

SD = IWORM + IRBM + IFM

Eugene Z. Stakhiv

**International Center for Integrated Water
Resources Management (ICIWaRM)**

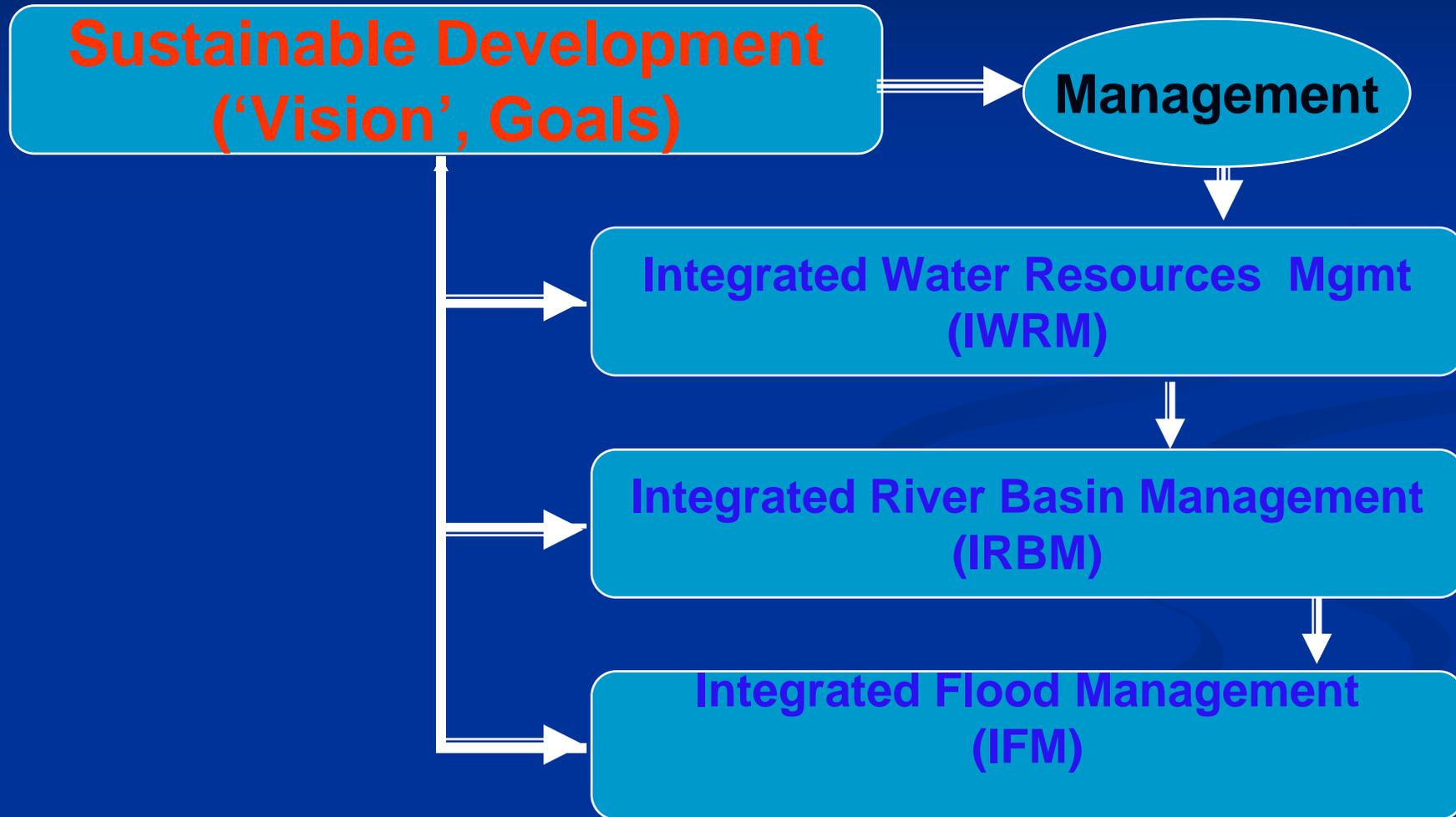
ICHARM International Symposium

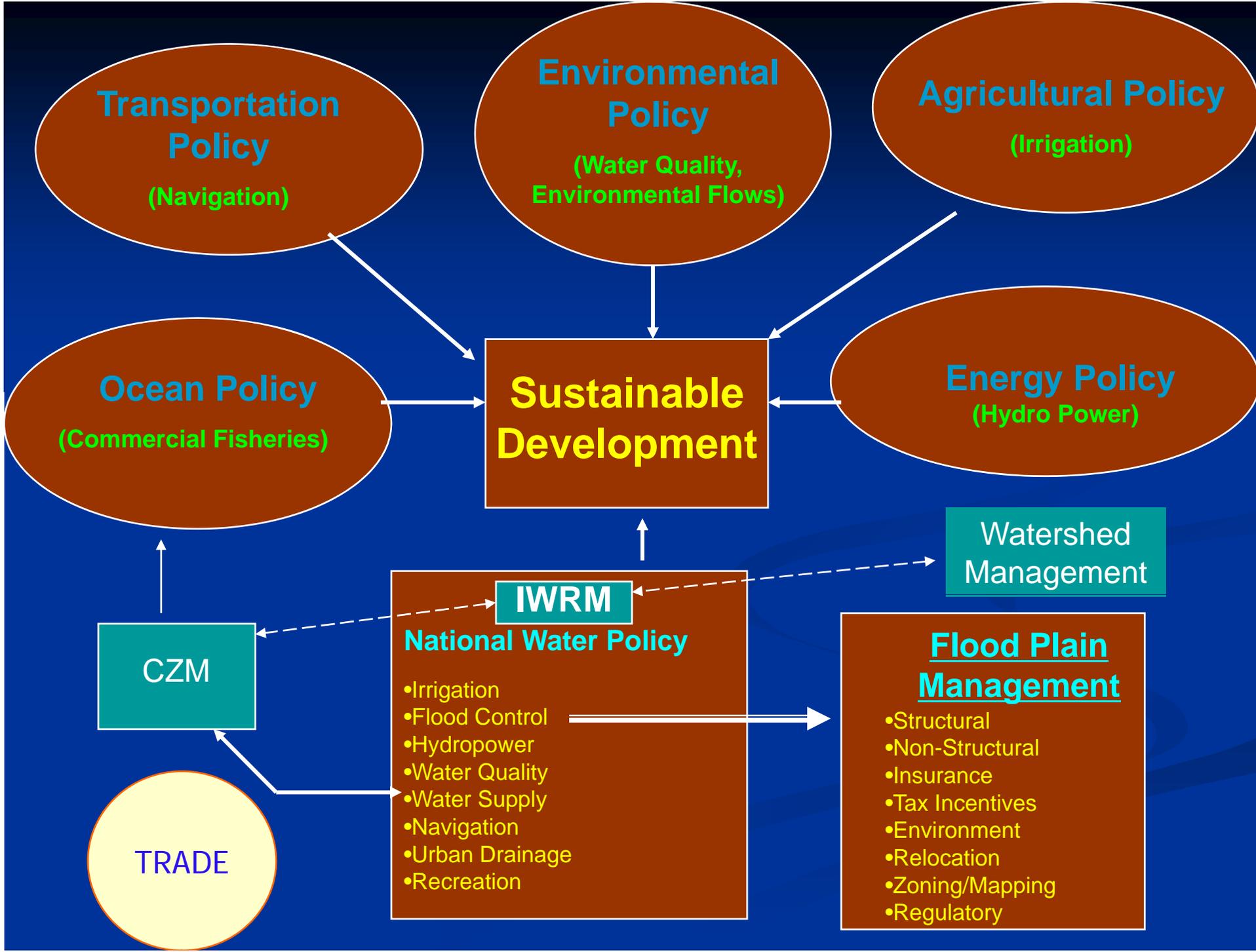
**“Local Practices of Integrated Flood Risk Management
under Changing Natural and Social Conditions”**

