



WATERSHED MANAGEMENT

Module 1 – (L3) **Introduction and Basic Concepts**

Prof. T. I. Eldho

Department of Civil Engineering,
IIT Bombay

Lecture No-**3** **Watershed Management Policies**

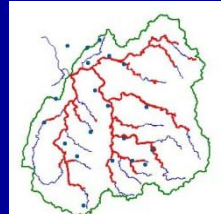
L3–Watershed Management Policies

- **Topics Covered**
- Introduction to Water Policy - Legislative framework, Institutional framework, Watershed Policies; Formulation, Policy issues for successful watershed management, National Water Policy, Case Study.
- **Keywords:** Water policy, Institutional Framework, Legislative Framework , Watershed Management Policy.



Photo, A.K. Singh, 2002

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





Water Policy

- **Water policy** - set of guidelines and directives to the State for harnessing water resources - to cater the sectoral (agriculture, industrial and domestic) - need in equitable way that leads to sustainable development.
- **A policy statement defines-**
 - Ownership and related right with regard to its use
 - Incentive and penalty awards towards conservation and deterioration of water resources
 - Water allocation priorities to sectors
 - Water conservation
 - Institutional structure for executing planning and implementation

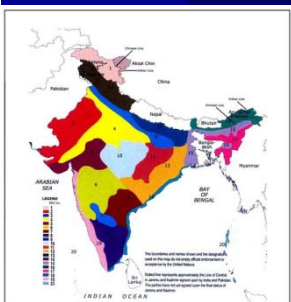
Components of Water Policy

- **Legislative framework**
 - Legal framework that defines the rights to exploit/use of water resources and provisions of award of incentives and penalties
- **Institutional framework**
 - Administrative system responsible for assessment and management of water resources



Legislative Framework

- Water in Indian constitution
 - “Water” in entry 56 of union list and entry 17 of state list.
 - Article 246 and 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 disputes . Interpretation- arbitration



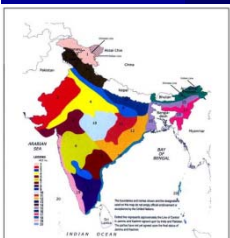
<http://mowr.gov.in/index3.asp?sslid=301&subsublinkid=394&langid=1>

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)

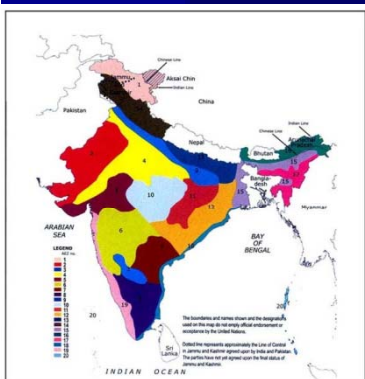
Component of water regulation	Applicable regulatory framework
Ownership of Water	Government of India Act: The Easement Act 1882- private right to groundwater since it is viewed as an attachment
Withdrawal of water	State subject : few states has enacted and implemented water resource legislation
Usage 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.



WATERSHED MANAGEMENT

Water Legislations in India...

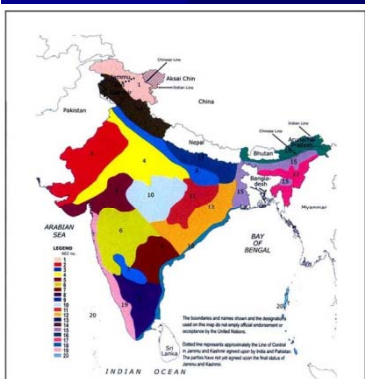
- Water (Prevention and Control of Pollution) Act 1974 (A 1978 & 1988)
 - Dealing with setting up institution related to administration of water (Central Pollution control Board and state PCB's)
 - It undertake functions related to prevention and control and maintaining and restoring related to wholesomeness of water
 - The institution provide consent to operate and consent to establish to industries based on applicability



WATERSHED MANAGEMENT

Water Legislations in India...

