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Network of Asian River Basin Organizations

# IWRM GUIDELINES

## at River Basin Level

**PART 2-I**

**THE GUIDELINES FOR IWRM COORDINATION**



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# I. Features and Structure of ‘the Guidelines for IWRM Coordination’

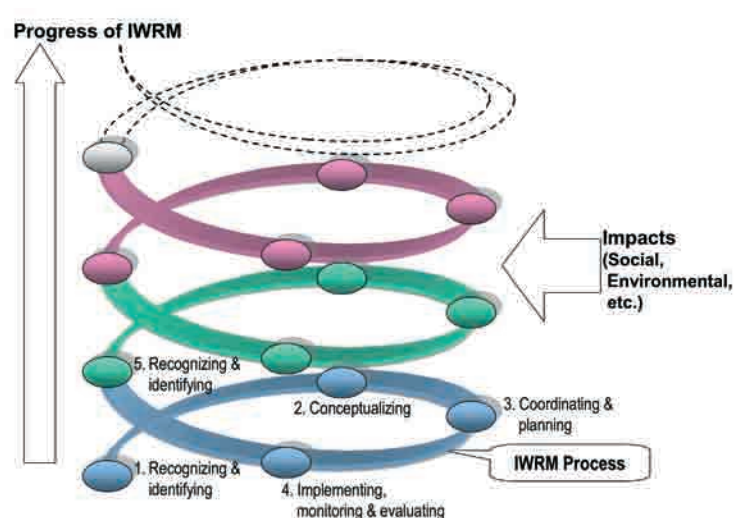
## I.1 FEATURES

‘The Guidelines for IWRM Coordination’ is intended for practitioners involved in IWRM coordination. It can be used as introductory guidance for those tackling IWRM for the first time, or as training material for intermediary practitioners and trainers of IWRM. For IWRM experts, it can be used as a reference guide to tackle the various issues and problems they face in their IWRM activities.

IWRM is a step-by-step process and takes time. By responding to changing social, economic and environmental needs or impacts, one can gradually achieve better and sustainable water resources management as if moving up a spiral, through such means as progressively developing water resources in the basin, building a more integrated institutional framework, or improving environmental sustainability. This set of Guidelines illustrates the dynamic and evolving process of IWRM in a river basin using a conceptual ‘IWRM Spiral’ model as shown in Fig. 1.1.

One turn of the spiral is equal to typical implementation of an IWRM approach: the ‘IWRM Process’. One moves up the spiral by implementing the IWRM process in the basin.

Further description of the ‘IWRM Spiral’ and ‘IWRM Process’ is provided in Chapter 4 of these Guidelines, which can be referred to as necessary.



■ Fig. 1.1 IWRM Spiral

## I.2 STRUCTURE

The Guidelines consists of five parts: Chapter 2/Sectoral Perspectives, Chapter 3/Key for Success, Chapter 4/IWRM Process, Chapter 5/Good Examples and Chapter 6/Useful Tools. These elements are linked by reference indices, which allow you to move from one to another in the way most convenient to you.

### Chapter 2/Sectoral Perspectives in IWRM

This section illustrates the principles of actions and interests of water-related sectors in water management and IWRM. Each sector values water and interacts with water differently. This section provides information on how individual water-related sectors

tend to think and act, how these sectors typically relate to water management and IWRM, and what they might want to convey to other sectors.

**Chapter 3/Key for Success**

A ‘Key for Success’ is a key that can be used in practice to help make IWRM succeed. It is a key to enable breakthroughs in challenging situations, opening the door to better IWRM. Many of them have already demonstrated their worth in practice. Some are generic, i.e. apply to every successful example of IWRM, others may apply only to specific situations, and some may not be in place as yet. It helps to find the key appropriate for the given circumstances of your basin IWRM process.

**Chapter 4/IWRM Process**

‘IWRM Process’ describes a typical process for IWRM implementation. It first describes the conceptual model of the ‘IWRM Spiral’, which is itself an evolving process. This is then followed by a schematic description of the ‘IWRM Process’ and its phases, which are linked to the relevant ‘Key for Success’. These help you to orient yourself through the process and serve as a map for find-

ing directions or the correct ‘key’ for enhancing water resources management.

**Chapter 5/Good Examples**

‘Good Examples’ includes best practice examples of IWRM at the river basin level in the forms of 1) case stories illustrating actual IWRM efforts, and 2) ‘Extracted Key for Success’ highlighting elements of success in enhancing IWRM, based on interviews with local resource persons conducted at the basin sites.

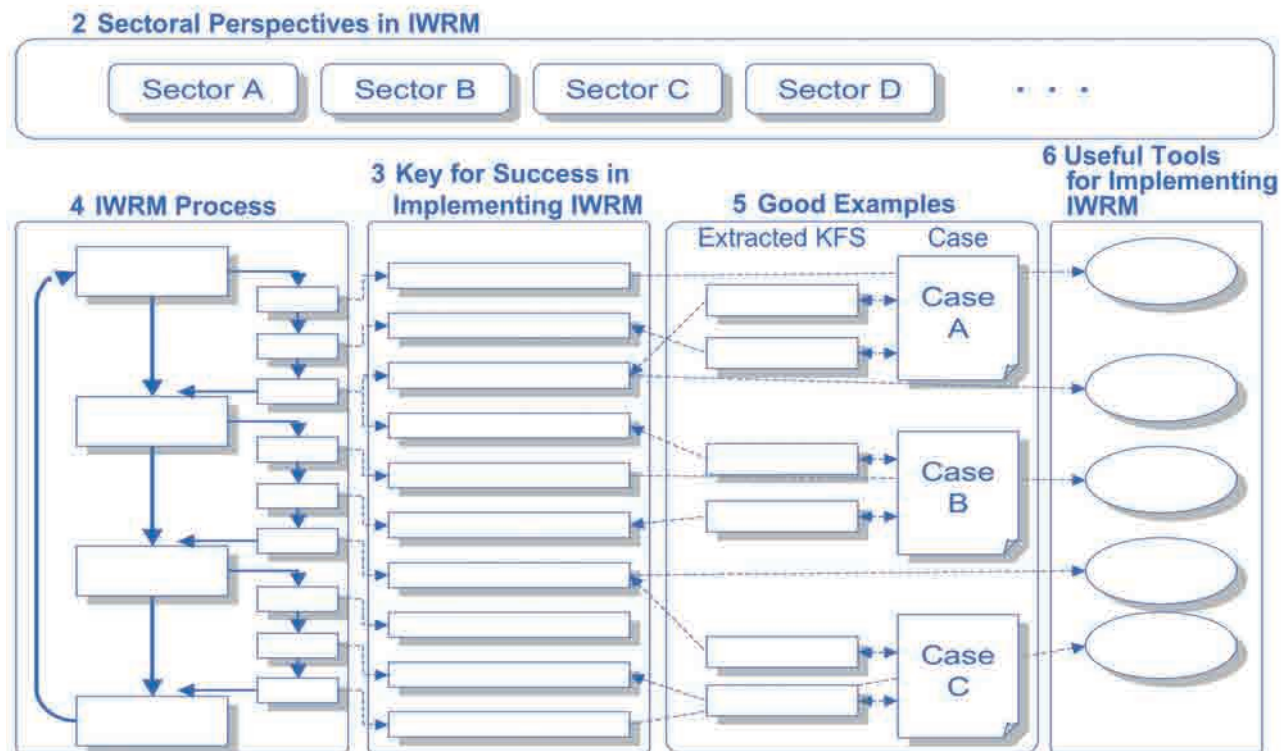
**Chapter 6/Useful Tools**

‘Useful Tools’ provide useful ideas/information that can be used in the application of keys for success.

The five elements below are linked in the document as shown below in Fig. –1.2

**IMPORTANT NOTE**

You do not have to read the entire document. This set of Guidelines is designed to enable you to skip to specific sections depending on your needs.



**Fig. 1.2** Structure of the Guidelines

## 2. Sectoral Perspectives in IWRM

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This chapter illustrates some of the typical perspectives of water-related sectors. The perspectives included here are not complete; however, they cover much of the information useful for IWRM coordination.

This chapter provides information on how individual water-related sectors tend to think and act, how the sector relates to water management and IWRM, and what the sector wants to convey to other sectors and the organization or persons responsible for coordinating IWRM efforts.

It is important to know the perspectives of other sectors when implementing IWRM. The same 1 m<sup>3</sup> of water is valued differently depending on the sector because each sector treats and uses water in different ways. Water is also valued differently depending on when and where it can be obtained, and at what quality.

### 2.1 GOOD-UNDERSTANDING OF SECTORAL PERSPECTIVES AND THEIR RELATIONSHIPS IS KEY FOR IWRM

Implementation of IWRM means proposing a plan to individual sectors – who tend to think of their own benefit as their first priority – that is close to their ideal plans, and obtain compromises by making proposals that present advantages to them. It is also important that as many sectors as possible are satisfied with the plan before a consensus is reached.

For this, managers in charge of coordination should not force his/her story on the sectors but should take a hor-

izontal approach to obtain the perspectives of the coordinated sectors, so as to deepen their level of understanding. The coordinators must understand the goals of the activities undertaken by the sectors or stakeholders, and how they relate to water resources and the basin in order to appropriately implement IWRM. Furthermore, good understanding by the coordinators on the benefits of IWRM to the individual sectors will facilitate efficient, appropriate and socially justifiable consensus-building. Thus, it is important to establish a good understanding of ‘sectoral perspectives’ in implementing IWRM.

### 2.2 WATER USERS’ PERSPECTIVES

#### 2.2.1 Agricultural Sector

- Primary concern is food production. Water is just an instrument.

##### 1. Interests of the agricultural sector

(Water for agricultural production)

Water, together with land, is only an instrument for agricultural production. The production outputs are food and ultimately revenues for the farmers. For farmers, water is a means of ensuring their living on their land.

(Sense of entitlement as a precedence user)

Agricultural sector has a history of investing and acquiring water before the concept of ‘water management’ even existed. Thus, there is a strong sense of entitlement that they can use their water exclusively.

(From close water sources to far water sources)

Agricultural water supplies used to acquire water

from close-by water sources; however, sectors eventually began to search for other water sources further from the farmland, which led to water resources development through dam-building.

In the monsoon regions of Asia, the amount of rainfall varies greatly during the wet season. Thus, in order to prepare for sudden droughts, they utilize groundwater, reservoirs or nearby rivers, and if they need more water they build dams upstream of the river. In arid and semi-arid regions, there is always a need for more water, but the search always begins with nearby water sources before seeking further away as water demand increases.

Thus, nearby water sources are utilized in most developing countries, but as development proceeds in the basin, larger infrastructures such as wide-area water transfers become necessary for obtaining adequate agricultural water.

(Agriculture as the fundamental industry of the country)

The agricultural sector contributes to national security through food production. The agricultural managers of the country and the region consider providing a stable supply of food for the region's most important objective. In developing countries, some consider that agriculture should be promoted in order to secure jobs and revenues in rural regions and prevent population concentration in urban cities. This cannot be realized without securing the water necessary for agriculture. The agricultural sector is also strongly influenced by national policies. Thus, it must be kept in mind that local coordination is sometimes not enough.

## 2. How other sectors may impact the agricultural sector

(Impacts by other water users)

- There is the possibility that irrigation users may not be able to obtain sufficient water if other water users draw water upstream. If a structure, such as an intake weir, is to be constructed by another water user upstream, that user will have physical advantages in drawing water, and thus the irrigation user will be opposed to such action.

(Impacts by flood management)

- When there is a risk of flooding due to increase in river discharge, drainage from agricultural land may be regu-

lated, and prolonged inundation of the fields may cause damage to the crops. The scale of anticipated damage is dependent on the duration of inundation, land use and type of crops. Coordination of drainage operation rules accounting for such factors will be necessary.

- When floodwater is temporarily stored in a reservoir to lower the flood discharge level, turbidity of water may persist even after the flood has subsided, depending on the nature of upstream sediment. If river water is used as irrigation water immediately after a flood event it may impact water use.

(Impacts by the environmental sector)

- The environmental sector demands that the agricultural sector minimize the impacts of agricultural production activity to the environment or requests alternate measures. For example, concrete channels for irrigation are conventionally designed in ways that are efficient from the economic standpoint. However, the environmental sector demands channels using more natural materials such as soil, rocks and wood. Considering environmental conservation may increase costs or maintenance needs.

(Impacts by the hydropower sector)

- Hydropower generation using dams discharges water according to electricity demands. Thus, it may cause large fluctuations in river flow downstream of the dam. It can also impact the stable intake or water quality of irrigation water.

## 3. Agricultural sector in relation to IWRM and the advantages of IWRM

- If the agricultural sector wishes to conduct a large infrastructure development, there is the possibility of significant cost reduction if the venture is jointly implemented with other sectors. Furthermore, the agricultural sector may gain forms of compensation if it reaches compromise with other sectors regarding the securing of water resources.
- By compromising on making decisions as regards water resources the agricultural sector may be able to receive compensation in another form, with the possibility of covering potential losses. Thus, it is important to issue proposals regarding agricultural production from a comprehensive standpoint.

- By uniting specific organizations or individuals in the agriculture sector, the sector can represent a significant amount of water resources. It can, therefore, facilitate the consensus-building process for IWRM implementation and enhance the benefits achieved by the entire agricultural sector.

## 2.2.2 Domestic Water Supply Sector

- Requires water quality on top of water quantity

### I. Interests of the domestic water supply sector

(Sanitation and domestic water supply)

Domestic water supply provides clean water to people in a stable manner and is highly public in its nature. Provision of safe drinking water may be normal in developed countries or cities but it is still a fundamental demand for sustaining the lives of people in developing countries and rural areas. Furthermore, water supply in these areas will lead to improvements in the social environment, such as less time fetching water, etc.

Provision of water supply in cities was originally developed from the viewpoint of crisis management in order to prevent water-related diseases. Supplied water may be 'drinkable' or 'not appropriate for drinking'. It is rare that water is 'drinkable' but in order to meet the needs of improving the sanitary environment, the provision of water that is not necessarily drinkable can be sufficient.

(No alternative for domestic water supply utility)

Current domestic water supply in cities does not provide an opportunity for users to choose their service. People have to use the available water supply in the area. There is probably no region where multiple water supply utilities compete (or a user can choose the water service).

Water pricing to collect initial investment and operation and maintenance costs depends on the area or utility; however, the water source available is often limited and regional differences in water pricing are inevitable and of little interest to the water supply sector. However, this issue is a primary concern for most water users.

(Privatization and water supply)

In the past there were movements to privatize water util-

ities to enhance profits. However, such movements have been revised to balance the public aspect of water utilities in meeting the social needs together with the business aspect of operation effectiveness and cost reduction.

(Water treatment technology and water source/water quality)

Before water treatment technology was developed to its current level, an important consideration for water sources for domestic water use was not only 'quantity' but 'quality'. Thus, groundwater was often utilized. River water was used if groundwater alone could not meet the demand. Before treatment technology was developed to its current level, the sector sought better quality water upstream of rivers. This often induced conflicts with existing water users downstream, but for the water sector it was important that good quality water was obtained as a water source. Furthermore, conventional water treatment by rapid filtration cannot treat dissolved substances.

In recent years - however - with advances in treatment technologies, water quality is no longer a major issue. It has now become possible to create drinking water from treated wastewater.

### 2. How other sectors may impact the domestic water supply sector

(Impacts by other water users)

- There is the possibility that a domestic water supplier may not be able to obtain sufficient water if other water users draw water upstream. If a structure, such as an intake weir, is to be constructed by another water user upstream, that user will have physical advantages in drawing water, and thus the domestic water supplier will be opposed to such action.

(Impacts by flood management)

- When floodwater is temporarily stored in a reservoir to lower the flood discharge level, turbidity of water may persist even after the flood has subsided, depending on the nature of upstream sediment. If river water is used for domestic water supply immediately after a flood event it may impact water use.

[New technologies and domestic water supply]  
 With the advancement of water treatment technologies such as membranes, the cost of water treatment is decreasing. With advanced and affordable technologies becoming newly available, water supply systems in developing countries now have the possibility of taking completely different approaches compared to developed countries where water resources have typically been secured through the construction of storage in upstream regions, etc.

(Impacts by the sewerage and drainage sector)

- A domestic water supplier will be affected if a drainage channel is connected, or effluent from wastewater treatment plant is discharged close to the intake location.
- Discharge water is often contaminated, thus the domestic water supplier sector would demand that any such discharge facility for drainage or a wastewater treatment plant be situated downstream of the intake location.
- Treated wastewater could in some cases be recycled and utilized for domestic water supply.

### 3. Domestic water supply sector in relation to IWRM & advantages of IWRM

- When demands for water supply increase due to the development of a new city, population growth or a change in social situation, the domestic water supply sector will have to locate new water sources, and be faced with the need to implement IWRM.
- When introducing IWRM, conformity with plans by other municipalities or water use sectors can be ensured by accounting for upstream and downstream, right and left banks, and coordination among municipalities or water utilities. Furthermore, infrastructure such as dams, intake weirs and treatment plants can be jointly developed and a joint management framework can be established. These can present substantial advantages to the domestic water supply sector.
- If there is shortage of water due to population growth or rapid urbanization, water transfers from other uses, particularly the agriculture sector, can become an option, together with the development of new water resources infrastructure such as dams.

### 2.2.3 Industrial Water Sector

- Primary deciding factor is cost

#### 1. Interests of the industrial water sector

(Low-cost water and industrial water)

The primary concern of the industrial water sector is how to obtain and provide low-cost water and discharge the wastewater in the least expensive way. Cost is the primary deciding factor.

Compared to the domestic water supply sector, which does not provide alternative option for users, the industrial water sector is much more sensitive to the demand for cost-effectiveness. The industries themselves are influenced greatly by aspects other than water (logistics, employment, environment, etc.), thus, it is difficult to develop long-term demand projections compared to domestic water supply.

(Groundwater utilization and industrial water)

Industrial water in earlier days was abstracted mostly from groundwater. This is because groundwater was a cheap and stable water source with high water quality. Drawing water from rivers requires water use rights, infrastructure development and water quality adjustment (treatment), thus, the use of river water for industrial use is discouraged if possible.

Excessive abstraction of groundwater in alluvial plains may induce ground subsidence or groundwater salinization, resulting in deterioration of groundwater quality. Users of industrial water are mostly private entities, and thus such problems are likely to occur if there is no adequate regulation.

(Water quantity, water quality and industrial water)

Industries that use large amounts of water such as steel, oil, chemical or paper industries select locations with easy access to water. Industrial water, unlike domestic water, demands varying levels of water quantity or quality depending on the usage. For example, advanced IT-related companies purify water themselves and thus the industrial water supplier may only need to provide raw water.

Discharging used industrial water directly into the river may cause severe contamination downstream. Industrial water users understand this but generally consider it



only necessary to meet the regulatory standards for industrial water discharge.

## 2. How other sectors may impact the industrial water sector

(Impacts by other water users)

- There is the possibility that an industrial water user/supplier may not be able to obtain sufficient water if other water users draw water upstream. If a structure, such as an intake weir, is to be constructed by another water user upstream, that user will have physical advantages in drawing water, and thus the industrial water user/supplier will be opposed to such action.

## 3. Industrial water sector in relation to IWRM and the advantages of IWRM

- If the industrial water sector wishes to conduct a large infrastructure development there could be a possibility of significant cost reduction if it is jointly implemented with other sectors.

### 2.2.4 Hydropower Sector

- How to generate the maximum amount of energy from water

#### 1. Interests of the hydropower sector

Electricity is indispensable for the development of the region and the country, and both the private sector and governments have promoted power-generation projects. Power development generally implemented over a wide area has high added value. It contributes to industrial development and creates employment, and thus often forms a primary focus for developing countries as the foundation for regional industrial activities and people's lives.

(Characteristics of electricity)

- Electricity cannot be stored, thus facility capacity generally exceeds demand peak.
- The same can be said for instant supply and demand, and lack of flexibility in supply often leads to inefficient operation.
- There is often no alternative service for power supply and thus the price of power has a public utility cost.

- Infrastructure investment and cost collection plans are long-term.
- It can be distributed over a wider area, compared to water (and is possible to transmit long-distance).

Generally, hydropower generation in its early stages was used to provide power for local consumption, such as factories. Although usually commencing in the form of private projects, it soon expanded to general implementation in combination with other electricity sources to provide economic and efficient electricity supply nationwide. In many countries hydropower development began before irrigation water development.

Hydropower generation often has lower running costs than thermal power generation, thus generating more electricity through hydropower and less through thermal power is ideal. Hydropower generation does not consume water as compared to other water-use sectors. However, hydropower generation upstream of a river harnesses the potential energy of water to its maximum extent. The hydropower sector plans to exploit this potential energy by utilizing as much water as possible and building multiple power-generation facilities. Its priority is efficient power generation; if that causes rivers to run dry, that is considered an inevitable cost.

Hydropower generation using dams to generate power depending on demand, and thus the discharged water quantity fluctuates. This also influences water temperature. Thus, consideration for other sectors and environment would be necessary. The hydropower sector may take measures to reduce its influence downstream by controlling discharges, but the sector is not proactive in this regard without the effect of investment.

Thus, the hydropower sector considers investment and the efficiency of power generation among its priorities, and river flow and the environment are only considered when required, through environmental assessments, etc.

#### 2. How other sectors may impact the hydropower sector

(Impacts by other water users)

- If other water users increase their water intake upstream of a hydropower plant, the water avail-

**[Hydropower planning and management]**

[High priority on investment efficiency in hydropower project planning]

When a hydropower project is planned, investment efficiency (profit) is the obvious factor in decision-making.

[Hydropower management]

Hydropower practitioners secure funding needed for water through the collection of electricity charges. Hydropower facilities are mechanical and can manage discharge relatively precisely by measuring the electricity generated.

able for hydropower generation will be reduced. This will also reduce the power generation capacity of the plant. Power generation is directly linked to the revenue of the hydropower sector; thus the sector will oppose any newly permitted forms of abstraction by new water users or otherwise may seek compensation.

### 3. Hydropower sector in relation to IWRM and the advantages of IWRM

- In developed countries where public awareness on environmental conservation is high and there is a high level of public participation, it is difficult to plan new hydropower projects without overall coordination. If the hydropower sector actively participates in IWRM and facilitates consensus building with relevant stakeholders with a special focus on environmental conservation, this will facilitate project planning and implementation, and will become an advantage for the sector.

#### 2.2.5 Sewerage (Sanitation)/ Drainage Sector

- How to collect wastewater efficiently and where to discharge it

##### 1. Interests of the sewerage/drainage sector

(Maintaining sanitary environment and crisis management)

Providing access to sanitation is as important as a safe

water supply in maintaining public hygiene and providing a sanitary environment. For example, the sewerage system must account for stormwater, otherwise urban areas can flood due to lack of stormwater discharge capacity and lead to backflow of sewage or wastewater, causing extremely unsanitary conditions. This could cause the spreading of water-related diseases.

If wastewater is discharged upstream of a river due to an underdeveloped sewerage system, the downstream river becomes inappropriate as a water source for domestic water supply. In many regions of the world, large cities are often situated downstream of large rivers. Wastewater disposal upstream can bring about crisis situation in such cities.

For a city, the development of a sewerage system in the upstream region of a river that flows down through a city is a crisis management issue.

(Recycling of wastewater)

Wastewater, if treated to an appropriate level, can be effectively reused for water-use purposes. A sewerage system is thus very important in order to recycle wastewater and to utilize it as a water resource.

(Urban drainage)

Drainage facilities in urban cities are sometimes not developed fast enough and heavy rains can cause inundations in the lowlands of cities resulting in severe damage to underground spaces. Garbage thrown into drainage channels often prevents drainage and intensifies the damage caused by inundations.

(Public nature)

Sewerage and drainage systems are highly public in nature. The efficient collection of wastewater, treated to the level requested by society, then discharged downstream as quickly as possible are of paramount importance.

##### 2. How other sectors may impact the sewerage/drainage sector

(Impacts by other water users)

- National and regional managers in the sewerage or drainage sector have to decide upon the discharge

location by negotiating with other water-use sectors and the environmental sector. If the discharge location is set immediately upstream of the water-intake location of a water-use sector, it can cause a conflict. From the economic perspective, to be able to discharge at the closest location possible is ideal, but from the water users' perspectives it is necessary to discharge downstream or in another river. The bypassing of water using a wide-area sewerage network also raises questions.

(Impacts by environmental sector)

- Water quality is also an important issue for consideration. It is technically possible to treat wastewater to the appropriate level. This also presents the advantage of reusing water for other purposes. On the other hand, it costs more, as the treatment level gets higher. The issue of who covers this cost is of great interest to this sector.

(Impacts by flood management)

- Rapid drainage of stormwater into rivers may cause an increase of river flow and may intensify flood risks downstream. Flood managers will, thus, demand coordinated implementation of drainage operations and flood control.

### **3. Sewerage and drainage sector in relation to IWRM and the advantages of IWRM**

- The drainage location and drainage water quality are important aspects that need coordination and consensus building with other sectors. Furthermore, participating in IWRM from the aspect of securing water quantity will enhance interaction with stakeholders. By improving drainage water quality, one may be able to set a closer drainage location. It can lead to overall economic benefits, ensuring adequate river flow and recycling of wastewater, etc.

## **2.3 ENVIRONMENTAL SECTOR'S PERSPECTIVE**

- Ensuring ecological diversity and social consensus

### **I. Interests of the environmental sector** (Maintenance of sustainable environment)

The principal interest of environmental managers is to ensure a sustainable environment over a long-term perspective. They prevent excessive, shortsighted development and call for the restoration of the natural environment. They demand and display requests to other water-related sectors. If these demands are social demands the coordinator will have to determine if social consensus can be attained for such demands including its cost allocation.

### (Maintaining the natural ecological state)

The environmental sector pursues the maintenance of the environment in its natural ecological state, striving for the preservation of forests or rivers without human influence.

From their perspective, overextraction of water or drainage from and to rivers causing insufficient water for the environment, or dams or weirs changing flow-variability in rivers, are considered to be problems.

### (Environmental conservation in harmony with human activities)

In areas where communities developed slowly around irrigation agriculture, environmental ecology has established within the interaction between nature and human activities. Such an environment is not without human influence but a harmony or a balance exists between human activities and nature. There are opinions that such environments with some level of human influences should be conserved in their present state.

For example, shallow riparian waters, tributaries and streams, or networks of irrigation channels and the surrounding agricultural land can be considered as forms of ecological habitats for fauna and flora.

(Added value of the environment)

In recent years focus on the added value of the environment has increased through the concept of ecosystem services. It is in the interest of the environmental sector to raise the overall value of the environment in a basin-wide manner, together with eco-tourism and environmental education.

## 2. How other sectors may impact the environment

Environmental conservation is an important objective of IWRM for developing a sustainable society. Environmental perspectives should exist in every sector and should be coordinated within the water-related sectors in order to realize IWRM.

(Impacts by water-use sectors)

- Abstraction of water from rivers impacts the environment downstream of the intake location. Excessive water abstraction, for example, for rice cultivation will prevent the river downstream from receiving adequate amounts of water flow, which may cause drying up of the river or worsening of water quality, leading to deterioration of the aquatic environment. Discharge of wastewater or used water into rivers will increase flow quantity but may deteriorate river water quality.
- Over-abstraction of groundwater by water-use sectors will lead to ground subsidence, groundwater salination or changes in groundwater quality.
- Structures placed in rivers for water-use purposes may impact the environment, for example, by directly disrupting the surrounding environment, preventing fish passing, or reducing the river flow downstream. Construction of large-scale structures such as dams or intake weirs, in particular, will alter the natural environment significantly. The environmental sector demands that all water-use sectors minimize their impacts to the environment or implement alternate measures. For example, installation of an intake weir for water uses will prevent fish species from moving upstream or downstream. The environmental sector will demand the installation of fish ladders, or ensure that the passage of fish is adequately secured.
- Overuse or improper use of pesticides and fertilizers

in agricultural practices may negatively impact water quality or ecological habitats.

## 3. The environment in relation to IWRM and the advantages of IWRM

- IWRM cannot exist without the introduction of environmental perspectives, thus the implementation of IWRM is a definite advantage for the environmental sector. However, the economic perspective is also important in gaining the consensus of relevant sectors, thus the importance of the environment has to be prioritized in social demands.

## 2.4 FLOOD MANAGEMENT SECTOR'S PERSPECTIVES

- Protecting the lives and properties of residents living in the river basin

### 1. Interests of the flood management sector

(Minimizing flood damage)

The primary concern for flood managers is to protect people and their properties in the river basin from floods, and to minimize damage in a basin-wide manner. Promptly realizing the benefits of flood control measures is the priority of flood managers. In this regard, flood managers consider it necessary to collaborate closely with managers responsible for IWRM in order to ensure complete coordination with other sectors and stakeholders as efficiently as possible.

### 2. How other sectors may impact flood management

(Impacts by water use sectors)

- In withdrawing water from rivers, water-use sectors want their water-intake facilities and locations to enable efficient water diversion.
  - Water intake structures may block floodwater flow. Fewer and smaller structures are desired.
- When developing multi-purpose water storage facilities such as dams, water-use sectors want to secure as much capacity as possible for water utilization.

→Due to the limitations of dam capacity, this may interfere with flood-control capacity and efficient flood control operations.

- During flood events, the agricultural sector tries to drain stormwater from their agricultural land as early as possible in order to avoid prolonged flooding of crops and resulting negative impacts to agricultural production.

→The timing and quantity of drainage needs to be controlled taking into account river water levels.

- When a structure that crosses a river channel (such as a distribution line for domestic, industrial or agricultural water) is being planned or designed by a water-use sector, they would normally try to find a location, direction or structural design for their structure (bridge, siphon or tunnel) that can distribute water in the most economical way.

→In order to prevent such structures from blocking flood flow or negatively impacting flood control facilities such as levees, the water-use sector plan regarding the location/direction of the structure needs to be changed accounting for levels of impacts such as flood-flow interference or impacts on flood control facilities, etc. It should also account for river improvement/construction plans for levees, facilities, water courses, etc.

#### (Impacts by the drainage and sewerage sector)

- Drainage and sewerage sectors want their drainage facilities and locations to enable fast and efficient stormwater drainage into rivers via urban or sewer drainage systems in order to prevent inland flooding.

→In areas where drainage facilities for inland flood control are extensively developed, but the river channel does not have adequate flood control measures implemented, drainage activities or construction of further drainage facilities could cause the flood discharge capacity of the river to be exceeded. Prohibiting or restricting drainage operations/activities during flood events should be discussed with flood managers. It is necessary to set drainage loca-

tions in a manner that minimizes flood risk of the basin by accounting for areas that need to be protected or are vulnerable to flood risks.

#### (Impacts by the environmental sector)

- The environmental sector is concerned about the environmental impacts of constructing or improving flood control infrastructure.

→There could be total opposition from the environmental sector, as well as requests for revising plans, further implementation of environmental impact reduction measures, or detailed investigations and reassessments based on the findings of investigations, etc. These could lead to delays in the realization of benefits from flood control measures.

- The environmental sector considers it desirable that habitats for fauna and flora be maintained in their natural condition. They consider that native vegetation species including trees in river channels should be conserved.

→Tree growth in river channels can interfere with flood discharge, or negatively impact flood control facilities such as levees and gates.

#### (Impacts by municipalities and developers)

- Local municipalities may consider developing housing and industries in the basin with public conveniences and industry as their priorities.

→Such developments will increase flood risks and could interfere with river improvement projects.

- They may seek to make effective use of available land by promoting the development of natural and unused land.

→This will reduce the infiltration and water retention capacities of the basin areas, resulting in higher basin runoff and higher risk of flooding.

- Local municipalities and developers may wish to utilize and develop land in the basin to optimize use of the land resources.

→Increased usage of waterfront areas will increase flooding risks. It may also interfere with river

channel improvement. Development in the basin reduces stormwater permeability and the storage capacities of the basin. Flood runoff increases and heighten flood risks in the area.