NYC/Tokyo

30 Sept. 2008

Levels of Integration & Management for Achieving Sustainable Development





US President's Council on Sustainable Development “Overarching Elements (1998)”

- Economic Efficiency
- Environmental Health
- Social Well-being and Equity

“the three elements are interdependent and must be pursued simultaneously and in a balanced way if sustainable development goals are to be met”

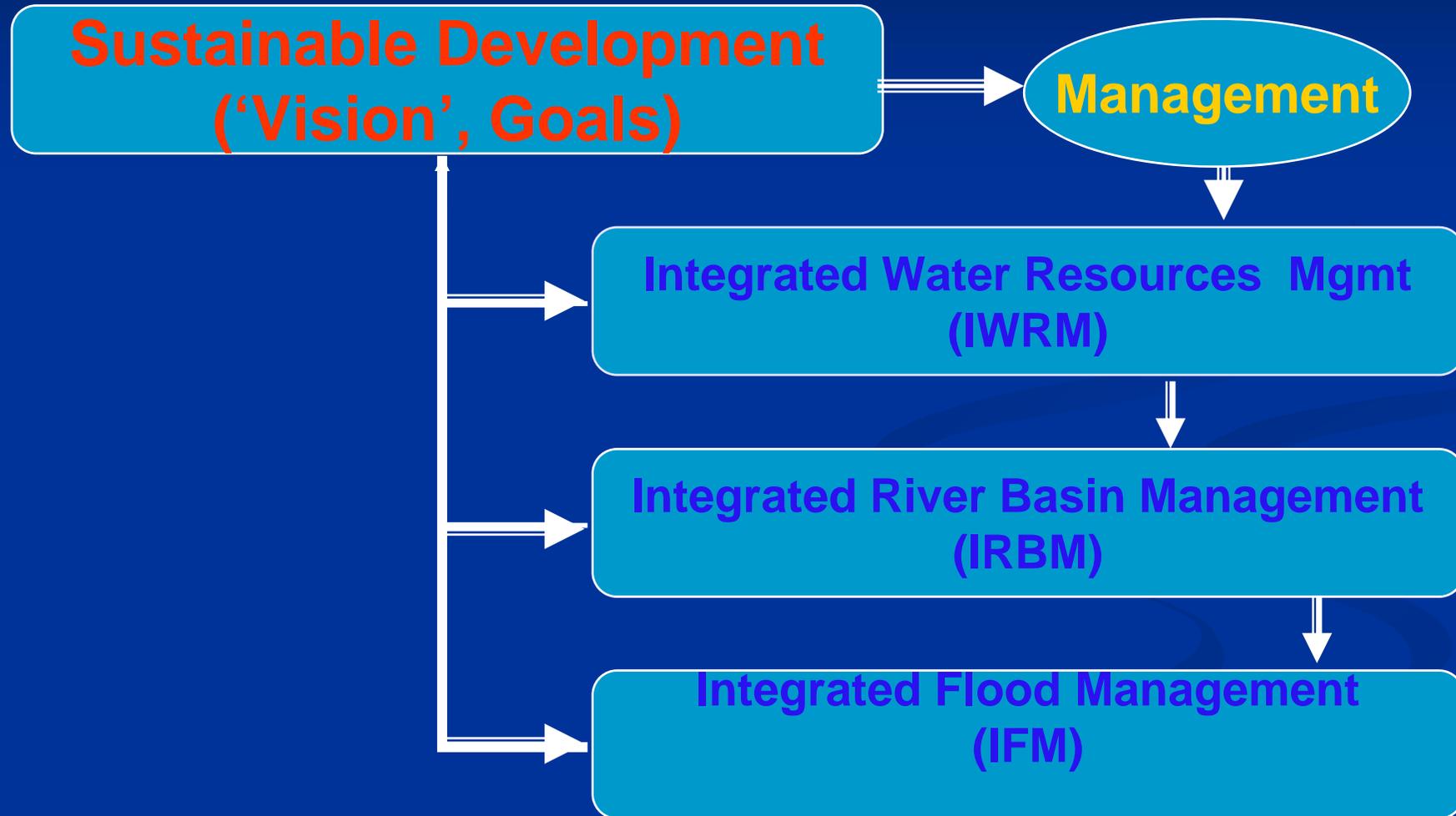
(Same as the original ‘WRC Principles and Standards’ of 1973/80)

Report of SIWI to CSD-13

“Making Water a Part of Economic Development”

- Improved water mgmt boosts economic growth and eradicates poverty
- Economic benefits of water supply and sanitation far outweigh investment costs
- Water storage capacity improves national economic resiliency to climate variability, and boosts growth
- Investing in water is good business-improved IWRM boosts productivity within economic sectors
- Public & private investment needs for water are high-but achieving investment goals is feasible for most nations

What is 'Management' ?



What are we managing for?

- What are the principal purposes for water management?
- How are they established? Can the goals change? Who changes them?
- How does one manage?
- What are the services we provide?
- How do we do it cost-effectively, reliably, environmentally sustainable, equitably?
- How to measure performance of management? how do we know we're doing the job well?

Functions/Elements of Water Resources Management Conventional Mechanisms for Adapting to Uncertainties (& climate variability)

- Planning **new investments**, or for capacity expansion (reservoirs, irrigation systems, levees, water supply, wastewater treatment)
- **Operation & regulation** of existing systems: accommodating new uses or conditions (e.g. ecology, climate change, population growth)
- Maintenance and **major rehabilitation** of existing systems (e.g. dams, barrages, irrigation systems, canals, pumps, etc.)
- Modifications in **processes and demands** (water conservation, pricing, regulation, legal)
- Introduce new **efficient technologies** (desalting, biotechnology, drip irrigation, wastewater reuse, recycling, solar energy)

IWRM Management

- Management is the action- & performance-oriented key to IWRM & the mechanism for achieving Sustainable Development Goals
- Mgmt means making strategic planning choices and operating decisions that promote the principles and improves performance
- IWRM must adapt to changes in goals, objectives, priorities, technologies and policies
- Policymakers are not managers; good management makes policies work effectively
- Implementation requires accountability, review, monitoring, performance measurement
- Outputs (water quantity, projects) vs. Outcomes (reduce poverty, deliver reliable, cost-effective services – clean water, reduce flood damages, irrigated agriculture, etc.)

