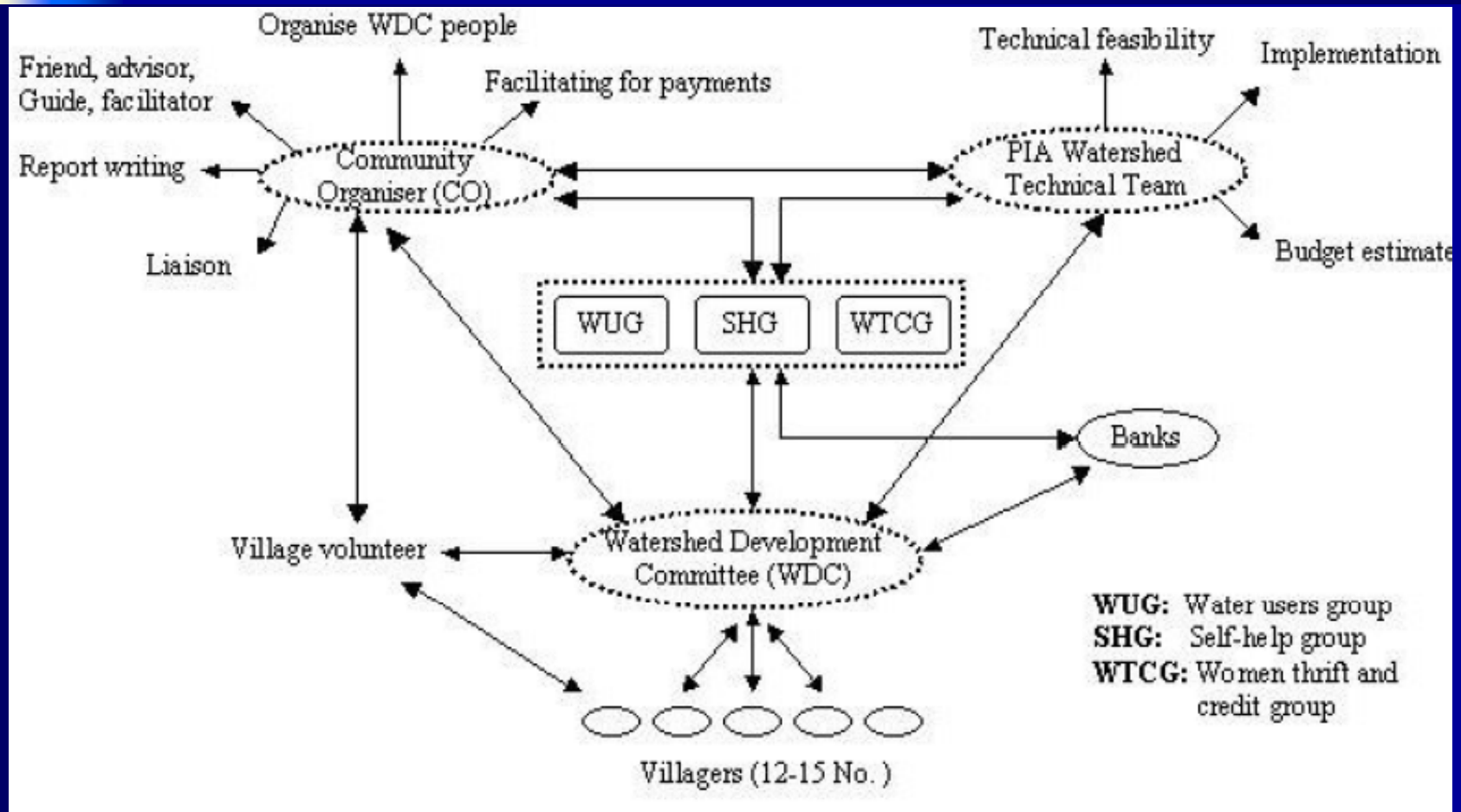
WATERSHED MANAGEMENT

Integrated Watershed Development & Management



WATERSHED MANAGEMENT

IWRDM - People Participation..