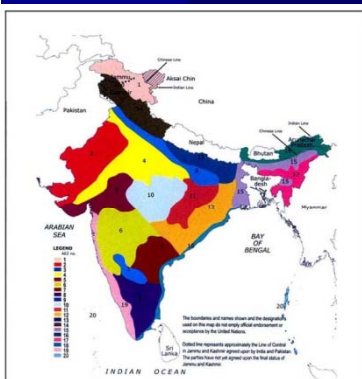
- Environment and Protection Act, 1986
 - It lays down the procedure for settings of standards emission and discharge of pollution
 - based on BIS standards such as IS : 3025 (for sampling), IS: 2373 (for flow measurement), BIS: 10500 (drinking water specification), contaminant wise related guidelines for wastewater issued by respective PCB's



WATERSHED MANAGEMENT

Water Legislations in India...

- Model Groundwater Bill 1970
 - Contains the broad framework of groundwater regulation of the country
 - The bill provides the union territory and state government to establish ground water authority to notify areas of control and regulate the groundwater development and management

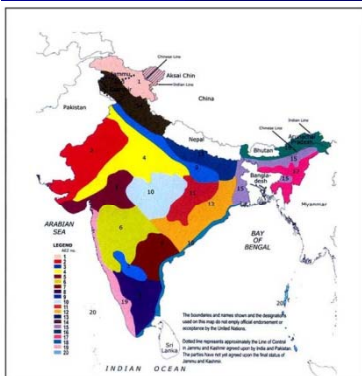


Under the bill CGWA categorizes country as “safe”, “critical” and “over-exploited”

WATERSHED MANAGEMENT

Water Institutions: Administrative structure

- Ministry of Water Resources - nodal agency for planning , development & management of water resources
- Departments-
 - Central Water commission – for surface water related issues
 - Central Ground Water Board – for groundwater
 - National Water Development Agency- to provide technical support



Water and Land Management Institutes and Agricultural Universities – research at state level

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

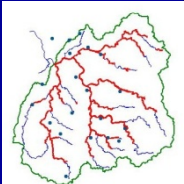
WATERSHED MANAGEMENT

Other Ministries – In India

Ministry of Rural Development	Department of Land Resources	Desert Development Programme Drought Prone Area Programme Integrated Wasteland Development Programme
	Department of Drinking Water Supply	Accelerated Rural Water Supply Programme
	Department of Rural Development	PM Rural Drinking Water Prog.
Ministry of Agriculture and Cooperation		National Watershed Development Projects for Rainfed Areas
		Regionwise Watershed Development Projects
		integrated Watershed Development Projects
Ministry of Environment and Forest	Central Pollution Control Board	Water Quality Programmes
	National River Conservation Board	National Eco-Development Programmes

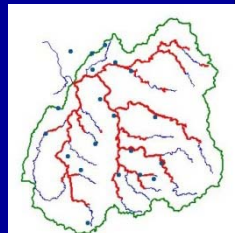
Watershed Policy

- To **manage & protect watershed** fully and effectively, a clear **policy** is required - emphasize *inter alia* a coordinated & integrated approach, local participation, manpower & resource building, land use planning, among others.
- **Main objective of watershed management:** promote integrated protection, conservation & development of land & water resources in watersheds for sustainable use and for the benefit of the nation as a whole.
- **Watershed Policy:** what regulates both public and private activities within our watersheds, primarily through use of codes & ordinances, through the establishment of minimum or maximum standards, and the setting of budgets.



Strategies for Implementation of the Watershed Policy

- Develop a National Watershed Programme
- Establish an inter-Ministerial Watershed Management Committee
- Strengthen human and financial resources required to co-ordinate, implement and monitor work in the watersheds
- Rank each watershed and establish priorities for interventions.
- Secure budgetary support for implementation of the Policy



Watershed Development Policy

- Regulations or policies generated towards one aspect of watershed management should not be contradictory to the other aspect
- Watershed development is prerequisite for land, water and biomass management
- Watershed development policy formulation should be consistent with federal, state and local legislation
- Overall policy formulation should be done by considering larger interest of the country