Three simple goals of Management

- *Manage the resources* (for effective delivery of services now)
- *Measure the resources* (to better understand where greatest needs are, and how well you're doing)
- *'Grow' (increase) the resources* (demand management, new supplies, conservation, better quality, increased reliability, increased access to wastewater treatment and water supply)

World Bank Report (2002):

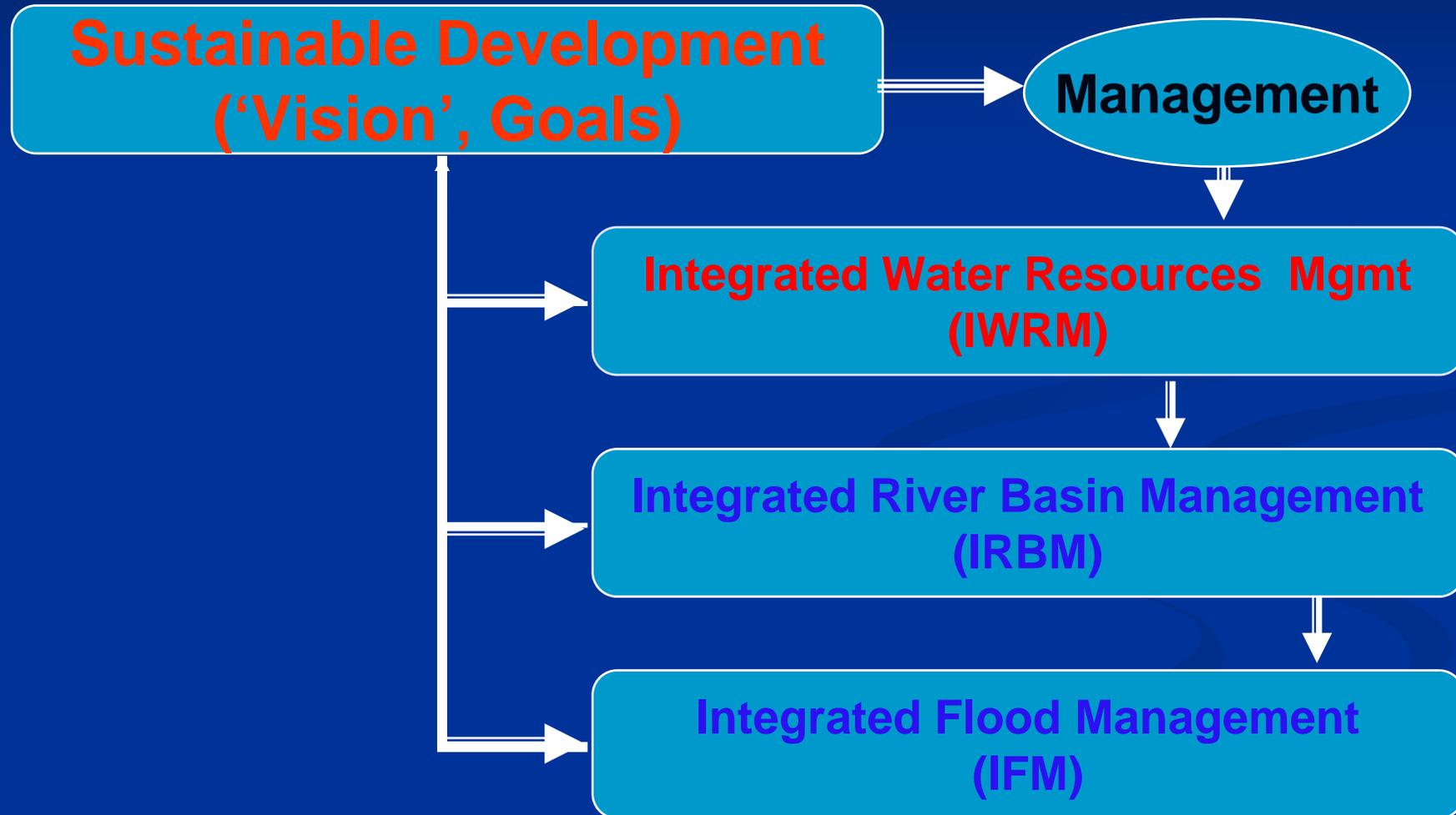
“Bridging Troubled Waters – Assessing the World Bank Water Strategy”

- Performance review of 1993 “Water Resources Management Policy (306 completed projects; 410 proposed projects; 98 CAS reports; 270 sectoral)
- Bank’s **principles** incorporated into sectoral & economic work, but difficult in country policy reforms and projects
- **Bank has not reorganized itself to treat water resources comprehensively**
- Adoption of institutional, financial and socioeconomic objectives within **traditional water service sectors**
- Service delivery focus is on improving water supply and sanitation – irrigation and drainage not so good

World Bank Report Recommendations

- Link water projects with CAS & poverty reduction strategies – assure access of water to poor
- Adopt use of environ & social assessments as part of overall water resources planning – focus on poverty
- **Employ economic instruments to manage conflicts in integrated water systems; balance demands at river-basin level, monitor project effects on poor**
- **Develop cost-effective, performance-based project selection, design and service delivery approaches**
- **Reorient capacity-building in water sector toward comprehensive water mgmt & regional partnerships**
- Determine choice between private vs public sector involvement water development based on realistic institutional analysis of what works in differing country contexts

What is IWRM ?



The Promise & Practice of IWRM

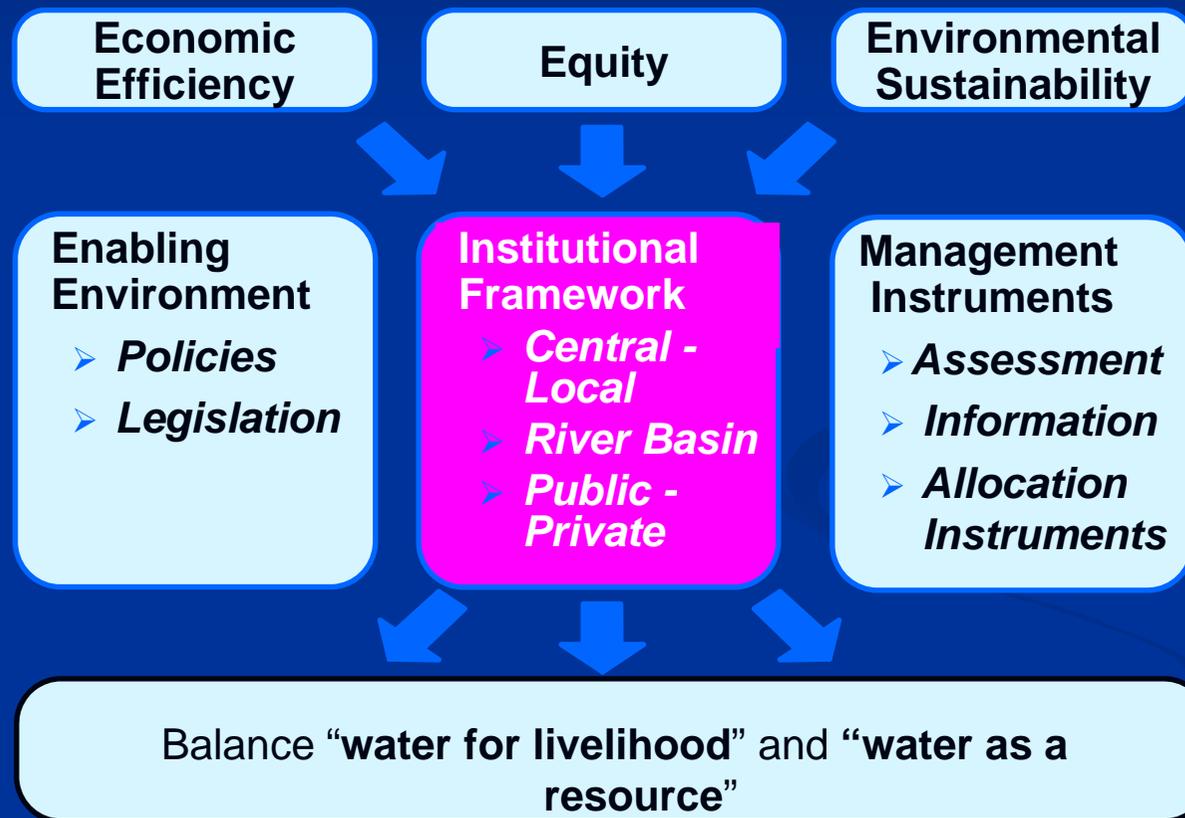
“IWRM is a process which promotes the coordinated development and management of water, land and related resources, in order to **maximize** the resultant **economic** and **social welfare** in an **equitable** manner without compromising the sustainability of **vital ecosystems**.” (GWP)

“...water sector reform is very complex. Even with sound governance, participation, institutions and skills – all largely missing in Bank client countries – such reform takes 10-20 years, even in OECD countries.” (World Bank Report, 2002).