Prof. T I Eldho, Department of Civil Engineering, IIT Bombay

Ref: Singh, A.K., T.I. Eldho, D. Prinz (2002)

Water Management Policy

- Supply side management – includes technical measures
- Demand side management – includes technical, financial and policy based measures .
- Focus on policy based measures for water resources management
- Integrated water Resources Management Covers everything

1

Enabling Environment

- Policies
- legislation and
- incentives

2

Institutional Rules

Organizational
Frame work &
institutional
capacity

3

Management Instruments

National Water Resources Policies

- National Water Resources Policy sets goals & objectives for management of water resources at national scale
- Includes policies for: Regions; Catchments; Shared or trans-boundary water resources within IWRM framework; Inter-basin transfers

A national policy may include following matters

- Jurisdiction and delegation
- The extent to which water management is decentralised or consolidated
- The use of economic incentives
- Capacity building to meet institutional challenges
- Monitoring & control to reduce ecosystem degradation

Integrated Water Policy

Major points for effective integrated policy making are:

- Clarified roles & goals of government and stakeholders
- Government- as regulator, as organiser of the participatory process and as a last resort adjudicator in cases of conflict
- Identification of key water resources issues
- Water is a social and economic good means designing policies to allocate resources
- Make explicit in the policy the links between land use and other economic activities
- Take into account trade-offs between short term costs and long term gains.

Water Rights

- **Right to use water**
- Good water law must be flexible enough to permit reform in response to technological change and socio-economic need
- The **tenets of effective and beneficial use** are:
 - ✓ Water must not be obtained for speculation or let run to waste
 - ✓ The end use must be a socially acceptable use
 - ✓ Water is not to be misused
 - ✓ The use must be reasonable as compared with other uses

Legislation for water quality

Characteristics

- Measures to protect the quality of water resources must be encoded in legislation - **preventive or corrective**
- **Preventive measures** include effluent & discharge regulations, technical standards & requirements for treating polluted effluents, economic instruments as well as quality standards for receiving waters
- **Legislation** sets out the principles upon which pollution control is based
- **Corrective measures** include cease & desist orders, compensation for damage & economic losses, & abatement and remediation requirements
- The **polluter pays principle** allocates responsibility for damage costs

Reform of existing legislation for strong IWRM frame work

- **Enabling institutional framework**, including the legal roles and responsibilities of institutions and their inter-relationship
- **Mechanisms** for stakeholders to participate in water resources management
- **Conflict resolution** mechanisms
- **Provision of water for basic human needs**, and standards of service
- **Tariff and water pricing** systems
- Clear mechanisms *for transfer of water* rights to minimise conflicts and risk of social unrest

Watershed Management – Guidelines & Policies

- **Most important policies and guidelines** for watershed management include
 - Agricultural policy; Water policy; Land policy
 - Forest policy; Watershed management guidelines
- **National agricultural policy** provides strong support to the watershed development programs. It reflects the observed commitment of Gov. to take watershed management programs more aggressively, including provision of necessary financial & institutional support.
- **Land policy** protects the interest of small and marginal farmers

WM - Guidelines & Policies

- **Water policy** identifies water management as one of the most crucial elements in development planning of country.
- **Water policy** states that the watershed management through soil erosion, catchment area treatment, preservation of forests and increasing forest cover & construction of check dams should be promoted.
- **Environmental laws** often dictate the planning and actions that agencies take to manage watersheds.
- **Some laws require** that planning be done, others can be used to make a plan legally enforceable & others set out the ground rules for what can & cannot be done in development & planning.
- **Most countries & states** have their own laws regarding watershed management.