WATERSHED MANAGEMENT

Policies

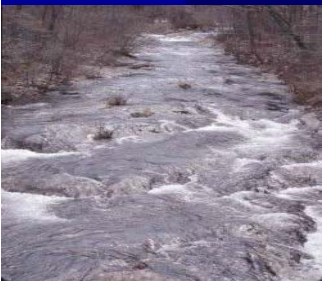
- Policies should stand as ready guides to answering many questions that may arise in the implementation of watershed
- Generally, watershed policies are formulated at the government level
- At Government level – watershed policy

↓
Decisions and actions (significant importance)
↓
Widest ramification

↓
longest time perspective

Formulating Watershed Policy

- Watershed policy formulation is very data intensive
- Hydrological information on watershed is expensive to obtain and interpret
- Basics sets of information required
 - a) An inventory of watershed resources
 - b) An inventory of use of resources



Collection of Information

Following aspects should be considered for collection of information

- Right of access to information: It should be readily available
- Information requirements:
 - Gathering and processing of information is a huge task.
 - Requirements should be kept to the minimum.
 - Should be gathered cost effectively



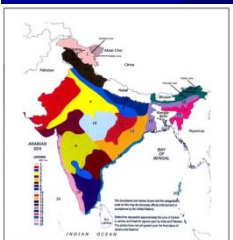
Policy issues for successful watershed management

- Understanding and quantifying the biomass types and interactions both in space and time.
- There should be proper linkage between social, political & technical system at appropriate levels.
- Agro-ecological approach should be considered for planning of watershed.
- Priority should be given to water resources development in watershed.
- Requirements of poor people & influences on the watershed - considered in policy formulation.

WATERSHED MANAGEMENT

Policy issues for successful watershed management...

- Need to establish and manage a national database system for watershed
- Watershed models should be properly formulated, verified and confirmed with field observations
- Agriculture is highly dependent on soils and climate
- Eg. Based on 50 years of climate data and an up-to-date soil database, India divided into 20 agro-ecological zones (AEZs)
- Each AEZ is as uniform as possible in terms of physiography, climate, length of growing period and soil type for macro level land-use planning and effective transfer of technology