US Project Planning & Impact Accounting System (US Water Resources Council, 1972)

- **National Economic Development (NED)**
 - beneficial and adverse effects on the national economy in monetary terms
- **Environmental Quality (EQ)**
 - effects of plans on significant environmental resources and ecological, cultural and esthetic attributes
- **Regional Economic Development (RED)**
 - distribution of regional economic activity from each plan in terms of regional income and employment
- **Other Social Effects (OSE)**
 - effects on urban and community impacts, life, health, safety factors; displacement, long term productivity; energy requirements and energy conservation

IWRM Components



Integrated WRM

- **Vertical Integration:** coordination and implementation of policies, programs and projects from national to regional to local levels
- **Horizontal Integration:** coordination and implementation of sectoral programs within project planning, across multiple agencies (e.g. IFM)
- **Multidisciplinary Integration:** forming teams of specialists from various relevant disciplines
- **Multiobjective Integration:** achieving social, environmental, economic and equity goals for sustainable development

Where does the 'Vision' for IWRM come from?

- **National Policies** (legislature, Parliament)
- **National Water Code** (coordinated collection of all rules and regulations related to water)
- **National water management plans**
- **River Basin, watershed plans**
- **Municipal, provincial plans**
- **Land use plans**
- **What else?**

How do we influence the 'Vision'? Who creates the 'vision' ?

Integrated Water Resources Management

- ***Integrated:*** coordinated, internally consistent, comprehensive, collaborative,
- ***Management:*** implementation of policies, laws, regulations, application of science and engineering ‘best management practices’ in a coordinated, consistent manner to provide essential services for society.
- ***Basic Operating Principles of, and evaluation criteria for SD:*** Equity, Economic Efficiency, Environmental Quality, Social Well-Being (social welfare)

Some Differences in IWRM Goals: Developing & Developed Nations

Developed

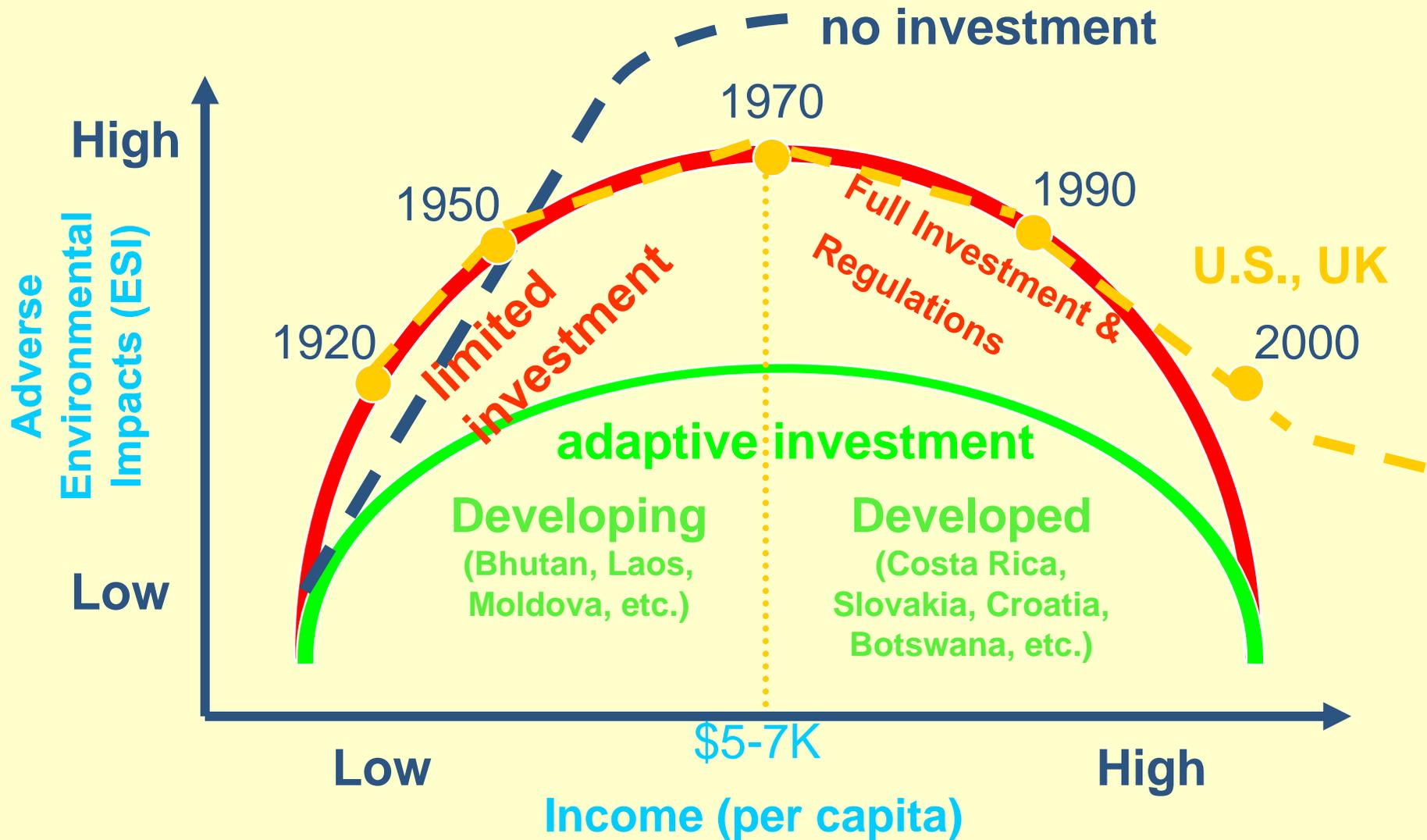
- Comprehensive planning
- Resource use efficiency
- Regulatory/Legal focus
- Flood control, navigation, multipurpose storage
- Private Sector Investment
- Ecorestoration/biodiversity
- Watershed Mgmt/Protection
- Hazard Risk reduction plans
- Recreation & Esthetics
- Transparency/Accountability
- Participatory planning
- Expensive technologies