Financing & Investment Policies

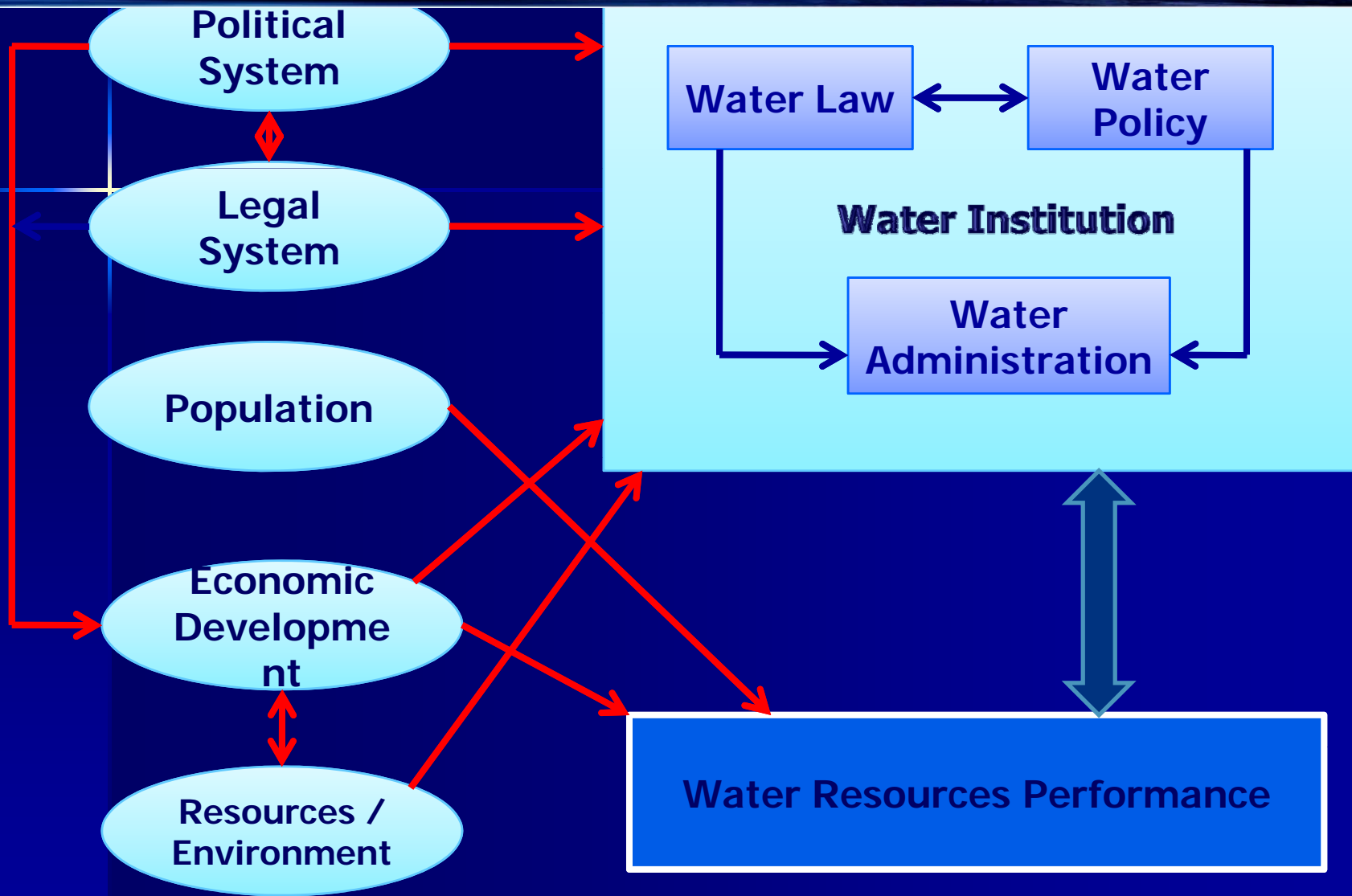
- **Gov. have a responsibility for investment policies** that affect the water sector.
- **Macroeconomic policies:** Trade policies affect the pace and type of development in the water sector
- **Tax incentives** might result in the growth of water-intensive industries
- **Public investment:** Investment in many sectors may affect demand for water, such as housing, new town & industry development, transport, power & energy, agriculture & tourism
- **Public & private investment** in the water sector itself: Water sector needs potentially very large financial needs for irrigation, water supply, waste water treatment, flood and environmental protection