- Local municipalities and developers may wish to utilize the waterfront area of rivers and lakes and promote the use of facilities situated in such areas for recreational purposes, such as sports facilities, parks, promenades, etc. They may wish to promote greater uses of the river and water recreational spaces.

→ More use of waterfront areas of river and lakes during flood events increases flood risks in the area. Locating facilities along the waterfront will also increase flood risks.

(Relevance to society as a whole)

- Society recognizes the threats of floods and importance of flood risk management when hit by a large flood disaster, but as time passes that awareness fades. This is particularly prominent in areas where people do not suffer directly from floods.

→ Flood managers are concerned by this and want society to remain alert to potential flood risks as these can occur at any time.

(Impacts by other sectors)

- Fisheries are dependent on the existing environment of rivers. The fishery sector will oppose destruction of fish habitats for flood management. They will also wish to be able to make use of their vessels and construct infrastructure, such as ports, in locations efficient for their business.

→ Flood control measures that cause significant river and basin alteration may be restricted from the standpoint of fisheries conservation. Fisheries infrastructure may interfere with flood flow or flood control facility construction. Furthermore, decreasing normal flow will also interfere with their navigation.

- When a structure that crosses a river channel (such as roads, railways and lifeline infrastructure) is being planned or designed by other sectors, they would normally try to find a location, direction or structural design for their structure that is most efficient and economical.

→ In order to prevent such structures from blocking flood flow or negatively impacting flood control facilities such as levees, coordination is necessary with other sectors regarding the location/direction of the structure and levels of impacts such as flood-flow interference or impacts on flood control facilities, etc. It should also account for river improvement/construction plans for levees, facilities, water course, etc.

- Navigation sectors or those who transport goods and people using boats may try to construct docks or mooring facilities in a convenient location and try to moor on water for efficient transport. They may also dredge channels in order to ensure adequate navigable space and the preferred route for navigation.

→ Such activities may interfere with flood flow. The facility locations and their size have to be accounted for and there must be coordination with their representative in order to prevent such impacts. Dredging may increase the discharge capacity of the channel but over-dredging or dredging close to structures could cause river flow to scour river facilities and cause negative impacts.

- People living in poverty may be living or cultivating on the flood plain of a river.

→ This increases flood risks. Coordination with other policy measures needs to be considered in order to prevent proliferation of new settlements into areas of flood risk, and to facilitate the smooth relocation of existing inhabitants.

### 3. Flood management in relation to IWRM and the advantages of IWRM

- The management of flood risks needs to be implemented through the involvement of various basin stakeholders, including development sectors, municipalities as well as residents. Flood managers are generally found on the coordination end of IWRM, with the relevant stakeholders and managers responsible for overall IWRM coordination.

- Flood risk management contributes to meeting overall IWRM objectives in the basin by preventing disastrous damage caused by floods, and hence enhancing the social and economic welfare of the basin. Its existing framework for negotiating with basin stakeholders can also be utilized for overall IWRM coordination, allowing for efficient stakeholder participation and coordination.
- Flood control not only mitigates flood disasters but also provides benefits for water-use sectors. Temporarily stored floodwater in facilities/reservoirs can be allocated for later water use. This can lead to cost-effective multi-sector collaboration, where flood managers as well as water-use sectors can all benefit from working together.
- Firmly positioning flood risk management as part of IWRM objectives ensures enhancement of prevention and preparedness capacities of the basin against future flood risks.
- Flood managers can also benefit from the overall IWRM arrangement in implementing flood risk management projects by utilizing the overall participatory/coordination framework. This facilitates the gaining of consensus from relevant stakeholders and enables project objectives to be achieved in an efficient manner.
- Floods may bring benefits to the basin in terms of fertile soil suitable for cultivation or by supporting the ecological functions of floodplains or wetlands.

## 2.5 OVERALL COORDINATION PERSPECTIVES

-Are stakeholders convinced? Is it socially justifiable?

The last part of this chapter describes how managers in charge of coordinating IWRM in the basin (such as in a river basin organization) think and act.

IWRM is a process that (1) promotes coordinated management of water resources among all stakeholders, (2) integrates management of water and land resources, and (3) facilitates information-sharing and participation among the people involved.

Managers coordinating the IWRM effort understand the necessity for IWRM and seek to make progress. However, that requires a firm understanding of the interests and concerns of other water-user sectors, environmental managers, and flood managers.

The manager leading the coordination may not be aware of the history of water use or flood control efforts in the basin, or may set unrealistic goals from the beginning, or rush to reaching a consensus without sufficient assessment or consultations. In these cases, individual sectors will make their opposition and case known to the coordinator. It is important that such opinions are well understood by those leading the coordination process in order to ensure that it proceeds smoothly and efficiently.

Coordinators can sometimes be influenced by the supporting organization or opinions of political decision-makers, but unjust coordination will cause problems later on. For example, if a stakeholder thinks that he/she suffered from a disadvantage in coordination when developing an infrastructure, it will become extremely difficult to obtain his/her consensus when the infrastructure ages and needs to be rehabilitated/improved.

It is also important that the coordinator is socially trusted, and that the content of the IWRM coordination is justifiable to all relevant stakeholders and society. Thus, ensuring transparency through proactive information dissemination is one of the coordinator's most important responsibilities.

Moreover, collaboration with sectors other than those related to water could enhance IWRM coordination. Land-use management is a good example. For example, land and water resources can be utilized more efficiently by ensuring consistency in river improvement through urban or agricultural land-use planning, and developing roads or agricultural infrastructure simultaneously. By establishing the possibility of coordination with sectors other than water sectors, the coordinator will be able to gain the trust of other water users.



## 3. Key for Success in Implementing IWRM

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A 'Key for Success' is a key that can be used in practice to help make IWRM succeed. It is a key to establishing breakthroughs in potentially challenging situations or to open the door to better IWRM. It provides tips and clues for making progress in the IWRM process (see Fig. 3.1).

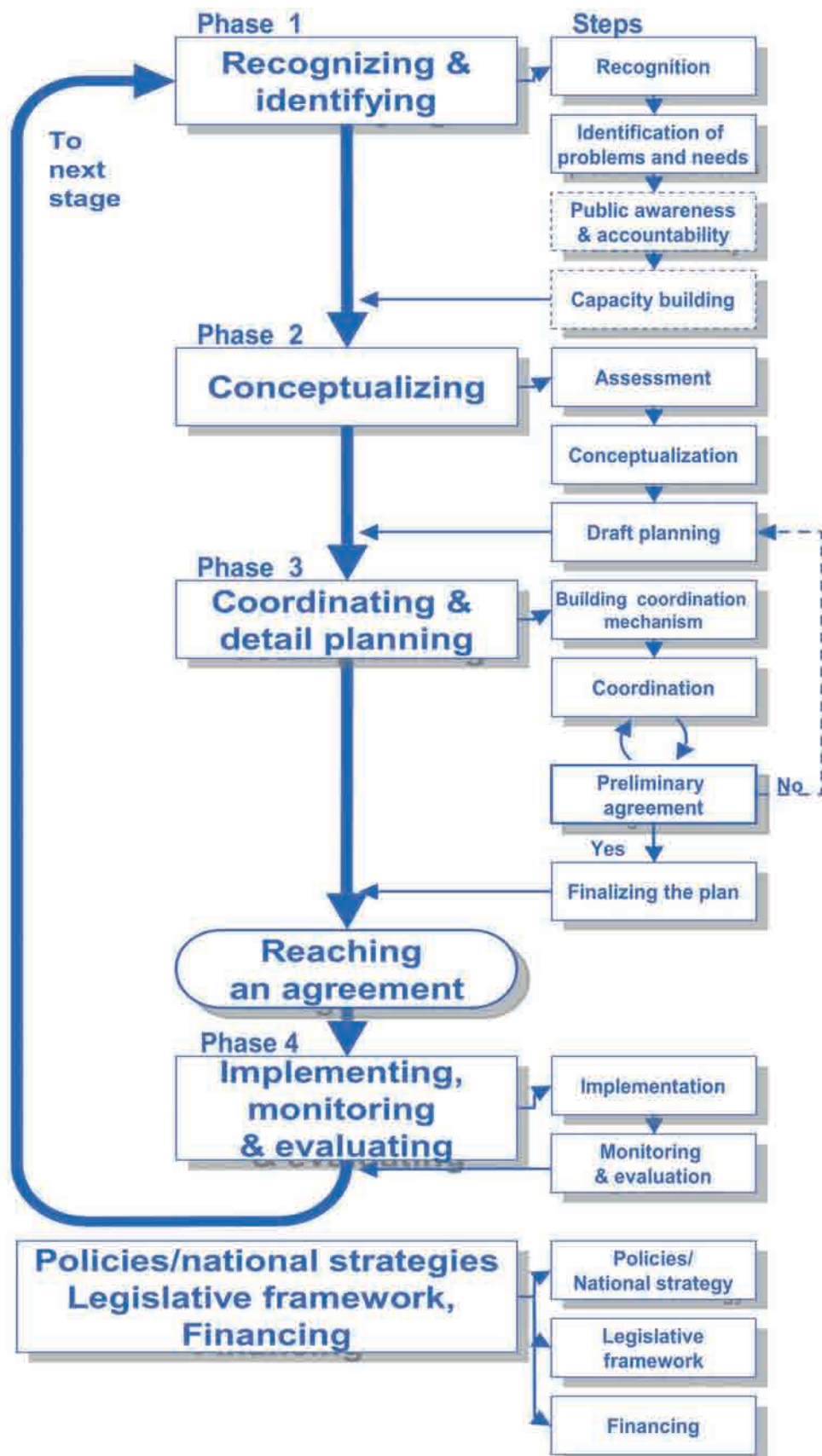
Many of the keys for success have been proven in practice and are linked to Good Examples in Chapter 5. Some are generic, in other words, apply to every successful example of IWRM; others may apply only to specific situations, and some may not be in place as yet. You do not have to apply them all. Work with them to see how they can assist you to move ahead with IWRM implementation in your basin.

Each 'Key for Success' is explained using the following format.

- **Key:** The essence of the 'Key for Success' is indicated in bold in the box.
- **Why:** The reason why the 'Key for Success' is important or useful is indicated in the box.
- **How:** The ways of implementing the 'Key for Success' are indicated outside the box.

You will also find links to **Useful Tools** and **Good Examples** for easy reference.





■ Fig. 3.1 IWRM Process

### 3.1 RECOGNIZING AND IDENTIFYING

The important part of this phase is to ‘recognize’ the need for IWRM and to grasp the overall picture of existing issues in the basin. Things to note in this phase are:

- Do you understand the needs and problems? Are you in need of IWRM?
- Are you aware of past evaluation results and the current situation?
- Are you thinking into the future?

Recognizing the need for IWRM through identification of needs and problems in the basin becomes the catalyst for improving water resources management in the basin. It is important to proactively ‘recognize’ the needs, and your understanding of the situation can be measured by how well you can make others understand. You can identify existing basin-wide issues by exploring the needs for improving existing approaches or schemes based on existing or past evaluation results, and by being alert to newly-arisen problems and needs as a result of socio-economic and environmental changes.

#### 3.1.1 Recognition

##### 1.1.1

- ✓ **Key**
- ✓ **Why**

**Be aware of IWRM efforts in your river basin, region or country.**

- In order to recognize the necessity for introducing or enhancing IWRM, you need to proactively find out the current status of IWRM activities in your basin, region or country. It helps to recognize the need for an IWRM approach and where you stand in the IWRM process. Such information is also useful in explaining to others and for expanding IWRM recognition.

- ✓ **How**
  - First, understand the definition of IWRM and its benefits. Take a look at basins where an IWRM approach has been implemented. See how the definition of IWRM has actually been put into practice and how they enjoy the benefits. If the IWRM approach wasn’t successfully implemented, try to find out what the problems or barriers were.
    - Search for river basins in your country or region where river basin organizations exist. See if they have implemented an IWRM approach. Obtain their evaluation reports, etc.
    - Even if an IWRM approach has not generally been practised in your basin, study its current status of water resources management.
    - IWRM is an evolving and spiral process. Knowing where you stand in that process is useful. Refer to Chapter 4 for more information.
  - It helps to be aware of national IWRM efforts. It may be helpful to find out if the national government has already prepared an integrated water resources management and water efficiency plan, agreed upon in the Johannesburg Plan of Implementation (JPOI) at the World Summit on Sustainable Development in 2002. ([http://www.un.org/esa/sustdev/documents/WSSD\\_POI\\_PD/English/POIToc.htm](http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/POIToc.htm)). The status of national efforts in IWRM is reported by UN-Water in ‘Status Report on Integrated Water Resources Management and Water Efficiency Plans at CSD 16, UN-Water, 2008’ ([http://www.unwater.org/downloads/UNW\\_Status\\_Report\\_IWRM.pdf](http://www.unwater.org/downloads/UNW_Status_Report_IWRM.pdf)).

#### Good Examples

- >> Extracted Key for Success from Davao River (I), ‘Integrating the fragmented sectors’, p.88

### 1.1.2

#### **Consider a significant change in the basin as a chance to move IWRM forward, and recognize and understand such changes as early as possible.**

- Changes in socio-economic and environmental demands of the river basin may trigger the need for introducing an IWRM approach. Even in those basins where IWRM approaches have already been implemented, a new or improved IWRM approach may become necessary when socio-economic or environmental changes occur. You can consider such changes as an opportunity, and make society become aware of the need for changing existing approaches to water resources management. This can become a strong driving force for moving IWRM forward.
  - Recognizing such changes at an early stage will provide you with a better chance of choosing the option with the maximum possible benefit using the least resources.
- 
- It is important to recognize not only changes in the direct and urgent needs of society, due to disaster or crisis situations, but also slow and gradual signs of change due to changing social values and needs for water caused by economic development or changes in the regional or global environment, such as climate change.
    - o Examples of changes in a river basin include:
      - Occurrence of major disasters (flood, drought).
      - Severe water pollution and environmental degradation.
      - Increase of water demand by rapid population growth and economic development.
      - Major national or regional events (such as the Olympic Games).
      - Change in national policy for water resources management due to political shifts.
    - o Gradual changes (such as those caused by climate change or changes in social values and demands) are more difficult to recognize. It takes time to make society aware of such changes and establish a driving force to move IWRM forward. Keeping the public updated and spurring public opinion by actively disseminating information from the early stages is indispensable.

#### **Good Examples**

- >> Extracted Key for Success from Lake Biwa (2), 'Formulation of comprehensive conservation plan with the participation of all stakeholders in the basin', p.99
- >> Extracted Key for Success from Sacramento – San Joaquin River (1), 'Achievement of efficient IWRM for complex multiple-purpose water uses', p.126
- >> Extracted Key for Success from Yoshino River (3), 'Creating a mechanism for drought conciliation', p.165

### 1.1.3

#### **Ensure broad and long-term perspectives when identifying changes occurring in the river basin.**

- A variety of changes occur at the river-basin level. Maintaining a narrow field of vision may prevent you from recognizing larger changes, and potentially lead you in a wrong direction. Mapping or visualization of related data and understanding their relationships is useful to understand the real status of a basin. It also forms good material for presentations or discussions with stakeholders. Useful in explaining to others and expanding IWRM recognition.

- It is important to uncover the current situation in the river basin by examining the results of monitoring and evaluation. It is necessary to look at the entire basin from a broad perspective and check for any new and emerging problems or issues. If such problems exist, determine where the social or environmental changes are occurring and what are causing such changes.
  - o Typically required data for recognizing a change in the river basin are:
    - Natural factors: geology, weather, hydrology, water quality, geomorphology, environment/ecology, etc.
    - Social factors: population and its dynamics, standards of living, social customs, land use, water use, etc.
    - Economic factors: working population, industrial activities, etc.

#### Useful Tools

- >> Visualization of the state of water use and 'high stress area', p.170

### 3.1.2 Identification of problems and needs

#### 1.2.1

#### Identify potential priority areas (critical locations and key issues) for IWRM implementation in the basin.

- Important locations or key issues need to be addressed first in order to achieve effective implementation of IWRM. Such priority areas can be identified through assessment of the current status of water resources in the basin and their uses, and pressing issues in the basin such as water pollution, environmental degradation, natural disasters, etc.
- Explore and identify issues and problems currently occurring in the basin as well as potential future issues.
- It is important first to roughly estimate the available amount of water in the river basin and the extent of water use. If the basin's water resources are used extensively, it is desirable to study in detail the natural or original capacity of the basin. Determining the water budget in the basin will be useful in understanding the current status of the basin's water resources.
- It is desirable to identify priority areas (critical locations and key issues) before coordinating the interests of sectors. An example of a critical location can be where there exists an overlap of interests due to a rapid increase in water demands or severe pollution loads, or areas of ecological significance such as a place where protection of endangered species is a critical concern.
- It is helpful to have an understanding of the historical background of water usage in the basin, the rules and how they have changed in the past. Look through documents and historical records or communicate directly with local elders. Hearing from local people helps understand their viewpoints, and the information obtained becomes a persuasive tool for later coordination and negotiation.
- Efforts must also be made to address not only the apparent issues but also prospective needs and challenges.

#### Good Examples

- >> Extracted Key for Success from Yoshino River (1), 'Formulating the water budget for an integrated plan', p.161
- >> Extracted Key for Success from Yoshino River (4), 'Securing environmental flow to improve IWRM into the next stage', p.167
- >> Extracted Key for Success from Murray-Darling Basin (3), 'Contingency measures to secure critical water demands', p.110

## 1.2.2

### **Make good use of existing information in the basin..**

- Recognizing the need for improvement or restructuring in water resources management is how one realizes the necessity of introducing an IWRM approach. It is important to maintain a broad view and be aware of the history, trends and issues in the basin. Information such as the opinions of the local elders, general public interest, and political discussions in local and national governments may provide good ideas. If the IWRM process is well underway, utilization of monitoring and evaluation results is effective for identifying areas for improvements.
- When introducing an IWRM approach for the first time, there may not be sufficient past monitoring or evaluation results available. However, it is not necessary to conduct a new extensive and exhaustive survey to obtain new information as it may delay the entire process. What is important in this phase is to utilize the existing information, understand the changes occurring in the natural and socioeconomic environment, and recognize the necessity for an IWRM approach.
- In cases where monitoring and evaluation of past IWRM activities exist, it is possible to re-evaluate past efforts based on the monitoring and evaluation results, and identify existing challenges.

## 3.1.3 Public awareness and accountability

### 1.3.1

#### **Proactive disclosure of information is a fundamental activity in IWRM.**

- Stakeholder participation is a crucial element in IWRM implementation. Information-sharing through disclosure is indispensable for facilitating coordination and negotiation among stakeholders reaching agreement on a plan.
- Proactive disclosure of information ensures transparency throughout the IWRM process.
- It is desirable to disclose information such as data shared among stakeholders and the records of discussion throughout the coordination process. It is also desirable to consider the appropriate method for disclosing information in the respective basin, such as the establishment of a website for information dissemination through the internet, publication of periodical newsletters in the region, and information disclosure through administrative information network. Such frameworks for disclosing information become useful especially during emergency situations.
- It is important that details on information/data availability and how to access such information are shared.
- Disclose all relevant information, including that which is not necessarily convenient for you and/or specific groups. Holding back information can cause problems later on.

#### **Good Examples**

- >> Extracted Key for Success from Negro River (3), 'Share information broadly with the public', p.120
- >> Extracted Key for Success from Yoshino River (1), 'Formulating the water budget for an integrated plan', p.161
- >> Extracted Key for Success from Tama River (2), 'Ensuring complete accountability by disclosing all information', p.137

## 1.3.2

**Facilitate awareness-raising through utilization of topics, materials and processes familiar to the public, including those usually outside the water sector.**

- Utilization of familiar topics, materials, and processes will establish better understanding and a sense of ownership among these groups, leading to immediate actions.
- It is important to make the public understand the relevance of water issues to their lives. Encourage them to act with a sense of ownership.
  - Local activities that help people to recognize the importance of water issues in their daily lives are effective. Community and volunteer organizations can be informed through distribution of brochures or organization of local meetings. Participatory events such as river clean-up activities or site visits are also effective.
  - It is important to let stakeholders know that there are various combinations of problems and solutions, as the IWRM approach aims to coordinate among stakeholders to agree on a solution out of many alternatives. Various alternative options and their comparative advantages/disadvantages should be explained to the public in an easy to understand manner. For example, the roles of a dam should be explained together with changes in required levee height, depending on the existence of a dam, etc.
  - The level of needs and sense of value for water differ among sectors or even among individuals. For example, the agricultural sector has varying water needs depending on the season, whereas the domestic and industrial water supply sectors are primarily concerned with a stable supply of good quality water. Stakeholders tend to view water issues from their own standpoint and are often not aware of the interests of others, thus it is important to build awareness within individual sectors.
  - Inviting representatives from other sectors to sector events such as symposiums, and having them share and speak about their views and perspectives may be effective in promoting understanding of various sector perspectives.

**Good Examples**

- >> Extracted Key for Success from Murray-Darling Basin (2), 'Enhancing public awareness', p.109

## 1.3.3

**Introduce educational activities on water and IWRM, focusing particularly on women and children.**

- It is particularly important to foster understanding on water issues among children to ensure future sustainability. Also, raising awareness among women, who have the most opportunities to deal with water in their daily lives, is effective. It can encourage equal participation of men and women, improve the status of women, and promote education in families.
- Awareness among and participation of children and women is important for raising awareness among the general public. Public education on water can be included in the school curriculum or workshops on water can be organized targeting women. The awareness built through such programmes can then extend to their families and spread throughout communities through everyday activities. Examples of awareness-raising activities include:
  - Making use of water and sanitation-focused campaigns carried out by international organizations such as UNICEF.
  - In areas where there are schools, incorporating education on water and IWRM into school curriculums.
  - Holding contests related to water activities in the local basin as a part of the school education.

- o Taking advantage of various activities aimed at improving the status of women in spreading and improving water awareness.

### Good Examples

- >> Extracted Key for Success from Murray-Darling Basin (2), 'Enhancing public awareness', p.109
- >> Extracted Key for Success from Negro River

(3), 'Share information broadly with the public', p.120

- >> Extracted Key for Success from Volta River (1), 'Mobilizing stakeholders from the community, national and transboundary levels for shared waters management', p.153
- >> Extracted Key for Success from Volta River (2), 'Causing motivation for ecosystem conservation', p.154

## 3.1.4 Capacity building

### 1.4.1

#### **Develop the capacity of a leader who can recognize problems, find necessary solutions, and implement them.**

- Coordination among many stakeholders requires a leadership role. Leading a coordination effort requires a good understanding of the viewpoints of individual stakeholder groups while keeping sight of the overall picture. An important ability of such a leader is the skill to recognize problems and find necessary solutions.
- IWRM coordination requires an appropriate understanding of the problems faced by each sector, and an extensive knowledge and understanding of the basin. However, knowledge alone is not enough. Ample experience, the ability to understand diverse perspectives, and the willingness to learn and gain wisdom backed by knowledge and experience are needed as well.
  - o It is important to first learn as much as possible from previous examples, by visiting and studying basins that have experienced similar situations. It is necessary to talk with people from various sectors to understand the problems faced in the basin. Talking with people with a wealth of experience leads to greater knowledge and insight, turning those experiences into your own. This helps build quality as a leader.
  - o Personnel exchanges between sectors to gain deeper knowledge and know-how of sectors operating in the basin or exchanges with other river basin organizations can also be effective ways of building capacity.
  - o Training programmes should be hands-on and practical, enabling trainees to experience as many life-based situations as possible. On-the-job training can also prove useful.
  - o Actively participating in related meetings and training is desirable as it broadens specialist knowledge.
  - o Make use of international capacity development initiatives for river basin organizations.
- Not only the capacities of the person leading the coordination, but also the capacities of the representatives of individual sectors need to be developed. Ensuring adequate understanding and capacity among stakeholder representatives will enhance coordination within their individual stakeholder groups, and hence facilitate overall coordination. Make use of opportunities for exchanging ideas and opinions to promote better understanding on IWRM among stakeholders.

## 1.4.2

**Integrate capacity building and incentives.**

- IWRM coordination is a human intensive effort, and requires the capacities as well as motivations of those involved. Capacity-building linked strongly with incentives is necessary.
- Incentives should be considered from a multi-faceted approach and not just in terms of profit and benefit. They should also include a sense of fulfillment or the satisfaction of having demonstrated a higher-level capacity/ability.
- It is important that involvement in IWRM activities is recognized as valuable work and that those involved have a sense of satisfaction..

**3.2 CONCEPTUALIZING**

The point of this phase is to understand the overall structure of the problem and conceptualize future actions. Things to note in this phase are:

- Is it in line with social demands?
- Is it well balanced?
- Do you understand the constraints and are you exploring 'what you can do'?

By viewing the structure of the problem from a broader perspective, you will be able to find clues or a place to start to find a solution. Furthermore, you will have to consider the course of action and the relevant stakeholders and their relationships in order to tackle the problem. You can conceptualize possible solutions by laying out various alternatives that meet the basin-wide balance, as well as the balance between supply and demand, and the balance among stakeholders, etc. then narrow down the list on the basis of the given constraints. You will have to reject certain aspects of your ideal plan in order to make implementation a reality.

**3.2.1 Assessment**

## 2.1.1

**Be selective when collecting data by setting priorities based on the problems.**

- When prioritizing data collection, it is necessary to consider the time, efforts and costs needed. Do not collect data in an exhaustive way. First collect and examine the existing or easily available data.
- When the necessary data is not available, it may be possible to deduce the required information from other data. For example, river flow can be estimated from rainfall data. The possibility of utilizing the data to extrapolate other necessary data should be thoroughly evaluated.

**Good Examples**

- >> Extracted Key for Success from Büyük Menderes River (1), 'Estimation of water demand and analysis of hydrology in the river basin for project planning', p.79
- >> Extracted Key for Success from Davao River (3), 'Awareness of importance of technology for water management', p.90



### 2.1.2

#### **Always keep eyes, ears and mind focused on the real situation in the field.**

- Focusing only on text and numerical information prevents you from identifying potential issues and real needs. Building field knowledge through frequent site visits and always being conscious of the actual field situation improves one's ability to validate data or analyse results.
- Direct information obtained on-site can provide a great many insights into ways to solve problems. For example, the condition of ageing or deteriorating facilities is easier to see rather than to determine from numerical data or photographs.
- In order to ensure the validity of information obtained on-site, more than one person at a time should conduct site investigations, as individual persons may interpret the same information differently.

### 2.1.3

#### **Conducting interviews with relevant people/sectors can prove effective. Be aware that it is already the beginning of coordination and be prepared.**

- Conducting interviews as part of an assessment is quite effective for identifying problems and possible solutions in the river basin. It is important to think and act noting that it is an initial contact with the stakeholder and coordination has already started at this point.
- When conducting interviews, it is important to obtain advance information about the person to be interviewed, including their position, what sector group he/she represents, their interests, etc.
- It is important to select an appropriate person to meet, who can provide you with the information you need. For example, if you need information regarding operational issues of water resources management in the river basin, meet with an officer working at field level rather than a high-level official in the organization. It should be noted however that directly contacting personnel at the field level may lead to distrust of the partner organization.

## 3.2.2 Conceptualization

### 2.2.1

#### **It is important to harmonize related plans including those from outside the water sector.**

- Harmonizing related plans can help prevent conflicts at a later stage. Other sectors would include land use, regional development, disaster prevention, environmental conservation, forestry, agricultural development, etc.

- In addition to water-related sectors such as water supply for domestic or agricultural uses, protection of water quality and the aquatic environment, and flood management, other sectors not directly involved – but often related – include health/sanitation, urban planning or private developers. It is important to be aware of plans made by all related sectors and share those plans among them. This helps to avoid duplication, and also leads to planning among sectors for win-win situations.
- To understand other related plans, it is important to be aware of the relevant background and intentions. This information can be obtained directly from the person involved in planning. Refer to '2. Sectoral Perspectives in IWRM' in this document for information on sectoral perspectives in IWRM. Understanding the intentions of the individuals in charge of their respective sectors can help facilitate coordination.
- Depending on the maturity of the plan and the stage of planning process, options for developing multi-purpose infrastructure and ways of integrating their operation can be considered.

### 2.2.2

**It is advisable to start considering mechanisms and courses of action for stakeholder participation during the conceptualization phase.**

- The mechanisms and courses of action for progressively involving various stakeholders in the basin need to be thoroughly considered, otherwise the later process of consensus building could involve many revisions making it time-consuming. Moreover, the agreement reached may become ineffective or may, in the worst case, be overturned.
- Mechanisms for participation may include setting up a committee, public hearings, and workshops. Appropriate forms of participation should be chosen based on local conditions and the relationships among the stakeholders.
  - Planning here does not only mean preparing plans for water-related projects, but also includes planning for the establishment of a coordinating organization like a river basin organization, or new rules, or planning for environmental conservation measures, etc.
  - Involving all stakeholders fairly and equally may not always be ideal. Gradually build better forms of participation over the course of coordination in a step-by-step and locally appropriate manner. For example, priority stakeholder groups most closely related to the issue/problem can be identified at the beginning, and the involvement of stakeholders can be progressively expanded from therein.
  - It is desirable that the coordinator is at least aware of the relationships among stakeholders. Complete knowledge is not necessary, but familiarity with the existing relationships is useful for future coordination. Neglecting this aspect, means that future coordination may take longer.

### Good Examples

- >> Extracted Key for Success from Davao River (1), 'Integrating the fragmented sectors', p.88
- >> Extracted Key for Success from Davao River (2), 'Integrating the fragmented sub-basins', p.89

- >> Extracted Key for Success from Tama River (1) 'Rules for coordination and consensus-building in developing the River Improvement Plan', p.136

### Useful Tools

- >> Grasping the Positioning of Stakeholders and their Mutual Relationships, p.173

### 2.2.3

#### **Identify key stakeholder groups, including those who are impacted or socially vulnerable, and identify key persons within them.**

- Knowing key stakeholder groups or individuals and getting them involved at an early stage will facilitate the coordination process. Involvement of key persons who have influence over decisions within their sectors/stakeholder groups is important for later consensus building.
- Identify at an early stage the key stakeholder groups and key persons or individuals within them who can provide useful input or facilitate coordination.
- It is best to focus on individuals. Identify relevant stakeholders, and key persons or individuals who can provide useful input.
  - Begin by first visiting each individual group. Ask and obtain information about their circumstances and opinions through informal interviews and meetings. Bear in mind that planning has already begun.
  - When the appropriate representative of a sector is not obvious, it may be useful to begin by talking with elders or those who are familiar with the area and its history.
  - Conflicts also often arise within a sector/group. These may not be apparent at first, but will eventually become evident through discussions and gathered information. Gradually winning support from allies within a sector/group is a useful approach.
- Approaching impacted stakeholders can be particularly difficult; however, disregarding their involvement can often lead to major impediments later on. It may be difficult to approach them at the very beginning, but it is necessary to identify key people early on and work towards appropriate timing to encourage their participation.

### Good Examples

- >> Extracted Key for Success from Büyük Menderes River (3), 'Framework for stakeholder participation in the new scheme', p.82

### 2.2.4

#### **Take into account the appropriate balance among water-related sectors in the whole basin.**

- Water resources management plans should take into account the balance within the whole basin, including long-term changes such as socio-economic changes. It is difficult to achieve consensus on a biased plan and such plans can lead to future conflict.