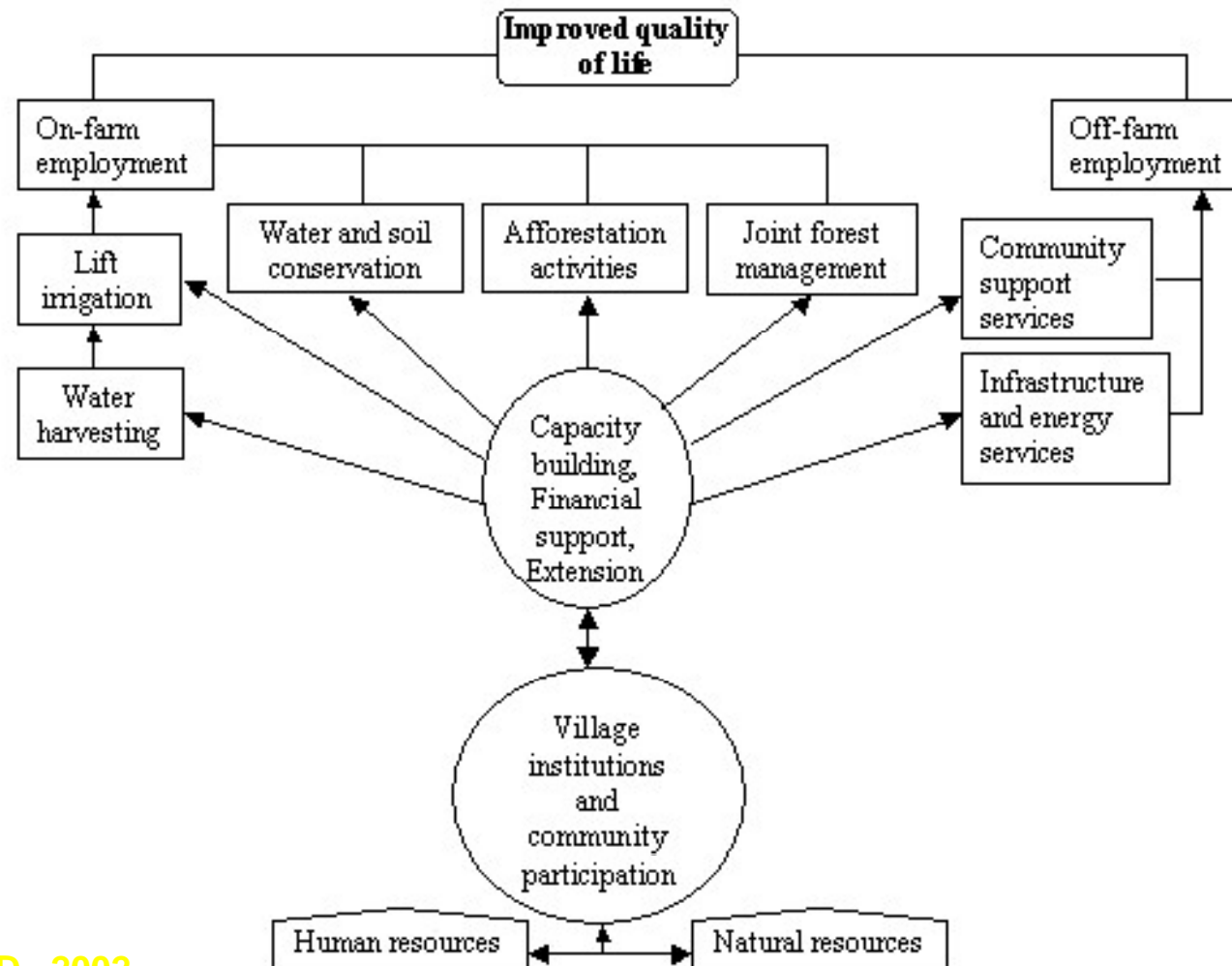


Policy issues for successful watershed management...

- Collaboration of all organizations can expand the experiences in an efficient manner.
 - EX: Ministry of agriculture, Ministry of Water Resources etc.
- ⑤ There should be proper institutional setup with people's initiative and involvement
- Continuous monitoring of the physical progress of the watershed projects
- Use of Remote sensing techniques and GIS should be promoted for assessing the capability of the land inventory