Organizational Framework

Roles and responsibilities

- Policy formulation
- Education and promotion
- Networking and information exchange
- Regulation, control and enforcement
- Surveillance and monitoring
- Allocation and supply of water
- Flood control and risk mitigation
- Water treatment and reuse
- Conservation and protection
- Pollution control and water quality management

WATERSHED MANAGEMENT



Water Legislations in India

■ Water in Indian constitution

- “Water” in entry 56 of union list and entry 17 of state list.
- Article 246 & Art 262, empowers parliament to make law regarding development and management of inter-state rivers.
- “ Art 262, specifies that parliament may by law provide that neither the supreme court or any other court shall exercise jurisdiction with respect of inter-state river disputesinterpretation
 - Tribunals set up under inter-state River Dispute Act -1956, though can announce award , but it can not be 1) liable to follow for parties , 2) can not be adjudicated to any court

www.wrmin.nic.in

WATERSHED MANAGEMENT

Water Legislations in India

Surface water and groundwater is not defined separately

“ water” in constitution mostly defined as surface water (Iyer R, 2003)

Component of water regulation	Applicable regulatory framework
Ownership of Water	Government of India Act: The Easement Act 1882- private right to groundwater since it is viewed as an attachment to
Drawl of water	State subject : few states has enacted and implemented water resource legislation
Usage of water	Government of India Act: Water (Prevention and Control of Pollution) Cess Act,1977,1990 and 2003 and rules thereof for providing for the collection of cess on water consumed on bulk
Wastewater Disposal	Government of India Act : Water (Prevention and Control of Pollution)Act , 1974 and 1998 , and rules thereof which provide norms for wastewater disposal and prevention and control of water pollution.

National Water Policy

- First adopted in 1987 and formulated in 2002
- It advocates water resources of the country should be brought within the category of utilizable resources to the maximum possible extent
- Salient features
 - Policy promotes use of non-conventional methods such as traditional water harvesting, rooftop rainwater harvesting
 - Water transfer to water scarce region
 - People's participation
 - Public Private Partnership
 - Water Resources planning at hydrologic unit not on political unit

National Water Policy

- Directed state to devise its own water policy – in practice very few state has prepared it so far.
- Allocation priority (national level, -differ at state level)
 1. Drinking Water
 2. Irrigation Hydropower
 3. Ecology
 4. Agro-industries
 5. Non-agricultural industries
 6. Navigation
- Same for all state, except Maharashtra where water for industrial use is top priority than irrigation

National Water Policy

- It emphasizes on-
 1. Need for efficient pricing system and transparent subsidy structure for disadvantaged and poor
 2. Transfer the water management to user groups and local bodies
 3. Private sector participation in water sector
 4. Undertaking phased programme for improvement of water quality based on 'polluter pay principle'
 5. Need based economic activities on the water zoning of the country
 6. Prioritizing the need of drought prone areas

Watershed Plans & Appraisal

- **Watershed plan – Outline**
 - Watershed management goals – e.g. water use
- **Steps:**
- 1. Develop a water use inventory – Gather information, survey, water balance.
- 2. Setting goals & priorities
- 3. Identify water management options – economic analysis
- 4. Define a plan of action
- 5. Implement water management plan – implementation & monitoring
- **Implementation Schedules & Budgets:** Schedule; Budget, Staffing, monitoring plan,

Watershed Plan Implementation

- **Classifying critical watersheds** to establish priorities for conservation and management strategies.
- **Identifying critical threats**, such as surface & groundwater pollution, to a watershed's integrity in order to protect its resources and value to society.
- **Making watershed management recommendations** to ensure sustainable, clean water flow & maintenance of aquatic resources.
- **Identifying system-wide** controlling processes & mechanisms to distinguish environmental indicators for ecosystem health evaluation.
- **Recommending land-use impact mitigation**, habitat restoration programs, & other remediation techniques in watershed disputes.