Developing

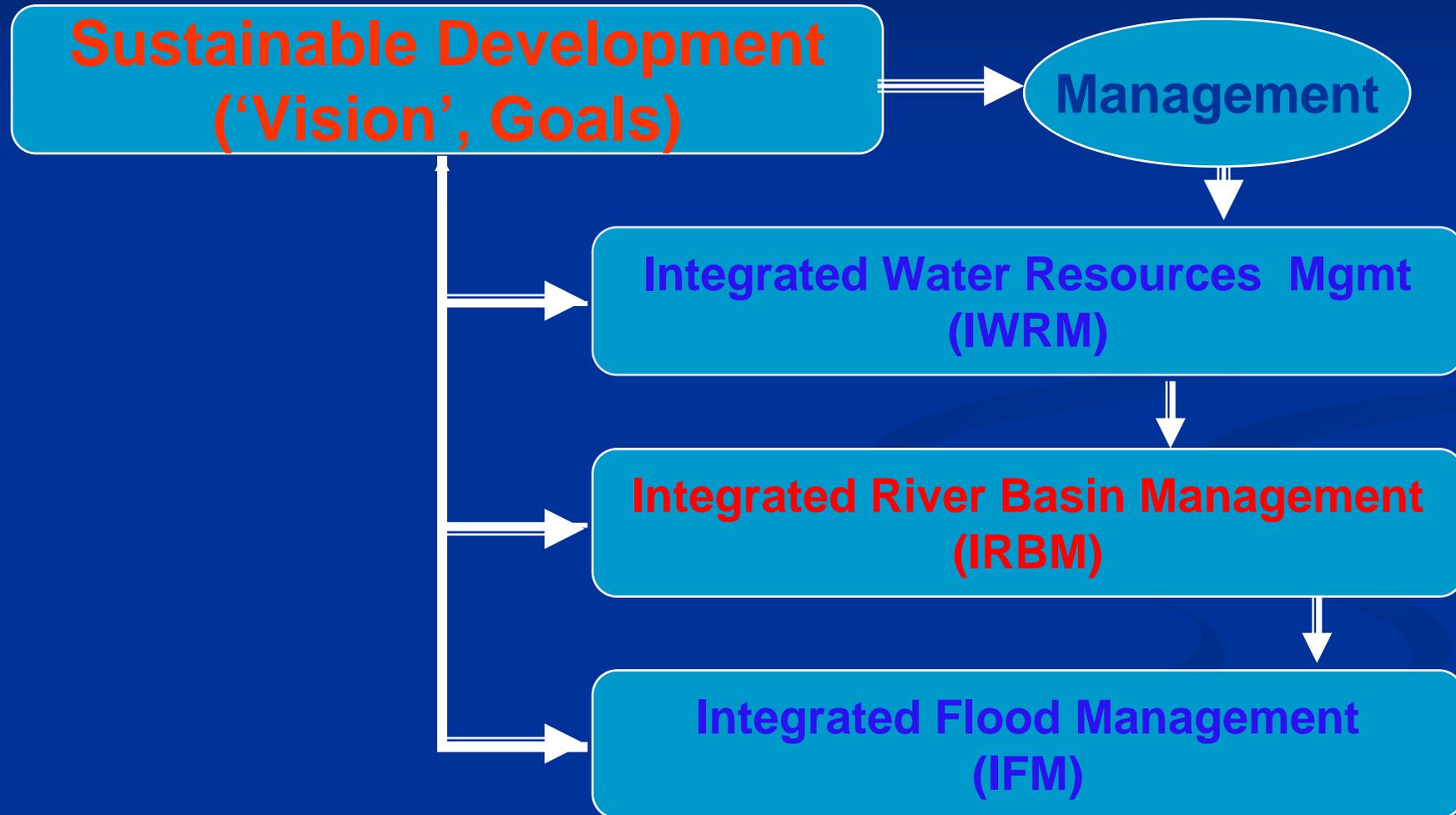
- Poverty reduction
- Access to clean water
- Women's roles promoted
- Irrigation/drainage
- Water Supply/Sanitation
- Public sector investment
- Waterborne diseases
- Rural Development
- Humanitarian disaster relief
- Water User associations for operation and maintenance
- "Appropriate" technologies

'The Kuznets curve':

(as investments increase for growth, reducing environmental quality, environmental impact first increases, then declines)



What is IRBM ?



CHECKS AND BALANCES OF IWRM Management

Ministry
Agency
Budgets
Project Approval
Planning Initiatives
Policies

PARLIAMENTARY
COMMITTEES

National Water Policy
National Environmental Policy
National Energy Policy
National Agricultural Policy
National Transport Policy

National Water Resources
Council (of Ministers)

Agriculture
Energy
Environment
Trade
Economics
Finance

**“Apex” National Water
Resources Planning and
Policy Organization“**

•Water Policy
•Water Code
•National Water Management
Planning
•Project Review
•Database Integration

Implement
Programs
Projects

Secretariat
Support

MINISTRIES,
STATES

MULTISECTORAL
APPROACH

POLICY FORMULATION
•Incentives
•Subsidies
•Regulations

PLANNING/
DESIGN

IMPLEMENTATION
CONSTRUCTION

MANAGEMENT
OPERATIONS
MAINTENANCE

REGULATORY
•Permits
•Cadaster

•Universities
•National
Academy
•Technical
Institutes
•Consultants

•NGO's
•States
•Municipalities

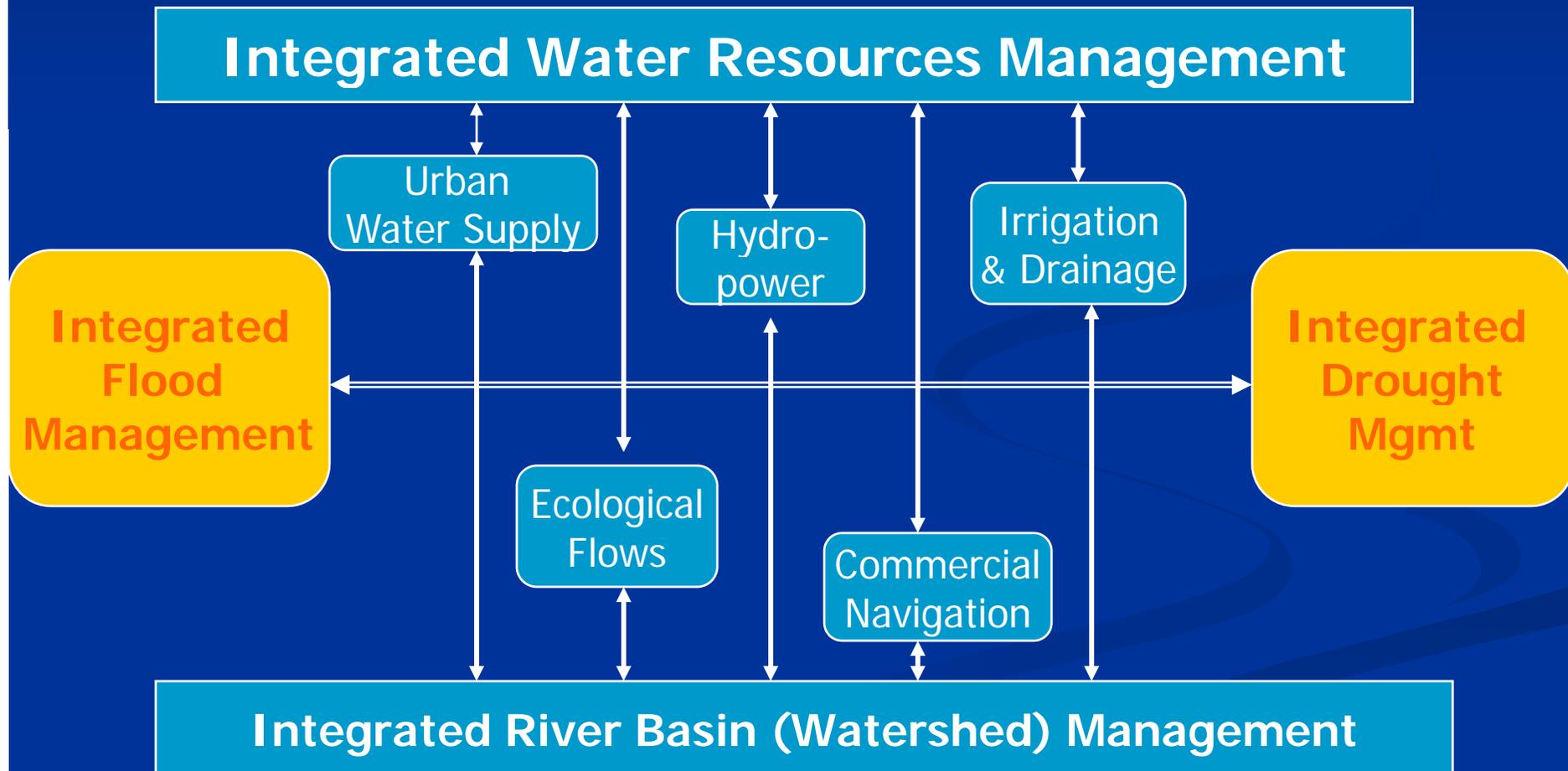
River Basin Commissions
Watershed Councils

