

## Chapter 5. Planning and decision making for integrated water management (30 problems)

### Integrated water resources management (IWRM)

#### Definition of IWRM

In Chapter 5 of the WMH, two definitions of IWRM are presented:

<b>Global Water Partnership's definition</b>	<b>Author's definition</b>
IWRM coordinates development and management of water, land and other resources to improve economic and social welfare, social equity, and sustainability of the environment.	A framework for planning, organizing and controlling water systems to balance all relevant views and goals of stakeholders.

Problem:

Give your opinion of these two definitions and whether either one fully captures the concepts behind IWRM.

Solution:

It might seem like an exercise in semantics to define IWRM, but the concept represents a serious attempt on the part of the international community to define and explain the concepts needed in a broad and comprehensive approach to managing water. The GWP's "definition" seems more like an explanation than a concise definition, and can be criticized as being too broad. The author's definition is shorter and can be criticized for not being comprehensive or broad enough. The lesson is that when a concept embodies many issues, it is difficult to explain it or to give a concise definition, and when different groups get together, they will inevitably see it in different ways. This is the case with IWRM.

#### Elements of IWRM

Problem:

This table shows integration elements that can be considered in water management. Give examples of integrated management situations that might apply in each category:

<b>Integration element</b>	<b>Examples of integrated management</b>
Policy integration	
Water sector integration	
Coordination among government units	
Coordination among levels in an organization	
Coordination among	

functions of management	
Coordination among geographic units	
Coordination during time of phases of management	
Coordination among disciplines and professions	

Solution: (others are possible too).

<b>Integration element</b>	<b>Examples of integrated management</b>
Policy integration	Water, energy and environmental policy may be coordinated by a law.
Water sector integration	At the local level, a public service authority may combine water supply and wastewater management.
Coordination among government units	EPA delegates authority to operate wastewater permit programs to state governments.
Coordination among levels in an organization	Monitoring programs might be executed by operational staff for reporting requirements of the utility.
Coordination among functions of management	Engineering and financial staff of a water utility should work together on the capital improvement program.
Coordination among geographic units	A water district may provide raw water to a number of local ditch companies and coordinates their use of water.
Coordination during time of phases of management	Operating staff of a water utility collect information used by planners to develop the capital improvement program.
Coordination among disciplines and professions	Engineers, lawyers, and economists work together on a water law.

## **Process of water resources planning**

### Coordination mechanism

Problem:

The Apalachicola-Chattahoochee-Flint river system in Georgia is a basin with abundant water resources, but growth of Atlanta, environmental concerns, fragmented local-state-federal interests, regional competition, interest group advocacy and political involvement create conditions for conflict rather than cooperation. Potential coordinating mechanisms include: interstate compact commissions, interstate councils, basin interagency committees, federal-interstate compact commissions, federal regional agencies, and a single federal administrator. Prepare a policy paper to assess the advantages and disadvantages of each type of coordinating mechanism to resolve the conflicts.

Problem:

Can river basin management be carried out without a central authority or "czar" to make decisions? If so, how?

### Commitment to solution

Problem:

One of the important steps in planning "process" is to be sure there is a commitment to solve the problem at hand. Explain why commitment is so important before effort and money is invested in planning.

Solution:

Planners are aware that their work may not always be implemented and there are plenty of jokes about plans going "on the shelf," rather than being used. One reason for this is that organizations may "go through the motions" to fulfill some requirement, but not have a commitment to implement a plan. This can usually be determined on the front end of the planning process to make it more effective.

### Environmental impact statement

Problem:

Explain how the EIS relates to the planning process for water resources development.

### Hydropower planning

Problem:

Power producers may negotiate with environmentalists during the "FERC relicensing process." What is FERC and how does it have jurisdiction? In your opinion, is the relicensing process an effective venue for comprehensive planning?

### Maintenance planning for joint use facilities

Problem:

If a regional flood control program included facilities with joint use such as recreation in flood plains, detention ponds, trails and the like, how would you suggest the program for maintenance be organized?

Solution: Either a central agency, such as the flood control agency, can be assigned the maintenance or a new entity can be organized to perform or contract out the maintenance. In any case, having an effective maintenance program is essential.

### Maintenance planning for levees

Problem:

Levees are flood control facilities that serve many people in dispersed locations. Who should have responsibility to maintain them?