Implementation Issues

- Analyzing socio-economic value of watersheds & their environmental services for policy development & management planning.
- Ensuring technical assistance in the design and installation of management measures
- Providing training and follow-up support to landowners and other responsible parties in operation & maintenance.
- Managing the funding mechanisms and tracking expenditures for each action and for the project as a whole
- Conducting the land treatment and water quality monitoring activities and interpreting and reporting the data
- Measuring progress against schedules and milestones
- Communicating status and results to stakeholders and public

Implementation Problems

- **Insufficient staff** assigned to monitoring
- **Funds allocated** or reserved for monitoring have been diverted and spent in other activities/items
- **Monitoring locations** are widely dispersed and remote, leading to logistical bottle-necks
- **Staff is not properly trained** to carry out the processes
- **Community loses interest** in community-based monitoring over the period of time
- **Necessity of simple**, inexpensive monitoring and evaluation systems, in line with the scope and needs of the project

Case Study: Co-Management of Electricity & Groundwater : Gujarat's Jyotirgram Yojana

- **The policy Decision-** 1980 shift of tariff regime to flat tariff based on HP
- **Implications**
 - Very sharp increase in electricity tube wells
 - Rampant corruption in terms of billing and meter reading
 - Flat based tariff system under subsidy regime has brought zero marginal cost of pumping, resulting –
 - Excessive withdrawal of groundwater by farmer
 - Selling of water to those who can not afford the infrastructure , resulting in development of informal groundwater market in state.

Shah & Varma, 2007: www.iwmi.cgiar.org

Case study: Situation in Gujarat

Retuning to volumetric tariff system was not easy, since farmers lobby is very strong in state

- GEB suffered heavy loss due to power supply to agriculture consumer, resulting into gradual reduction in power supply.
- Farmers found alternative of using capacitor to cover single phase to 3 phase power, getting 18-20 hr of electricity.

