Integrated River Basin Management
IRBM

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Guy Alaerts
May 2005
1. Clear and strong institutional arrangements

2. Good water-related data, information, systems, and models

3. A complete suite of basin-wide policies, procedures, and strategies

4. An appropriate form of communication and participation for all basin stakeholders and partners

5. Basin sustainability performance indicators and an agreed approach to monitor and report on how the basin is being managed and how the resources are being consumed and protected
1. Concepts and Institutions

- **IRBM is often a new concept, can be very different from existing arrangements:**

  - 20\textsuperscript{th} century: Develop!
  
  - 21\textsuperscript{st} century: Manage sustainably!

- From **Development** (construction)
  
  to **Management** (balancing supply, and competitive uses)

- Integration of economic, social, environmental, technical, up-river and down-river

- Civil engineering versus multi-disciplinary

- From **Hierarchical** to **Inclusive** (⇒ local govt/comm)
The Tarim basin (China) -- 1,035,500 km²
Tarim River Basin (China, Xinjiang Province): Conventional == Top-down
Tarim River Basin: After management-focused un-bundling

- **Provincial Governor**
  - **Provincial Environment Bureau**
  - **Provincial Bureau of Mines**
  - **Provincial and District Water Resources Bureaux** (construction)
  - **Standing Committee Tarim Basin Commission** (policy and planning regarding ground and surface water; all users, incl. downstream ecosystems)
  - **Water User Associations:**
    - Irrigation
    - Industry
    - Water supply (assuming local O&M)
  - **User fees**
  - **Bulk Water Supply Company** (O&M of the river trunk, pricing, fee collection)
1. Concepts and Institutions

- Requires changes which may be resisted:
  - Right to complain, initiative, plan, coordinate, approve, decide
  - Fiscal shifts ➔ Budget raising & allocation ➔ works = $$
  - Water allocation = $$ and patronage
  - Delegate power to lower/regional authority (de-concentrate or de-centralize or un-bundle) OR
  - Delegate power to higher authority (federal countries, international basins) (centralize and un-bundle)
  - Always requires cooperative action
  - ➔ needs strong political drivers, a catalyst, & win-win outlook
1. Concepts and Institutions

- **Adopt the simplest institutional model**
  - RBO should not replace existing organizations if they are working efficiently (*subsidiarity principle*)
    - demonstrate it won’t, to avoid resistance
  - Adds value to everyone, & addresses weaknesses
1. Concepts and Institutions

Model selection

- Geographical coverage (small or large)
- Functions – institutional structure & decentralization extent depend on function
- Source of legitimacy and power (Council of Ministers; Council of Local govts; Agency established by national, federal, state, local govt, ...)
- Management structure (inside or outside administration; corporatized; separate govt level, ...)
The Senegal basin (East Africa) -- 300,000 km²
Physical attributes of basin (urbanized / rural, wet / dry …)

Demand & supply structure in basin

Administrative structure of state

Dynamics of economic & social development

Institutional design principles

Cultural and political traditions
<table>
<thead>
<tr>
<th>Functions</th>
<th>New RBO</th>
<th>Adult RBO</th>
<th>Mature RBO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group 1:</strong> Water (&amp; natural resource) <strong>data collection</strong> &amp; processing, systems modeling, basic water &amp; natural resource <strong>planning</strong></td>
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<tr>
<td><strong>Group 2:</strong> Coordination, project feasibility, design, implementation, <strong>operation &amp; maintenance</strong>, raising funds</td>
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<tr>
<td><strong>Group 3:</strong> Allocating &amp; monitoring water shares (quality and quantity and possibly natural resource sharing), <strong>cost sharing</strong></td>
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<tr>
<td><strong>Group 4:</strong> Policy &amp; strategy development for economic, social &amp; environmental issues, community awareness &amp; participation</td>
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<tr>
<td><strong>Group 5:</strong> Guide water use &amp; shares, <strong>decide investment &amp; operation</strong>, monitoring pollution &amp; environmental conditions, oversight &amp; review role for projects promoted by RBO partners, monitoring and assessing the health of the basin’s natural resources, monitoring the ‘sustainability of resource management.'</td>
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</table>
## Finding the Balance: Trade-offs between conflicting RBO design principles