- Achieving balance among water-related sectors means allocating benefit through water among areas or among sectors for maintaining social fairness in the basin.
- In this case, 'balanced' does not mean that everything is fair and equal. An appropriate balance among water-using sectors and the environment, and among upstream and downstream, must be based on appropriate development standards (capacities against floods and droughts, etc) for the entire basin area, accounting for social, economic, and environmental needs, and the demands and requests of various sectors, and future forecasts.
- There is no prescribed method for determining the appropriate balance. Consider where you stand in the IWRM spiral and identify priority issues and possibilities for tradeoffs. Referring to other cases and seeing how they have determined their appropriate 'balance' for themselves may provide you with some insights. Refer to Chapter 4 for a further description of the IWRM spiral.
- Prepare future scenarios by combining various options based on expected future sector needs, costs, and timing of implementation. Simulating such future scenarios could facilitate well-balanced planning.
- Plans prepared by individual sectors must be consistent in order to realize a 'well-balanced' plan. Check for inconsistencies, discrepancies, or overlaps. It is a good idea to make information 'visible' by displaying it through figures or graphs with quantitative indicators. Doing so makes it possible for stakeholders to share a common understanding of the present situation, and to facilitate consensus building.
- The appropriate balance at one time may become inappropriate later as social changes or economic developments progress. Be ready to revise the plan when necessary. It will be necessary to evaluate the plan even if it is already in the implementation stage.
- When conducting simulations with combinations of various options and planning based on their results, it is important to verify the gap between the simulated results and actual situations in the fields. Being consistently aware of the actual field situation will help identify such gaps.

### Good Examples

- >> Extracted Key for Success from Tone River (3), 'Improvement of water budget in the basin without the construction of new facilities (such as dams)', p.147

## 3.2.3 Draft planning

### 2.3.1

#### Set priorities among problems to be solved, taking into account constraints such as time and funds.

- IWRM typically addresses multiple issues in an integrated manner. Each issue will have different time and financial requirements. It is not necessary to address all issues and solve all problems at once. It is important to set priorities and to define the extent of issues to be addressed at a particular stage based on time and financial constraints.
- Priorities on time constraints are required for the following reasons:
  - Limitations on both time and budget (or funds to be secured): for example, the agricultural sector is in the midst of repayments for an irrigation project, and does not currently have sufficient means to fund a new project.
  - In such cases, the funds available for the current stage are limited until the repayment for past projects is made.
  - When time constraints limit scale/scope of construction of a proposed facility: for example, the consensus building process among stakeholders for constructing a multi-purpose dam is taking

longer than expected, but lives and properties along the downstream region have to be protected from flood disasters as a matter of urgency. In this case, a flood-control dam may be constructed instead of a multi-purpose dam.

- o When coordination among stakeholders is taking a long time and agreement can only be reached among limited stakeholders within the given time constraints: construction of a new facility may become urgently necessary due to extreme events or to accommodate large events such as the Olympic Games.
- Setting a priority does not mean giving up on solving specific problems. These can be addressed in a phased manner.

- Priorities need to be determined through intensive discussions among stakeholders. Prepare multiple options (see Key 2.3.5) that are achievable at this stage, taking into account the time and financial constraints of stakeholders, and determine which problems need to be addressed at which level of the current stage.

### Good Examples

- >> Extracted Key for Success from Brantas River (2), 'The comprehensive plan must be positioned as a national priority and as a regional (river basin wide) priority', p.70

## 2.3.2

### Take into account future prospects with regard to social and environmental changes, such as population growth, urbanization, and climate change.

- It is necessary not only to understand the current situation, but to recognize changes in socio-economic needs of the basin or external impacts such as climate change. The IWRM process from planning to implementation requires much time and effort. It is important therefore to prepare an IWRM plan that takes into account expected changes such as population growth, urbanization, and climate change, if signs of such changes are already apparent and are expected to impact the basin in the future.
- Accounting for future prospects in a plan should not delay addressing the existing priority problems, as there are always time and financial constraints. Making an appropriate decision is important and can be facilitated through an approach as below:
  - o Implement the project in multiple phases. The

first phase should be designed in a way so that it allows for future expansion or modification. The second phase, and any later phases, can be designed and implemented such that it accounts for the changes observed in the future.

## 2.3.3

### Make effective use of conventional technologies and methods applied in the basin or region.

- Technologies and methods applied locally have advantages as the applicability and stability of these technologies have been assured through the history of their local application, the materials used for such technologies are locally available, and sufficient knowledge exists for appropriate maintenance.

- The appropriate level of technology for the region or social/economic condition must be applied in order to effectively implement IWRM.
- To this end, it is important to be aware of technologies used in both the basin and the region, and to share this information among the relevant sectors.
  - It is advisable to first learn about existing technologies in the region and to promote exchange/sharing of information on and application of useful technologies for IWRM implementation. It is also a good idea to learn about technologies applied in other river basins with similar characteristics.
  - It is also possible to obtain information on highly applicable technologies in the region through international networks and databases.

#### 2.3.4

##### **Explore, adopt and customize new technologies so that they can be applied in the basin.**

- IWRM activities in the basin can be enhanced through the adaptation of new technologies. New technologies can include technologies for collecting or analysing more accurate data, or for more precise facility operation. Exploring, adapting and customizing new technologies, knowledge and creative ideas in a way suited for the basin improves water resources management in the basin.
- Firstly, it is important to collect information on new technologies and knowledge. The applicability of these technologies in the basin for IWRM-related survey, design, construction and management should be examined, and if applicable, the technologies should be customized so that they can be applied in the basin.
- When introducing new technologies to replace a conventional method under current use, it is necessary to examine the benefit and cost of applying such technologies, including their future feasibility.
- When examining the application of new technologies, it is necessary to take into account maintenance requirements. If facilities or devices introduced are made overseas, repairing or obtaining spare parts may be costly or difficult. In such cases, the introduced facilities or devices may not be able to fully function as originally expected.

##### **Good Examples**

- >> Extracted Key for Success from Davao River (3), 'Awareness of importance of technology for water management', p.90

#### 2.3.5

##### **Prepare multiple options which may be 'acceptable' to stakeholders.**

- The best option differs for each stakeholder. The important thing to consider when determining or selecting options is whether the option would be 'acceptable' to stakeholders. Selecting multiple alternative options taking into account the constraints of stakeholders and their priorities for decision making will facilitate the decision-making process in the future.
- Grasp the needs of stakeholders and prepare several alternative options acceptable to all stakeholders in terms of conceptualizing a plan. Obtaining feedback from stakeholders on the different options, whether partial or whole, can enhance understanding of stakeholder needs.
  - All the options prepared should be efficient and effective from the perspective of the basin, addressing priority issues with an appropriate balance. In the case of water resources development, the options need to account for requirements in terms of water quantity, water quality, supply stability (to secure necessary quantity and quality when

needed) and the level of infrastructure capacity development required. The time and financial constraints of stakeholders must also be considered. Refer to '2. Sectoral perspectives in IWRM' in these Guidelines to help you understand different stakeholder perspectives and what may be 'acceptable' to different sector groups. For example, the domestic water supply sector may find a plan that provides them with good quality water appealing even if it costs more and provides less water. On the other hand, the agricultural sector may find a low-cost plan that provides an adequate

amount of water for food production in line with their production plan appealing.

- o When presenting options to stakeholders, inform them that the presented option is not definitive so as to avoid unexpected reactions.
- When coordinating several alternative options among stakeholders, coordination and negotiation can be facilitated by visualizing the characteristics of those options.

### Useful Tools

>>Pentagram, p. 169

## 3.3 COORDINATING AND DETAIL PLANNING

This phase finalizes the concepts formulated in Phase 2 into a detailed plan and coordinates with stakeholders towards reaching an agreement.

- Is transparency secured (satisfying to the reason)?
- Are stakeholders convinced (satisfying to the heart)?

- Is it socially fair (satisfying to the law)?

Coordination for reaching agreement on a draft plan means revising the plan based on the opinions of relevant stakeholders. A transparent process and public awareness are prerequisites for ensuring effective stakeholder participation. They also ensure the social fairness of the process. Striving to improve the situation of all stakeholders will facilitate reaching an agreement.

### 3.3.1 Building coordination mechanism

#### 3.1.1

#### **Prepare a framework for stakeholder participation to build consensus among stakeholders.**

- A framework for stakeholder participation is necessary in order to facilitate smooth coordination and consensus building. Considerable time and resources may be required if such a framework does not exist.
- Organizational structure for coordination can take many forms, such as informal meetings for information-sharing, committees provided with a level of authority, or specialized institutions. It is important to consider existing coordination processes or changing needs within the basin, and build step-by-step an appropriate process or organization to realize the overall objectives.
  - o Making use of existing organizations and processes with proven track records is an option. However, it must be recognized that there are limits to existing organizations and processes. Depending on the goals, it may be necessary to revise existing institutional arrangements.
  - o In situations with a wide variety of stakeholders, it may be advisable to employ a mecha-

nism whereby a third party (organization or individual) without a direct interest in the project performs the role of coordinator.

### Good Examples

- >> Extracted Key for Success from Büyük Menderes River (3), 'Framework for stakeholder participation in the new scheme', p.82
- >> Extracted Key for Success from Sacramento – San Joaquin River (2), 'Effectively coordinating and integrating water management of different levels of government', p.127
- >> Extracted Key for Success from Lake Biwa (2), 'Formulation of comprehensive conservation

plan with the participation of all stakeholders in the basin', p.99

- >> Extracted Key for Success from Tama River (1), 'Rules for coordination and consensus-building in developing the River Improvement Plan', p.136
- >> Extracted Key for Success from Volta River (1), 'Mobilizing stakeholders from the community, national and transboundary levels for shared water management', p.153
- >> Extracted Key for Success from Yoshino River (2), 'Practical coordination mechanism by working group', p.163

### 3.1.2

#### Ensure the timely involvement of all relevant stakeholders.

- Involving stakeholders too late in the process may make the agreed plan ineffective or may in the worst case overturn past agreements.
- It is necessary to ensure the participation of various stakeholders in the basin and establish a mechanism for stakeholder coordination. Stakeholder participation needs to be considered from an early stage. Refer to Key 2.2.2 and Key 2.2.3 for further information.
- Involving stakeholders at an early stage is the key to avoiding conflict and building consensus among them. Involve them at a step earlier than you think is appropriate.
- Even if unexpected stakeholders participate in the coordination process, do not exclude them and listen to their positions and opinions, and try to understand their level of interests. Their participation in the coordination process may be beneficial.

### Good Examples

- >> Extracted Key for Success from Murray-Darling Basin (1), 'Community consultation and participation in decision-making', p.108

### 3.1.3

#### Select a lead coordinator(s) (organization or individual) whom the maximum possible number of stakeholders participating in the process can accept.

- An appropriate organization or individual needs to be selected to lead the coordination process in order to facilitate its smooth running.
- The organization or individual acting as coordinator must be someone who has credibility among all participating stakeholders.
  - The coordinator must be well versed in the characteristics of the basin and its stakeholders, understand their positions, and consider what is fair from the basin perspective.
  - The coordinator must possess the leadership necessary to ensure smooth coordination among a large number of stakeholders.
  - The coordinator must possess the necessary qualities, even if the role is assumed by a basin organization.



## Good Examples

- >>Extracted Key for Success from Büyük Menderes River (3), 'Framework for stakeholder participation in the new scheme', p.82
- >>Extracted Key for Success from Davao River (1), 'Integrating the fragmented sectors', p.88

- >>Extracted Key for Success from Murray-Darling Basin (1), 'Community consultation and participation in decision-making', p.108
- >>Extracted Key for Success from Tone River (1), 'Foundation of the coordination and implementation body', p.144

## 3.3.2 Coordination

### 3.2.1

#### **Coordinate in such a way so that resulting changes will be favourable for and equitable among stakeholders.**

- Coordination and its resulting changes need to be convincing for and as equitable as possible among stakeholders. Consensus will not be reached among stakeholders if the plan is biased towards specific stakeholder groups.
- Each stakeholder values water differently. The same quantity of water has different values for individual stakeholder/sectors because their requirements for water, such as quality, place and timing, vary. Such aspects of water can be utilized for exploring multiple alternatives and to find an agreeable solution for all stakeholders.
- In order to build consensus among stakeholders, the level of satisfaction achieved needs to be as equitable as possible. Thus, it is important to coordinate in such a way that the resulting changes are favourable for and as equitable as possible among stakeholders.
  - Prepare several alternative proposals based on the needs of stakeholders, their degree of physical and psychological satisfaction, social backgrounds and future prospects. When choosing the most appropriate solution, the coordinator must be able to clearly explain that the overall situation will improve.
  - It is important to take into account the needs, financial responsibilities and appropriate timing of stakeholder groups. Only then can the best solutions be chosen and agreed. It is important to recognize, however, that the best solution changes depending on the situation and timing.
  - For example, when planning to install a water-intake facility in the upstream section of a river for new domestic and industrial uses, an option for improving the situation for existing downstream users, for example, by ensuring stable intake downstream, should also be considered as part of the plan.
  - When stakeholders are in direct opposition and a consensus cannot be reached, negotiate steadily and tenaciously, and look for signs of reconciliation.
- When coordination runs into extreme difficulties, the coordinator must patiently and continually negotiate with stakeholders in accordance with the principles outlined above. Depending on the situation, a step-by-step approach may work best although this may be time and resource-consuming.
  - In principle, it is important to include all stakeholders in the coordination process. However, depending on the circumstances, it is sometimes useful to hold separate discussions with individual stakeholders. Afterwards, all the stakeholders can regroup and continue with discussions towards building consensus.
- In situations where certain sectors are advanced in their activities while others are lagging in interest, it

is possible to first put those leading sectors at the centre of discussions and gradually broaden debate to include other sectors.

### Good Examples

>> Extracted Key for Success from Tone River

(2), 'Project planning, coordinating multiple sectors, and conflict resolution', p.145

>> Extracted Key for Success from Tama River (1), 'Rules for coordination and consensus-building in developing the River Improvement Plan', p.136

### 3.2.2

**In the event that the coordination process shows no sign of reaching an agreement, return to the previous process and revise the plan as necessary.**

- If the coordination process faces extreme difficulty, it may be necessary to return to the previous process and re-evaluate objectively, rather than forcing a consensus.

- All sectors act according to the values and norms of conduct based on their own goals and policies. Often this leads, to a greater or lesser extent, to conflicts of interest between sectors.
- If resolution of conflict is difficult, the pre-conditions set for the draft plan may not be appropriate. Objectively identify problems and explore solutions and measures that will result in effective overall results.

### 3.2.3

**Be aware of the infrastructure development plans of individual sectors and coordinate among relevant sectors.**

- Infrastructure development is typically conducted by individual sectors based on the social needs and feasibility (costs, time) of the project. In order to develop infrastructure that is effective and efficient from the perspective of the whole river basin, it is desirable to consider from an early stage the effective allocation and distribution of facilities, giving due consideration to the local area.

- To achieve this, it is first necessary to understand and share sector plans. By knowing what infrastructure is needed by each sector, a possibility for developing multipurpose infrastructure can be identified. Sectors could voluntarily coordinate among themselves if the benefits are obvious.
  - The development of multi-purpose infrastructure greatly improves cost effectiveness, therefore, it is desirable for coordinators to actively facilitate the coordination necessary for their development.
  - There are cases where it is possible to further improve the effectiveness of existing infrastructure by operating them in an integrated and coordinated manner. It is desirable for a coordinator to understand the roles and functions of infrastructures within the basin and explore ways of improving their efficiency of operation.
- Establishment of a 'basin fund' or a 'basin agreement' whereby people in the benefit-receiving area provide support to the river source area may be effective in promoting cooperation with regards to infrastructure development.
- When preparing alternative options consider the perspectives of other sectors by referring to '2. Sectoral Perspectives in IWRM' in these Guidelines. Knowledge of sectoral interests can facilitate coordination.

### 3.2.4

#### **Consider ways, including policy interventions, to secure water supplies during extreme events.**

- Coordination among water users is particularly crucial in times when securing a stable water supply is difficult (i.e. drought, etc). It is advisable to be prepared for emergency situations, and to develop cooperation frameworks or a contingency plan that allows an effective and flexible response to crisis situations.
- Available water resources may be limited during a drought or water quality accident. Consider in advance the framework for coordinating water allocation among users during such emergency situations. It is advisable to take into account a mechanism for flexible water use such as water trading, or measures for securing water during emergency situations.
- Groundwater is less influenced by the impact of climate variability compared to surface water. Integrated management of groundwater with surface water can reduce the impacts of variability in surface water flow. There have been cases where rapid increase in groundwater abstraction during droughts has caused ground subsidence, deterioration of groundwater quality and salination. Thus, it is necessary to examine in advance the potential impacts of groundwater abstraction on groundwater quality and ground subsidence.
- Rainwater harvesting can reduce withdrawal of surface water and groundwater. Rainwater can be used as a water source for domestic water supply during emergency situations such as earthquakes.
- Recycled water can be utilized as water resources. For example, highly treated wastewater can be discharged to rivers as environmental flow during normal times, and can be transferred for other purposes during drought time, reducing the impact of droughts. It is important to clarify the areas where utilization of recycled water is effective, the quantity and quality of water needed, and the rules to be applied for transferring recycled water among uses.

#### **Good Examples**

- >> Extracted Key for Success from Murray-Darling Basin (3), 'Contingency measures to secure critical water demands', p.110
- >> Extracted Key for Success from Yoshino River (3), 'Creating a mechanism for drought conciliation', p.165

### 3.2.5

#### **Prepare a well-balanced plan by exploring a wide variety of options and combinations.**

- Solving various problems with one single solution may not be efficient. Solving a problem with a structural solution alone will require a large facility, which may not be cost effective. A combination of various options including structural and non-structural measures is likely to make the plan more efficient, effective, and environmentally sustainable.
- Options to be considered include the following:
  - Structural measures: dams and reservoirs, channel improvement.
  - Operational measures: improving facility operation.
  - Financial/economic instruments: subsidy, cost allocation.
  - Social/institutional measures: water-saving campaign, coordination during drought, laws and regulations.

- For example, in the case of flood management, options for consideration include not only structural measures such as the construction of a flood control dam and reinforcement of levees, but also non-structural measures such as operational improvement of existing dams during flood events or preparation and dissemination of flood hazard maps, and social/institutional measures such as enhancing flood warnings and evacuation frameworks.

### 3.2.6

#### **Acting as the representative for the environmental sector.**

- According to the definition of IWRM, the sustainability of the indispensable eco-system must not be impaired. It is important to recognize the environment as a stakeholder. If there is no definitive sector representing environmental conservation, it is necessary for the coordinating organization to act as a spokesperson for environmental conservation activities during the coordination process.
- When developing infrastructure, the coordination process must pay due consideration to impacts on the natural environment and ecosystem.
  - Organizations and sectors in the basin that can speak for the environment must participate in the planning process. If such organizations or sector do not exist, then the coordinator should take into account environmental conservation when coordinating with other sectors.
  - A coordinator must accumulate a good knowledge of the basin environment in order to be a spokesperson for environmental conservation.
  - Data collection for addressing problems in the basin should also include available data and information on the basin ecosystem.

#### **Good Examples**

- >> Extracted Key for Success from Volta River (2), 'Causing motivation for ecosystem conservation', p.154

### 3.2.7

#### **Introduce water conservation incentives appropriate for local conditions.**

- The introduction of incentives such as water charges, etc. can promote water-use efficiency and enhance sustainability and flexibility of water use.
- When introducing an incentive system for the first time, it is not always effective to introduce the same systems employed by other regions. There are many such unsuccessful cases, thus, applicability to the basin in question should be considered.
  - Common incentives include the collection of domestic and agricultural water charges. However, introduction of such water charges may not be easy due to social constraints or lack of physical systems required for their management and collection. Introduce an appropriate incentive in a step-by-step manner. Draw upon successful case examples of other regions and start with a pilot project.
  - Due consideration must be given to social situations and the economically vulnerable when collecting water charges. An economic incentive can be effective, but it has a significant social influence. When introducing such incentives it is necessary to consider diverse perspectives as well as indirect impacts.
  - Economic incentives include pricing, but also indirect methods such as improvement of water productivity and labour-saving through water-saving irrigation.
  - In cases where a water charge collection

system is introduced, make sure that it leads to effective water-conservation, for example,

by varying the unit charge depending on the total volume of water used.

### 3.2.8

#### **Consider introducing incentives to coordinate water use in the event of emergency situations such as drought.**

- The IWRM approach is particularly important in the event of emergency situations such as drought, when coordination among water uses is inevitable. Introduction of an incentive for limiting water uses may facilitate building consensus among stakeholders.
- The IWRM approach becomes particularly useful at times of emergency such as drought. It is advisable to introduce necessary policy interventions or mechanisms (such as establishment of a drought fund, water trading, etc.) which allow flexible water use while ensuring consensus among water users.
- Incentives must be appropriate for the local situation, taking into consideration social and economic

situations, local history and culture, etc. They must also be applied in a fair and transparent manner to everyone in the basin.

#### **Good Examples**

>> Extracted Key for Success from Murray-Darling Basin (4), 'Reducing the economic impacts of severe water shortages', p.111

## 3.3.3 Preliminary agreement

### 3.3.1

#### **Develop a plan that is appropriate and acceptable for all stakeholders at the time of the agreement.**

- Depending on the situation one might have to 'give up' certain elements from the 'ideal plan'. Even in such cases, it is important that the resulting agreement leads to favourable changes for all stakeholders and that equitability is ensured as much as possible.
- It is important to aim to maximize benefits in the basin as a whole. However, it is extremely difficult to achieve ideal IWRM immediately.
  - In the event that coordination encounters difficulties, carefully consider the needs, cost and timing, and if appropriate initiate and proceed with the agreement reached at that point.
  - It is difficult to find a solution that can completely satisfy all stakeholders. 'Change in a favourable way' should therefore include monetary compensation.
  - However, there are times when monetary compensation is not a solution. A set of solutions must be selected with great care. At the
- minimum, avoid creating a one-sided victim.
- 'Satisfying to reason, to the law, and to the heart' should be kept in mind when coordinating among stakeholders.
- In order to ensure effective implementation of the agreed plan, it is necessary to clarify at the planning stage issues such as the division of roles in the planning, monitoring and reevaluation, and to include these into the plan.

#### **Good Examples**

>> Extracted Key for Success from Tama River (1), 'Rules for coordination and consensus-building in developing the River Improvement Plan', p.136

## 3.3.2

**Secure social equity and transparency.**

- A lack of social equity and transparency in a plan or in a planning process will raise dissatisfaction among stakeholders even after the agreement, and will prevent the fulfillment of public accountability.
- Securing social equity requires not only an agreement among stakeholders but also that the result of coordination during the planning or implementation phase is acceptable to the public and society as a whole.
- Ensuring transparency and accountability is indispensable for avoiding skepticism regarding the plans or decision-making process and for smooth implementation of the agreed plan.

**3.3.4 Finalizing the plan**

## 3.4.1

**Determine the cost allocation acceptable to all stakeholders by ensuring that it is justifiable.**

- Cost allocation is an issue one cannot avoid in realizing a multi-stakeholder plan. Even if the contents of the plan have been agreed, the final agreement has not been reached until all stakeholders accept the allocation of cost by each stakeholder. For this, a transparent rule for cost allocation is necessary, which should take into account the nature of the plan, such as the main targeted user, etc.
- There is no definitive solution for cost allocation: it must be decided as appropriate for each case. The basic rules for cost allocation and the actual procedure for the computation of costs should be agreed among stakeholders in order to ensure transparency, social acceptance, etc.
- Coordination and negotiation on cost allocation should consider the characteristics of the plan, such as who is the main target user, etc.
- In cases where the cost allocated for a stakeholder group is borne by another entity, the entity responsible for the payment should be involved in the discussion and coordination for cost allocation. For example, if a part of the cost will be covered by a grant from the government, an agency in charge should be involved.
- If an entity or the government bears the cost then collects fees from individual stakeholders, the government, etc should present the cost allocation proposal to the stakeholders for their agreement beforehand.

**Good Examples**

- >> Extracted Key for Success from Tone River (2), 'Project planning, coordinating multiple sectors, and conflict resolution', p.145
- >> Extracted Key for Success from Tone River (3), 'Improvement of water budget in the basin without the construction of new facilities (such as dams)', p.147

**Useful Tools**

- >> Cost Allocation Method, p.172

### 3.4.2

#### **Develop infrastructure with an eye to long-term sustainability.**

- If the infrastructure developed is not maintained properly it will not be able to sustain the intended functions and the investment made will have been wasted. It is necessary to integrate the concept of 'time' into infrastructure development, i.e. account for operation, maintenance and replacement for long-term sustainability of the infrastructure.
- Ensure discussions among stakeholders take place regarding the planning and designing phases of the infrastructure to ensure the sustainable and appropriate maintenance of the infrastructure. Take into account the necessary frameworks and human resources for everyday operation and inspection, fail-safe measures and procurement of replacement parts.
  - It is necessary to promote infrastructure development/maintenance by taking into account the life cycle cost. Introduce appropriate asset management through such measures as rehabilitation of ageing infrastructure, etc.

### 3.4.3

#### **Operate existing facilities in an integrated manner.**

- If water resources management in the basin is at a mature stage with multiple structures and facilities existing in the basin, operational efficiency of existing facilities can be improved through the integrated operation of multiple facilities or re-distribution of their capacities in a basin-wide manner. This will also allow response to future needs without the construction of new infrastructures. These possibilities should be explored before additional investment in infrastructure is made.
- Even if existing facilities have been appropriately maintained and are functioning at expected levels, changes in society and the natural environment may demand that those facilities serve additional or different roles or functions. It may be possible to address such change without constructing new facilities but by improving the operational efficiencies of existing facilities by operating several facilities in the basin in an integrated manner.
  - Coordination among the relevant stakeholders of the existing facilities will be needed to integrate the operation of existing facilities. This will also require coordination with water users or other stakeholders in the area if the flow regime of the river is changed as a result.

#### **Good Examples**

- >> Extracted Key for Success from Tone River (3), 'Improvement of water budget in the basin without the construction of new facilities (such as dams)', p.147

### 3.4 IMPLEMENTING, MONITORING AND EVALUATING

This aim of this phase is to implement, develop, manage and operate the agreed scheme or framework (including infrastructure development or establishment of legislation or institutional framework). Things to note in this phase are:

- Is the implementation programme executed promptly?
- Is the system adapted and functioning?
- Are there any new problems with the new approach/scheme?

#### 3.4.1 Implementation

##### 4.1.1

#### **Strive to realize the benefit of the project early.**

- In cases of infrastructure investment, efficient financing and early completion of the project is essential in order to realize the benefits of the project early and to ensure investment efficiency. Fiscal policy and financing should aim for early completion of the project which should take into account the nature of the plan, such as the main targeted user, etc.
- Prioritize budget allocation based on the urgency and cost-effectiveness of the projects (see Key 2.3.1).
  - For example, dam construction requires significant funds in the few years before the completion of the project. It is important to develop a budgetary plan that allows for intensive financial allocation in those years.
  - If multiple facilities, such as dams, weirs, channels or treatment plants, are to be constructed to deliver new water services, ensure that the construction and financing schedules allow the facilities to be completed and commissioned in a consistent manner.
- It may be difficult to make users pay for the construction of facilities prior to completion of the project or before users recognize the benefit of the project. It is advisable to prepare a system whereby the project executing body makes an advance payment for construction of the facility and then receives redemption from users following project completion through collection of fees.

Prompt execution of the implementation programme and early realization of its impacts and effectiveness is important for the IWRM process. However, things do not always turn out as planned. There are times when the established approach or scheme does not function in the way expected. Thus, monitoring is an important aspect of an IWRM process. Furthermore, it is necessary to retain a broad view and watch out for new problems caused by social changes, etc.

It is also important to evaluate the impacts of issues not addressed in the current plan and see if such issues need further attention in the future. This leads to the 'recognizing and identifying' phase in the next stage of the IWRM spiral.

##### 4.1.2

#### **Keep to the coordination scheme established for planning and share information among stakeholders.**

- Even if a plan is agreed upon by stakeholders, additional challenges may occur at the implementation phase. Maintain the participatory scheme established during the planning stage. Continuous information sharing allows additional issues to be addressed in an appropriate and participatory manner.



- The coordination scheme established for planning can be used later on as a mechanism for coordination during droughts, etc.
  - A permanent framework for information sharing will facilitate understanding among stakeholders on the status of water resources and its uses, and facilitate coordination among stakeholders. Organized regular annual meetings, etc are effective.
  - Such schemes can also serve the function of mutually monitoring stakeholders to ensure compliance with the agreement made.

#### Good Examples

- >> Extracted Key for Success from Yoshino River (3), 'Creating a mechanism for drought conciliation', p.165

### 4.1.3

#### **Ensure that information from construction/improvement of a facility is carried over into management and operation.**

- If operation and maintenance (O&M) of an infrastructure is to be carried out by an entity different from that responsible for commissioning, the information regarding the construction of the infrastructure needs to be appropriately taken over by the entity responsible for O&M in order to avoid any operational problems.
- The basic thoughts and the background to the planning and design of the infrastructure, the outcomes of numerous coordination processes and agreements made with relevant parties, are important information for the appropriate management, and for the operation and maintenance of the facility. This information needs to be appropriately taken over from the entity responsible for commissioning by the entity responsible for operation and maintenance.
- If the same entity constructs and manages a facility, information such as design specifications and detailed information from the construction is passed on to the management phase without any omission. This ensures that appropriate measures are implemented at times of malfunctions and reduces maintenance costs.

### 4.1.4

#### **It is advisable to prepare an institutional framework to aggregate experience and knowledge obtained through construction/improvement or operation/maintenance of infrastructure in and out of the basin.**

- Experience and knowledge gained through construction/improvement or operation/maintenance (O&M) of an infrastructure is very valuable for construction/improvement or O&M of other facilities. If such experience and knowledge is not aggregated or shared it will eventually be lost, which will be an enormous social and economic loss.
- Needless to say, infrastructure construction/improvement or operation/maintenance conducted in the basin must be appropriate for the basin's situation. At the same time, the information used can also be useful for infrastructure development in other basins. Alternatively, obtaining information regarding infrastructure development or O&M of infrastructure in other basins can usefully enhance infrastructure development or O&M in your own basin and improve the quality of the services delivered. Thus, it is advisable to prepare an institutional framework to aggregate experience and knowledge obtained through construction/improvement or operation/maintenance of infrastructure in various basins.

### 3.4.2 Monitoring and evaluation

#### 4.2.1

##### **Continuously collect necessary data and share among stakeholders.**

- Data changes from day to day. Collecting important data continuously provides understanding of changes occurring in the basin as well as changes expected in the future. Such data and information are important not only to carry on current activities, but can also be used in assessment and evaluation to advance the basin's IWRM efforts in the future.
  - Data sharing among stakeholders during coordination is critical because it builds common understanding among those involved. Inadequate sharing of information will prevent building common bases for discussion among stakeholders, and may lead to disruption of the consensus building process by e.g. creating suspicion among stakeholders or loss of credibility.
  - It is vital that individual stakeholders make decisions and act based on shared information, particularly in cases of extreme events such as droughts and water quality hazards, in order to avoid truncated information and ensure the integrity of the various activities.
- It is crucial to first make clear the types of data collected by each sector and where the data can be accessed. Discharge data during a drought or flood event is particularly important. A data-sharing platform using the internet or a database is convenient but establishing such a mechanism may cost time and money.
  - The most important point is to make current data publicly available and inform others as to where such data can be accessed. This can be done without building an elaborate mechanism for information sharing. Data accessibility or usability can be enhanced by improving ways of classifying or storing data (for example, gathering data of the same type in one place and arranging them in sequential order, etc). Thus, many objectives can be achieved with existing material.
  - It needs to be stressed that recording and storing data over the long-term requires financial and human resources to be instituted in a continuous manner. Policy makers need to recognize the importance of continuous data collection. Furthermore, managers responsible for data management need to thoroughly consider the necessity and sustainability of continuous data collection, select the type of data to be stored and utilized, and decide on the data management strategy.
  - A database is useful but not versatile. Developing a database requires thorough consideration of whether and how the system to be developed will be utilized, maintained, and updated in a sustainable manner into the future.