This heavy theft of electricity has led to –

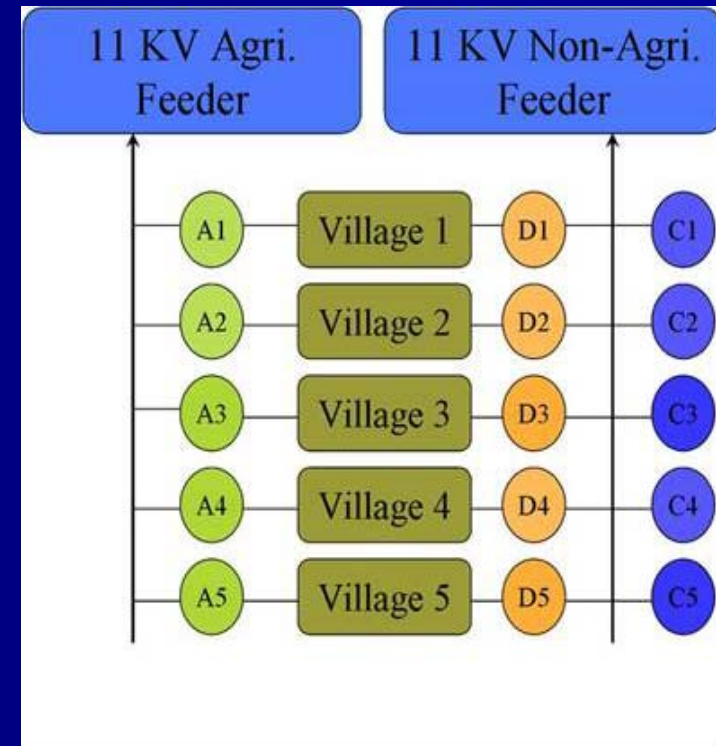
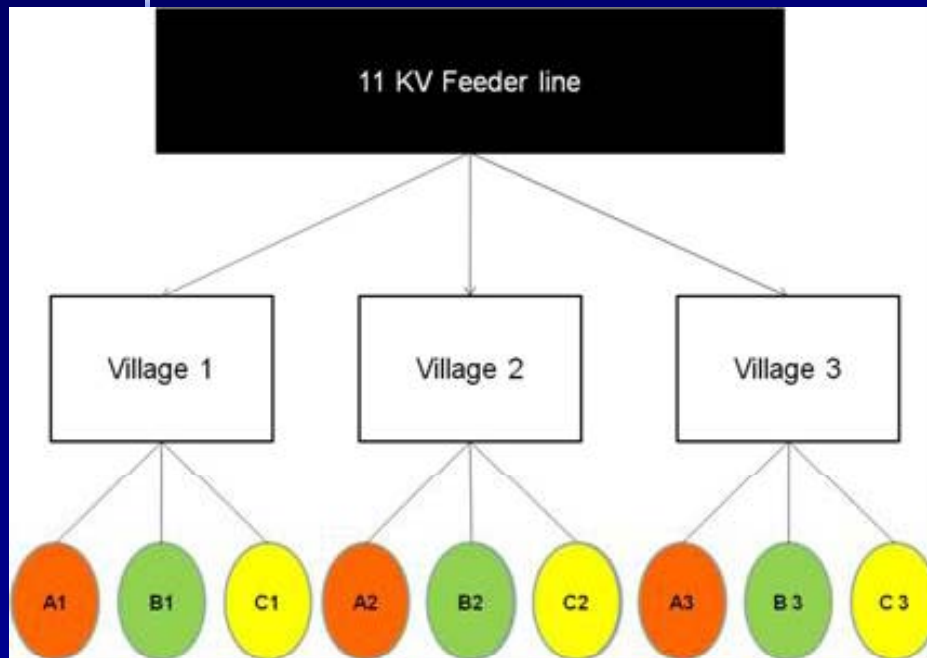
- Huge financial loss to utility
- Excessive withdrawal of groundwater- in north Gujarat, farmers have gone down to 1000 ft for drawing water
- Construction of groundwater well was expensive – require more than Rs 12 lakh to drill bore well
- Practices such as cooperative bore well drilling , sharecropping and selling groundwater was exercised in the region

Case study: Proposed solution

- Provide quality power to the farmers and convert flat based tariff system into metered tariff system (*It was also a condition negotiated by ADB while providing loan for the unbundling power system through power sector reform*) - (implementation impossible)
 - Providing logistic is problematic
 - May attract massive opposition of farmers
- Though metering process was initiated , but at very slower rate than ADB's expectation
- **The Result** – ADB suspended loan installment of US\$ 350 m, on ground of government's failure to meter tube wells
- Time to think for innovative idea

WATERSHED MANAGEMENT

Jyotir Gram Yojana (JGY) proposed & Implemented



Rural feeder of entire state was rewired into agricultural and non-agricultural feeder at cost of Rs 1700 crores from 2006 to 2007 (end)

Ref: Shah & Verma, 2007: www.iwmi.cgiar.org

Case Study: JGY – Salient feature

- Separation of agricultural feeder from non-agricultural use
 - 8-12 hours quality power to farms
 - 24 hr non stop power to villages for domestic use
- Gradual increase of flat based tariff system to approach average cost consumed by tube well
- Intelligent scheduling and management of 'rationed' power supply to farm sector – central element of co-management of electricity and irrigation