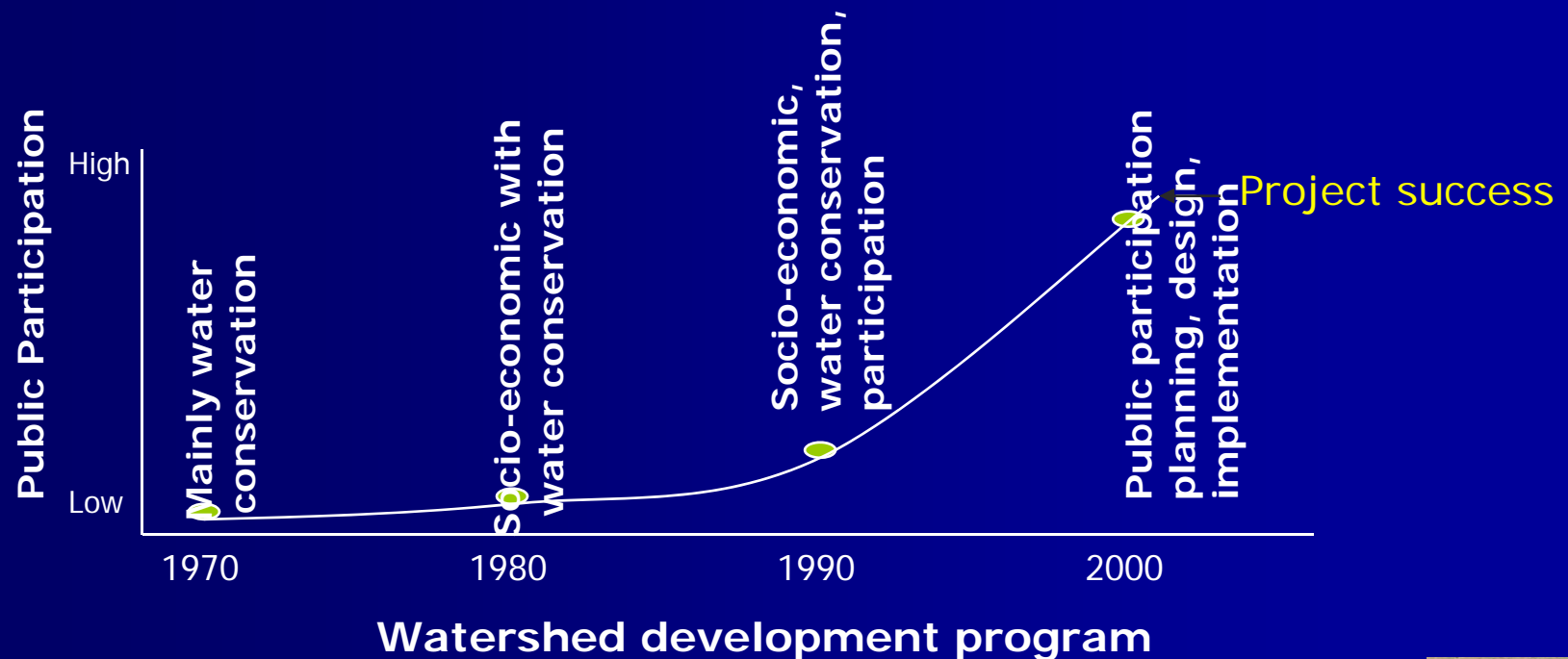
WATERSHED MANAGEMENT

Outcome – Successful Watershed Policy



WATERSHED MANAGEMENT

Successful Watershed Policy in India



Singh A.K., Eldho T.I., Prinz D., 2002



Photo, A.K. Singh, 2002

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

Photo, A.K. Singh, 2002



National water policy in India- Needs

- Availability of water is highly uneven in both space and time
- Precipitation is confined to only few months in a year
- Rainfall Varies spatially – eg. In India: from 100 mm in the western parts of Rajasthan to over 10000 mm at Cherrapunji in Meghalaya
- On an average, floods affect around 7.5 milli. Hectare/ year
- Planning and implementation of water resources projects involve a number of socio-economic aspects and issues
- Eg: environmental sustainability, rehabilitation of project-affected people and livestock
- Common approaches and guidelines are necessary on these matters
- Gross irrigation potential is estimated to have increased from 19.5 million about 95 million hectare by the end of the Year 1999-2000.
- Some other factors like degradation of water quality

National Water Policy in India

- 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 & 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 in India..

- Directed state to devise its own water policy – in practice very few state has prepared it so far
- Allocation priority (national level, may 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 in India..

- 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

Case Study1: U.S Regulations related to Watershed Management

Federal Clean water act (CWA)

- For evaluating Federal Water Pollution control Act
- Amended in 1977, revised in 1981 and reformulated in 1987
- Objective:
 - To restore and maintain the chemical, physical, biological integrations of the nations water
 - As a part of CWA, the EPA delegates this responsibilities to states or native Americans
 - Clean Water Act (CWA) is the cornerstone of surface water quality protection in the United States

Salient features of regulation

- ◉ Involvement of stakeholder groups in the development and implementation of strategies
- ◉ For achieving and maintaining state water quality is another hallmark of this approach
- ◉ Under the CWA, EPA has implemented pollution control programs such as setting wastewater standards for industry
- ◉ Water quality standards for all contaminants in surface waters
- ◉ NPDES - Controls water pollution by regulating point sources that discharge pollutants into waters.

CWA Time Line and Amendments

1972

- Goal - prohibit the discharge of any pollutant to waters of the USA from a point source unless the discharge is authorized by a NPDES permit
- NPDES: National Pollutant Discharge Elimination System
- NPDES - track point sources, such as industrial waste water and municipal sewerage and to minimize the discharge of pollutants
- Process was extremely successful in manage the pollution from point sources

Time line contd.....

1987

- Section deals with non point source pollutions
- Goals of the NPDES program are achieved through the use of BMP (Best Management Practices)
- To improve the quality of storm water out flow

1992

- EPA published a notice requesting information and public comments for preparing regulations under CWA point source pollution section

1995

- EPA proclaimed formally a final rule, refused to the regulations in 1987 amendments to apply for an NPDES permit by August 7, 2001

Time line contd.....