#### 4.2.2

##### **Continuously monitor and evaluate the effectiveness of IWRM activities (plans, projects, infrastructure, legal framework, organizations, etc) in the basin.**

- Continuous monitoring and evaluation improves IWRM approaches implemented in the river basin, as well as the services delivered, enabling movement up to the next stage of the IWRM spiral (refer to Chapter 4 for further description of the IWRM spiral).

- Examine which activities in the river basin have been successful or should be continued through ongoing monitoring and evaluation of introduced projects, plans, facilities, legislative framework or related organizations.
- When evaluating projects, facilities or legal frameworks, take into account socio-economic benefits, environmental or socio-economic sustainability and social fairness, bearing in mind the initial objectives and current status.
- In the event that projects, facilities, legal frameworks or related organizations have been newly introduced, it is necessary at an early stage to evaluate the adaptability of the new scheme and examine whether the initially expected benefits and functions have been fully realized. Based on the results, make adjustments or revise as necessary. It should be noted that certain activities or projects do not provide apparent benefits in the short term.
- Indices used for evaluation should reflect changing social needs and priority issues in the basin. Indices

should be appropriate for local characteristics and should be easy to understand and measure.

- When monitoring, ensure that stakeholders are in compliance with the agreement. If not, find out the reasons and the issues to be addressed.
- Evaluations should be conducted in an objective and fair manner. The evaluation system should have the agreement of all stakeholders.

### Good Examples

- >> Extracted Key for Success from Brantas River (3), 'Managing water resources and infrastructures in the basin', p.71
- >> Extracted Key for Success from Büyük Menderes River (2), 'Continuous project monitoring in order to improve next steps', p.80
- >> Extracted Key for Success from Lake Biwa (2), 'Formulation of comprehensive conservation plan with the participation of all stakeholders in the basin', p.99

### 4.2.3

**Examine evaluation results and identify/analyse changes occurring in the basin from broad and long-term perspectives at each turning point of the IWRM process. Translate this into a driving force to improve IWRM.**

- IWRM is a dynamic process that evolves with changes occurring in the basin. At each turning point of the IWRM process, it is important to conduct a review of the outcome, identify any gaps between social demands and current IWRM, set the next priority issues and define the new direction for IWRM. It is crucial for IWRM to be firmly placed within the social system and to continue evolving.
- It is highly important to review past efforts and discuss/identify future directions and priority issues to push forward IWRM efforts in the basin. Such reviews should take place at each turning point of the IWRM process, for example, in the completion of a project or basin plan, etc.
- Changes in the state of the basin (changes in urbanization, population, land use, income group structure, economic status, environmental degradation, etc) or changes in social framework and recognition (legislative framework, awareness on environmental, energy or climate change issues, etc) should be viewed from a panoramic perspective. Identifying issues that are different or new from those initially envisioned will become useful when discussing and putting together a new IWRM strategy or concept.
- It is important to 'recognize' changes occurring in the basin or any signs of changes from evaluation results. If any IWRM activities in the basin were identified as unsatisfactory in the evaluation, this could be due to gaps between socio-economic and environmental demands and current IWRM activities. Determine how important such changes are, and see if they need to be addressed urgently. It is important to translate information on changes occurring in the

basin into a driving force (identifying priority issues for the new IWRM plans, etc) in order to improve IWRM efforts in the basin (refer to Key 1.1.2).

- It is also necessary to proactively disseminate and share such re-evaluation results with stakeholders in the basin and society. This can enhance, strengthen and propagate the driving force.

### 3.5 POLICIES/NATIONAL STRATEGIES, LEGISLATIVE FRAMEWORK, FINANCING

The rest of this section includes keys for success, which are useful for readers concerned with policies/national strategies, legislative frameworks and financing, but are also important throughout the entire IWRM process. Things to note in this phase are:

- Can you move ahead with just the consensus built among stakeholders or do you need a formal framework?
- Are you working bottom-up to influence national or higher level organizations?
- Do you have financial sources in mind?

Policies/national strategies and legislative framework are established at the national level except in the case of special regional or local laws and regulations. These have significant impacts on water resources manage-

#### Good Examples

- >> Extracted Key for Success from Yoshino River (4), 'Securing environmental flow to improve IWRM at the next stage', p.167

ment. However, it takes enormous time and effort to establish a new framework or amend existing ones. It is important to always consider whether these are really necessary in order to proceed with the IWRM process. If it can be achieved through consensus among stakeholders instead of laying out a national level framework a lot of time will be saved.

Furthermore, financing is an important aspect of the IWRM process. You must be aware of the budgeting schedule and undertake the necessary actions. If you are expecting financial assistance from donors you must also be aware of their approval and procedural schedules.

#### 3.5.1 Policies and National Strategies

While the rest of the section includes keys for success useful for a reader concerned with national policy and legislation at the national level, they might also be useful for practitioners at the field level.

##### 5.1.1

#### **Advocate the importance of water resource management at the basin level and promote coordination among all sectors to be addressed in policies and national strategies.**

- The positioning of IWRM in national policies and strategies is of great interest to practitioners. At the same time, however, there are often practitioners who cannot be directly involved in its realization.
- However, there are many ways that practitioners can contribute to addressing IWRM in national policies. The major role of practitioners is to inform policy makers of the importance of IWRM, good practices and critical factors to be addressed in its institutionalization, and to promote understanding and action by policy makers. This also has advantages for policy makers as better understanding of the importance of IWRM and success factors will greatly facilitate their work of addressing IWRM within policies. Furthermore, continuous awareness-raising on IWRM among the general public brings practical and political advantages.
- It is not only in IWRM that regional or local success stories are taken up in national policies. Do not think that national policy issues are not your business. Continue communicating with policy makers, stakeholders and the general public, and raise IWRM awareness.

(Actions to be taken by practitioners)

- Document your experience and success stories of IWRM and present them to networks and communities of specialists at various opportunities. These are important activities for sharing information, maintaining your motivation and building capacities.
- Discuss among practitioners the key points to making IWRM policies and institutions function at the field level based on their activities at the basin level. Training and seminars are constructive in this regard.
- IWRM practitioners at senior levels have an important role in creating opportunities for dialogue between policy makers and practitioners, in order to turn the knowledge and experience gained by practitioners into national level plans and international strategies.
- Practitioners who actually implement IWRM at the basin level should recognize the significance of public voices being delivered to the national government through grassroots activities at regional and basin levels. Raising awareness on water and the importance of IWRM approaches should be considered a part of their responsibilities and its enhancement should be explored.
- Recognize that a practitioner holds a responsibility to implement a part of the national-level plan, to convey his/her own message or opinion to decision makers through an administrative channel, and to promote and back-up cross-sectoral cooperation at the national level.
- Even if IWRM is not positioned in national policies or strategies, IWRM practitioners should continue promoting IWRM efforts in the basin.

(Actions to be taken at the national level or by policy makers)

- There are various water-related internationally agreed strategies such as the MDGs (Millennium Development Goals) and the development of IWRM plans promised at the Johannesburg Summit. Setting up a state level organization responsible for implementation of international strategies can be effective in this regard.
- Genuinely listen to the voices of practitioners and stakeholders and translate them into policy or institutional frameworks.
- Securing appropriate human resources is important for implementing IWRM, not only for the coordinator but also for the stakeholders being coordinated. It is advisable to incorporate capacity building of required human resources into national policies and strategies.

### Good Examples

- >> Extracted Key for Success from Brantas River (1), 'Applying integrated river basin development and management concept', p.69
- >> Extracted Key for Success from Lake Biwa (2), 'Formulation of comprehensive conservation plan with the participation of all stakeholders in the basin', p.99
- >> Extracted Key for Success from Negro River (1), 'National policy and needs are important to promote an integrated approach', p.118

### 5.1.2

**In countries with an international river basin, act to encourage a mechanism for coordination with the countries sharing water, to be included in policies or national strategies.**

- When a basin is shared with another country, conflicts over water may lead to national security concerns. On the other hand, water-sharing cooperation among such countries contributes to peace and stability in the basin.

- In international river basins, coordination among countries can lead not only to securing stable water resources but also to reducing national security risks. This is also true for basins situated in a single country, but shared by multiple jurisdictions.
- Improving or enhancing the IWRM framework in a country will contribute to transboundary cooperation with other countries.
  - It is also important to recognize that developing a consensus-building framework within a basin is the first step towards basin cooperation.
  - If establishing a new institutional framework for basin cooperation, or a basin organization is not realistic from the outset, it may be effective to promote information sharing in a step-wise manner through cooperative activities such as organizing dialogues, rather than establishing a river basin organization at the initial stage.
- There may be various potential kinds of framework for cooperation in the river basin, such as cooperation between two countries or among several. It may be practical and effective to establish a multi-country framework at first, and then use it as basis for cooperation between two countries.

### 3.5.2 Legislative framework

#### 5.2.1

#### **Advocate the importance of the basin as a basic unit for water resources management and promote its existence in legislation.**

- Individual sectors implementing measures in accordance solely with their own relevant laws can put to risk the sustainability of water management in the basin. Clearly stating in legislation the importance of basin-wide cooperation will facilitate smooth IWRM implementation.
- Water has many stakeholders, thus managing water and implementing water-related projects requires sector cooperation and coordination. Sectors in society are generally managed under the jurisdiction of a sectoral administrative agency. It is possible to share information and coordinate among sectors without a legislative framework at the practice level, but some activities can be limited due to sectoral legislation. Positioning the importance of sectoral coordination for efficient water management within the national legislative framework, and addressing in it responsibilities with regard to cooperation and information sharing is a significant step.
- A law cannot be created in a short space of time, but it is important to recognize the usefulness of positioning IWRM in legislation based on past experiences or examples of other basins and countries, and to undertake the necessary actions.
  - Start by informing the person in the organization responsible for jurisdiction over legisla-
- tion of the importance of IWRM, proven by actual cases of IWRM implementation. It is also important to point out whether existing legislation is sufficient as regards IWRM. The first hurdle in institutionalizing IWRM is overcome if he/she recognizes and understands the importance of IWRM.
- It is desirable that legislation clearly states the important elements of IWRM implementation in the basin and the relevant sectors.
- Clearly defining IWRM in legislation sends a clear message to the international community that the country places a high priority on water and IWRM.

#### **Good Examples**

- >> Extracted Key for Success from Brantas River (4), 'Coordinating among sectors and all stakeholders', p.72

## 5.2.2

### **It is advisable to define frameworks for coordination, consensus building and implementation/evaluation of IWRM-related plans in legislation.**

- If important elements in the IWRM implementation process do not have sufficient legal back-up, coordination of IWRM activities are often conducted based on related existing laws, and in some instances within the discretionary power of the individual or organization in charge. These activities can often facilitate IWRM. However, political/administrative conflicts or practical problems can occur in areas where there are legal conflicts or missing responsibilities. It is desirable to build up the experience of successful IWRM practices while on the other hand continuing the progressive effort to institutionalize the IWRM coordination framework and processes.
- A law cannot be created in a short space of time, but it is important to recognize the usefulness of positioning IWRM in legislation based on past experiences or examples of other basins and countries, and to undertake the necessary actions.
  - If there are no relevant laws or institutions, consider substituting them with a binding document such as a declaration statement, circular notice, etc in order to secure some level of binding force for IWRM implementation. It is also possible that IWRM processes originating from grass-roots activities may become institutionalized through a bottom-up process.
  - Accumulation of such binding documents or past accomplishments can prepare the ground for new laws and legislative frameworks. It is useful to keep policy makers informed of international declarations or actual regional IWRM activities.
  - Policy makers that understand IWRM and its functioning in actual practice form a significant first step towards development of effective institutional frameworks.
  - The person responsible for IWRM coordination should understand laws and the institutional frameworks of relevant sectors in order to facilitate development of new frameworks as well as to enhance IWRM activities.

### **Good Examples**

- >> Extracted Key for Success from Lake Biwa (I), 'Legislative framework for conflict resolution between upstream area – the Lake Biwa basin - and downstream area', p.97
- >> Extracted Key for Success from Negro River (I), 'National policy and needs are important to promote an integrated approach', p.118
- >> Extracted Key for Success from Tone River (I), 'Foundation of the coordination and implementation body', p.144

## 3.5.3 Financing

### 5.3.1

#### **Secure financial resources for IWRM coordination in order to promote IWRM in the basin.**

- The IWRM process requires coordination of numerous stakeholders in the basin and sets out a basic direction for the overall effort in order to address intricate water issues. The success of such IWRM coordination requires adequate financial resources.
- Financial resources required for coordination are relatively small compared to those required for infrastructure development. However, lack of understanding by decision makers on the importance of IWRM results in insufficient funds, which then prevents the introduction of IWRM or delays in IWRM coordination and implementation. Continuation of conventional sector-led planning can lead to enormous losses for the basin, society, and the environment

- Coordination efforts for consensus building, such as assessments of water resources in the basin, various studies and simulations, coordination for implementation/monitoring/evaluation, all require financial resources.
  - The coordination activities alone do not produce profit, and the effectiveness of the investment is not obvious at the time of coordination. This has led to inadequate recognition of the importance of investing in IWRM implementation in many national and regional policies.
  - Implementation of IWRM delivers significant advantages to the basin and society. For example, constructing a multi-purpose dam rather than a single-purpose dam can result in massive cost reductions for the sectors involved. The cost advantage is much greater than the costs required for coordination.
  - IWRM practitioners need to inform policy makers of these benefits and promote their understanding and awareness.
- Transparency is a key for coordination in IWRM process. Funding from relevant sectors for coordination should be welcomed, but care must be taken in preparing the funding scheme so that it does not lead to any bias in coordination or suspicion of bias among stakeholders.
- Public financing from national or regional administrations or cooperation from donors may be necessary in regions where river basin organizations are yet to be established, or are at initial stages of development, as basin organizations are often financially fragile.
- Other sources of funding can be explored at a more mature stage of coordination, such as cost allocation among stakeholders or utilizing a part of the profits generated by water resources development/management to establish a basin fund.
- In any case, it is crucial to establish a scheme whereby financial sources are secured not in a temporary but in a sustainable manner.

### Good Examples

- >> Extracted Key for Success from Negro River (2), 'Securing permanent finance for coordination activities', p.119



Essence of a handbook for integrated water resources management in basins prepared by the collaborative work of the International Network of Basin Organizations (INBO) and the Global Water Partnership (GWP). This handbook is written primarily for basin managers and government officials, and their partners. It provides practical guidance for improving the governance of freshwater resources, in particular through the effective application of the integrated water resources management (IWRM) approach in lake and river basins and aquifers. The following table details the key points noted in the Handbook to implement the IWRM approach.

Action	Key points
Establishing basin management systems	<ul style="list-style-type: none"> <li>• Political will, high-level commitment and water user dialogues are essential in establishing basin management systems.</li> <li>• Basin management is governed by national water policies and legislation, and international agreements.</li> <li>• Basin organizations operate within a three-dimensional framework: the enabling environment, institutional arrangements (roles and responsibilities), and management mechanisms.</li> </ul>
Roles and types of basin organizations	<ul style="list-style-type: none"> <li>• The mandate of basin organizations is to be the 'leading voice' on basin water management.</li> <li>• Basin organizations have three main functions:               <ol style="list-style-type: none"> <li>1. monitoring, investigating and coordinating;</li> <li>2. planning and managing; and</li> <li>3. developing and regulating.</li> </ol> </li> </ul>
Finance	<ul style="list-style-type: none"> <li>• Basin management systems need adequate, reliable and sustained financing.</li> <li>• Financing supports three main functions:               <ol style="list-style-type: none"> <li>1. stewardship of the resource;</li> <li>2. developing and maintaining infrastructure; and</li> <li>3. operating the basin organization.</li> </ol> </li> <li>• There are three basic sources of revenues:               <ol style="list-style-type: none"> <li>1. taxes;</li> <li>2. tariffs (and other charges); and</li> <li>3. transfers.</li> </ol> </li> </ul>
Involving stakeholders	<ul style="list-style-type: none"> <li>• Ensure key stakeholders are represented in basin management.</li> <li>• Distinguish between consultation, information, participation and empowerment.</li> <li>• Carefully consider the balance between informing all and involving a few.</li> <li>• Ensure administrative processes do not jeopardize real participation.</li> <li>• Ensure participation is transparent.</li> <li>• Boost ownership of basin action plans by establishing and maintaining community participation.</li> <li>• Ensure financing for involving stakeholders is adequate.</li> <li>• Ensure communication between those managing local action plans, heads of government water agencies, and heads of basin organizations.</li> <li>• Develop the capacity of disenfranchised groups so they can participate in planning and implementation at appropriate levels.</li> </ul>
Strategic long-term planning	<ul style="list-style-type: none"> <li>• Strategic planning involves setting long-term goals for water management in a basin.</li> <li>• In developing the strategy, key areas to cover are issues, priorities, management actions, costs and benefits, and risk assessment.</li> <li>• Strategic basin planning links basin-level actions to national development goals, policies and planning processes.</li> <li>• The strategic plan needs to be flexible enough to adjust to new information and changing circumstances as they emerge.</li> </ul>

**Table 3.1** Key Points from A Handbook for Integrated Water Resources Management (GWP/INBO)

Basin action plans	<p>The basin action plan sets out the goals, objectives and actions to be taken in the short term to implement the long-term strategy.</p> <ul style="list-style-type: none"> <li>• The basin action plan details the resources needed to implement the plan and the sources of financing.</li> <li>• The basin action plan spells out how actions will be coordinated.</li> <li>• The basin action plan states how regulations will be enforced under current legislation.</li> <li>• The basin action plan specifies cost-sharing arrangements.</li> <li>• The basin action plan spells out how management outcomes will be reported to stakeholders.</li> </ul>
Basin information systems and monitoring	<p>Make sure there is an interactive, accessible, affordable, appropriate and equitable basin information system.</p> <ul style="list-style-type: none"> <li>• Collect and organize a comprehensive set of biophysical, social and economic data and information on the basin.</li> <li>• Make sure data and information relate to the basin management strategy and action plan.</li> <li>• Ensure stakeholders can access and use the data and information in ways that suit their needs.</li> <li>• Use geographic information systems and other user-friendly means to present the status of basin resources and monitor changes.</li> <li>• Set up a basin-monitoring programme that coordinates information from state, federal, commercial, and non-government organizations.</li> </ul>
Communication	<ul style="list-style-type: none"> <li>• Good communication boosts ownership of basin management.</li> <li>• Public awareness campaigns and education programmes encourage support for basin management.</li> </ul>

# 4. IWRM Process

## 4.1 THE 'IWRM SPIRAL' CONCEPTUAL MODEL

### 4.1.1 The IWRM spiral

The 'IWRM spiral' demonstrates how the dynamic and evolving process of IWRM in a river basin progressively achieves better and more sustainable water resources management.

The model provides the following advantages:

- It helps users to understand both their current situation and where to head next in the IWRM process by integrating a timeframe.
- It enables users to seek better solutions that adapt to changes.
- It facilitates reaching agreements and increasing ownership at each 'turn of the spiral'.
- It provides a framework for looking ahead and planning for the next 'turn of the spiral'.

IWRM at the river basin level seeks better water resources management through such means as progressively developing water resources in the basin, building a more integrated institutional framework, and improving environmental sustainability. This goal must always be kept in mind wherever you are positioned in the IWRM spiral. However, it should be noted that the process cannot proceed at once in a short period of time; IWRM is an evolving, step-by-step process.

One turn of the spiral includes such phases as: (1) recognizing/identifying pressing issues or needs,

(2) conceptualizing the problem itself and locating possible solutions, (3) coordinating and planning among stakeholders to reach an agreement, and (4) implementing/monitoring/evaluating the plan and its outcome. This creates a new IWRM framework or scheme in the basin, which also forms the beginning of the next stage of the spiral. One turn of the spiral may take a long time. In the case of a large water resources development project, such as the construction of a dam, it may take more than ten years to complete one turn. Creating a new institution or organization would also require several years.

Each of the good examples cited in Chapter 5 includes a diagram illustrating their spiral IWRM progression. This can provide ideas on how actual IWRM practices progress in a spiral manner.

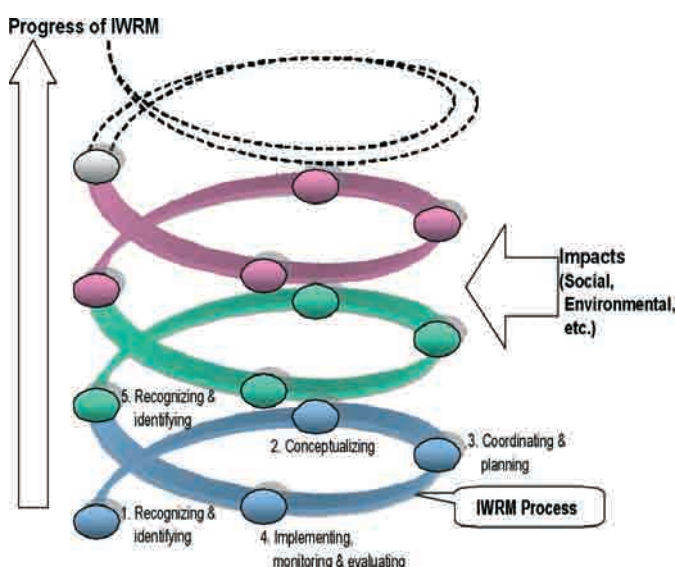


Fig 4.1 Spiral evolution of IWRM

### 4.1.2 Stages of the IWRM spiral

The IWRM spiral begins by recognizing the necessity for IWRM. First, you need to possess an overall picture of the basin. Start with the information already available. This will help you understand the issues and problems existing in the basin, leading to recognition/identification of the need for introducing an IWRM approach. You will then assess the current circumstances and conceptualize possible solutions. Prepare a plan and finalize it through coordination with relevant stakeholders, then implement the plan to create a new IWRM scheme or approach in the basin. This is the first stage of the spiral.

The stages to follow begin with recognizing either the necessity for improving the current IWRM approach/framework or for a new IWRM system. Recognition of needs may be triggered by the intensification of problems left over from the previous stage, such as rapid increase in demands, or by increasing concerns over new issues, such as climate change.

### 4.1.3 Recognizing the stage shift

The stage changes when you recognize the need for change. Moving up the spiral is a time-consuming process, and requires reaching agreements with stakeholders and building consensus. It is important that water resources managers recognize changes or needs, and take early action while ensuring public understanding and support.

Significant changes in the basin, such as economic development, changes in social values and demands, and unexpected crisis situations can become the occasion to realize the need for improving or revising water resources management. Such changes can become the driving force for better water resources management, and should be considered as a chance to improve IWRM in your basin.

### 4.1.4 Where do you stand in the spiral?

Where do you stand in this spiral? Where is your basin situated in the spiral? What phase are you in? Are you in the phase for ‘recognizing’ changes or ‘conceptualizing’? How many stages have you already been through in the IWRM spiral? Take a moment and think about it. It is useful to approximately situate yourself in the spiral when reading these Guidelines in order to find the information you need.

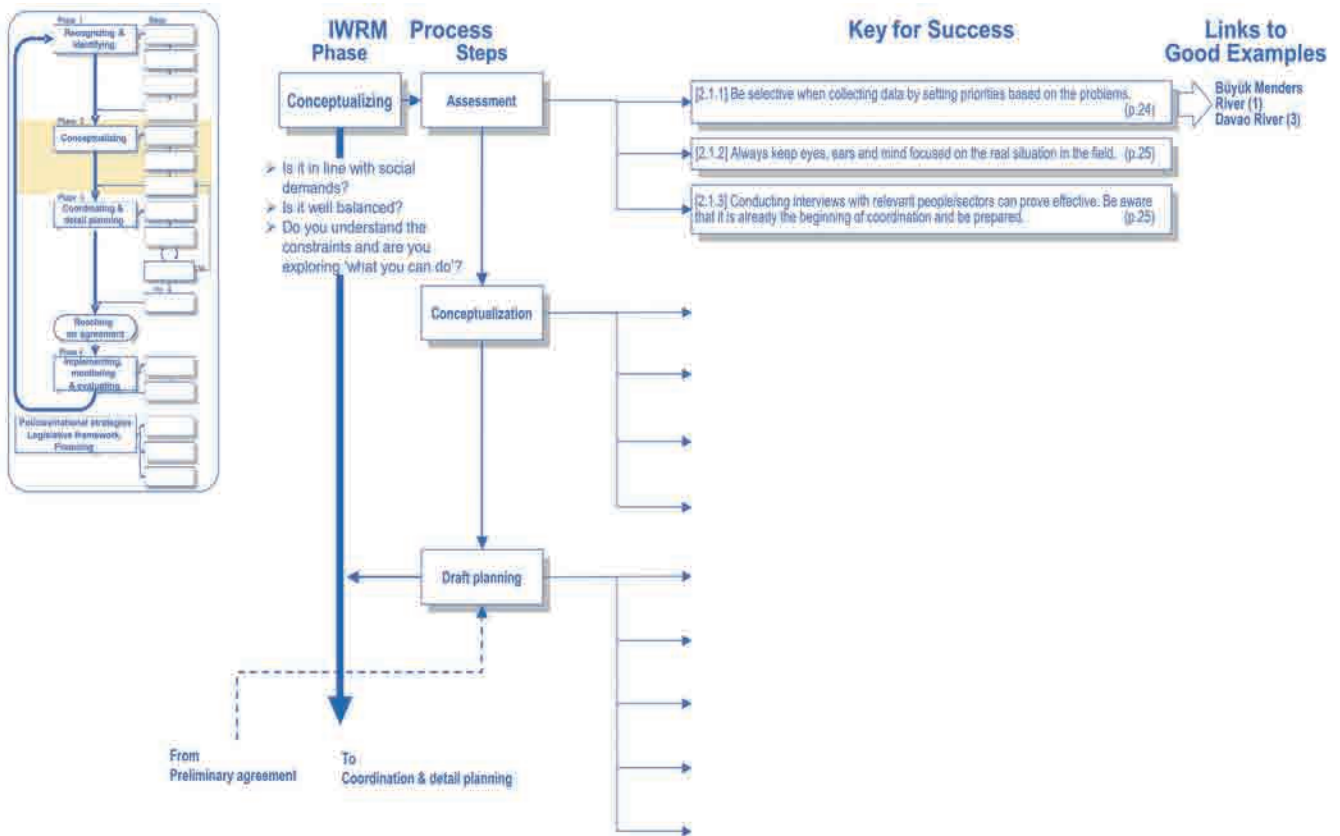
If you cannot find a solution appropriate for you, change your position in the spiral. Looking at different phases or steps in the IWRM process by flipping back and forth through the Guidelines may help you. Thinking about your positioning allows you to check if you have missed any steps in the past, as well as helping you to visualize actions that may be necessary in the future.

## 4.2 PHASES, STEPS AND KEYS FOR SUCCESS IN THE IWRM PROCESS

In the Guidelines, an IWRM process at a given stage is described in terms of four phases. The elements of the process that are related to all phases, such as policies, legal frameworks and financing, are indicated

outside of the process flow. Each phase is further explained through the steps it involves.

The IWRM process and its respective steps are each linked to a relevant ‘Key for Success’ and ‘Good Examples’ included in chapters 3 and 5 of these Guidelines.



■ Fig. 4.2 IWRM process, the ‘Key for Success’ and ‘Good Examples’

## 4.2.1 Phase 1: Recognizing and Identifying

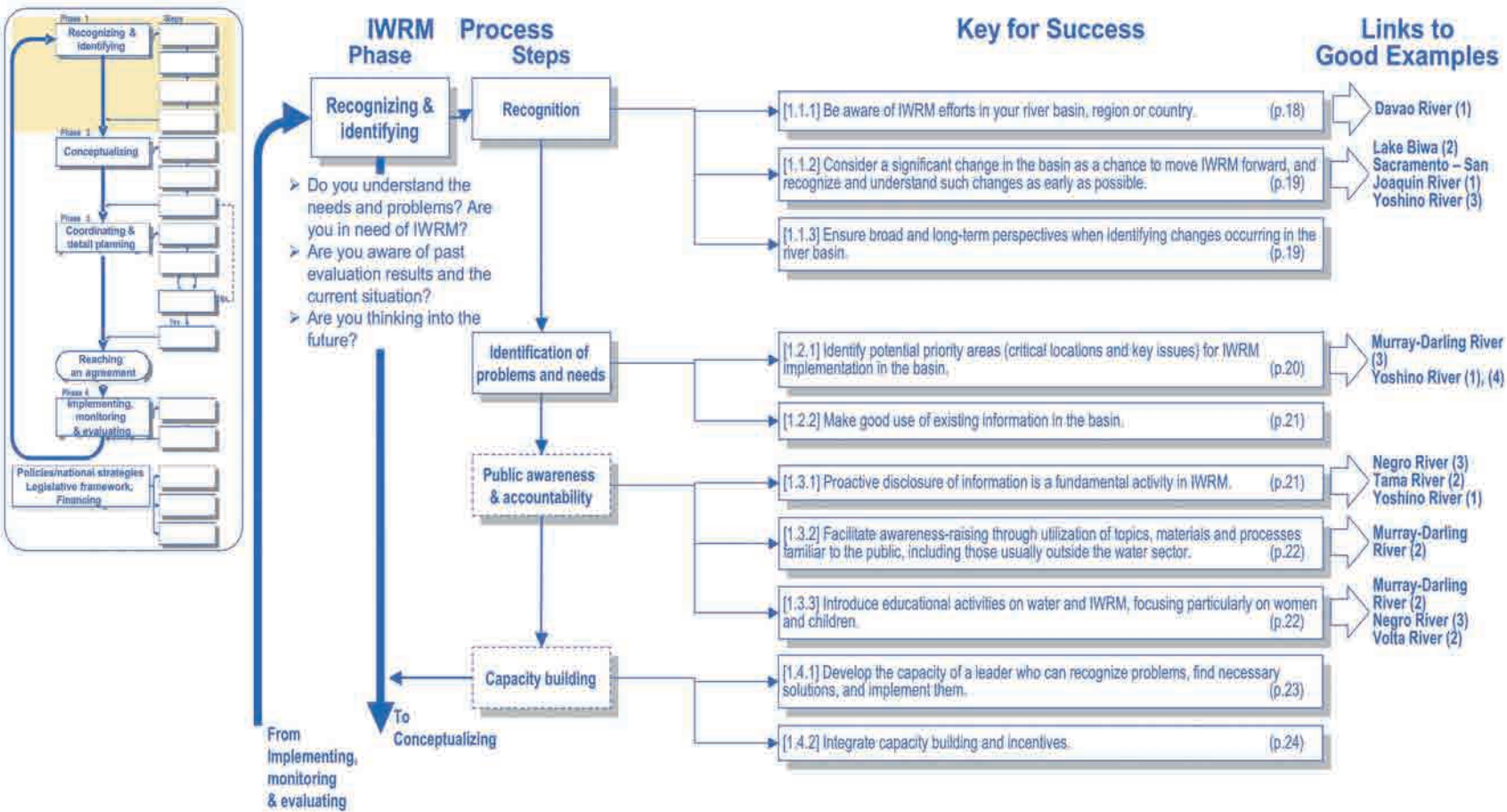


Fig. 4.3 Phase 1: Recognizing and Identifying

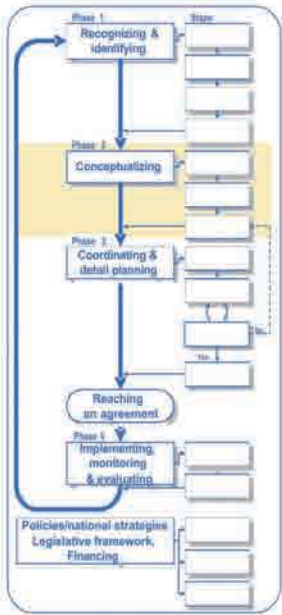
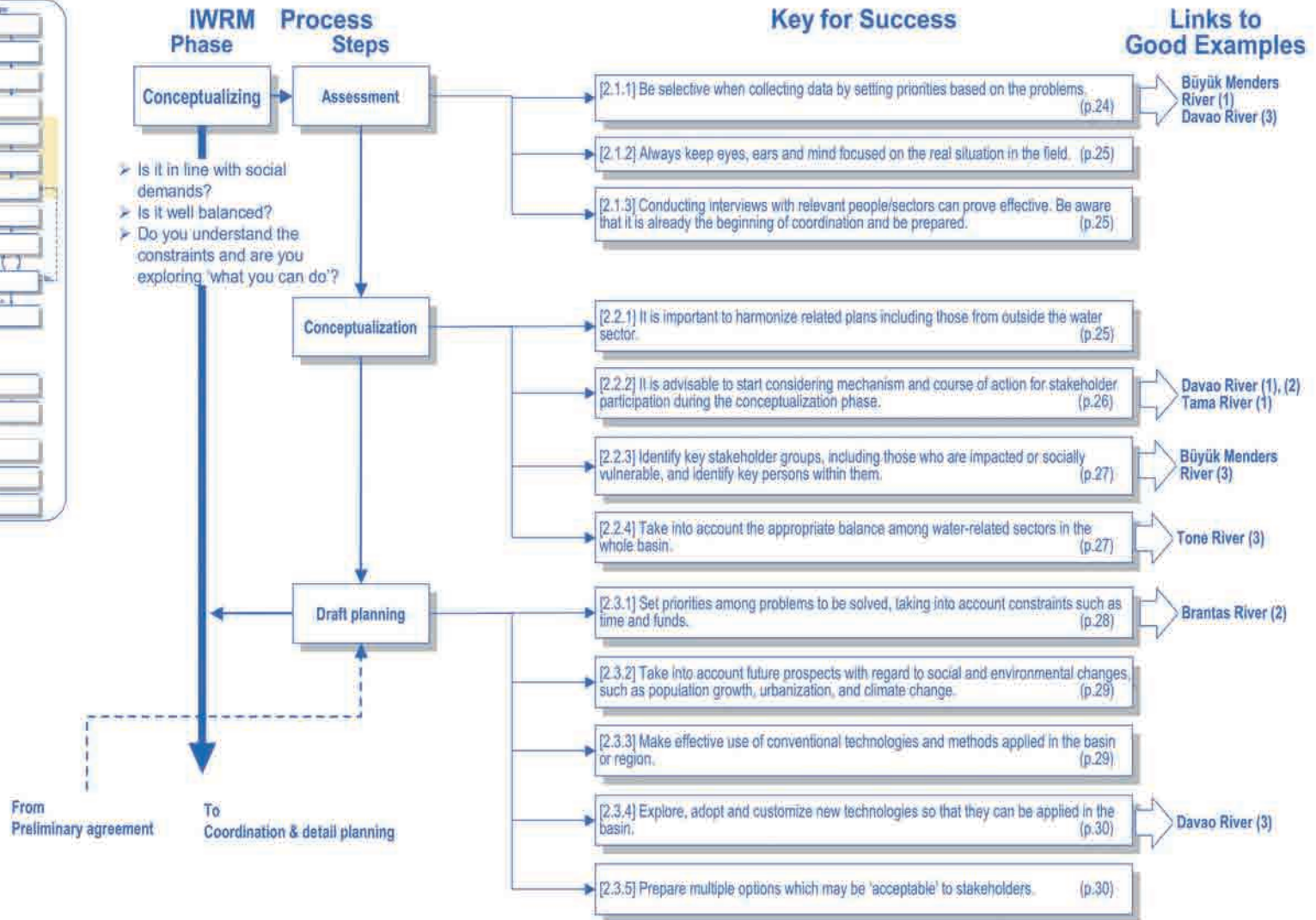


Fig. 4.4 Phase 2: Conceptualizing



**Steps in Phase 2: Conceptualizing**

**Assessment :** Grasp the overall structure of the problem such as 1) problems and needs, 2) natural conditions, and 3) human factors. Interactions with stakeholders have already began at this stage.