Solution: Building a levee is inherently a risky decision because if it is neglected and fails, many people pay the price. Thus, before an agency gets permission to build a levee, the responsibility for maintenance should be fixed.

## Water Resources Planning Act (WRPA)

### Provisions of WRPA

Problem:

What were the main provisions of the WRPA?

Solution:

The Water Resources Planning Act (WRPA) provided for:

- Establishment of a government Water Resources Council
- Establishment of Principles and Standards for water resources plans
- Periodic national water assessments
- Support for state planning programs
- River basin (level B) studies

### Levels of planning

Problem:

Explain and give examples of what is meant by Level A, Level B and Level C planning.

### River basin commissions

The WRPA created a number of river basin commissions (RBCs), but most were dismantled. Several Latin American countries are now adopting systems of river basin commissions. Explain how provisions such as those in the WRPA would apply to these countries.

Solution:

<b>WRPA provision</b>	<b>How it applies to a nation with RBCs</b>
Government Water Resources Council	Ministries or cabinet departments of a national government develop policies that must be coordinated so guidance to the RBCs can be given.
Principles and Standards for water resources plans	RBCs range from sophisticated to non-sophisticated, and they need guidance and standardization.
National water assessments	National governments need scorecards on how their water is doing.
Support for state planning programs	RBCs operate within the context of regional or state governments,
River basin (level B) studies	The river basin studies form the technical basis for the RBC programs.

The fact that the US commissions were dismantled does not mean that the same approach will not be more effective in Latin America.

### Principles and standards in the WRPA

Problem:

In the Water Resources Planning Act's "Principles and Standards" for water resources planning, what were the four "accounts" for analysis of costs and benefits?

Solution:

National economic development, environmental impacts, social equity, and regional development.

### Lessons of WRPA

Problem:

What lessons can be drawn from the experience with the Water Resources Planning Act?

Solution: Many lessons can be drawn. One is about how government functions to handle inter-sectoral problems, such as water. The lesson is that sectoral departments will seek power in their own domains and not cooperate to solve shared problems, unless there is strong leadership by the executive power, in this case the President of the US.

### **Evaluation of feasibility**

#### Benefit-cost analysis

Problem:

Explain why benefit cost analysis is not totally adequate for water planning and project evaluation.

Solution: In its narrow interpretation, benefit-cost analysis does not consider social and environmental accounts.

Problem:

For each category of the six tests of feasibility (economic, financial, political, environmental, social, technical) give one example of a benefit and one example of a cost for a hypothetical dam construction project.

Solution:

	<b>Benefit (+)</b>	<b>Cost (-)</b>
Economic	Flood control benefits	High maintenance cost
Financial	Money is available	Money is not available
Political	Project will unify region	Project is divisive
Environmental	Project improves habitat	Project eliminates habitat
Social	Project improves local community	Project requires relocation of homes
Technical	Project easy to construct	Difficult construction conditions

### Mega-projects

Problem:

In your opinion, is a "megaproject" like China's Three Gorges Dam a good thing?

Solution: this is a very complex question, of course, and there is no universally-correct answer. Arguments for it are that it provides many benefits (such as navigation and power) at impressive economies of scale. Arguments against it are that it has heavy economic, social, and environmental impacts.

### **State water plans**

Problem:

What should be the role of state government in water resources planning? Should a state have a “State Water Plan?” Which agency should develop a state water plan? What process should be followed to develop a state water plan?

Solution:

Obviously, this is a complex set of questions. Generally, state government is a coordinating and regulating level, rather than an implementing level of government water actions. By preparing a plan, a state government can fulfill a useful coordinating role. A large state, like California, will have a more general plan. A small state, like Maryland, would focus on different topics of concern. Usually, the natural resources agency will develop the plan. The process should be broadly participatory, in the spirit of the coordinating purpose of the plan.