•Set priorities consistent with
policies, goals
•Permits, allocation
•Regional planning
•Water demand/ availability

*Horizontal
INTEGRATION*



Horizontal Integration among Sectors



Types of River Basin Organizations

- **Advisory Committees** (formally established, representative orgs; advice, coordination, information exchange)
- **Associations** (citizen-initiated; advisory)
- **Councils** (legally established citizen advisory)
- **Authorities** (makes planning decisions, set regulations, enforces regs, revenues, projects)
- **Commissions** (formally delegated to make decisions to manage and veto)

IJC, DRBC, MRC, M-DRBC, Ohio Sanitation, Tarim RBC

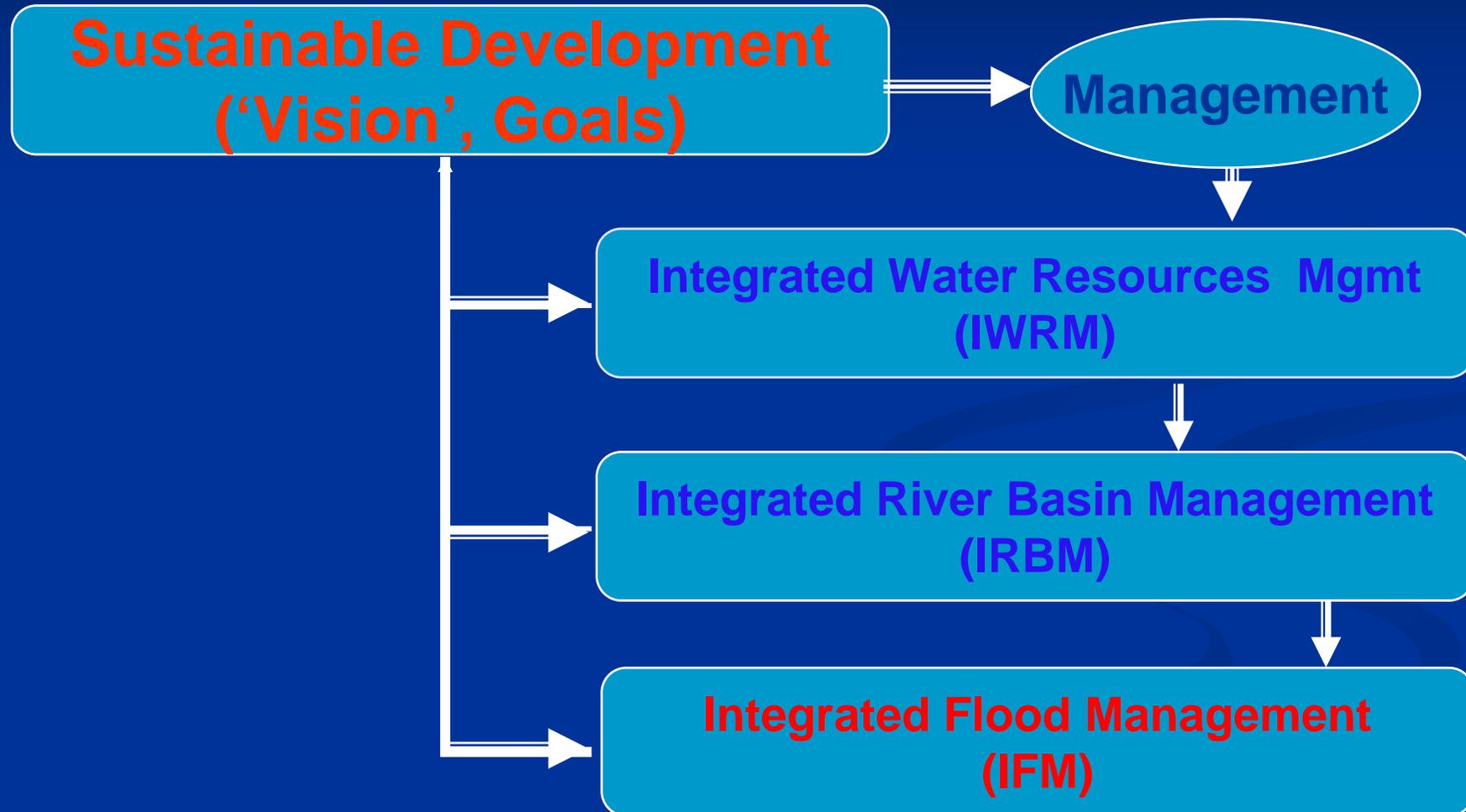
Functions of RBO's

- Coordination among many users and Ministries
- Strategic planning
- Planning, evaluating new projects
- Regulating water abstractions, use
- Licensing
- Revenue generation (fees, charges, taxes)
- Managing water allocation, distribution
- Managing, maintaining infrastructure
- Data collection, Monitoring
- Research
- Dispute resolution

Checklist for RBO's

1. **Defining the role of the organization** – why it exists and what is its mandate?
2. **Planning performance** – what it intends to do?
3. **Developing organizational strategies** – how it will carry out its plans?
4. **Allocating resources** – matching the staff, technology, systems, and the budget to the plans and strategies?
5. **People management** – how to develop and maintain staff skills for high performance?
6. **Resource control** – how to keep track of what is spent and what is achieved?
7. **Public accountability and transparency** – reporting results in an open and transparent way
8. **Review and evaluation** – determining whether plans are being realized and identifying improvements that can be made.

What is IFM ?