<table>
<thead>
<tr>
<th>Principle A</th>
<th>versus</th>
<th>Principle B</th>
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</table>
| • “Smaller is better” - Decentralize  
Devolve to lower levels to generate local ownership  
→ better cost recovery  
→ more responsive institutions  
• Separate regulatory & operational functions  
(create “checks and balances” and avoid monopolistic situations)  
• Unbundle operational activities  
  to autonomous, separately managed entities – some of which can be commercialized | • “Unity in command” - Centralize  
Consolidate at large scale  
→ optimal planning sector-wide  
→ lower transaction costs  
• “Seek economies of scale” to:  
  o Compensate lack of technical capacities  
  o Pool financing capacities  
  o Lower costs  
  o Internalize the externalities | • Do not earmark water-based revenues by basin – the decisions on economically optimum use of national income transcends the basin. “Rich basins should transfer funds to poor basins where the funds have a larger economic impact”.

• Earmark water-based revenues from inside a basin to improving water management in the basin  
  (“this is the only way to ensure that the costs associated with externalities such as pollution get addressed”)
<table>
<thead>
<tr>
<th><strong>“SECRETARIAT” TYPE</strong></th>
<th>HIGHER AUTH INITIATIV</th>
<th>TASK: POLICY AND COORD.</th>
<th>TASK: PLAN &amp; ALLOCAT</th>
<th>OPERAT TASK: FINANCE</th>
<th>OPERAT TASK: INFRASTR DEVEL.</th>
<th>STAKEHS PARTICIP/ SUPERVIZ</th>
<th>AWARENESS RAISING</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>International:</em> Rhine Commission</td>
<td>No</td>
<td>Yes</td>
<td>Minor</td>
<td>No</td>
<td>No</td>
<td>Represent from Govts.</td>
<td>Strong</td>
</tr>
<tr>
<td><em>International:</em> Danube Comma &amp; Environm Program</td>
<td>UN facilitation</td>
<td>Yes</td>
<td>Minor</td>
<td>No</td>
<td>No</td>
<td>Represent from Govts.</td>
<td>Links to NGOs</td>
</tr>
<tr>
<td><em>International:</em> Mekong River Commission</td>
<td>UN facilitation</td>
<td>Yes</td>
<td>Minor</td>
<td>No</td>
<td>No</td>
<td>Represent from Govts.</td>
<td>Yes</td>
</tr>
<tr>
<td><em>France:</em> Agences de l’eau</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Major</td>
<td>No</td>
<td>Basin Parliament</td>
<td>Local. represents</td>
</tr>
<tr>
<td><em>Australia:</em> Murray-Darling Comm.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Minor</td>
<td>State Govt. representatives</td>
<td>Strong</td>
</tr>
<tr>
<td><em>USA:</em> Delaware River Comm.</td>
<td>Court order</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Local Govt. representatives</td>
<td>Strong</td>
</tr>
<tr>
<td><em>USA:</em> ACT-ACF Compact</td>
<td>Federal facilitation</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>State Govt. representatives</td>
<td>Yes</td>
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<tr>
<td>“AGENCY” TYPE</td>
<td>HIGHER AUTH INITIATIV</td>
<td>TASK: POLICY AND COORD.</td>
<td>TASK: PLAN &amp; ALLOCAT</td>
<td>OPERAT TASK: FINANCE</td>
<td>OPERAT TASK: INFRAST DEVEL.</td>
<td>STAKEHS PARTICIP/ SUPERV</td>
<td>TASK: AWARENESS RAISING</td>
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<tr>
<td><strong>Netherlands: Water Boards</strong></td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Dikes, canals, WW trt.</td>
<td>Basin Elected Council</td>
<td>Strong</td>
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<tr>
<td><strong>Brazil: Paraíba do Sul</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Minor</td>
<td>No</td>
<td>Councils</td>
<td>Yes</td>
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<tr>
<td><strong>Brazil: Ceará state:</strong></td>
<td>Yes Strong</td>
<td>Yes Minor</td>
<td>Minor Yes</td>
<td>No Yes</td>
<td>No Canals, dams</td>
<td>Strong No</td>
<td>Yes No</td>
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<tr>
<td><em>Basin councils</em></td>
<td></td>
<td></td>
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<tr>
<td><em>State Water Deptt</em></td>
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<tr>
<td><strong>Mexico: Local Water Commissions</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Canals. Reservoirs. Pumps</td>
<td>State Govt. representatives</td>
<td>Strong</td>
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<tr>
<td><strong>Indonesia: Citarum and Brantas River Corporations</strong></td>
<td>Strong</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes O&amp;M</td>
<td>O&amp;M</td>
<td>Minor (deconcentrated corp.)</td>
<td>Yes</td>
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<tr>
<td><strong>Tennessee Valley Authority</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>POWER, dams, dikes</td>
<td>No</td>
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<tr>
<td><strong>United Kingdom (‘73-‘88): Water Authorities</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>WS, WW trt. Reservoirs. Dikes</td>
<td>Local Govt. representatives</td>
<td>Strong</td>
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</tbody>
</table>
2. Water-related Data and Info