### **Rational and political planning models**

#### Steps in planning process

Problem:

The “rational planning model” is, in reality, a series of general steps for problem solving. For the scenario where a lake is polluted by inappropriate land uses in its drainage basin, give examples of each of the steps in the planning process:

<b>Step in planning process</b>	<b>Tasks to be done</b>
Problem identification	
Goal-setting	
Assembly of information on options	
Evaluation of options	
Decision making	
Implementation	
Operations and control phase	

Solution:

<b>Step in planning process</b>	<b>Tasks to be done</b>
Problem identification	Assess how polluted the lake is and what the causes are
Goal-setting	Set goals for how clean the lake should be and how

	cleanliness levels will be measured
Assembly of information on options	Identify options for solutions and characterize them
Evaluation of options	Evaluate each option for costs and impacts
Decision making	Present the decision package to the decision maker
Implementation	Implement the recommended program
Operations and control phase	Operate and maintain the facilities and program elements

### Political process in planning

Problem:

The political model involves superimposing stakeholders on top of the rational process. Using Appendix C of the WMH, identify the five most important categories of stakeholders in this issue and describe the positions you would expect them to take.

Solution:

Stakeholders will vary according to the local situation, but some that are likely in this case are:

Federal or state water agencies, including EPA	Local offices will enforce rules and policies, might be a source of a planning grant
Local governments	Local governments might draw water or discharge wastewater into the lake, want to protect their rights and interests
Farmers and irrigators	Might feel threatened by potential regulations
Recreation interests	Might either be against regulation of land use or want to put pressure to get lake cleaned up
Land owners around the lake	Might either feel threatened by potential regulations or be upset by pollution

### **Decision scenarios**

#### Controversial issues

Problem:

For each decision scenario listed in the table, list one issue that might be controversial and require the manager to work with stakeholder groups to resolve it.

<b>Scenario</b>	<b>Controversial issue</b>
Build or renew a capital facility	
Obtain water supplies	
Capital programming and budgeting	
Obtain funds for capital or operating programs	
Reservoir operation	
Treatment plant operation	

Water distribution system operation	
Irrigation system operation	
Emergency planning and security	
Monitoring water source systems for operations	
Set a rule	
Issue a permit	
Allocate supply or ration uses	
Enforcement action	
Operate a regulatory monitoring program	
Regulate land use in flood plain	
Planning and budgeting	
Setting rates and charges	
Controlling expenditures	

Solution:

<b>Scenario</b>	<b>Controversial issue</b>
Build or renew a capital facility	Building a dam always creates controversy
Obtain water supplies	An interbasin transfer can be highly controversial
Capital programming and budgeting	A capital improvement program may bring out protesters against public spending
Obtain funds for capital or operating programs	New capital charges such as tap-on charges may be opposed within the community
Reservoir operation	Operating a reservoir draws environmental opposition
Treatment plant operation	Operating a water or wastewater treatment plant is a technical issue and usually only draws attention from well-informed groups, who may protest a treatment goal such as chlorination
Water distribution system operation	A water distribution system may have pressure that is too high or low to suit some groups
Irrigation system operation	Irrigators may not be happy with plans for water delivery
Emergency planning and security	Emergency plans usually do not draw scrutiny until an emergency happens, but an issue might be the schedule to reduce water service to respond to a drought
Monitoring water source systems for operations	System monitoring will usually draw attention only from well-informed groups, but they might object to lack of inclusion for certain contaminants or issues
Set a rule	Rule making draws attention from interest groups who may be affected, for example, a rule to re-classify a stream to accept a wastewater treatment plant will draw protests from local land owners

Issue a permit	A decision to issue a permit might draw protests from the applicant who considers the conditions too stringent
Allocate supply or ration uses	Allocating supplies during a time of shortage is inherently a controversial process
Enforcement action	Enforcement action will be controversial to those who receive a penalty or may seem to lenient to others
Operate a regulatory monitoring program	Regulatory monitoring systems are not well-understood by the public but might be opposed or supported by those regulated
Regulate land use in flood plain	Land owners in a flood plain may oppose regulation if it affects their property values
Planning and budgeting	The operating budget may be opposed if it introduces higher rates or includes unpopular programs
Setting rates and charges	Rate increases are always unpopular
Controlling expenditures	Cost control programs may affect jobs and contracts and be controversial

## Principles for water management

### Examples of effective management principles

Problem:

For each of the following “principles” for effective water management, give one example of how it applies.