Ref: Shah & Verma, 2007: www.iwmi.cgiar.org

WATERSHED MANAGEMENT

Comparison Before and after JGY

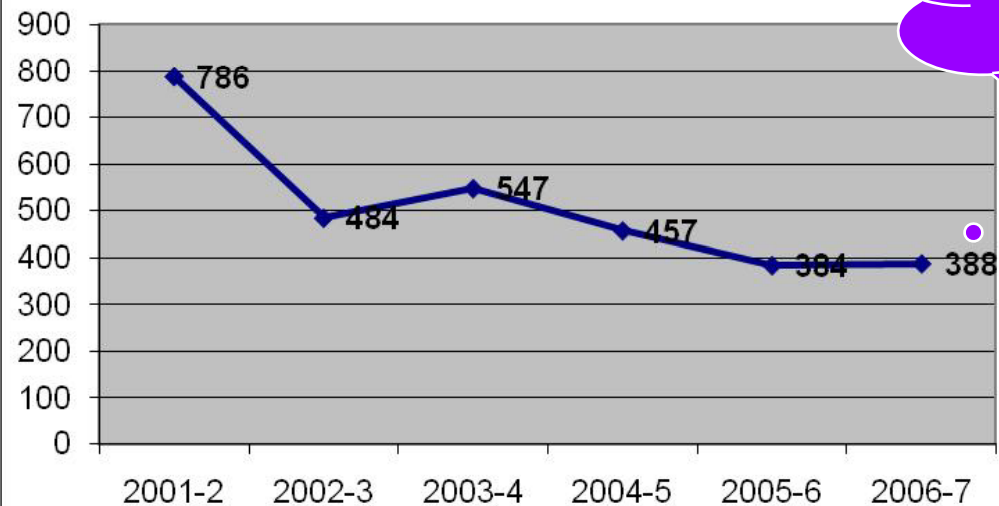
- | ■ Before | Ref: Shah & Verma, 2007: www.iwmi.cgiar.org |
|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| ■ Tube wells get 12-13 hours of 3-phase power supply of variable voltage, with frequent tripping, at unknown times mostly during nights | After

Farmers get 8 hours/day of high voltage uninterrupted power at fixed schedules; night in one week, day-time the next |
| ■ Flat tariff: Rs 350-500/hp/year | Flat tariff Rs 850/hp/year |
| ■ Massive use of capacitors to convert 1 and 2 phase power to run tube wells | Capacitors out; impossible |
| ■ Non-farm users de-electrified because of capacitors | Non-farm users get 24-hour non-stop single phase power |
| ■ Motor burn-out and rewinding the most important part of maintenance cost | Motor burn out at the minimum |
| ■ New connections not available. | New connections allowed at high costs; now rationed; |

Impacts of JGY

Reduction in Gujarat Government's Electricity subsidies (million US \$)

(Source: Patel, Dilip 2007.. Courtesy Tusar Shah)



◆ Electricity subsidies (million US \$)

Power supply to agriculture
fell from 13 b units in
2000/1 to 9 b units in
2005/6

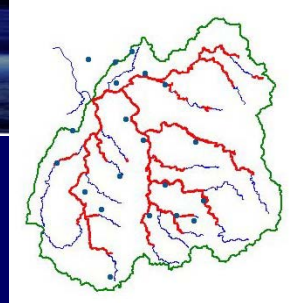
Groundwater
draft is
expected to
fell by 20-30%

Case Study: Lessons Learnt

- Policy based measures under demand side management really play greater role.
- Groundwater withdrawal could be curbed in the depleted areas with the help of policy based innovative solution like JGY
- Subsidy restructuring is big issues, especially for states where groundwater depletion is fast and farm power is free (eg. Punjab and Tamil Nadu)
- JGS significantly reduced the misery of the agrarian poor by adjusting the schedule of power supply to match peak irrigation periods.