**Conceptualization :** Consider the course of action and the relevant stakeholders and their relationships for tackling the problem based on the assessment conducted above. Conceptualize possible solutions.

**Draft planning :** Prepare draft plans based on the concepts outlined above. It is most important that multiple alternative solutions are prepared. In cases where coordination in phase 3 does not reach an agreement you may have to come back to this phase again. Carefully drafting proposed plans will avoid such impediment.

### 4.2.3 Phase 3: Coordinating and detail planning

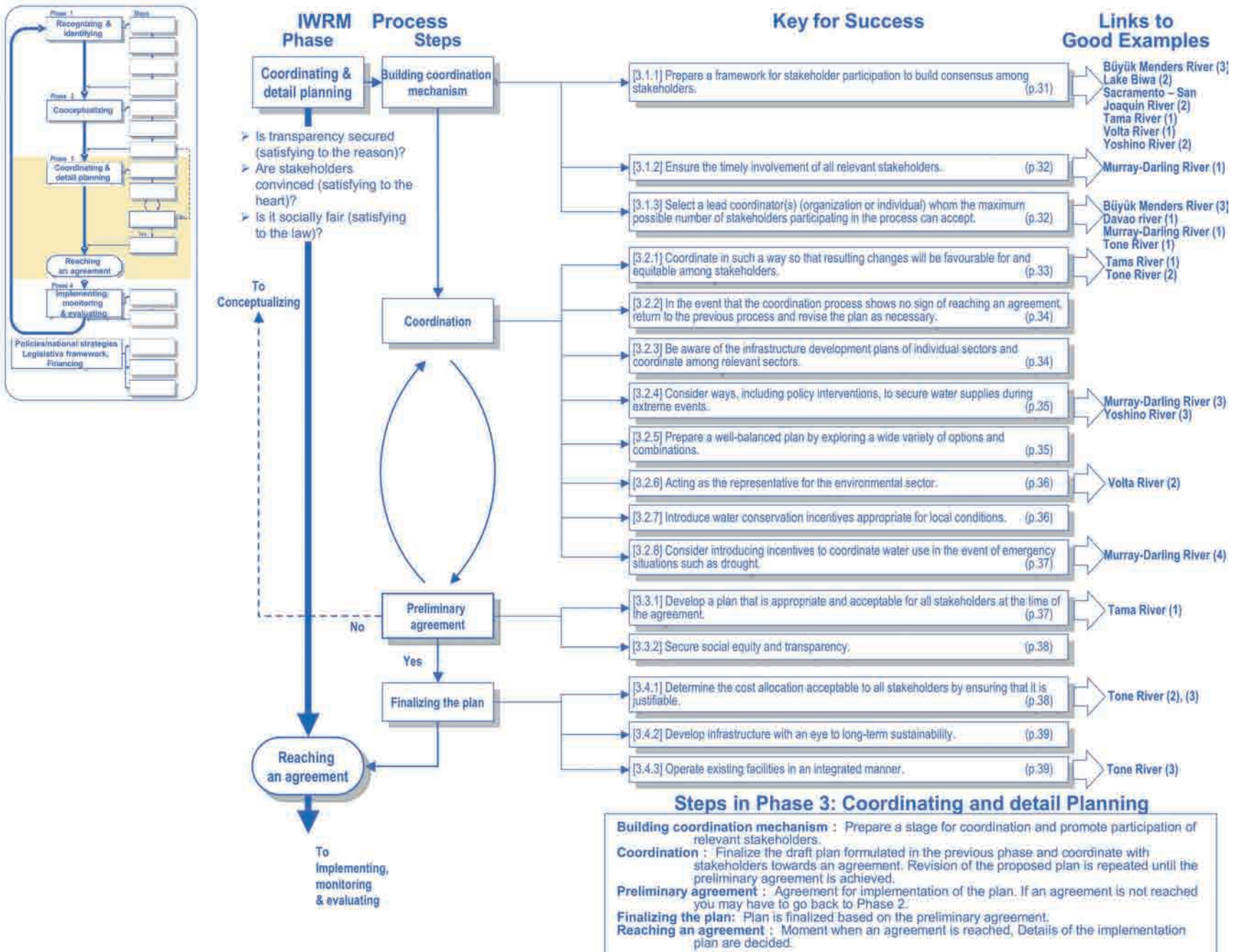


Fig. 4.5 Phase 3: Coordinating and detail planning



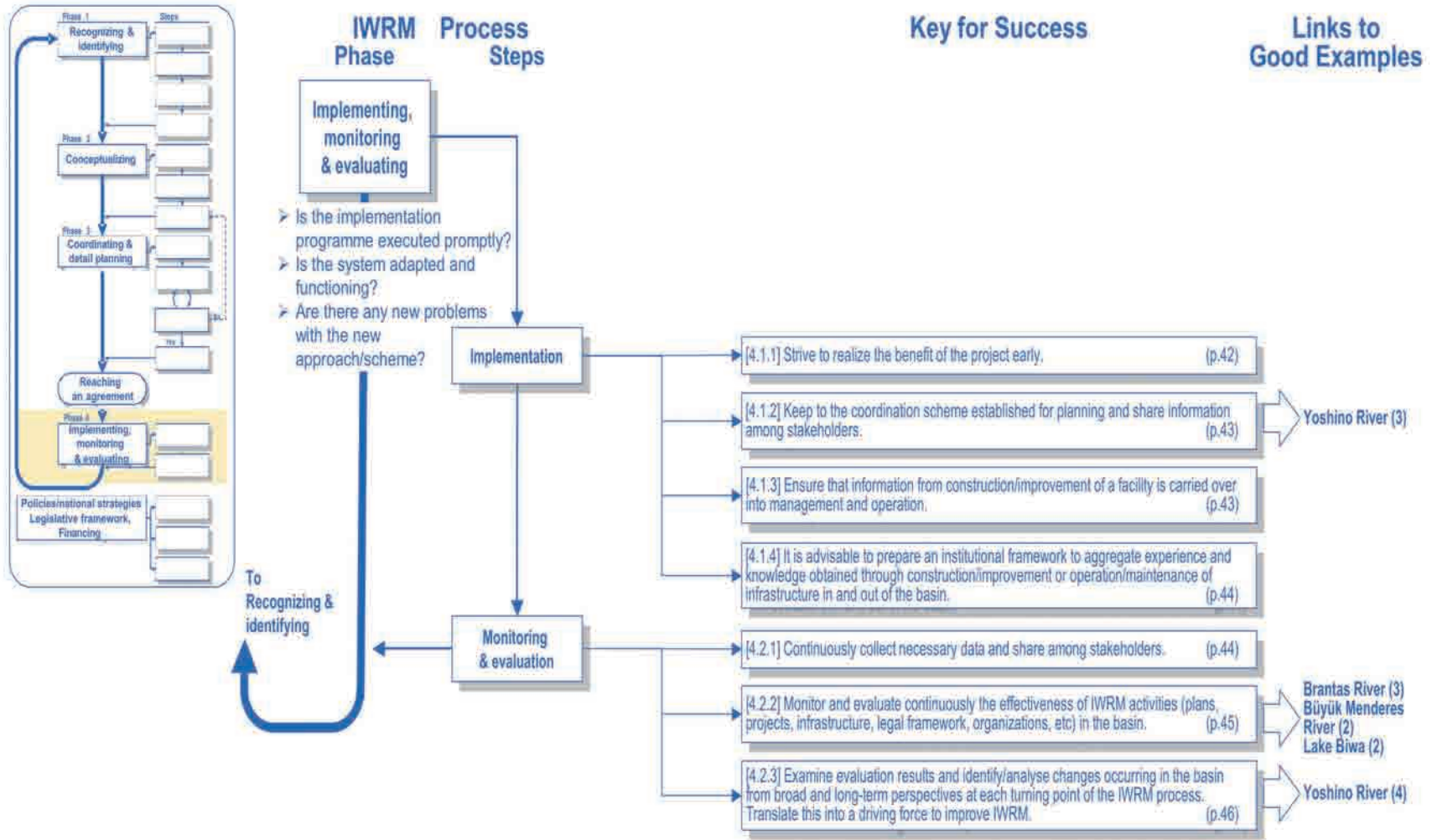
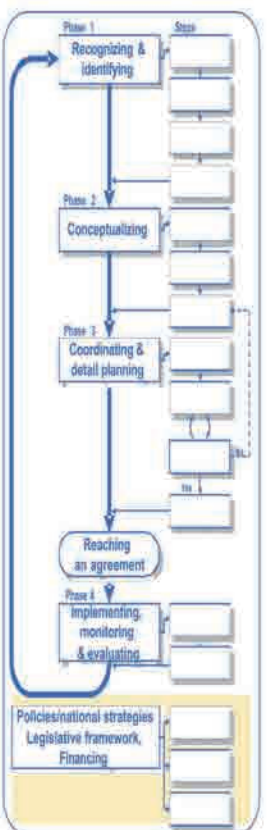
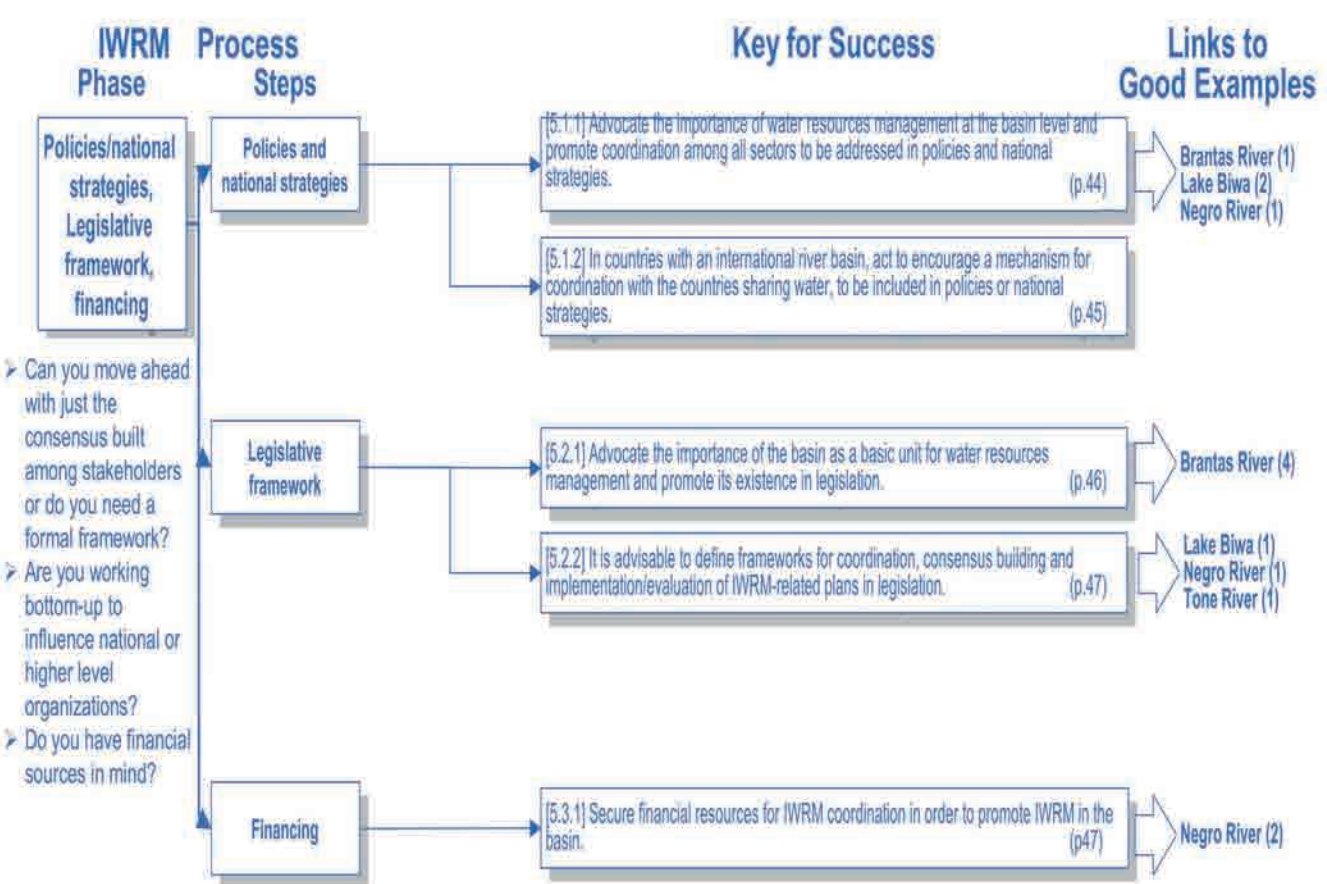


Fig. 4.6 Phase 4: Implementing, monitoring and evaluating

### 4.2.5 Important aspects of IWRM: Policies/national strategies, legislative framework, financing



**Fig. 4.7** Important aspects of IWRM: Policies/national strategies, legislative framework, financing

# 5. Good examples

This section includes good examples of IWRM at the river basin level in the form of Case Stories illustrating actual IWRM efforts, and 'Extracted Key for Success' highlighting elements of success for enhancing IWRM, based on interviews conducted at sites.

## 1) Case Story (explaining the process pathway)

A Case Story lays out the facts in a sequential manner and illustrates the pathway towards the 'Key for Success' (KFS). The Case Story includes links to the 'Extracted Key for Success' so that one can understand how the Key for Success fits into the overall story.

Facts	Ref. to KFS
2. Management phases and institutional strengthening (top-down but bottom-up enablement) ... <u>Public education was seen as an important part of the process... Educational programmes were implemented to enhance public awareness and to help increase understanding of the people in the communities. A programme that has been particularly successful is 'Special Forever', which was...</u>	KFS-5.5.2 (2)

**Fig. 5.1** Format and Example of Case

## 2) Extracted Key for Success

The Extracted Key for Success illustrates why the 'Key for Success' was implemented and what the thought process behind it was. In order to ensure the relevance

of keys for success to users, 'the Key' is explained in a generalized manner together with conditions and limitations for its application. It also includes references to 'Useful Tools' that may enhance its effectiveness.

<b>[ Title ]</b> Enhancing public awareness	Type of problem to solve
<b>[ Situation ]</b> Ensuring public awareness and support in implementing policy changes...	Description of the situation
<b>[ Problem ]</b> It was important to ensure that people in the basin understood the importance of the changes being implemented to the basin's water resources management...	Problems encountered
<b>[ How the problem was overcome ]</b> Public awareness was enhanced through an environmental education programme implemented at primary schools...	Measures taken to overcome the problem
<b>[ The key ]</b> Interactive educational activities targeting primary school children facilitated greater awareness on environmental issues in the basin, not only among children but also among their families. [1.3.2].....	Wisdom behind the measures taken in a generalized terms
<b>[ Conditions and limitations in applying the KFS ]</b> The programme can be effectively implemented through an organization such as a teaching association...	Conditions and limitations, tools to enhance the application of the KFS, etc

■ **Fig. 5.2** Format and Example of Extracted Key for Success

## 5.1 BRANTAS RIVER (INDONESIA)

### 5.1.1 Case Story (Brantas River)

Facts	Ref. to KFS
<p><b>1. The challenges of Brantas River Basin development</b></p> <p>As a major river basin in East Java, Brantas has become the main water source supporting an area covering nine regencies and five municipalities with a total population of 15.5 million in 2004 (Fig. 5.1.1).</p> <p>Originating from an active volcano, the potential threat of Mount Kelud erupting looms over the area. In addition, unique topographic conditions arising from a winding clockwise watercourse and the eruption of Mount Kelud has caused the riverbed to rise decreasing its flood capacity in areas where floods frequently occurred. Vast fertile deltas offer ideal areas to plant food crops especially rice. The area has become a major food producing region. Indonesia's second largest city is located downstream of the river and hence requires an important water supply for domestic purposes.</p> <p>The Brantas Basin has a large capacity to develop. Except for irrigation infrastructure in the early 1960s, no major infrastructure has been embarked upon to regulate water and collect water during the rainy season for use during the dry season. Today each provincial government manages its water supply. The eruption of Mount Kelud in 1951 had the effect of raising the riverbed while decreasing its flood capacity. Frequent floods caused regular damage to the region, which in turn decreased rice productivity. Comprehensive development of the entire Brantas Basin should be prioritised together with community development, which must also be strengthened.</p> <p><u>The development of the Brantas Basin began with a comprehensive multi-purpose project based on the concept 'One River, One Plan' and included multi-purpose dams and reservoirs which, among other things, improved flood control, irrigation, power generation, domestic and industrial water supply. A special inter-provincial and cross-sectoral institution, the Brantas River Basin Development Project (BRBDP), was set up to implement basin wide development run by central government.</u></p> <p>Priorities were selected within each of the different stages of development, which in turn will lead to the subsequent stages. Initially the overall development plan was conducted for the entire basin and was known as the Brantas Plan (1958), which was later consolidated as the Master Plan I of the Brantas River Basin (1961). Flood control was the main priority of Master Plan I while irrigation development became the main priority of Master Plan 2 (1973), with domestic and industrial water supply the priority in Master Plan 3 (1985).</p> <p>Growing industries as well as cities require a continuous and adequate supply of electricity and water from within the area. Hydroelectric power could potentially provide a safe power source for the region. At the same time, environment degradation caused by intensive human activities, especially in the upper catchment areas, has already commenced at an alarming rate. Following the completion of facilities, conservation and effective water management became the main priority of Master Plan 4 (1998). A special institution was set up for cost recovery especially for O&amp;M and water resources management. <u>The Brantas River Basin Development Plan finally became committed to the principle 'One River, One Plan, One Integrated Management'.</u></p>	<p>KFS-5.1.2 (1)</p> <p>KFS-5.1.2 (1)</p>

Facts	Ref. to KFS
<p><b>2. Project prioritizing of staged Master Plan</b></p> <p>When the Brantas River Basin Development began in 1958, the basin suffered from floods almost annually causing severe damage resulting in personal injury, crop damage and losses to basin assets. This was due to the large amounts of volcanic debris and ash from Mount Kelud in 1951, which caused a gradation of the Brantas river bed and thus reduced the discharge capacity of the river.</p> <p>Although flood prevention was the main priority, severe food shortages were a national problem and electric power was needed for regional development. The Master Plan therefore had to be implemented in phases in parallel with other development projects.</p> <p>Project priorities were economically evaluated by applying the B/C method (total benefit / total cost of the project). Flood control was selected for Master Plan 1 (1961). Karangates Dam and Karikont Dam were considered the best B/C projects as they mainly focused on flood control but also power generation and irrigation. Irrigation infrastructure rehabilitation in the Lower Brantas Delta was selected as the second priority, Lengkong Dam and Pollon River development for flood mitigation was the third priority. Following construction of the Sutami (Karangkates) Dam (1972) and the Wlingi Dam (1978), the frequency of floods decreased drastically, which led to the next stages of priority development.</p> <p>Project priorities were economically evaluated by applying the RIRR (Relevant Internal Rate of Return) method and five projects were selected for Master Plan 2 (1973). Rodoyo – Turungagung Irrigation Development together with Wlingi multi-purpose Dam became the main priority in Master Plan 2 because of their focus on water resources. River development in the middle reach was the second priority, while the third priority was the Palle – Gangjyuku Irrigation Project.</p> <p>As concern for flood control grew, the design-flood discharge was based on the following: the importance of the river (main and tributary reaches), the flood prevention levels of other Indonesian rivers, and the scale of the damage potential.</p> <ul style="list-style-type: none"> <li>• The main stream of the Brantas River: 10-year flooding is set as the design-flood discharge in Master Plan 1, and 50-year flooding is set in Master Plan 2.</li> <li>• Tributaries: a 10~25 year flood is set as the design-flood discharge in Master Plan 1 in accordance with the flood prevention level of other rivers in the country. The design-flood discharge of the Widias River will be set at 25-year flooding.</li> <li>• Identify the areas at risk of flooding and the extent of that risk.</li> <li>• Develop a plan that accounts for balanced flood management for the entire basin.</li> </ul>	<p>KFS-5.1.2 (2)</p>

Facts	Ref. to KFS
<p><b>3. Integrated Water Resources Management by RBO</b></p> <p>Water resources management was previously carried out by provincial water resources services. The task was originally to provide individual irrigation services to the nine regencies and five municipalities. There was no previous major infrastructure to control flood and regulate water for the various uses within the basin.</p> <p>As there was no major infrastructure, the area suffered from flooding and inadequate irrigation especially during the dry season. In addition, coordination was limited between related agencies. This scheme presented a risk to water resources degradation that in the long term will have an affect on the economic development of the basin. Moreover, wherever water degradation occurs, sustainable resources are at risk.</p> <p>The central governments set up the Brantas River Basin Development Project (BRBDP) to carry out development studies and the construction of major infrastructure within the basin. <u>Following construction, their O&amp;M activities encountered problems in obtaining funds that were required to offset their limited budget. This resulted in degradation of the water resources infrastructures. In order to obtain O&amp;M funding, the government established the Jasa Tirta I Public Corporation (PJT1) in 1990 through Government Regulation No. 5/1990.</u> Its major task is to manage water resources in the forty tributaries and rivers within the Brantas Basin as well as operate and maintain the major infrastructures. They can allocate water for independent and professional purposes. The corporation is managed by a board of directors and a supervisory board composed of central and provincial government representatives. The corporation has played an active role in developing effective coordination of water resources management among all the stakeholders.</p> <p>In contrast, the Water Resources Management (WRM) Committee was established by the East Java Governors Degree No. 59 of 1994 as a coordinating body where all aspects of water resources management (planning, implementation, supervision, control, and funding) is decided. It includes allocating water among users in the basin and conflict prevention (Table 5.1.1).</p> <p>The BRBDP, the Provincial Water Resources Services (PWRS), and the PJT1 Corporation joined forces with the WRM Committee to collaborate, manage, monitor and evaluate water resources management of Brantas River. The WRM Committee coordinates all basin-wide stakeholders (Fig. 5.1.2).</p>	<p>KFS-5.1.2 (3)</p>

Facts	Ref. to KFS
<p><b>4. Stakeholder participation, Legal framework, Finance, Legislation</b></p> <p>Following the construction period, completed infrastructures were operated/maintenanced by the Brantas River Basin Development Project (BRBDP) whose duty is solely to carry out construction. The irrigation sector has its own maintenance system (see section 3). As domestic/industrial water demand has greatly increased, water use in Brantas River has become even more complex and multi-purpose; water allocation among many sectors has become extremely important. As water use has become multi-sector and basin-wide, there's a greater risk of conflict. The coordination of water allocation/ water fees among sectors is therefore vital with all stakeholders demanding strong (and independent) institutions that can serve as mediators in conflicts of interest.</p> <p>With political reform, the government system has shifted to a decentralized and autonomous system. Local government has the political power to position its mandate to serve its own people. Regulatory reform was a necessity such that Law No. 11/1974 covering water resources was amended and has become Law No. 7/2004. However, water resources should still be managed on the basis of river territory. Cross boundary district river basins will be managed by provincial government while cross boundary provincial river basins will be managed by central government.</p> <p>Water resources management comprises conservation, utilization, and protection from the destructive forces of water. Water resources development and management should be based on the water resources pattern and the Master Plan. The law should also provide regulation regarding the 'beneficiaries pay' principle, the water management fee, and basic water rights. Only the public corporation can commercially manage water resources in a river basin. The corporation can be set up through government regulation and is authorized to collect revenue from public stakeholders and other commercial users.</p> <p><u>The Water Resources Council, as the water parliament, is composed equally of government and non-government organizations including scientists.</u> Public involvement in every step of water resources management is guaranteed, including class action.</p> <p>The flow chart of water allocation preparation in the Brantas River Basin can be seen in Fig 5.1.3.</p>	<p>KFS- 5.1.2 (4)</p>