- Type, quantity etc. of data to be prioritized, agreed upon and standardized

- Access and sharing of data is crucial (may need to be formalized through a specific protocol)

- Funds to be allocated
  - from central or decentralized budgets?

- Maximize use of technology (internet, remote sensing, ET, etc.) IF appropriate
2. Water-related Data and Info

- **Value:**
  - Informs about priority problems
  - Informs about the future issues and opportunities
  - "Sells" the message
  - Tool for communication and negotiation
  - Ensure level playing field (symmetry of information)
  - Informs operation: allocation, early warning, etc.

- **Impacts of development on key parameters should be known:** ecology, $$, jobs
2. Water-related Data and Info

- Modeling tools are essential for assessing strategic scenarios & development proposals (optimization; simulation of impacts)

- Equipment and skills maintenance are important – Agree on finance
Development scenarios

Baseline

Chinese dams

Low development

Embankments

Agriculture

High development
Fish habitat index

- Index of habitat available to fisheries
- Related to production.
- Wetting – drying.
- < 6 months
Results of Fish Habitat Index in Mekong basin in High Development Scenario

<table>
<thead>
<tr>
<th>Year</th>
<th>Index for baseline year '000 days.km²</th>
<th>% change from baseline scenario</th>
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<tr>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>1996</td>
<td>2,868</td>
<td>-3</td>
</tr>
<tr>
<td>1997</td>
<td>2,598</td>
<td>-3</td>
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<tr>
<td>1998</td>
<td>1,607</td>
<td>-9</td>
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<tr>
<td>1999</td>
<td>2,552</td>
<td>-4</td>
</tr>
<tr>
<td>2000</td>
<td>3,140</td>
<td>-2</td>
</tr>
</tbody>
</table>
Mekong delta: Changes in areas suffering salinity intrusion due to development scenarios

Difference in areas with river salinity above critical threshold
- Green: Becomes available
- Red: Becomes unavailable

- Chinese dams
- Low development
- Embankments
- Agriculture
- High development

- Failure of many ‘master plans’ ➔ Move to strategic, policy and planning frameworks
- Cross-sectoral, integrated, sustainable for natural system, with high-level & political endorsement
- Economic, environmental and social data allow description of trade-offs

- Water shares, use rights, and utilization rules should be established upfront
- Decide on who should pay
  - Fiscal decentralization
  - Earmarked fees and charges for the RBO ...
- Top-down AND Bottom-up
IBRM Needs Both “Top-down” and “Bottom-up”

TOP DOWN

- Sustainable management and use of water and environmental protection require:
  - Establishment of policies, laws, institutions, and regulations;
  - Definition of water availability and determination of broad water allocations within river basins and aquifers;
  - Setting quality standards;
  - Cooperation - cross-sectoral and inter-provincial and up/downstream - river basin and/or aquifer level.
IBRM Needs Both “Top-down” and “Bottom-up”

**BOTTOM UP**

- More buy-in at the local govt level – who **co-pay**
- Improve water use efficiency, water conservation and pollution control—**act locally**
- Transparent volumetric water charging & local govt budget allocation—**cost recovery**
- IRBM depends on local **land use planning**
- Educate and mobilize water users; incorporate their views and contribution into planning and management processes
The Murray Darling Basin (Australia) -- 1,061,469 km²
“Top-down” and “Bottom-up” Murray-Darling basin: New South Wales
Do We Rather Need A Bipolar Model?