References

- J.V.S Murthy (1991), Watershed Management, New Age international Publications
- Economic and Political Weekly September 16, 2000, 3435- 3444, Sustainable Watershed Management Institutional Approach. V Ratna Reddy.
- Saleth R M, 2004, "Strategic Analysis for Water Institutions in India: Application of a new Research Paradigm", Research Report 79, Colombo: Sri Lanka, International Water Management Institute.
- Shah T, 2003, "The Groundwater Economy of South Asia: An Assessment of Size, Significance, and Socio-Ecological Aspects", source : www.law.ku.edu/publication/journal/pdf/v15n3/shah2.pdf
- Shah T and Verma S, 2007 " Real Time Co-management of Electricity and Groundwater: An Assessment of Gujarat's Pioneering ' Jyotigram' Scheme", source: www.iwmi.cgiar.org/Publications/Other/PDF/NRLP%20Proceeding-2%20Paper%2015.pdf
- James A J, 2003, "institutional Challenges for Water Resources Management: India and South Africa", Water, Household and Rural Livelihood Project Working Paper 7 (draft).
- Gupta S.K, Deshpande R.D, May 2004, "Water for India in 2050: First Order Assessment of Available Options" , Current Sciences, Vol. 86(9),pp 1216-1224.
- Iyer R , Water- Perspective, Issues and Concern, Sage Publication.

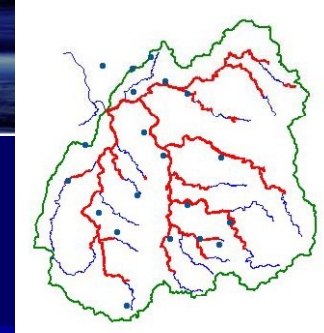


Tutorials - Question!?.

- Critically study the various water legislations in India.?. (Ref: www.ielrc.org; www.wrmin.nic.in)
- Discuss how the various water legislations helped to improve water management plans in India.
- Review the National Water Policy of India. Discuss the salient features?. What are the main emphasizes of National water Policy.
- How the National Water Policy can be effectively implemented?.

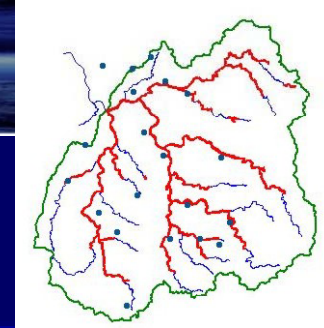
Ref: www.wrmin.nic.in

Prof. T I Eldho, Department of Civil Engineering, IIT Bombay



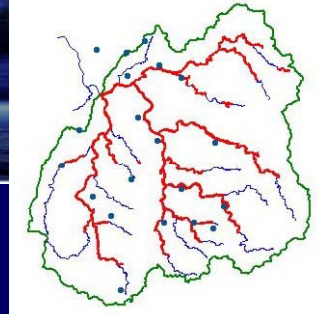
Self Evaluation - Questions!.

- What is the importance of IWRDM in watershed management plans?.
- Discuss salient features of successful water management policy.
- What are the important points to be considered for integrated water policy.?.
- What are the important watershed management policies & guidelines?.
- What are the important steps to be considered in watershed plans and appraisal?.



Assignment- Questions?.

- How a typical IWRDM scheme can be implemented in a watershed?.
- What are the basic requirements of National Water Policy?.
- Illustrate important features of good water legislation.
- Discuss the various organization framework for water legislation.
- What are the important watershed implementation issues?.



Unsolved Problem!.

- Develop an IWRDM scheme for your watershed area. Study the various IWRDM related issues in your watershed area.
- Develop appropriate schemes for IWRDM plan in your study area.
- How you can implement the IWRDM plan?..
- What are the main implementation issues?.
- How to monitor the implemented plans?.

WATERSHED MANAGEMENT

THANK YOU

Dr. T. I. Eldho

Professor,

**Department of Civil Engineering,
Indian Institute of Technology Bombay,
Mumbai, India, 400 076.**

Email: eldho@iitb.ac.in

Phone: (022) – 25767339; Fax: 25767302

<http://www.civil.iitb.ac.in>