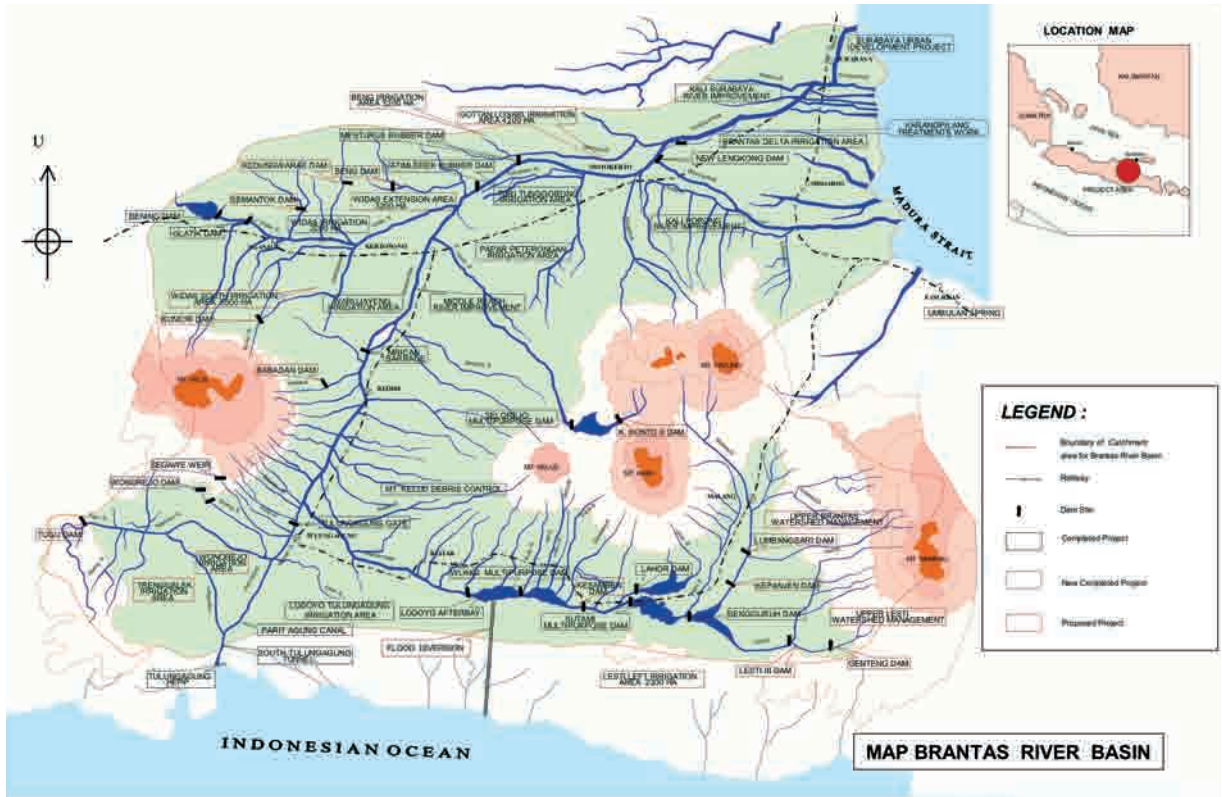


Fig. 5.1.1 Brantas River Basin

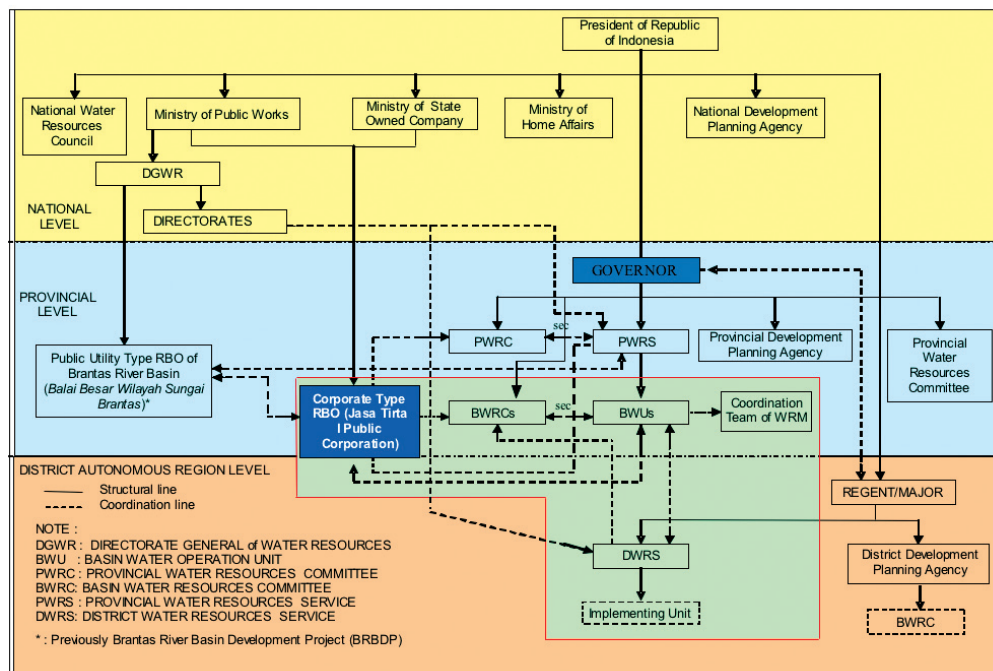


Fig. 5.1.2 Institutional Framework for Brantas Basin Management

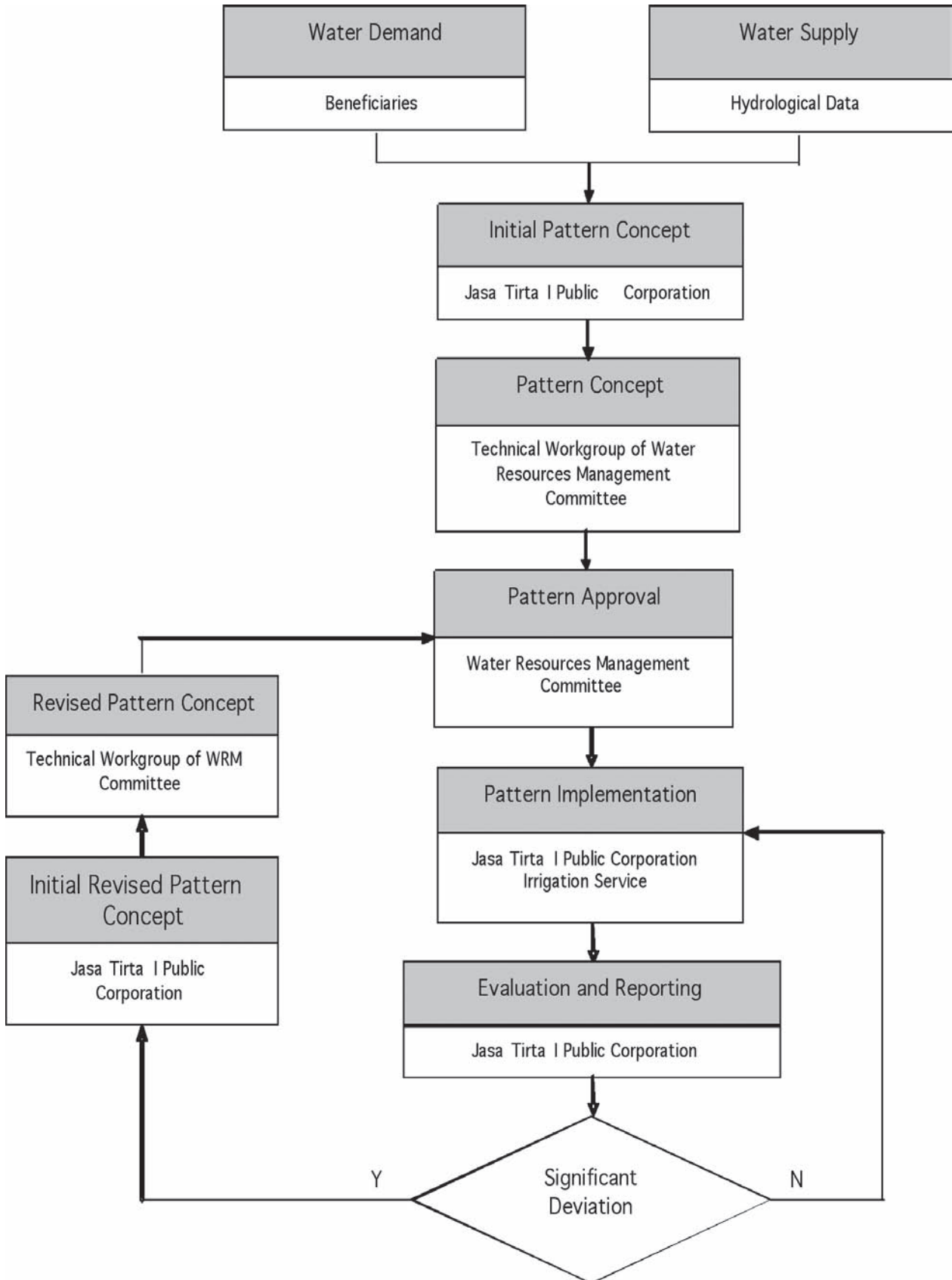


Fig. 5.1.3 Flow Chart of Water Allocation Preparation in the Brantas River Basin

No.	Position in Membership	Description on Position/Agency
1.	a. Chairman (also as member) b. Vice Chairman I (also as member) c. Vice Chairman II incl. member	Vice Governor of East Java Province (Economic and Development Affairs) Chairman of East Java Province Planning Board Head of East Java Public Works Regional Office Head of East Java Provincial Irrigation Service
2.	a. Secretary (also as member) b. Vice Secretary I c. Vice Secretary II	Head of Physical and Infrastructure Affairs of East Java Planning Board Head of River and Lake Section of East Java Provincial Irrigation Service
3.	Members	a. Assistant II East Java Regional Secretary b. Governor Assistant in East Java c. Head of East Java Regional Office of Department of Industry d. Head of East Java Regional Office of Department of Agriculture e. Head of East Java Regional Office of Department of Forestry f. Head of East Java Food Crop Agricultural Service g. Head of East Java Fishery Service h. Head of East Java Industrial Service i. Head of East Java Human Settlement Service j. Head of East Java Tourism Service k. Head of East Java Mining Service l. President Director of Jasa Tirta I Public Corporation m. Director of East Java Region of State Electric Power Company n. Head of Law Bureau of East Java Regional Secretariat o. Head of Population & Environment Bureau of East Java Regional Secretariat p. Regional Coordinator of East Java Provincial Irrigation Service q. Chairman of East Java Investment Coordination r. Chairman of Indonesian Farmers Association of East Java s. Chairman of East Java Trade and Industry Chamber t. Water Resources Expert of the Institute of Technology 10 November Surabaya u. Water Resources Expert of the Brawijaya University Malang

**Table 5.1.1** Membership Structure of East Java Water Resources Management Committee

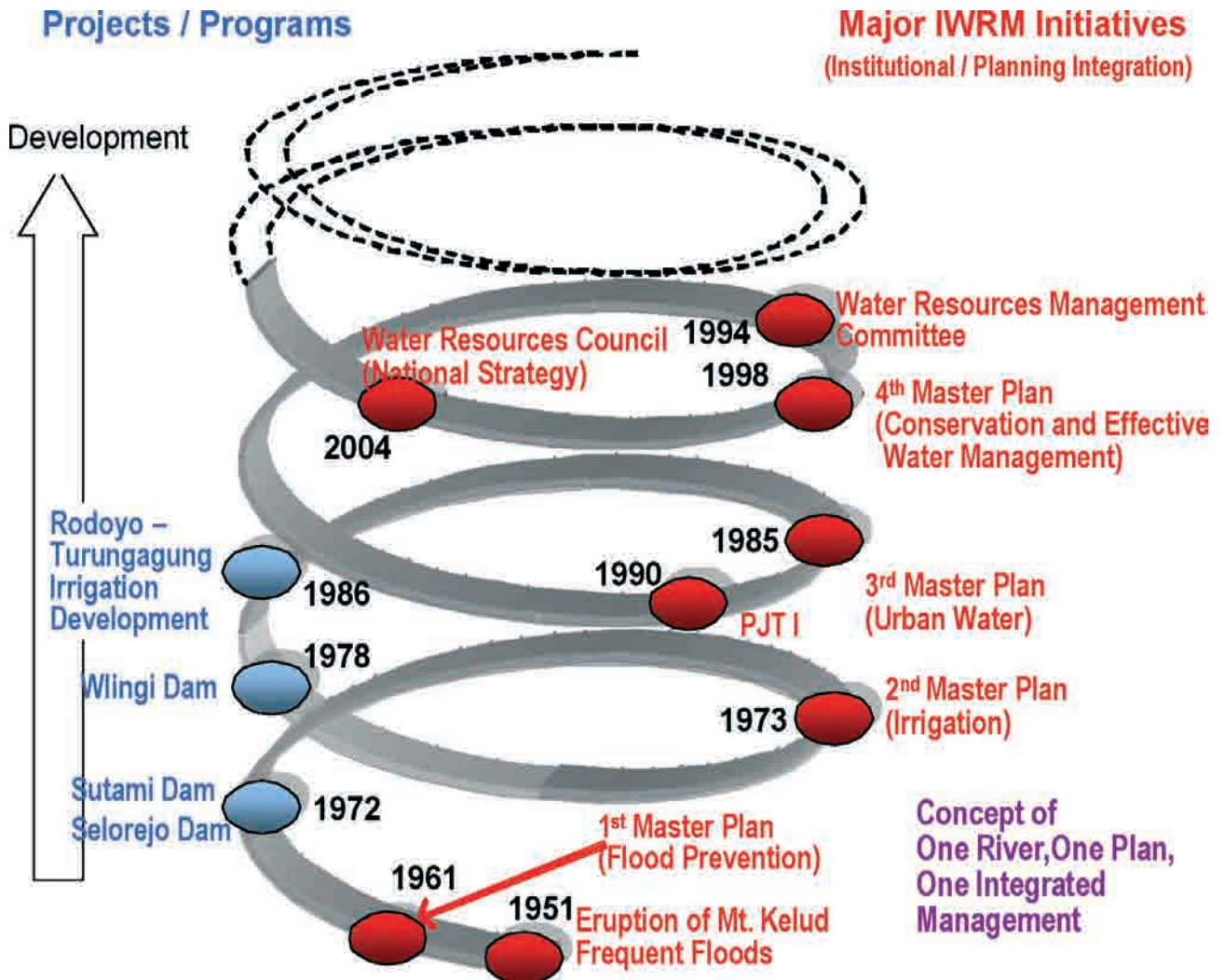


Fig. 5.1.4 IWRM spiral of Brantas River

[Interviewer: Toshiyuki Yoshioka, Hiroyoshi Tanaka (Japan Water Agency)]  
 [Report: Dr. Ir. Mochammad Amron MSc. (Member of the steering committee),  
 Toshiyuki Yoshioka, Hiroyoshi Tanaka (Japan Water Agency)]

### 5.1.2 Extracted Key for Success

#### (I) Extracted Key for Success from Brantas River

Reference to 5.1.1 Case Story (Brantas River)

<p><b>[ Title ]</b>  <b>Applying integrated river basin development and management concept.</b></p>
<p><b>[ Situation ]</b>          Originating from an active volcano, the potential threat of Mount Kelud erupting looms over the area. In addition, unique topographic conditions arising from a winding clockwise watercourse and the eruption of Mount Kelud has caused the riverbed to rise decreasing its flood capacity in areas where floods frequently occurred. Vast fertile deltas are major crop producing areas. The second largest city of Indonesia is located downstream of the river and therefore requires adequate water and electricity supplies for domestic and industrial purposes.</p>
<p><b>[ Problem ]</b>          The Brantas Basin has a large capacity to develop. Except for irrigation infrastructure in the early 1960s, there was no major infrastructure to regulate and collect water during the rainy season for use during the dry season. Water usage has traditionally been managed by each provincial government.          The eruption of Mount Kelud in 1951 caused the riverbed to rise and decreased its flood capacity. Frequent floods caused considerable damage to the region and rice productivity remained low. The entire Brantas Basin was expected to undertake comprehensive and basin wide development. Development priorities should be defined and at the same time community development should be strengthened.</p>
<p><b>[ How the problem was overcome ]</b>          The development of the Brantas Basin began with the concept ‘One River, One Plan’ – a comprehensive multi-purpose project that included multi-purpose dams and reservoirs with such benefits as flood control, irrigation, power generation, and domestic and industrial water supply. An inter-provincial and cross-sectoral institution, the Brantas River Basin Development Project (BRBDP) was set up by central government to implement basin-wide development.          Priorities were selected within each stage of development leading to the next stages of priority development. The initial overall development plan was carried out for the entire basin and known as the Brantas Plan (1958), which was later consolidated into the Master Plan I of the Brantas River Basin (1961). Flood control was its main priority. Irrigation development became the main priority of Master Plan 2 (1973), and water supply for domestic and industrial use, conservation and effective water management was prioritized in Master Plan 3 (1985).          On completion of these facilities, the institution for integrated water resources management, the Brantas River Basin Development Plan, was finally committed to the principle ‘One River, One Plan, One Integrated Management’.</p>
<p><b>[ The Key ]</b>  <b>In the case of Brantas, in order to meet water demand for the various sectors and control flooding in the basin, the government set up a plan for the entire basin. The Brantas River Basin Development Plan finally became committed to the principle ‘One River, One Plan, One Integrated Management’. This was later consolidated by Law 11/1974. Water resources management should be based on river territory.</b>  <b>&gt;&gt;&gt; [5.1.1] Advocate the importance of water resource management at the basin level and promote coordination among all sectors to be addressed in policies and national strategies.</b></p>
<p><b>[ Conditions and limitations in applying the KFS ]</b></p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b></p>

**(2) Extracted Key for Success from Brantas River**

Reference to 5.1.1 Case Story (Brantas River)

**[ Title ]**

**The comprehensive plan must be positioned as a national priority and as a regional (river basin wide) priority**

**[ Situation ]**

When the Brantas River Basin Development began in 1958, the basin suffered from almost yearly floods causing severe damage and resulting in personal injury, crop damage and losses in basin assets. This was due to the fact that a large amount of volcanic debris and ash from Mount Kelud in 1951 had caused a gradation of Brantas' river bed and had reduced the discharge capacity of the river.

**[ Problem ]**

Although flood prevention was the top priority, severe food shortages was also a national problem while electric power was needed for regional development. It had to be implemented in a phased manner in parallel with other development projects.

**[ How the problem was overcome ]**

In Master Plan 1 (1961), project priorities were economically evaluated by applying the B/C method with flood control selected as the main focus. Karangates Dam and Karikont Dam were considered the best B/C projects as they focused on flood control as well as power generation and irrigation. Irrigation infrastructure rehabilitation in the Lower Brantas Delta was selected as the second priority, and the third priority was Lengkong Dam and Pollon River development for flood mitigation. Following the construction of the Sutami (Karangates) Dam (1972) and the Wlingi Dam (1978), the frequency of floods decreased dramatically. This led to the next stages of priority development.

In Master Plan 2 (1973), project priorities were economically evaluated by applying the IRR method and as a result five projects were selected. Rodoyo –Turungagung Irrigation Development together with Wlingi multi-purpose dam became the main priority in Master Plan 2 because of their focus on water resources for irrigation development. River development in the middle reach was the second priority, and the third priority was the Palle – Gangjyuku Irrigation Project.

As concern for flood control grew, the design-flood discharge was based on the following:

- the importance of the river (main and tributary reaches);
- the flood prevention levels of other Indonesian rivers; and
- the scale of the damage potential.

**[ The Key ]**

**The initial development design was substantial and required a considerable budget. The Brantas River Basin Development therefore carried out a step-by-step approach with the main priority on solving the most crucial and pressing problems. Master Plan I was targeted mainly on mitigating flood problems within the area so as to protect the irrigation/ agricultural zones. The subsequent Master Plan concentrated on improving irrigation facilities to promote regional food production. The plan later concentrated on improving domestic, municipal and industrial water supply.**

**The most recent plan focuses on environmental/conservation and water security concerns.**

**>>> [2.3.1] Set priorities among the problems to be solved, taking into account constraints such as time and funds.**

**[ Conditions and limitations in applying the KFS ]****[ Ideas for enhancing the applicability of the KFS ]**

### (3) Extracted Key for Success from Brantas River

Reference to 5.1.1 Case Story (Brantas River)

#### [ Title ]

**Managing water resources and infrastructures in the basin**

#### [ Situation ]

Water resources management was previously carried out by provincial water resources services. The task was originally to provide individual irrigation services. The river flows in nine regencies and five municipalities yet there was no major infrastructure for flood control and water regulation for the various uses within the basin.

#### [ Problem ]

Due to the lack of major infrastructure the area suffered from flood and inadequate irrigation water especially during the dry season. In addition, there was limited coordination among the related agencies. This scheme posed the risk of water resources degradation, which in the long term can affect the economic development of the basin. Moreover, wherever water degradation occurs, sustainable resources are at risk.

#### [ How the problem was overcome ]

The central government set up the Brantas River Basin Development Project (BRBDP) to carry out development studies and the construction of major infrastructure within the basin. Following construction, their O&M activities encountered problems in obtaining funds. This resulted in the degradation of the water resources infrastructures. In order to obtain O&M funding, the government established Jasa Tirta I Public Corporation (PJT I) in 1990 through Government Regulation No. 5/1990.

Its main task is to manage water resources in the forty tributaries and rivers within the Brantas Basin as well as to operate and maintain the major infrastructure in these rivers. They can allocate water for independent and professional purposes. The corporation comprises a supervisory board of central and provincial government representatives and is managed by a board of directors. The corporation has played an active role in developing effective coordination among all stakeholders in managing the water resources.

In contrast, the Water Resources Management Committee was established by the East Java Governor's Degree No. 59 of 1994 as a coordinating body where all aspects of water resources management (planning, implementation, supervision, control, and funding) is decided. It includes allocating water among users in the basin and conflict prevention.

The corporation and committee collaborate to manage the Brantas River water resources. An authoritative and qualified institution is vital in the operation, maintenance and management of water resources. A public corporation supervised by a board composed by government is a possible institution to act as a strong RBO while the WRM Committee coordinates all basin-wide stakeholders.

#### [ The Key ]

**In the case of Brantas river, when difficulties of O&M in basin water management occurred, the government decided to establish a special organization (PJT I) based on the river basin.**

**Today the WRM Committee together with PWRS and PJT I plays the key role of monitoring and evaluation regarding the status of water resources management in the basin.**

**>>> [4.2.2] Continuously monitor and evaluate the effectiveness of IWRM activities (plans, projects, infrastructure, legal framework, organizations, etc) in the basin.**

#### [ Conditions and limitations in applying the KFS ]

#### [ Ideas for enhancing the applicability of the KFS ]

**(4) Extracted Key for Success from Brantas River**


Reference to 5.1.1 Case Story (Brantas River)

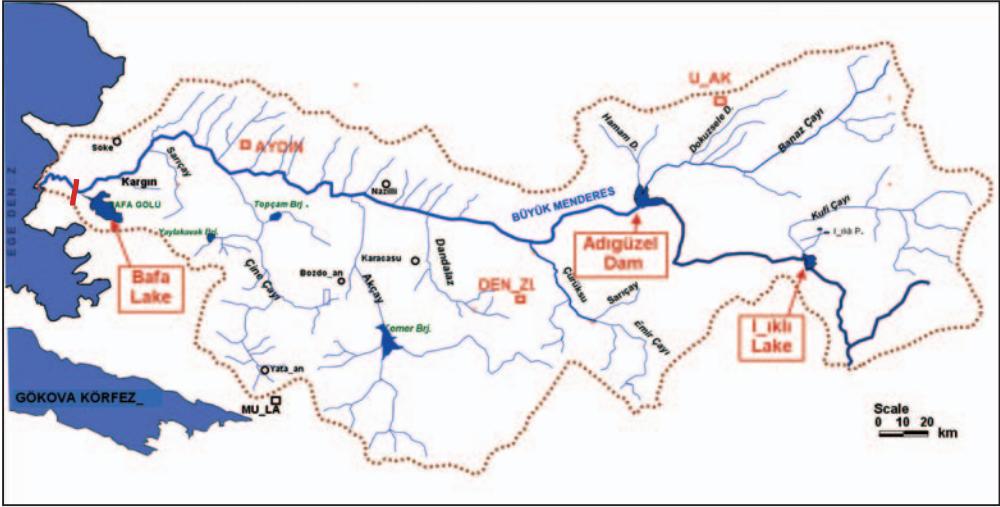
<p><b>[ Title ]</b>  <b>Coordination among sectors and all stakeholders</b></p>
<p><b>[ Situation ]</b>  <b>Following the construction period, the completed infrastructures were operated/maintained by The Brantas River Basin Development Project (BRBDP) whose sole duty is to carry out the construction.</b></p> <p>Each region's irrigation sector had their own maintenance system (see section III). As the demand for domestic and industrial water greatly increased water use in the Brantas River became increasingly complex and multi-purpose with water allocation among many sectors becoming extremely important.</p>
<p><b>[ Problem ]</b>  As water use became increasingly multi-sectoral and basin-wide, there was a growing likelihood of water conflict. The coordination of water allocation/water fee among sectors requires strong institutions that can serve as mediators in conflicts of interest.</p>
<p><b>[ How the problem was overcome ]</b>  The Water Resources Management Committee was established by the East Java Governor's Degree No. 59 of 1994 as a coordinating body where all aspects of water resources management (planning, implementation, supervision, control, and funding) were decided including the allocation of water among users in the basin and conflict prevention.</p> <p>The amended water law of 2004 included the Water Resources Council, the water parliament, which comprises an equal number of government and non-government organizations including scientists.</p> <p>Public involvement in every step of water resources management is guaranteed, including class action. Political and technical support is socially acceptable through public consultation and community involvement.</p>
<p><b>[ The Key ]</b>  <b>Law No. 11/1974 amended by Law No. 7/2004 clearly states that the basin is basic unit in water resources management. A Water Resources Development and Management Master Plan, which includes environmental conservation and water security based on the law, will be elaborated and issued.</b></p> <p><b>[5.2.1] Advocate the importance of the basin as basic unit for water resources management and promote its existence in legislation.</b></p>
<p><b>[ Conditions and limitations in applying the KFS ]</b></p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b></p>



## 5.2 BÜYÜK MENDERES RIVER (TURKEY)

### 5.2.1 Case Story (Büyük Menderes River)

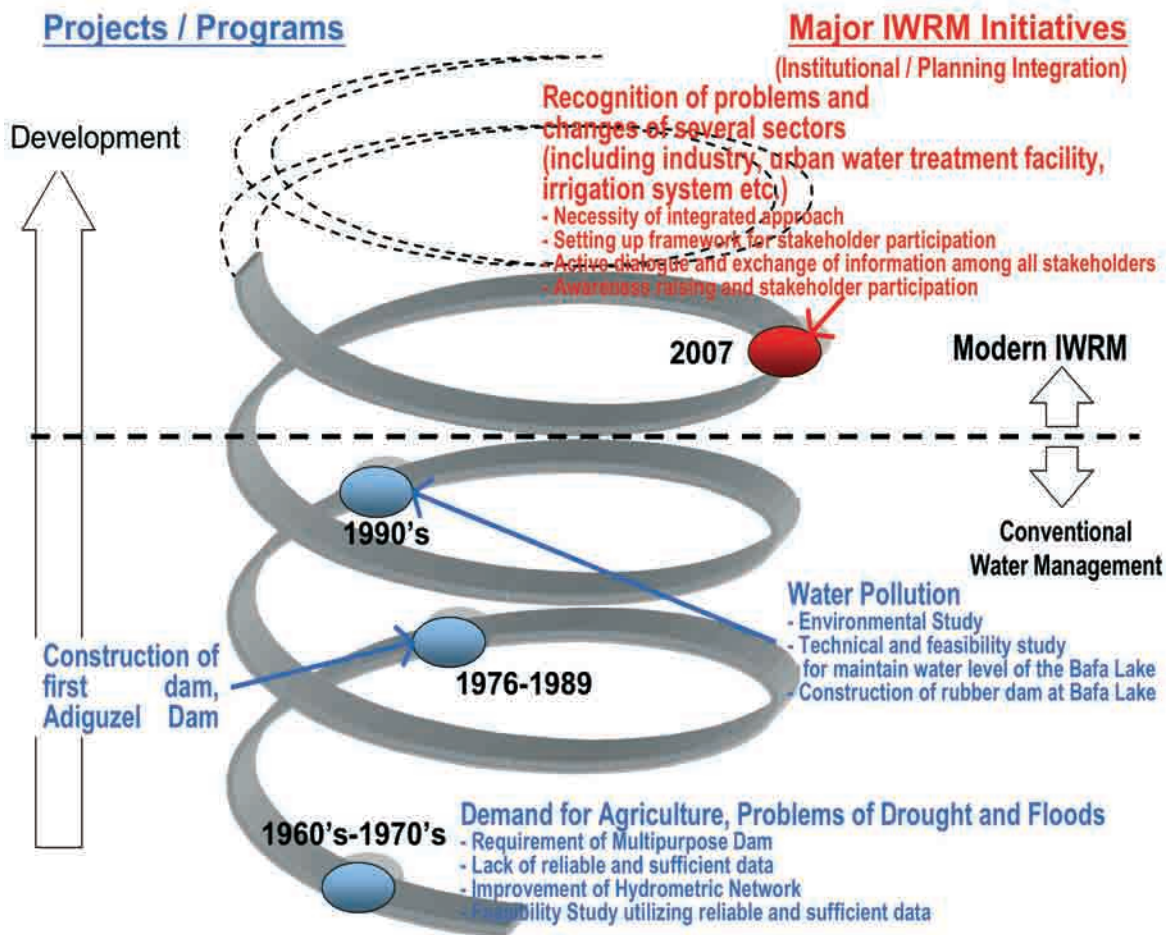
Facts	Ref. to KFS
<p data-bbox="177 456 1094 490"><b>I. Tackling the increasing demand for irrigation water and other uses</b></p> <p data-bbox="177 526 1217 663">The Büyük Menderes River Basin is located on the southwestern part of Turkey (Fig. 5.2.1). It comprises an area of 24,873 sq. kilometers and covers 3.2 per cent of Turkey's surface area. The length of the Büyük Menderes River is 584 km and it discharges into the Aegean Sea.</p>  <p data-bbox="320 1149 1107 1182"><b>Fig. 5.2.1</b> Location of the Büyük Menderes River Basin in Turkey</p> <p data-bbox="177 1218 1217 1388">The climate in the basin varies between the coast and inland. The coastal regions have a Mediterranean climate whereas the inland region has a dominating continental climate. The average annual precipitation in the basin is 635 mm with 999 mm in the nearby coastal regions gradually decreasing to 350 mm upstream. Precipitation is high during spring and winter but low in summer.</p> <p data-bbox="177 1424 1217 1594">Forty per cent of the land is used for agriculture in the Büyük Menderes Basin and the main agricultural products are cotton, olives, fig, vegetables, and citrus fruits. Agriculture is more intensive in midstream and downstream, i.e. in the Aydın province. On the other hand, the leather industry is active in the Usak province located upstream while the textile industry, including dyeing, is active in the Denizli province at midstream.</p> <p data-bbox="177 1630 1217 1977">Being one of the most important factors influencing the economic development of a country, water is a natural yet limited resource. Turkey's economy in the 1960s was mainly dependant on agriculture. In the 1970s, Turkey was one of seven countries with 100 per cent self-sufficiency in food supply. In order to sustain its high self-sufficiency rate, agricultural improvements and the optimum utilization of land and water resources were among the priorities of national policies. Moreover, increasing income levels and living standards of the rural population, thanks to improved agriculture and irrigation, has been another priority since the population began migrating from rural to urban areas, i.e. to larger cities namely Istanbul, Ankara and Izmir. This significant increase has created many challenges for national government and municipalities.</p>	

Facts	Ref. to KFS
<p>The climatic conditions in Turkey mean that the precipitation-flow relationship is rather complex. Precipitation changes seasonally and also from year to year. There exist substantial differences in precipitation and thus natural flow. They drop to minimum levels in summer when there is maximum demand. Furthermore, droughts are experienced frequently during which mean annual water supply decreases to one third of the annual average. Nevertheless, the irregular regime also creates flood events which are threatening and, in many cases, damaging to natural and economic life. Therefore, in view of providing sufficient and regular water for irrigation and other purposes as well as protection from extreme water events, construction of dams and reservoirs that store water and regulate flow was inevitable. However, this is not sufficient as the limited water supply is unable to meet the increasing demand. Therefore, in addition to dam construction, water supply and demand balance in the river basins should be maintained within an integrated management approach.</p> <p>In line with the above-mentioned national policies and priorities and hydrological characteristics, land and water resources development in the Büyük Menderes Basin was initiated by the General Directorate of State Hydraulic Works (DSI), the main organization responsible for development and management of water resources in Turkey. For adequate planning and rational utilization and management of water resources in the Büyük Menderes Basin, reliable hydrological data and information was required. <u>However, previously existing data was insufficient. Therefore, the first task was to improve the hydrometric network in the basin. Feasibility studies were subsequently carried out using the available information.</u> Based on these studies, the Adigüzel Dam, the Isikli Lake and the Kemer Dam were designed for irrigation, hydro-power and flood control purposes.</p> <p>The construction of the Adigüzel Dam, which is the first dam in the basin, was started in 1976 and completed in 1989. To date, there are 18 dams under operation supplying adequate irrigation water to farmlands in an equitable and timely manner. Moreover, they manage flood control, domestic water supply and energy generation.</p>  <p><b>Fig. 5.2.2</b> River Network in Büyük Menderes River Basin</p>	<p>KFS-5.2.2 (1)</p>

Facts	Ref. to KFS
<p><b>2. Recognition of New Problems</b></p> <p><b>Pollution</b></p> <p>Irrigation has become more efficient following completion of the dams in the basin. A significant part of the water resources have also been utilized by industry upstream, particularly the leather and textile industry. However, this brought about water pollution, which became an important issue in the 1990s. In order to address the pollution, the Büyük Menderes Basin was divided into three sections in terms of pressures and impacts.</p> <ol style="list-style-type: none"> <li>1. Upstream part of the Adigüzel dam: pollution is already noticeable and is attributed to domestic waste and the leather industry's waste water discharges in Usak province.</li> <li>2. Middle part of the river downstream of the Adigüzel dam: the condition is worsening due to domestic, industrial (leather and textile) and agricultural pollution as well as waste water discharges from a thermal power plant situated in the vicinity of Denizli province.</li> <li>3. Downstream part of the river: environmental degradation is quite serious due to domestic, industrial (leather, textile and olive oil) and agricultural pollution.</li> </ol> <p>In addition to the pressures mentioned above, water pollution during the summer season worsens, especially at the downstream portion, because of low precipitation, reduced water flow, and increased pollutant concentration.</p> <p><b>Bafa Lake Case</b></p> <p>Bafa Lake is situated at the downstream portion of the Büyük Menderes Basin. The lake is a natural alluvial embankment lake formed by the alluvium brought by the Büyük Menderes River. Geological studies show that the lake site was previously a gulf in the Aegean coast. The Bafa Lake is an important habitat for migratory fishes and birds and was attributed 'National Park' status in 1994.</p> <p>Sedimentation caused by flooding in the Büyük Menderes Basin led to decreases in the depth of the lake, which adversely affected the ecosystem especially for fish. Floods were also harmful for residential and agricultural areas by the lake. In 1985, the DSI constructed a dike on the left side of the riverbank to overcome these problems.</p> <p>Furthermore, water resources development, upstream pollution, and droughts led to the following problems in Bafa Lake:</p> <ul style="list-style-type: none"> <li>- Water levels in the river and lake decreased during dry periods such that the river and the lake were disconnected.</li> <li>- As a result of the decreased flow, low circulation and pollution, DO (dissolved oxygen) was low causing adverse effects on ecosystems.</li> <li>- Due to a low water level in the river, salt water intrusion into the lake from the Aegean Sea caused degradation to agricultural land.</li> </ul> <p><u>In order to address these problems, environmental studies were carried out for fish habitats and water quality. Technical and feasibility studies were conducted based on the results of the environmental studies, which suggested maintaining the water level in the lake at +2 m above sea level to protect the ecosystem from salt water intrusion, as well as connecting the mountain between the lake and the river. To achieve this, construction of a rubber dam was planned by DSI.</u></p>	<p>KFS-5.2.2 (2)</p>