1996

- ⊙ EPA's National Water Quality inventory showed that 40% of surveyed U.S water bodies did not meet national water quality standards

1998

- ⊙ EPA national water quality inventory report showed that nonpoint source pollution, which includes urban storm water runoff is considered as the leading cause

1999

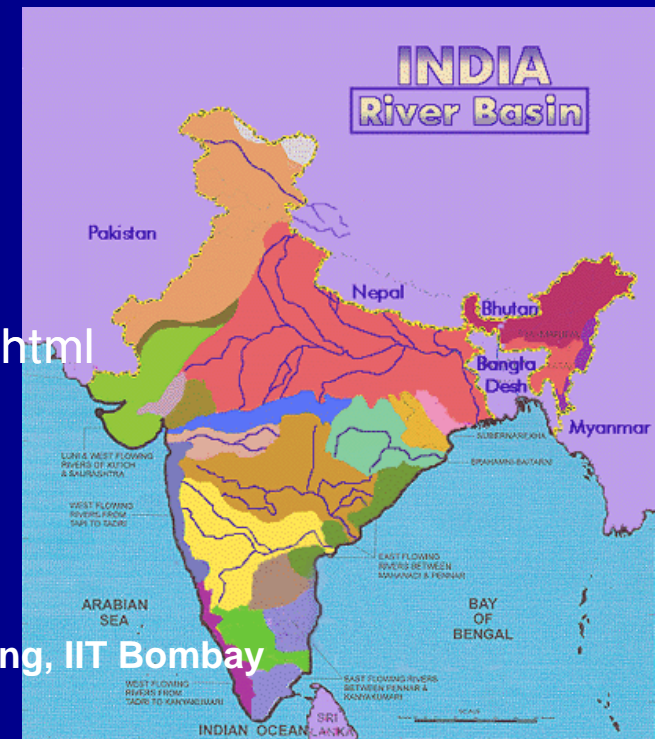
- ⊙ Goals was set of establishing total maximum daily loads (TMLDS)
- ⊙ TMDL specifies the amount of each particular pollutant that may be present in a water body

Case Study 2: River interlinking project of India (proposed)

- **Rationale:** large spatial & temporal distribution of rainfall patterns causing drought and flood like condition in India. This give birth to policy concept of river-interlinking project, connecting water surplus area with water scarce area.

Suggested Reading :