Use decision theory	
Use comprehensive framework for integration	
Coordinate, cooperate, and promote partnerships	
Manage on sustainable basis	
Use watershed and river basin focus	
Use water pricing	
Use enterprise approach to financing	
Separate service delivery and regulation	
Require local accountability, responsibility and capacity	
Use nonstructural approaches	
Minimize diversions	
Prevent pollution	
Manage risk	
Involve and inform leaders	

and the public	
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Solution:

Use decision theory	Any situation where options are identified and weighed is an application of decision theory, such as whether to build a reservoir or drill a well.
Use comprehensive framework for integration	When a stakeholder involvement process is used with full participation in decision making, it is a comprehensive framework.
Coordinate, cooperate, and promote partnerships	For example, a water utility could promote a regional solution to water supply, rather than a “go it alone” approach.
Manage on sustainable basis	A careful approach to environmental impact evaluation will lead to sustainable solutions.
Use watershed and river basin focus	Watershed forums for planning and coordination help to gain acceptance for water management actions.
Use water pricing	Use of incentives such as a conservation rate will achieve public purposes.
Use enterprise approach to financing	Make sure that user fees cover all of a utility’s costs.
Separate service delivery and regulation	Make sure that different groups regulate and provide services. This is often a problem in developing countries who are just getting organized.
Require local accountability, responsibility and capacity	An enterprise approach to management by a local community is an example of local accountability.
Use nonstructural approaches	Nonstructural approaches to flood plain management are widely used.
Minimize diversions	A water utility that emphasizes conservation and recycling will minimize diversions.
Prevent pollution	An education program for non-point source control will prevent some pollution.
Manage risk	A utility’s security and safety program is a risk management program.
Involve and inform leaders and the public	Public hearings with full disclosure of information is good management.

## Financial planning

### Financial and economic feasibility

Problem:

What is the difference between financial feasibility and economic feasibility in planning?

Solution:

Economics considers costs and benefits from a broad perspective. Finance considers ability to pay and who pays.

### Program budgeting

Problem:

Planning-Programming-Budgeting Systems (PPBS) were introduced during the 1960s as a tool to make government work better. Explain how PPBS fits into the process of river basin planning.

Solution:

In theory, a river basin *plan* would form the basis for the capital improvement *program*, which should be the basis for the capital *budget*. In practice, a difficulty arises because the plan is a shared product among governments and others, whereas a program and a budget usually relate to specific government units.

### Federal subsidies

Problem:

Earlier water projects were built with federal subsidies. Assuming these projects could be built today, how should they be financed?

Solution:

Project finance principles would assign as many costs as possible to the direct beneficiaries, and any contributions by federal or state governments would be decided through the political process.

### International lenders

Problem:

China's 3-Gorges dam project is of great significance to the country and to the international community. Discuss the process that international lenders should follow to consider lending money for such a project.

## **Environmental planning**

### Fragile environments

Problem:

The environment of South Florida is fragile. Describe the difficulties in providing an adequate and balanced water supply to the region as it experiences population Growth, and describe the water management approaches that will be necessary to mitigate the environmental problems.

### Instream flow policy

Problem:

Should instream flow requirements be included in a state water policy? Explain.

## **Politics in planning**

### Coordination in river basins

Problem:

How can water managers improve coordination in river basins when political decisions are made by cities, districts, states and federal agencies using jurisdictional boundaries that do not coincide with the river basins?

### Techniques to stop or support projects

Problem:

Suggest three techniques or laws that environmentalists might use to stop a water project and describe how water managers might respond to each to lead to a better project.

Problem:

A reservoir is being proposed for water supply, but environmental organizations plan to oppose it. Prepare a strategy memorandum outlining how you would either use the available law and planning process to succeed in or defeat plans to develop the reservoir. You may take the side of the project proponents or opponents. In the first case, prepare your strategy memorandum for the Board of Directors of the local Water Conservancy District, the water management district that would develop the project. In the second case, prepare your memo for the Board of the local environmental organization opposing development. Your memorandum should be a memo that assesses “issues and options” and provides policy recommendations for either organization. Consider the different aspects of water and environmental law that are available and all aspects of the planning process, including the issues of feasibility in the categories of: technology, finance, politics, law and environment.

Solution:

There is no model solution for the memos, but experience with this exercise in graduate classes shows that by preparing memos or staging debates the case for the environmental opposition groups is much easier to make and to present than that for the water conservancy district. So, the lesson is that water management organizations must work very hard to anticipate opposing points and prepare their advocacy cases.