Facts	Ref. to KFS
<p>The rubber dam, together with an intake structure and feeding canal, is especially important for:</p> <ul style="list-style-type: none"> <li>- Maintaining the fish population and increasing the natural life level of the lake to the original average level by raising it by 2 m above sea level.</li> <li>- Preventing flooding of the residential and agricultural areas at 3 m above sea level around the lake by automatically deflating the rubber dam.</li> <li>- Preventing salt water intrusion and soil degradation along the river.</li> <li>- Enabling a flexible operation system for the lake-river-sea link.</li> </ul> <p>The rubber dam was completed in 2003 (Fig. 5.2.3 and Fig. 5.2.4). A fish pass was also constructed on the left bank.</p> <div data-bbox="418 792 943 1220" data-label="Image"> <p>The map shows the geographical layout of the rubber dam system. It includes Lake Sercin and Lake Bafa, connected by a Feeder Canal and a Discharge Canal. The Great Meander River flows into Lake Sercin. Key features include the Sercin Inlet, Dalyan Inlet, and a Rubber Regulator. An inset map shows the location within Turkey, near the Black Sea coast.</p> </div> <p style="text-align: center;"><b>Fig. 5.2.3 Rubber Dam Map</b></p> <div data-bbox="368 1341 1066 1803" data-label="Image"> <p>An aerial photograph showing the rubber dam structure across the B. Menderes river. The dam is a long, narrow structure with a fish pass on the left bank. Bafa Lake is visible in the background, and the surrounding area includes agricultural fields and some buildings.</p> </div> <p style="text-align: center;"><b>Fig. 5.2.4 Rubber Dam</b></p>	

Facts	Ref. to KFS
<p><b>3. Approach for Integrated Water Resources Management</b></p> <p>In the past decade, problems such as water scarcity, drought, and environmental concerns have been shared by all the stakeholders in the basin. Every stakeholder has attempted to solve the problems for which they're responsible. For example:</p> <ul style="list-style-type: none"> <li>- Industries, especially leather factories, that were once scattered throughout the Usak Province were relocated to the designated industrial zone where the construction of a common waste water treatment facility had been completed.</li> <li>- In the Denizli Province, an urban waste water treatment facility is in operation, and the textile industry has established a common treatment facility.</li> <li>- Existing irrigation systems have been replaced with modern irrigation systems to ensure efficiency and thus save water.</li> <li>- Non-governmental organizations have also initiated a number of projects.</li> </ul> <p>Moreover, it became obvious that the general problems encountered in the basin should be solved not through individual means but through more extensive basin-based measures, which can be achieved through an integrated approach, and which has received wide acceptance in the past decade.</p> <p>The first project carried out in the basin with this new approach was the 'Pilot implementation of the European Union Water Framework Directive'. Following the project, a new project entitled 'Capacity Building Support to the Water Sector in Turkey', was begun in 2007 for the implementation of the EU Water Framework Directive. The objectives of the pilot projects are as follows:</p> <ul style="list-style-type: none"> <li>- to stimulate the sustainable use of water based on the protection of available long-term water sources;</li> <li>- to decrease pollution;</li> <li>- to prevent further deterioration of the aquatic ecosystem as well as areas depending on those ecosystems;</li> <li>- to enhance the aquatic environment, among other things, by decreasing discharges;</li> <li>- to raise awareness and stakeholder participation.</li> </ul> <p><u>Within the scope of this project, active dialogue and information exchange have taken place with all the stakeholders such as the Büyük Menderes Environmental Protection Union, municipalities, irrigation unions, Chambers of Industry and Trade, and NGOs.</u></p> <p>All the activities carried out in the basin were communicated to all the stakeholders, so as to better coordinate the work and create public awareness in the basin.</p>	<p>KFS-5.2.2 (3)</p>



**Fig. 5.2.5** IWRM spiral of Büyük Menderes River

[Interviewee: Mr. Yakup Darama, Mr. Saint Tahmiscioglu, Mr. Murat Hatipoglu, Mr. Huseyin Gundogdu, Mr. Taner Kimence (DSI\*1)]

[Interviewer: Tomomi Inoue, Koichi Takano (Japan Water Agency)]

[Report: Mr. Adnan Altay Altınörs (Member of the steering committee), Mr. Toshihiro Sonoda (UNESCO), Mr. Tomomi Inoue (CTI International), Mr. Koichi Takano (Japan Water Agency)]

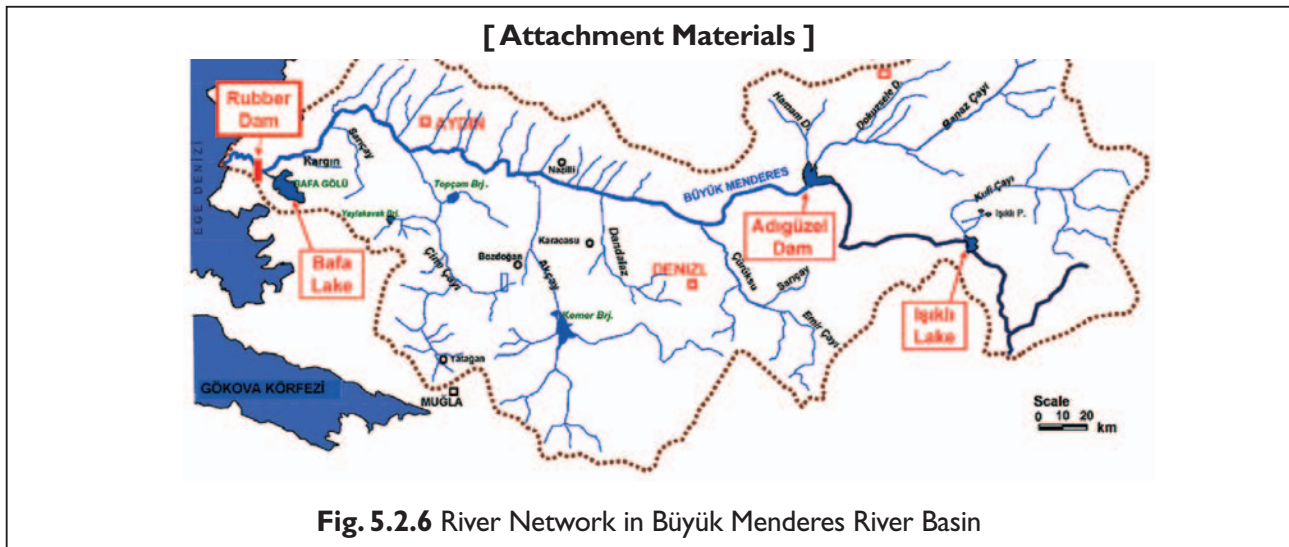
\*1 DSI: The General Directorate of State Hydraulic Works, Turkey

## 5.2.2 Extracted Key for Success

### (I) Extracted Key for Success from Büyük Menderes River

Reference to 5.2.1 Case Story (Büyük Menderes River)

<p><b>[ Title ]</b>  <b>Estimation of water demand and analysis of hydrology in the river basin for project planning</b></p>
<p><b>[ Situation ]</b>  <b>Phase to make a planning for irrigation water and flood prevention in a fruitful area</b>          Turkey's economy in the 1960s was mainly dependant on agriculture. In the 1970s, Turkey was one of the seven countries with 100 per cent self-sufficiency in food supply. In order to sustain its high self-sufficiency rate, agricultural improvements and the optimum utilization of land and water resources were among the priorities of national policies. Moreover, increasing income levels and living standards of the rural population, thanks to improved agriculture and irrigation, has been another priority since the population began migrating from rural to urban areas, i.e. to larger cities namely Istanbul, Ankara and Izmir. This significant increase has created many challenges for national government and municipalities. Floods were also a big problem at midstream and downstream portions, which are extremely flat. Heavy rains flooded most of the farmlands resulting in serious damage to agriculture. The multiple problems encountered should be addressed during the planning phase.</p>
<p><b>[ Problem ]</b>  <b>As available data was limited, improvement of the hydrometric network was required for project planning</b>          Insufficient data in the 1950s meant that a feasibility study was not carried out. Precipitation was only measured at a few points, and flow rates were determined only at some main points of the river. Also, studies of irrigable land were not completed.</p>
<p><b>[ How the problem was overcome ]</b>  <b>Required minimum data were observed for water demand and hydrology</b>          Firstly, master plan studies for the determination of land and water resources potential in the basin was done in 1967. To start comprehensive feasibility studies in the region, the hydrometric network was improved, and irrigable land was evaluated with surveys at the basin level. Water resource potential was calculated by precipitation and flow rate data. Irrigation water supply was then determined according to the surveys. Flow rate at the dam site was calculated by using the old data as well as newly measured data covering twenty years. In addition, geological investigations were carried out at the dam sites.</p>
<p><b>[ The Key ]</b>  <b>As needed data was not available, necessary data was deduced from available data. Precipitation data were collected only at city centres; validity to use them for mountainous parts, where the climate is different, was carefully examined. Flow rate was calculated using existing data at other points while carefully examining differences in climate conditions. In addition, data modification was conducted in consultation with experienced technicians.</b>          &gt;&gt; [2.1.1] Be selective when collecting data by setting priorities based on the problems.</p>
<p><b>[ Conditions and limitations in applying the KFS ]</b></p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b></p>



## (2) Extracted Key for Success from Büyük Menderes River

Reference to 5.2.1 Case Story (Büyük Menderes River)

### [ Title ]

**Continuous project monitoring in order to improve next steps**

### [ Situation ]

**Phase to evaluate the effect downstream by the project upstream**

Irrigation has become more efficient following completion of the dams in the basin. A significant amount of water resources were utilized by industry upstream, particularly the leather and textile industries, with the result that water pollution became an important issue in the 1990s.

In addition to the pressures, water pollution during summer is more severe, especially downstream where there is low precipitation, reduced water flow and increased pollutant concentrations.

### [ Problem ]

**Water resource development and pollution upstream as well as droughts led to problems downstream**

Bafa Lake is situated downstream of the Büyük Menderes Basin. The lake is a natural alluvial embankment lake formed by the alluvium brought by Büyük Menderes River. It was previously a gulf in the Aegean coast. The Bafa Lake is an important habitat for migratory fishes and birds and was attributed 'National Park' status in 1994.

In addition, water resource development and pollution upstream as well as droughts led to following problems in Bafa Lake:

- Water levels in the river and the lake decreased during dry periods such that the river and the lake were disconnected.
- As a result of the decreased flow, low circulation and pollution, DO was low causing adverse effects on ecosystems.
- Due to a low water level in the river, salt water intrusion into the lake from the Aegean Sea caused degradation of agricultural land.

### [ How the problem was overcome ]

**An environmental investigation and action plan with planned countermeasures**

In order to address these problems, environmental studies were carried out for fish habitats and water quality. Technical and feasibility studies were conducted based on the results of the environmental studies and it was suggested that the water level be maintained in the lake at +2 m above sea level to protect the ecosystem. For this purpose, construction of a rubber dam was planned by DSI.



**[ The Key ]**

Continuous monitoring and evaluation of water resources development activities both upstream and midstream of the river were conducted that take into account socio-economic and environmental effects, sustainability and fairness based on the initial goals and the current status. The environmental study found that these activities had affected the ecosystem in Bafa Lake. As a consequence, the rubber dam project was planned and this led to improving IWRM and a step up to the next stage.

>> [4.2.2] Continuously monitor and evaluate on the effectiveness of IWRM activities (plans, projects, infrastructure, legal framework, organizations etc) in the basin.

**[ Conditions and limitations in applying the KFS ]**

Monitoring and evaluation must be conducted throughout the basin within an holistic approach

1. It is important to have an overview of the entire river basin in order to recognize problems as the project may have an effect beyond the project area

**[ Ideas for enhancing the applicability of the KFS ]**

**[ Attachment Materials ]**



Photo 5.2.1 Rubber dam



Fig. 5.2.7 Location of Bafa Lake and Rubber Dam

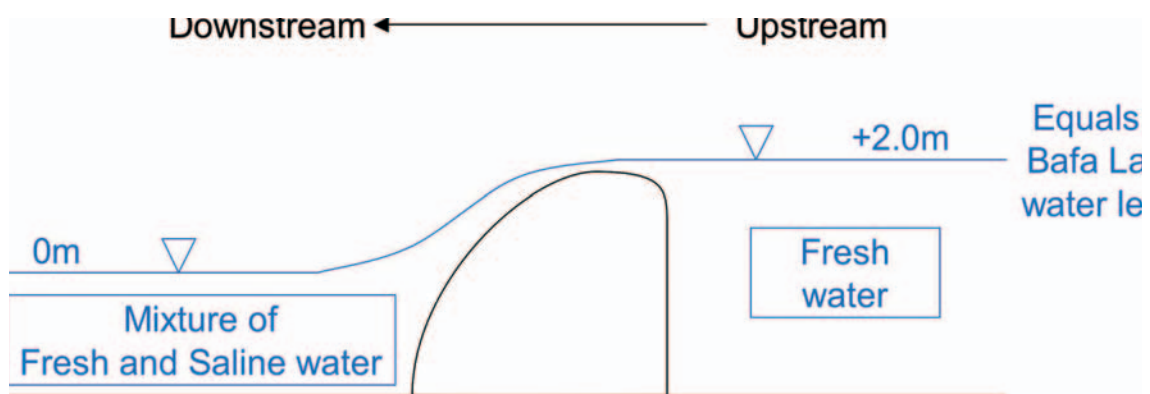


Fig. 5.2.8 Longitudinal crosscut of rubber dam (under normal conditions)

**(3) Extracted Key for Success from Büyük Menderes River**

Reference to 5.2.1 Case Story (Büyük Menderes River)

<p><b>[ Title ]</b>  <b>Framework for stakeholder participation in the new scheme</b></p>
<p><b>[ Situation ]</b>  <b>The project was implemented to solve individual problems in the basin</b>  In order to overcome problems in the basin:</p> <ul style="list-style-type: none"> <li>- Industries, particularly the leather factories, which were once scattered throughout the Usak Province, were relocated to the designated industrial zone where the construction of a common waste water treatment facility for the industrial zone had been completed.</li> <li>- In the Denizli Province, an urban waste water treatment facility is in operation, and the textile industry has established a common treatment facility.</li> <li>- Existing irrigation systems have been replaced with modern irrigation systems to ensure efficiency and thus save water.</li> <li>- Non-governmental organizations have also initiated a number of projects.</li> </ul>
<p><b>[ Problem ]</b>  <b>Necessity to solve the problems through an integrated approach</b>  It became obvious that the general problems encountered in the basin should be solved not through individual means but through more extensive basin-based measures, which can be achieved through an integrated approach, and which has received wide acceptance in the past decade.</p>
<p><b>[ How the problem was overcome ]</b>  <b>A new consortium was established with transparency and disclosure, and a qualified person was selected as chairperson</b>  The ‘Capacity Building Support to the Water Sector in Turkey’ project began in 2007 for the implementation of the EU Water Framework Directive.  Within the scope of this project, active dialogue and information exchange have taken place with all stakeholders such as the Büyük Menderes Environmental Protection Union, municipalities, irrigation unions, Chambers of Industry and Trade, and NGOs.  All the activities carried out in the basin were communicated to all stakeholders, so as to better coordinate the work and create public awareness in the basin. Furthermore, the governor of Usak Province was appointed as chairperson of the Büyük Menderes Environmental Protection Union. He contributed to the improvement of water quality by relocating the leather factories to an area equipped with a water purification plant.</p>
<p><b>[ The Key ]</b>  <b>An appropriate form of participation was chosen based on local conditions, and a consortium was set up making full use of existing stakeholders groups. The most qualified, experienced and credible person should be selected as the chairperson of the consortium. In this case the governor of Usak Province was appointed who actively led water quality improvement activities.</b></p> <ul style="list-style-type: none"> <li>&gt;&gt; [2.2.3] Identify key stakeholder groups, including those who are impacted upon or socially vulnerable, and identify key persons within them.</li> <li>&gt; [3.1.1] Prepare a framework for stakeholder participation in order to build consensus among stakeholders.</li> <li>&gt;&gt; [3.1.3] Select a lead coordinator(s) (organization or individual) whom the maximum possible number of stakeholders participating in the process accept.</li> </ul>
<p><b>[ Conditions and limitations in applying the KFS ]</b></p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b>  <b>To continually hold meaningful stakeholder meetings</b></p> <ol style="list-style-type: none"> <li>1. To make a rule to hold regular stakeholder meetings.</li> <li>2. To share information of river basin in the meeting.</li> </ol>

## [ Attachment Materials ]

### I. Objectives of the project, Capacity Building Support to the Water Sector in Turkey.

- to stimulate the sustainable use of water based on the protection of available long-term water sources;
- to decrease pollution;
- to prevent further deterioration of the aquatic ecosystem as well as areas depending on those ecosystems;
- to enhance the aquatic environment, among other things, by decreasing discharges;
- to raise awareness and stakeholder participation.

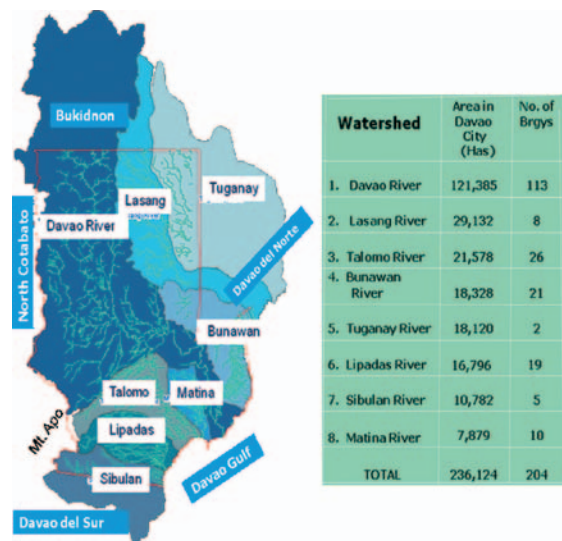


**Photo. 5.2.2** Photos of the meeting (20th Sep 2008)

## 5.3 DAVAO RIVER (PHILIPPINES)

### 5.3.1 Case Story (Davao River)

Facts	Ref. to KFS
<p><b>I. Description of Davao River Basin</b></p> <p>The land area of Davao City consists of eight major river basins all of which drain into the Davao Gulf. It is for the reason that watershed management is one of the thrusts of the Environmental Plan of the City. To translate this thrust, in 2007 the City Council approved the Watershed Management Code, officially upholding an integrated approach in managing the interactions among water, land, and life forms in the eight river basins.</p> <p>This fact sheet gives a brief profile of the eight river basins emphasizing the integrated approach which HELP (Hydrology for the Environment, Life and Policy) - Davao has identified as one key towards successful management of the city's water and environment. While sectoral initiatives are present in each river basin, significant advances have been made in parallel efforts toward converging those initiatives at the policy and governance level. The convergence took the form of adopting a common watershed ordinance and an inclusive management council.</p> <p>Davao City with a land area of 244,000 ha is the largest city in the Philippines (Fig. 5.3.1). It is located in southeastern Mindanao at 658' to 734'N and 125 40'E. It is bounded by Bukidnon province in the north, Davao Gulf in the east, Davao del Sur in the south, and North Cotabato in the west. The city consists of 204 <i>barangays</i>, the smallest administrative division in the Philippines.</p> <div data-bbox="560 1312 879 1742" data-label="Figure"> </div> <p><b>Fig. 5.3.1</b> Davao City, Philippines, source: CPDO-PCEEM</p> <p>Geophysically, the city consists of eight river basins (Fig 5.3.2). The Davao and Talomo Rivers are the major drainage systems. The Malagos River, a 235 ha declared protected area, has its headwaters from the Davao River and is therefore not a separate river basin.</p>	



**Fig. 5.3.2** Location of the eight river basins of Davao City, source: CPDO

The Davao River ranks number one in almost all of key indicators such as land use, population, and socio-economic activities while the Tuganay River ranks last. This has implications in the sustainable uses of the various resources in the Davao River and the sound development of the Tuganay in the future.

**2. 1st step**

At the national level, the National Water Resources Board (NWRB) was established in 1974 to coordinate the use of water for the different purposes, but the lack of reliable data on present water resources and water use, coupled with conflicting department mandates, hampered the progress and the effectiveness of the NWRB. The absence of an NWRB field office in the Davao City contributed to its weak coordination of water uses in the river basins.

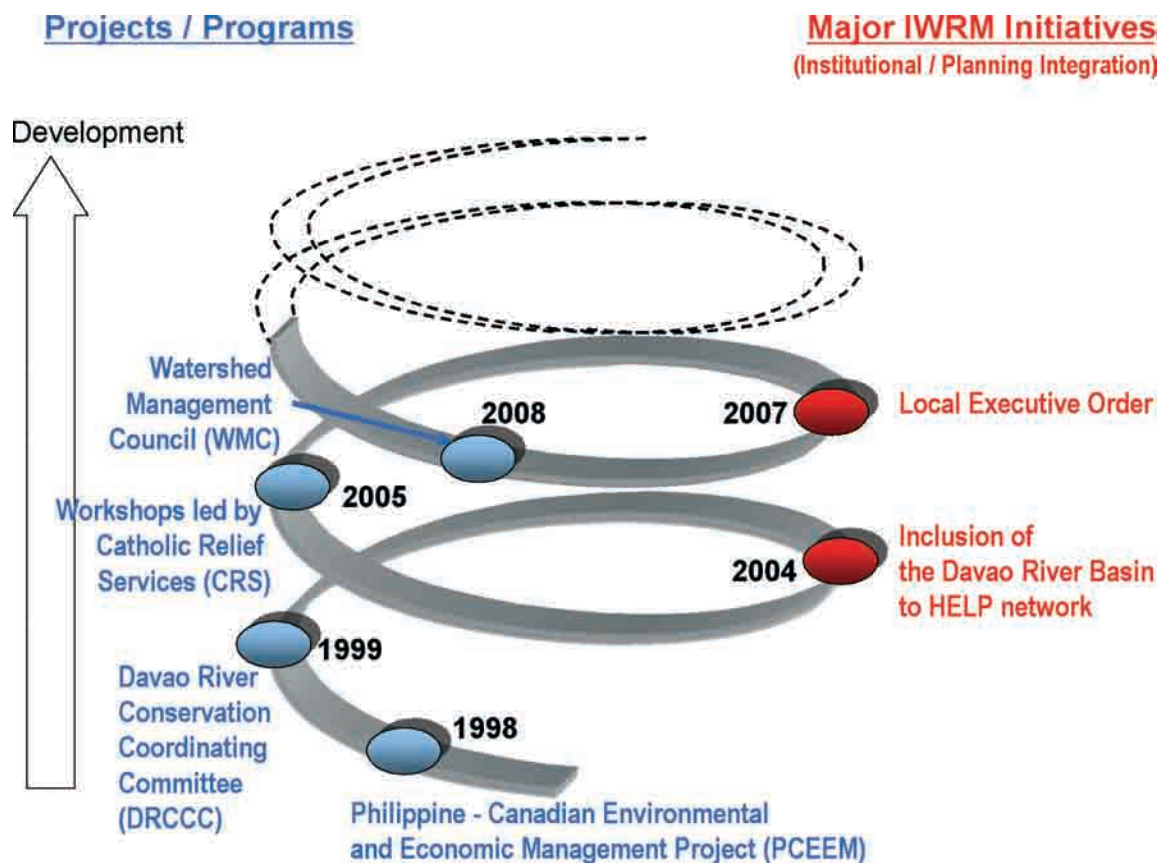
In the absence of national government actions, a number of local initiatives started building awareness and capacities in the different river basins in Davao City. Major efforts in the development of integrated water resource management (IWRM) had been the focus in the Talomo-Lipadas Rivers; the source of major aquifers that provide 98 per cent of the Davao City Water District’s (DCWD) regulated drinking water supply. But since DCWD only serves 56 per cent of the total population of the city, large populations across the river basins continue to be unregulated for water supply. Being the largest river basin, the Davao River plays a key role in ensuring water for much of the remaining 44 per cent of the population and is critical for other factors including food production and other ecological services.

Under the circumstances, formal organizational initiatives were launched. The Philippine-Canadian Environmental and Economic Management Project, funded by the Canadian Government (now re-titled People Collaborating for Environmental and Economic Management, or PCEEM), commenced in 1998 to help improve the condition of the Talomo-Lipadas Rivers; and the multi-sectoral Davao River Conservation Coordinating Committee (DRCCC) was formed in 1999 to help conserve the Davao River.

KFS-5.3.2 (1)

Facts	Ref. to KFS
<p><b>3. 2nd step</b></p> <p>In 2004, a group of stakeholders of the Talomo-Lipadas Rivers, where PCEEM was formulated, and the Davao River, where DRCCC was formulated, advocated an integrated plan for all the river systems of the city. Meanwhile, in 2003, the Catholic Relief Services (CRS), recognizing that the development of IWRM could play a vital role in poverty alleviation in developing countries, sought to support local watershed initiatives.</p> <p>In January 2004, a proposal for inclusion of the Davao River basin was submitted jointly by CRS and DRCCC to the international HELP network of river basins under UNESCO. Using the profile of the Davao River as the point of description, Davao Rivers which include the eight major river systems that make up the city, were classified as Operational Basin in June 2004.</p> <p>In early 2005 a series of CRS-led workshops formulized the HELP concepts to key local actors, and consensus was reached to use the HELP Network as a driver for integration of existing initiatives. The complexity of issues and the limited resources available signified a daunting task in the development of integrated manngement for all eight river basins.</p> <p>After some exploratory meetings, a Local Executive Order was issued creating an interdisciplinary Ad-Hoc Committee to initiate the crafting of an integrated watershed management framework and to pave the way for the formation of a city-wide Watershed Management Council (WMC). To fast-track the legislation process, the draft of the framework was used to author the Watershed Management Code, which was subsequently signed into a City Ordinance in 2007. The city passed a Watershed Management Ordinance, which provided for the creation of a WMC that would materialize in October 2008. The council is now working towards its institutionalization, which includes the formation of Barangay Watershed Management Councils and a multi-sectoral monitoring team.</p> <p>While there are eight river basins, their management is integrated under the newly passed Watershed Management Ordinance. This means that the local government shall take the lead in using an holistic approach in planning and conservation through the Watershed Management Council. The uniqueness of each watershed, on the other hand, will be under the stewardship of the Barangay Watershed Councils, which shall use specific strategies while adopting a common management framework and a set of guiding principles.</p> <p>Alongside legislative initiatives, the related sectors of civil society and environmental groups are working under its own agenda. Each has its own perspective and strategy on how to achieve its set goals. Working in the context of limited resources, these groups have been creative and ingenuous in pursuing their goals. The challenge is how to consolidate the strengths of each and harmonize efforts in order to reach greater and longer-term goals. Recent environmental issues such as clean water and flashfloods have increased the awareness of these groups to work alongside each other and to discuss solutions based on reliable information. Networking and collaboration have become a common strategy and the city government has taken on a very progressive outlook on the critical contributions of various sectors and civil society in general. The newly formed WMC is getting enthusiastic support towards integrated management from its multi-sectoral membership.</p>	<p>KFS- 5.3.2 (2)</p> <p>KFS- 5.3.2 (2)</p>

Facts	Ref. to KFS
<p><b>4. Next Steps</b></p> <p>The expertise and twinning program with the Murrumbidgee 'HELP Demonstrational' River Basin in Australia has expanded the network of technical cooperation and exposure of the city government and HELP-Davao with regards to watershed management. The scientific approach of HELP has reinforced the paradigm shift in local governance from decisions based on politics to decisions based on reliable information from various stakeholders and scientific principles. Harnessing this technical cooperation will be advantageous for the Watershed Management Council</p> <p>As mentioned above, IWRM proceeds step by step as compared to a 'spiral' process. This spiral approach is efficient for the conceptualization to the implementation of IWRM, particularly ahead of the establishment of the formal river basin organization.</p>	<p>KFS-5.3.2 (2)</p>



**Fig. 5.3.3** IWRM spiral of Davao River

[Interviewee: Ms. Cristy G. Gallano, Dr. Ruth Gamboa, Mr. Arnolfo Cabling (HELP-Davao Network)]

[Interviewer: Masayuki Shiraishi, Akira Nishimura (Japan Water Agency)]

[Report: Dr. Ruth Gamboa, Ms. Cristy G. Gallano (HELP Davao Network), Mr. Declan Hearne (former HELP Davao Network), Mr. Akira Nishimura (Japan Water Agency)]

### 5.3.2 Extracted Key for Success

#### (I) Extracted Key for Success from Davao River

Reference to 5.3.1 Case Story (Davao River)

<p><b>[ Title ]</b>  <b>Integrating the fragmented sectors</b></p>
<p><b>[ Situation ]</b>  <b>A number of local initiatives started building awareness and capacities in the different river basins in the Davao City</b>  Major efforts in the development of integrated water resource management (IWRM) had been the focus in the Talomo-Lipadas Rivers, the source of major aquifers that provide 96 per cent of the Davao City Water District's (DCWD) regulated drinking water supply. However, as DCWD only serves 56 per cent of the total population of the city, large populations across the watersheds continue to be unregulated for water supply. Being the largest river basin, the Davao River plays a key role in ensuring water for much of the remaining 44 per cent of the population and is critical for other factors including food production and other ecological services.</p>
<p><b>[ Problem ]</b>  <b>The local initiatives were fragmented in the different river basin even though each group is working on limited resources</b>  Fragmented initiatives only created water quantity and quality problems. Contradictions and conflicts in rules and roles are inevitable as local initiatives evolved their policies and strategies in isolation.</p>
<p><b>[ How the problem was overcome ]</b>  <b>The formal organizational initiatives in major river basins were launched</b>  The first formal organizational initiative was the Philippines-Canadian Environmental and Economic Management Project (now re-titled People Collaborating for Environmental and Economic Management, or PCEEM). PCEEM commenced in 1998 to help improve the health of the Talomo-Lipadas Rivers by building collaborative and integrated governance supported by continuous capacity enhancement. Similarly the multi-sectoral Davao River Conservation Coordinating Committee (DRCCC) was formed in 1999 through City Executive Order 29. The central role of the committee was to help conserve the Davao River through the promotion of projects to rehabilitate and enhance the watershed.</p>
<p><b>[ The Key ]</b>  <b>At the onset, only DRCCC members learned about the IWRM process. This process, and in particular the importance of IWRM, was then brought to public attention.</b>  &gt;&gt;&gt; [1.1.1] Be aware of the IWRM efforts in your river basin, region or country.   <b>The activities of DRCCC only concerns the Davao River basin level yet DRCCC is composed of related stakeholders such as governments (local and national), the business sector and civil society including the church and academia.</b>  &gt;&gt;&gt; [2.2.2] It is advisable to start considering the mechanism and course of action for stakeholder participation during the conceptualization phase.   <b>Local NGOs took on the coordination role, which resulted in an effective participation of the different stakeholder groups. Catholic Relief and Services (CRS) and PCEEM worked as partners in coordinating meetings and schedules, which resulted in a better appreciation of water and watershed issues.</b>  &gt;&gt;&gt; [3.1.3] Select a lead coordinator(s) (organization or individual) whom the maximum possible number of stakeholders participating in the process can accept.</p>
<p><b>[ Conditions and limitations in applying the KFS ]</b>  A collaborative spirit that prevails among partners.</p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b>  Volunteer – even though resources are limited, volunteerism and creative initiatives from private groups and ordinary citizens at local level can promote IWRM.</p>



## (2) Extracted Key for Success from Davao River Reference to 5.3.1 Case Story (Davao River)

<b>[ Title ]</b> <b>Integrating the fragmented sub-basins</b>
<b>[ Situation ]</b> <b>The initial formal organizational initiatives were launched at the end of 1990s</b> The Philippines-Canadian Environmental and Economic Management Project (now People Collaborating for Environmental and Economic Management, or PCEEM) commenced in 1998 to help improve the health of the Talomo-Lipadas Rivers; and the multi-sectoral Davao River Conservation Coordinating Committee (DRCCC) was formed in 1999 to help conserve the Davao River.
<b>[ Problem ]</b> <b>The initial formal organizational initiatives were still conducted separately</b> The Davao City has eight major river basins all of which drain into the Davao Gulf. However, PCEEM and DRCCC were respectively concerned only with the Talomo-Lipadas and Davao Rivers. In 2003, Catholic Relief Services (CRS), recognizing that the development of IWRM can play a vital role in poverty alleviation in developing countries, sought to support local watershed initiatives. Meanwhile, in 2004, a group of stakeholders of those river basins advocated an integrated plan for all the river systems of the city.
<b>[ How the problem was overcome ]</b> <b>(1) A framework under the international HELP network was developed</b> In January 2004, a proposal for inclusion of the Davao River basin was submitted to the international HELP network of river basins under UNESCO by CRS and DRCCC. Using the profile of the Davao River as the point of description, Davao Rivers, which include the eight major river systems that make up the city, were classified as Operational Basin in June 2004. This HELP Network was an effective driver for integration of various initiatives. <b>(2) A framework under the local government was developed</b> After some exploratory meetings, a Local Executive Order was issued creating an interdisciplinary Ad-Hoc Committee to initiate the crafting of an integrated watershed management framework and to pave the way for the formation of a city-wide Watershed Management Council (WMC).
<b>[ The Key ]</b> <b>It was noteworthy that the separate formal organizational initiatives were integrated under the HELP Network. Likewise, the newly formed WMC led by the city government is getting enthusiastic support towards integrated management from its multi-sectoral membership.</b>  <b>A proper participatory process should be promoted even if it may take longer (such as countless hearings and consultations). Once a solution is reached, there is strong ownership and accountability among those involved (stakeholders).</b> <b>&gt;&gt;&gt; [2.2.2] It is advisable to start considering the mechanism and course of action for stakeholder participation during the conceptualization phase.</b>
<b>[ Conditions and limitations in applying the KFS ]</b> Involve the city government as main partner and extract strong responsibility and accountability from them.
<b>[ Ideas for enhancing the applicability of the KFS ]</b> Appeal to citizens' great awareness of environmental conservation and strong sense of ownership of the local resources.