<http://www.ecoworld.com/waters/indias-water-future.html>

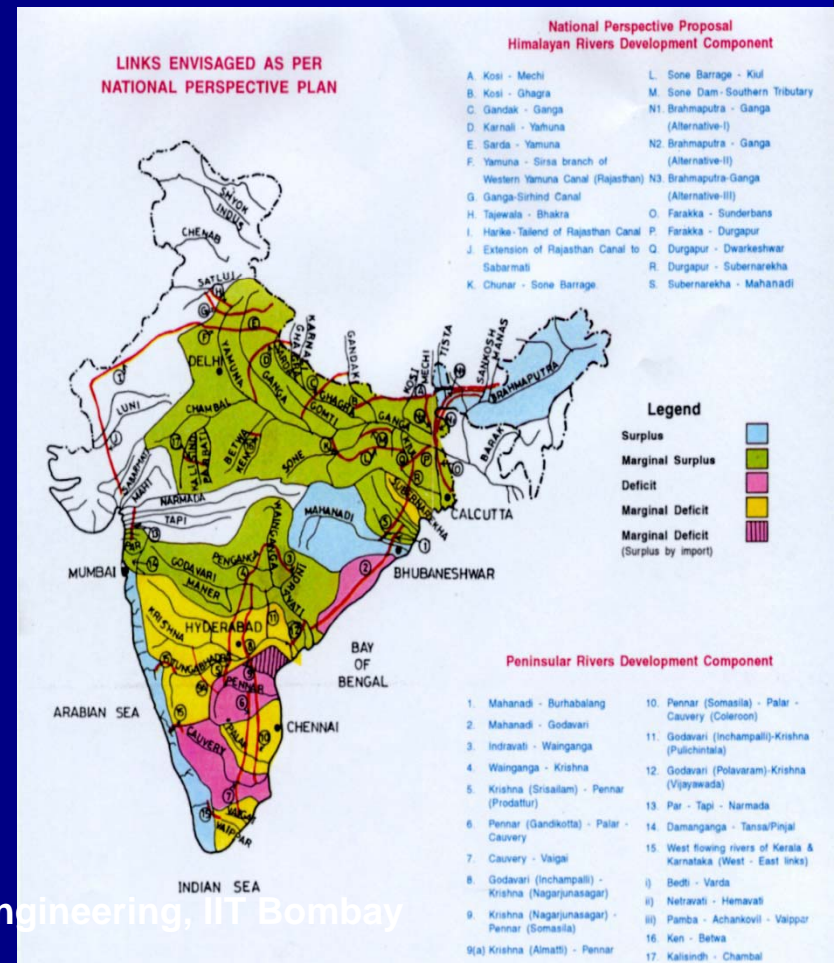


WATERSHED MANAGEMENT

Case Study 2: River interlinking project of India (proposed)...

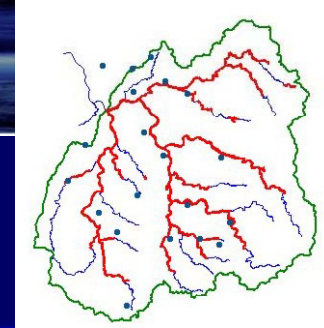
■ Policy Impact:

- (anticipated) enhance food grain production by 500 million tonnes to meet ever increasing population demand by 2025. provide 35 million ha. of additional potential arable land and 34000 MW of electricity.
- Involve huge expenditure , causing burden on taxpayers. Require huge energy to lift water.
- Anticipated displacement of people and environmental damages



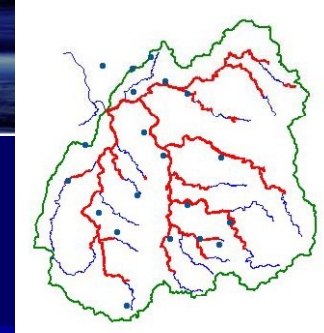
References

- Raj Vir Singh (2000), Watershed Planning and Management, Yash Publishing House
- <http://cfpub.epa.gov/npdes/>
- <http://www.ecoworld.com/waters/indias-water-future.html>
- http://www.nrca.org/policies/watershed/policy_information.htm
- <http://mowr.gov.in/index3.asp?sslid=301&subsublinkid=394&langid=1>



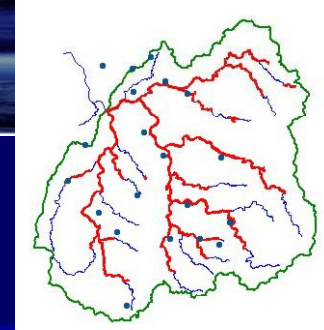
Tutorials - Questions!..?.

- Discuss the needs of water policy and components of an effective water policy.
- Describe the outcome of a successful watershed management policy.
- Discuss the National Water policy in India.



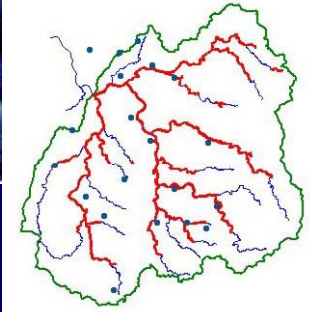
Self Evaluation - Questions!.

- What are the important policy issues for successful watershed management?.
- Discuss water related Institutions, its roles & Administrative Structure in India.



Assignment- Questions?.

- Illustrate various water Legislations in India and its impacts.
- How to formulate an effective watershed policy?.
- Discuss about the necessity of an effective watershed policy for better watershed management practices.



Unsolved Problem!

- Develop a case study of watershed policy of a country by considering: Physical setting, watershed conditions and problems, History of watershed management, International trends, legislative framework, Institutional framework, challenges, strategies for policy implementation, financial aspects, implementation issues etc.
- **Hint: Check Watershed Policy of Jamaica:**
- <http://www.nrca.org/policies/DRAFT%20WATERSHED%20POLICY.pdf>

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>