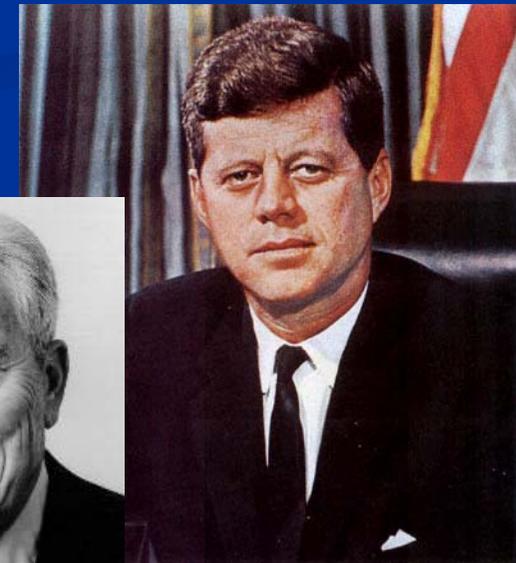
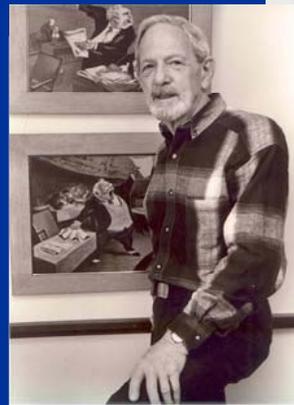
Gilbert White – “Human
Adjustments to Floods”
(1945)

*“Floods are Acts of God, but
flood losses are largely acts of
man”*

(who’s in charge of land use planning?)

Evolution of Comprehensive Planning & IWRM in the US

- 1958-61 Harvard Water Program
- 1962 Design of Water Resources Systems (Maass, et.al.)
- 1965 Water Resources Planning Act
 - Basin Planning Commissions
 - Principles and Standards
 - Water Resources Council



US Flood Policy Development & Non-Structural Floodplain Management

- Gilbert White, 1945 Dissertation
- Executive Order 11988, *Floodplain Mgmt* (1977)
- P&S requirement for nonstructural plan (1980)
- Water Resources Development Act (WRDA1986)
- Unified Nat'l Prog for Floodplain Mgmt (1992)
- Upper Miss R. Flood (1993)
- “Galloway Committee” Report (1994)
- “Challenge 21” Legislation (WRDA 99)
- Response to Katrina (2005- 08) – ‘Fair’

PRINCIPLES: Unified National Flood Plain Management Program

- **Modify Human Susceptibility to Flood Damage** (*relocation, flood warning forecasting, disaster preparedness, assistance, land acquisition, etc.*)
- **Modify Impact of Flooding on People and Communities** (*emergency response, flood recovery*)
- **Preserve and Restore Natural Floodplain Resources** (*land acquisition, restore habitats*)
- **Modify Flooding** (*dams, dikes, detention basins*)

“CHALLENGE 21”

- WRDA 99 (PL 106-53), Section 212: *“Flood Mitigation and Riverine Restoration Program”*
- ***“...projects to reduce flood hazards and restore the natural functions and values of U.S. rivers”***
- *“...studies and projects shall emphasize, to the maximum extent practicable, nonstructural approaches to preventing or reducing flood damages”*
- ***ensure the restoration of natural functions and values of floodplains.***

WMO/IFM/IFI FOCUS AREAS

FLOOD RISK MANAGEMENT

- Multi-hazard analysis
- Data for risk assessment
- Hydrologic, hydraulic and economic modeling
 - Flood hazard mapping
- Structural and non-structural measures

VULNERABILITY

- Methodologies to account for multiple stressors
- Estimating social, political, health, and ecological impacts
- Estimating economic impacts including benefits of floods
 - Mechanisms (including financial) to increase coping capacity and resilience
 - Indicator development

EARLY WARNING AND EMERGENCY MANAGEMENT

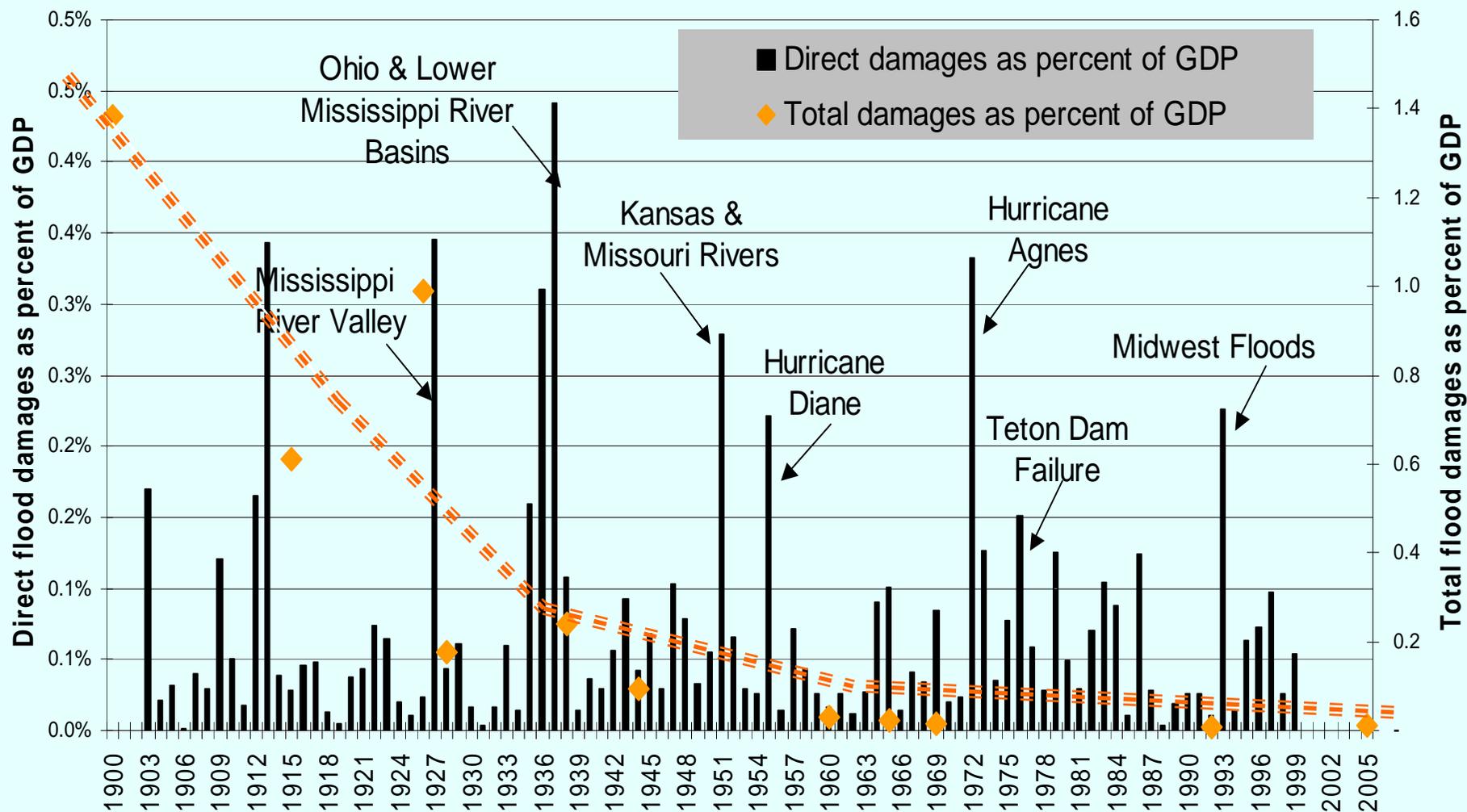
- Effective forecasting and early warning
 - Effective communication
 - Preparedness
 - Response to warning