State of New South Wales

Catchment Management Committees
VERY LOCAL, Sub-catchments

Murray Darling Basin Commission
VERY BIG COVERAGE

BUT: lack of professionals
4. Communication and Participation

- Critical: awareness raising to create broad political support, locally and centrally
- Critical: Local leaders and champions
- Key information to be disseminated
- Communication is two-way street: not just “telling”, also listening and respecting
The Delfland water board (Netherlands) – 410 km²
5. Monitoring and Assessing Sustainability

- Performance indicators are essential (even if preliminary or interim)
- A basin resources inventory helps define hot-spot areas and priorities
- Results should be distributed, and feedback obtained → demonstrate win-win, maintain broad political support from local communities
6. Final Touches

- Management is serious business:
  - organizational strategy development
  - human resources management
  - performance review and evaluation

- RBO staff must be aware of the vision and the goals

- Leaders should be seen and heard
Managerial autonomy

Autonomy from central government

TVATVA
France
Mexico
Netherlands
Wolga
How to get there ...

- Ownership of relevant parties throughout the process is needed ➔ build trust & demonstrate win-win
- Stakeholders from all sectors, constituencies
- Transparent, flexible, process, through continuous negotiation
- Grab window of opportunity – Analyze, and negotiate with resistance
- Process is shock-wise, often crisis-triggered
Planning Process for Creating an Effective and Efficient RBO

- **Mission Statement**
- **Vision Statement**
- **River Basin Organization Planning Process**
- **Key Results Areas**
- **Analysis of the human resource base**
- **Action plans and strategy**
- **Monitor and evaluate**
The Lerma-Chapala basin (Mexico) -- 54,421 km²
RBO development drivers:
Stakeholder Participation, and Efficiency

Added value / Performance / Sustainability

High

Stakeholder participation

Efficiency: capture of scale economies or commercialization

Netherlands Water Boards
Agences de l'eau
Murray Darling
Federaciones hydrograficas
Tennessee Valley Authority

Rhine
Danube
Mekong
Paraiba do Sul
Curu

China 7 River Basin Commissions
Mekong Delta

Zerafshan
Aral Sea
Wolga

Brantas
Tarim

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Mekong Delta

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Aral Sea
Wolga

Brantas
Tarim
Thank you

Questions
### RBO functions that are associated with successful arrangements

<table>
<thead>
<tr>
<th>Activity brought usually under:</th>
<th>Flood mitigation</th>
<th>Pollution control</th>
<th>Water allocation in arid basins</th>
<th>Watershed management and conservation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Central government</strong></td>
<td>Large structures and coastal defenses</td>
<td>(Usually co-finances and regulates)</td>
<td>Depends on which government level owns the water according to Constitution</td>
<td>(Usually co-finances and regulates)</td>
</tr>
<tr>
<td><strong>Regional RBO</strong></td>
<td>Medium and small structures</td>
<td>Yes</td>
<td></td>
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<tr>
<td><strong>Local/regional government</strong></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
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<tr>
<td>River basin org key functions:</td>
<td>a primarily coordinative and “council” function</td>
<td>a coordinative, “council” and financing function</td>
<td>a “council”, financing and strong executive function</td>
<td>a financing and strong executive function</td>
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<td></td>
<td>2. For execution: local orgs</td>
<td>2. Basin org for (co-) financing</td>
<td>2. For execution: local agencies</td>
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<td></td>
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<td>3. For execution: local agencies</td>
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</table>
The bottom line:
Three partners – Two driving forces – One principle

- Three partner-institutions:
  - The RBO proper
  - The “Council”
  - The existing (public works etc) agencies

- Two driving forces for development:
  - Stakeholder participation (and oversight)
  - Organizational efficiency

- One principle:
  - No “model” – seek what adds value and works