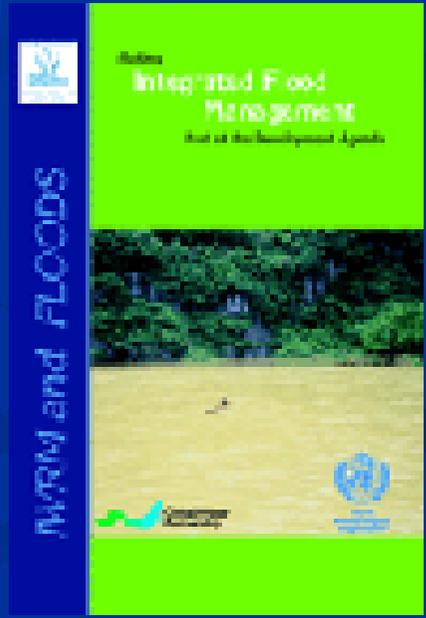
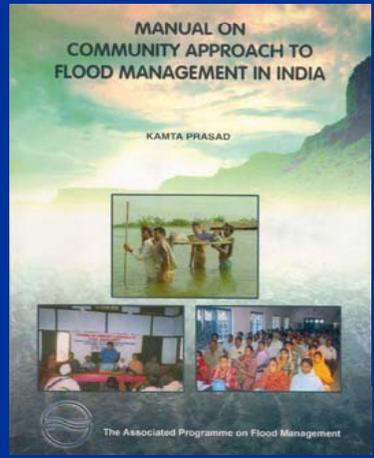
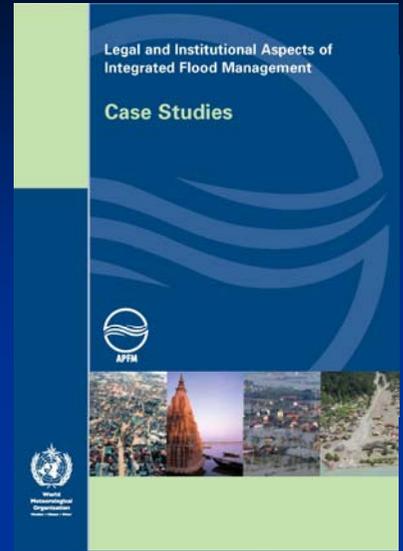
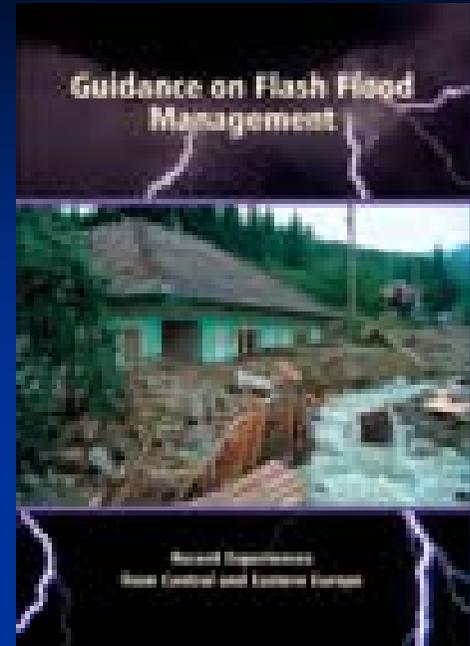
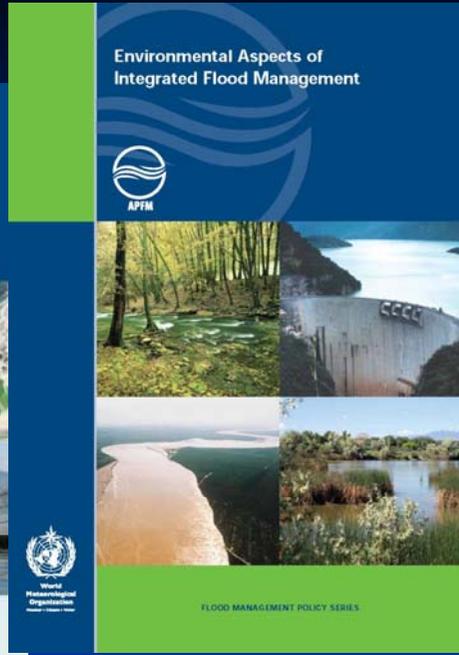
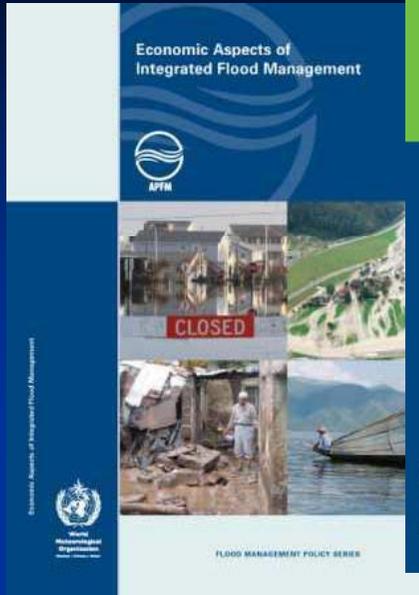
GOVERNANCE AND PARTICIPATION

- People networking
- Institutional reform
- Developing stakeholder processes

Flood Damages as Percent of GDP

(Based on damages and GDP data in 2000 dollars)





Implications for IHP-VII/ICHARM ?

- What are the scientific/technical issues that jump out of the Katrina event? For ICHARM ?
 - Flood warning/evacuation/recovery planning
 - Risk-cost based standards vs. deterministic standards (PMF, PMH, SPF or .01, .001, .0001)?
 - **Risk and reliability analysis & communication**
 - Role of public participatory processes in decision making and setting of safety standards
 - Role of governance/institutions/consensus
 - **Subsidiarity, 'LOCALISM'**
 - FOCUS on HORIZONTAL IWRM/IRBM/IFM

Finis-Thanks

(Questions?)



ICIWaRM - Program Goals



Undertake **capacity-development** focusing on training for implementing IWRM at both watershed and national levels, particularly in Latin America, Africa & Asia, working closely in collaboration among UNESCO centers towards joint problem-solving.

Capacity Development

Water Education

IWRM Practice

BMP'S

Contribute to the development & **advocacy of IWRM principles and best management practices**, focusing on institutional, engineering, planning and evaluation issues.

ICIWaRM:
*International
Center for Integrated
Water Resources
Management*

Foster research, tech development and **technology transfer** of models and methods that enhance IWRM .

Water Science

Technology Transfer

Focus of ICIWaRM

- **Practical science, applied research and technology embodied in IHP-VII programme** which can be readily transferred to improve IWRM and sustainable development (SD) and contribute towards meeting MDGs and goals of other related UN and complementary programs.
- Actively partner and support **existing IHP programs**, e.g., IFI, WWAP, HELP, FRIEND, ISI, ISARM, etc, which serve to implement IHP-VII programmatic objectives that are related to attaining IWRM objectives.
- Foster collaborations for joint, applied research, capacity-building and training **programs through existing UNESCO Centers** and established IHP programs, on a global basis, but with an initial emphasis on the Western Hemisphere – Latin America and the Caribbean, and in Africa.
- Major emphasis on **water education**, training, capacity building, and technology transfer.
- Concentrate on IWRM principles, **best management practices (BMP's)**, proven technologies to further **multi-purpose, multi-sectoral, multi-objective approaches** to solving water resources management problems.

ICIWaRM Core Organizations and Partners



 The Nature Conservancy

 Global Water Partnership

 USA Institute for Water Resources (IWR)

 Professional Practice / NGO Sector

 Water Science / Academic Sector

 Participating Universities - IWRM Masters Degree Program