**(3) Extracted Key for Success from Davao River**

Reference to 5.3.1 Case Story (Davao River)

<p><b>[ Title ]</b>  <b>Awareness of importance of technology for water management</b></p>
<p><b>[ Situation ]</b>  Scientific data were insufficient for the Davao River Basins.  Scientific data had not been collected sufficiently in the Davao River basins.</p>
<p><b>[ Problem ]</b>  <b>The local actors were making decisions without scientific information</b>  Appropriate data had not been collected in the Davao River basins. Therefore the local actors were making decisions without reliable information from the various stakeholders and scientific principles.</p>
<p><b>[ How the problem was overcome ]</b>  <b>(1) The local actors realized the importance of understanding hydrological processes through HELP inclusion of the Davao River Basin</b>  Membership in global initiatives of the UNESCO Water Sector paved the way for further technical capacity-building opportunities, although at the same time it pointed out the huge gap in the technical capacities of local actors.  <b>(2) Gather data and take an integrated and collaborative approach</b>  PCEEM commissioned some seven studies on the Talomo-Lipadas Rivers, among them was the Terrain Analysis. CRS profiled Davao River while the Water District also conducted two studies on groundwater. Likewise, the city government began the socio-economic profiling of each watershed. Using this information, and taking into consideration the current initiatives of the different sectors, a Local Executive Order, on the adoption of recommendations in the Terrain Analysis and later a Watershed Management Ordinance, were passed.  <b>(3) Use reliable information and scientific data to reach a fair decision</b>  The city council took on the challenge of making tough decisions by listening to as many viewpoints from stakeholders as possible, and matching them with available scientific information.  <b>(4) Share resources</b>  Civil society, business groups, and academia were quick to respond to scientific information and initiated their own projects toward addressing specific issues.</p>
<p><b>[ The Key ]</b>  <b>The collection of reliable and appropriate data and the making of rigorous analysis paved the way toward resolving water and environment issues. Without the hard and sound facts from the studies, and the use of science to explain events and trends and to project scenarios, it would have been difficult to reach a win-win solution from the various stakeholders.</b>  &gt;&gt;&gt; <b>[2.1.1] Be selective when collecting data by setting priorities based on the problems.</b>   <b>Using sound science, the HELP network has become a practical platform where competing stakeholders can debate possible solutions and build collaboration. It has also become a driver for good governance. The changes were repeatedly demonstrated through the attitudes and behavior of stakeholders.</b>  &gt;&gt;&gt; <b>[2.3.4] Explore, adopt and customize new technologies so that they can be put to best use in the basin.</b></p>
<p><b>[ Conditions and limitations in applying the KFS ]</b>  Existing groups/sectors working in the watersheds are ready to embrace a new paradigm such as incorporating science and optimizing multi-sectoral participation when pursuing integrated management.</p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b>  Demonstrate the benefits. Let the partners try out the new technologies for themselves and let them identify the derived benefits.</p>

## 5.4 LAKE BIWA (JAPAN)

### 5.4.1 Case Story (Lake Biwa)

Facts	Ref. to KFS
<p><b>1. Introduction – the Yodo river basin and the Lake Biwa</b></p> <p>The length of Yodo river is 75.1 km and its catchment has an area of 8,240 sq. kilometers covering six prefectures: Shiga, Kyoto, Mie, Nara, Osaka, and Hyogo. The defining characteristic of the Yodo River system is that it holds Lake Biwa in its upstream, which is the largest freshwater lake in Japan.</p> <p>As it flows out of the lake, the name of the river changes along the length of its travels: in the upper and middle reaches it is called the Seta River and the Uji River, respectively. The river brings together major tributaries such as the Kizu River and the Katsura River near the boundary of Kyoto Prefecture and Osaka Prefecture. It then travels southwest and flows into Osaka Bay.</p>	
<p><b>2. The Lake Biwa basin</b></p> <p>Lake Biwa has a catchment area of 3,848 sq. kilometers and covers 47 per cent of the total Yodo river system catchment area. Lake Biwa is situated in the centre of its catchment area and has an area of 674 sq. kilometers; its catchment area is almost the same size as Shiga Prefectural area. The capacity of the lake is 27.5 billion cubic meters.</p> <p>There are about 500 rivers flowing into the lake from the surrounding mountains. However, only one river, the Seta River, flows from the lake. Lake Biwa therefore plays an important role in stabilizing the water flow of the entire Yodo River system.</p> <div data-bbox="150 1182 501 1626"></div> <div data-bbox="528 1160 1214 1626"></div> <p><b>Fig. 5.4.1</b> Map of the Yodo River and the Lake Biwa      <b>Photo 5.4.1</b> Lake Biwa</p>	

Facts	Ref. to KFS
<p><b>3. Lake Biwa – an ancient lake</b></p> <p>Lake Biwa was created some 400 million years ago and is one of the world’s oldest lakes. Because of their long history, ancient lakes feature a great number of endemic species that have evolved within the lake. Lake Biwa also possesses abundant biodiversity offering habitats for more than 1,000 species, including at least fifty endemic species such as Biwa trout and <i>Seta corbicula</i>.</p>	
<p><b>4. Conflicts among Lake Biwa and downstream residents</b></p> <p>In the midstream and downstream of the Yodo River is situated Japan’s second largest megapolis, the Keihanshin area that includes Kyoto, Osaka and Kobe. Lake Biwa supplies water to a population of fourteen million. Lake Biwa is therefore vital to the area.</p> <p>Conflicts have arisen because of flood management and water use issues between residents in the Lake Biwa basin and the downstream riparian residents. In the Lake Biwa basin, residents discharge water from the lake during floods and store water in the lake during droughts while the opposite occurs in the downstream area; residents store water in the lake during floods and discharge water from the lake during droughts.</p>	
<p><b>5. Recognition of necessity of Lake Biwa Comprehensive Development</b></p> <p>After World War II, the Japanese economy enjoyed soaring growth. Heavy and chemical industries were developed in the coastal Osaka Bay area, and Osaka and Kobe (Hanshin) coastal industrial regions. These industries sought water from groundwater sources. Moreover, Osaka Prefecture, which is the central part of the region, used groundwater as a main source for its waterworks system. Consequently, land subsidence occurred caused by the excessive pumping of groundwater, which then became a major problem in the region. Demand for domestic water also increased as the population grew in the Hanshin region. So in addition to the industrial water sector, the domestic water use sector also sought new water sources from the Yodo River and Lake Biwa. For that reason, the Lake Biwa Comprehensive Development (LBCD) was conceptualized.</p> <p>Due to the long history of conflicts between upstream and downstream residents, the formulation of a program negotiated among prefectural governments proved difficult such that coordination by national government was deemed necessary. In April 1956, the Lake Biwa Comprehensive Development Council was founded through the collaboration of Kinki Regional Bureau of the Ministry of Construction (hereinafter ‘MOC’, now reformed to Ministry of Land, Infrastructure, Transport and Tourism, hereinafter ‘MLIT’) and the related prefectural governments.</p> <p>Since 1960, various plans for LBCD have been proposed by the council, Shiga Prefecture, Ministry of Agriculture, Fishery and Forestry (hereinafter ‘MAFF’), and MOC respectively, but they were not all agreed by the stakeholders. Shiga Prefecture, whose jurisdiction covers almost the entire Lake Biwa catchment area, insisted that the LBCD should not only benefit the downstream area but also the upstream area for its regional development. Shiga Prefecture also insisted on the need for specific national legislation.</p>	

Facts	Ref. to KFS
<p>In July 1968, a preliminary agreement was reached with the basic framework of comprehensive development that included both water resource development for the downstream area and regional development for the upstream area. Lake Biwa Comprehensive Development was finally able to proceed. Nevertheless, some issues still remained in the detailed planning such as lower and upper lake water levels for additional water use, i.e. the capacity of water between these water levels that can be used for new water use. The high water level for flood management continued to be discussed between the coordinator, MOC, and the Shiga Prefecture.</p> <p>The coordination among relevant ministries bore fruit in 1972, when an agreement between ministries and prefectures was formulated that included:</p> <ol style="list-style-type: none"> <li>1. confirmation of amount of water to be developed;</li> <li>2. the upper and lower lake water level for water use, and;</li> <li>3. the operation procedure during abnormal drought.</li> </ol> <p>Accordingly, the 'Special Law for Lake Biwa Comprehensive Development' was enacted in June 1972 and in December 1972, the Lake Biwa Comprehensive Development Plan was formulated.</p>	
<p><b>6. The Special Law for Lake Biwa Comprehensive Development and Lake Biwa Comprehensive Development Plan</b></p> <p>The key concept of LBCD was to realize both downstream and upstream needs at the same time, i.e. water resources development of Lake Biwa to meet demand downstream, and regional development and conservation of the lake for the upstream area.</p> <p><u>The Special Law for LBCD provides the legal grounds for establishing the national ten-year term plan implemented by Shiga prefectural and local governments, as well as the Water Resources Development Public Corporation (now the Japan Water Agency), with support from related national ministries.</u></p> <p><u>The law also provides the legal grounds for allocating special funds from national government. It also stipulates the special cost-covering arrangement for upstream Shiga prefectural and local governments for their projects by transferring funds from downstream prefectural and local governments. This legal system paved the way for many subsequent water resources development programs throughout Japan.</u></p> <p>Major objectives of the Lake Biwa Comprehensive Development Plan include:</p> <ol style="list-style-type: none"> <li>1. Conservation and restoration of the lake's environment including water quality.</li> <li>2. Flood control of the Lake Biwa and the Yodo River.</li> <li>3. 40 m<sup>3</sup>/sec of new water resources development for downstream area and water use programs for upstream area.</li> </ol> <p>The program – implemented with support, understanding, cooperation and collaboration of Shiga Prefecture, downstream prefectures and national government – required as many as 25 years of history. It started in 1972 and ended in 1996 with two term extensions and modification of the plan over the 25 years.</p>	<p>KFS-5.4.2 (1)</p>

Facts	Ref. to KFS
<p><b>7. Recognition of Further Environmental Protection</b></p> <p>The degree of limpidity of Lake Biwa was originally very high; it was once possible to see more than 10 m below the water surface. However, in the latter half of the 1950s, increasing pollutants into the lake led to eutrophication. The first problems of infiltration arose in Kyoto city in 1959, followed by freshwater red tide first occurring in 1977, and blue-green algae blooms in 1983.</p> <p>The severe freshwater red tide in May 1977 had a significant and lasting impact on the residents of Shiga Prefecture. The red tide outbreak led residents to take action to prevent further eutrophication. An increasing number of citizens became involved in environmental protection resulting in a prefecture-wide campaign to stop the use of synthetic household detergents containing phosphorus; one of the major causes of eutrophication. As a result of this movement, Shiga Prefecture enacted the Eutrophication Prevention Ordinance in 1979 to prevent the eutrophication of Lake Biwa by controlling inflows of nitrogen and phosphorus for the first time in the nation. The ordinance bans marketing, and the use of phosphorus-containing synthetic detergent. It also comprises regulations on industrial wastewater together with guidelines for reducing nitrogen and phosphorus from domestic and agricultural wastewater.</p> <p>The Lake Biwa Comprehensive Development Plan has had a considerable effect on flood management and water use. It has also contributed, to a considerable extent, in maintaining a sustainable environment as a result of water quality conservation projects including the construction and improvement of sewage treatment plants, livestock waste treatment facilities, agricultural community drainage facilities, and waste treatment plants. Despite these efforts, problems still persist such as the slow increase of COD (chemical oxygen demand) level, while phosphorus and nitrogen levels have much improved. In addition, the ratio of pollution load by point source, i.e. discharge from industry and household, has decreased. On the other hand, the ratio by discharge from a non point source, i.e. agricultural land and rainwater flush from road and land, has increased. In addition, a change of the lake shore land use caused a loss of natural lake shore including the reed belt as well as an invasion of non-native fish species, which caused the decline of the indigenous fish habitat.</p> <p>To meet the need for environment protection and to resolve the problems of Lake Biwa, the Shiga Basic Environment Ordinance, aimed at securing a healthy and high quality environment, was enacted in March 1996. In this ordinance, the basic environmental principles and policies, the role and duty of enterprises, the prefectural administration, and people, are stipulated so as to promote the integrity of the environment.</p>	
<p><b>8. Lake Biwa Comprehensive Conservation Plan</b></p> <p>In response to these efforts by prefectural government and residents in the Shiga prefecture, the ministries and agencies concerned, the National Land Agency (now incorporated into MLIT), the MOC, the Environmental Agency (now the Ministry of Environment), the Ministry of Health and Welfare (now the Ministry of Health, Labour and Welfare), and MAFF, decided to evaluate the outcome of the Lake Biwa Comprehensive Development. Using the plan as its base, a comprehensive lake conservation plan, as a model plan encompassing Lake Biwa and its peripheral regions, was developed by coordinating and integrating various initiatives taken by respective ministries/agencies. As a consequence, the governmental bodies concerned jointly established a committee comprising specialists from a wide spectrum of academic fields. In the two years from</p>	

Facts	Ref. to KFS
<p>fiscal year 1997 to fiscal year 1998, the committee conducted a comprehensive survey to study and discuss the diverse aspects such as the improvement of water quality and soil recharge capacity, along with the preservation of the natural environment and landscape. The survey outcome was compiled in a report titled ‘Survey for Preparing Lake Biwa Comprehensive Conservation Plan’.</p> <p>According to the survey outcome, Shiga Prefecture set up the Lake Biwa Comprehensive Conservation Plan (Mother Lake 21) in 2003, which is Japan’s most comprehensive lake management program. The plan places emphasis on protecting water for ecosystem, as compared to Lake Biwa Comprehensive Development, and it consists of programs in three areas:</p> <ol style="list-style-type: none"> <li>1. maintaining water quality;</li> <li>2. improving the recharge capacity of the soil; and,</li> <li>3. preserving the natural environment and landscapes.</li> </ol> <p>Extensive programmes are promoted in these areas. It sets long-term targets of 50 years, below which are 10-year plans,</p> <p>Another feature of the plan is that it promotes participation of all the stakeholders to conservation actions in the Lake Biwa catchment area while governments continue to proceed with the conservation programs. It also promotes the establishment of a sub-basin level association in each major lake inflow river basin area.</p> <p>Based on Mother Lake 21, various programs are being implemented including cutting-edge ecosystem programs such as Reed Preservation Ordinance to protect the reed belt along the lake shores; the Environmental-Friendly Agriculture Promotion Ordinance, which promotes reduction of chemical synthetic pesticides and fertilizers; the Fish’s Cradle Project, which restores watercourses between the lake and rice paddy fields for fish spawning; and the restoration project of reclaimed land for agriculture back to lake.</p>	<p>KFS-5.4.2 (2)</p>
<p><b>9. Present and Future of the Lake Biwa</b></p> <p>Most of the residents in Shiga Prefecture – more than 1.4 million people – live in the Lake Biwa basin. Nevertheless, the Lake Biwa is distinctively unique in keeping, to certain extent, its environment in good condition. Furthermore, it is a blessing to the nation that the water resources, supporting fourteen million people living in the Keihanshin region, are a source of aquatic and tourism wealth. It is therefore necessary to keep these resources sustainable.</p>	
<p><b>References</b></p> <p>ILEC. 2005. Managing Lakes and their Basins for Sustainable Use: A Report for Lake Managers and Stakeholders, International Environment Committee Foundation</p> <p>Lake Biwa Comprehensive Preservation Liaison Coordination Council and Lake Biwa Comprehensive Preservation Promotion Council, 2003. Lake Biwa Comprehensive Preservation Initiatives – Seeking Harmonious Coexistence with the Lake’s Ecosystem – <a href="http://www.mlit.go.jp/crd/daisei/biwako_hozen/pamphlet/pamphlet_en.pdf">http://www.mlit.go.jp/crd/daisei/biwako_hozen/pamphlet/pamphlet_en.pdf</a></p> <p>Shiga Prefectural Government: Environment of Shiga <a href="http://www.pref.shiga.jp/multilingual/english/environment/">http://www.pref.shiga.jp/multilingual/english/environment/</a></p> <p>Shiga Prefectural Government: Mother Lake 21 Plan <a href="http://www.pref.shiga.jp/biwako/koai/mother21-e/index.html">http://www.pref.shiga.jp/biwako/koai/mother21-e/index.html</a></p>	

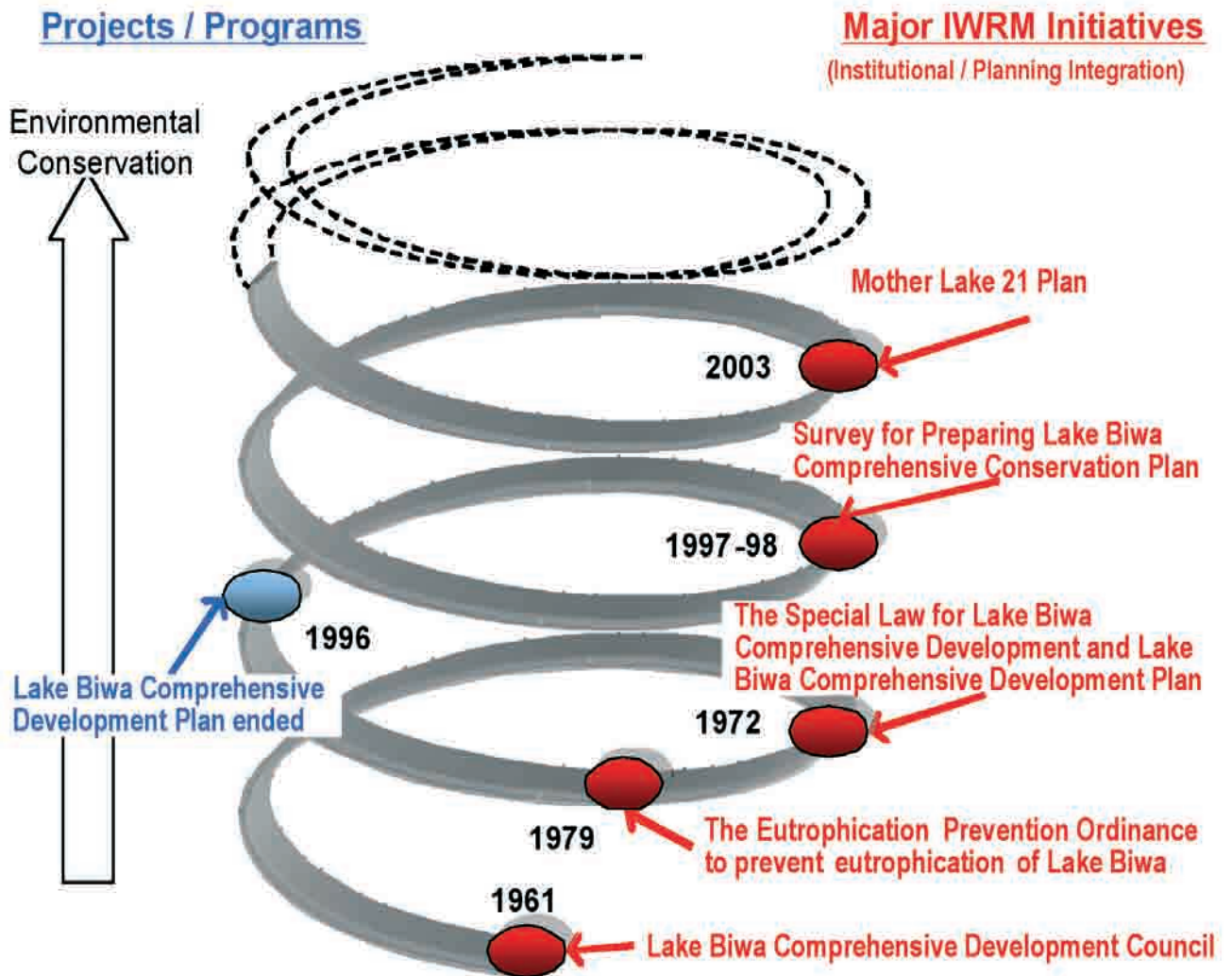


Fig. 5.4.2 IWRM spiral of Lake Biwa

[Interviewee: Mr. Masaki Hirowaki, Mr. Shinsuke Nishikawa, Mr. Kazutaka Sakiya (Shiga Prefectural Government, Japan)]

[Interviewee: Mr. Yasuhiro Ochii, Mr. Koichi Takano (Japan Water Agency)]

[Report: Mr. Masaki Hirowaki, Mr. Shinsuke Nishikawa, Mr. Kazutaka Sakiya (Shiga Prefectural Government, Japan), Mr. Yasuhiro Ochii, Mr. Koichi Takano (Japan Water Agency)]



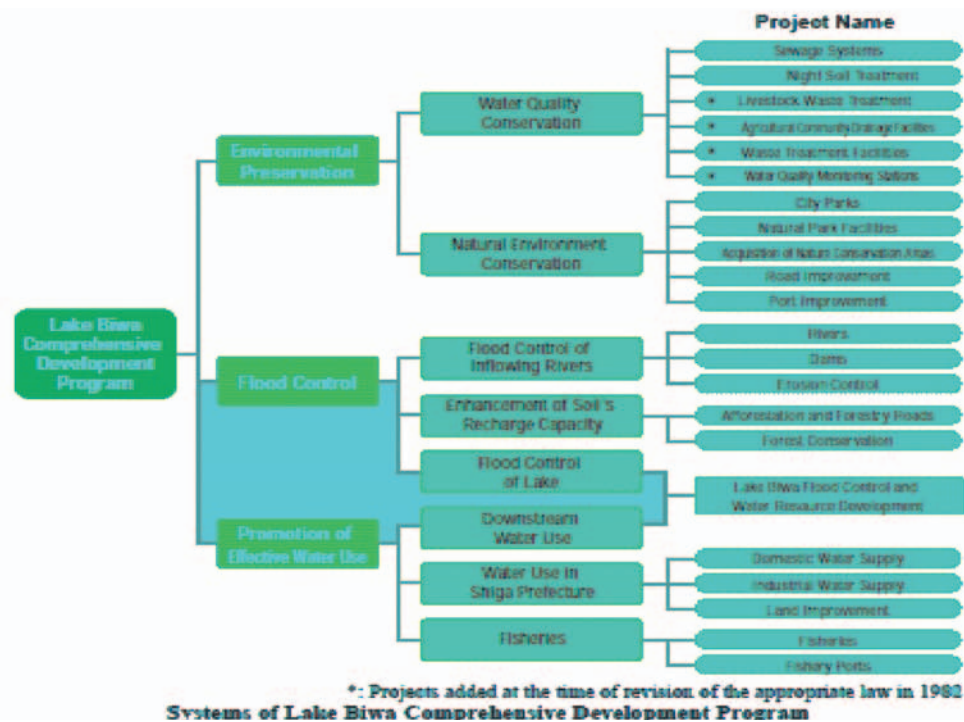
## 5.4.2 Extracted Key for Success (Lake Biwa)

### (I) Extracted Key for Success from Lake Biwa

Reference to 5.4.1 Case Story (Lake Biwa)

<p><b>[ Title ]</b> <b>Legislative framework for conflict resolution between upstream area – the Lake Biwa basin – and downstream area</b></p>
<p><b>[ Situation ]</b> <b>New source for water is sought due to overuse of groundwater, urbanization and industrialization</b> After World War II, the Japanese economy enjoyed soaring growth. Heavy and chemical industries were developed in the coastal Osaka Bay area, Osaka and Kobe (Hanshin) coastal industrial region. These industries sought water from groundwater sources. Moreover, Osaka Prefecture, which is a central part of the region, used groundwater as a main source for its waterworks. Consequently, land subsidence occurred caused by excessive pumping of groundwater, which later became a major problem in the region. Demand for domestic water also increased as the population grew in the Hanshin region. So in addition to the industrial water sector, the domestic water use sector also sought new water sources from the Yodo River and Lake Biwa. For that reason, LBCD was conceptualized.</p>
<p><b>[ Problem ]</b> <b>Due to the long history of conflicts between upstream and downstream residents, the formulation of a program negotiated by prefectural governments proved difficult.</b> Conflicts arose because of flood management and water use issues between residents in Lake Biwa basin and the downstream riparian residents. In April 1956, the Lake Biwa Comprehensive Development Council was founded through the collaboration of Kinki Regional Bureau of the Ministry of Construction and related downstream and upstream prefectural governments. In July 1968, a preliminary agreement was reached with basic framework of comprehensive development that included both water resource development for the downstream area and regional development for the upstream area. Shiga Prefecture, whose jurisdiction covers almost the entire Lake Biwa catchment area, insisted that LBCD should not only benefit the downstream area but also the upstream area for its regional development. Shiga Prefecture also insisted on the need for specific national legislation.</p>
<p><b>[ How the problem was overcome ]</b> <b>Framework for cost allocation stipulated in the Special Law for Lake Biwa Comprehensive Development sought to resolve conflicts between the upstream and downstream areas.</b> The ‘Special Law for Lake Biwa Comprehensive Development’ was enacted in June 1972. The law provides legal grounds for establishing the national ten-year term plan. The law also provides legal grounds for allocating special funds from the national government. The rates of national government’s subsidies were set higher than that stipulated in other related laws. It also stipulates a special cost-covering arrangement for upstream Shiga prefectural and local governments for their projects, such as for the construction of sewerage systems, by transferring funds from downstream prefectural and local governments. These integrated efforts thus changed the situation and brought coordination forward.</p>
<p><b>[ The Key ]</b> <b>The ‘Special Law for Lake Biwa Comprehensive Development’ stipulates the IWRM implementation process, including measures that strengthen benefits and ensures the framework for cost allocation. Having sufficient legal back-up, the coordination activities of IWRM was carried out and resolved the conflicts between the upstream and downstream areas. It could also prevent practical problems from arising, reduce the time required for coordination, and realize early benefit of the program.</b> &gt;&gt;&gt; [5.2.2] It is advisable to define frameworks for coordination, consensus building and implementation/evaluation of IWRM related plans in legislation.</p>
<p><b>[ Conditions and limitations in applying the KFS ]</b></p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b></p>

## [ Attachment Materials ]



**Fig. 5.4.3** Systems of Lake Biwa Comprehensive Development Program

- Special funds from national government  
The national government endowed special funds (by raising the ratio of national government's subsidy to prefectural and local governments) to many projects implemented as part of the Lake Biwa Comprehensive Development Plan.
- Funds transfer by downstream prefectural and local governments  
The prefectural and local governments downstream, beneficiaries of the lake development projects, shared the expenses of the regional development projects in the areas of lake conservation, flood control, and water use programs implemented by Shiga Prefectural and local governments in Shiga Prefecture. The share of the funds transferred from downstream governments to Shiga governments was determined among downstream governments in accordance with the water volume to be supplied by the newly developed lake water resources (40 m<sup>3</sup> per second in total). The amount of funds transferred by the downstream governments totalled approximately 60.2 billion yen. In addition, Osaka and Hyogo prefectures loaned Shiga Prefecture funds totalling 5 billion yen.
- Lake Biwa Management Fund  
To finance the cost of maintenance of the facilities constructed by Lake Biwa Comprehensive Development and other maintenance costs of Lake Biwa, Shiga Prefecture established the Lake Biwa Management Fund with approximately 10 billion yen in fiscal year 1996, when the Lake Biwa Comprehensive Development Plan ended.

**Fig. 5.4.4** Special Financial Measures in 'The Special Law for Lake Biwa Comprehensive Development'

**[ Title ]**

**Formulation of comprehensive conservation plan with the participation of all stakeholders in the basin**

**[ Situation ]**

**Water quality in Lake Biwa had been deteriorating**

Previously, the degree of limpidity of the Lake Biwa was originally very high; it was once possible to see more than 10 m below the water surface. However, in the latter half of the 1950s, increasing pollutants into the lake led to eutrophication. The first problems of infiltration arose in Kyoto city in 1959, followed by freshwater red tide first occurring in 1977, and blue-green algae blooms in 1983.

**[ Problem ]**

**Deterioration of water quality in Lake Biwa was caused by all the activities in the Lake Biwa basin**

The causes of the deterioration include the increase of domestic waste water, and livestock waste and drainage from farmland. As the area was vast and many people were affected, basin-wide and all-hands efforts were necessary to improve water quality.

**[ How the problem was overcome ]**

**Bottom-up approach, by which citizens' movement triggered actions of prefecture and finally resulted in the actions of national government, led to the establishment of a participatory and comprehensive conservation plan.**

The red tide outbreak in May 1977 led residents to take action to prevent further eutrophication. An increasing number of citizens became involved in environmental protection resulting in a prefecture-wide campaign to stop the use of synthetic household detergents containing phosphorus, one of the major causes of eutrophication.

As a result of this movement, Shiga Prefecture enacted the Eutrophication Prevention Ordinance in 1979 to prevent the eutrophication of Lake Biwa by controlling inflows of nitrogen and phosphorus for the first time in the nation. The ordinance bans marketing and the use of phosphorus-containing synthetic detergent. It also comprises regulations on industrial wastewater together with guidelines for reducing nitrogen and phosphorus from domestic and agricultural wastewater. Furthermore, to meet the need for environment protection and to resolve the problems of Lake Biwa, the Shiga Basic Environment Ordinance, aimed at securing a healthy and high quality environment, was enacted in March 1996.

Meanwhile, the Lake Biwa Comprehensive Development Plan contributed, to a considerable extent, in maintaining a sustainable environment as a result of water quality conservation projects such as the construction of sewage systems.

In response to these efforts of prefectural government and residents in the Shiga prefecture, comprehensive surveys were conducted by the ministries and agencies concerned. According to the survey outcome, Shiga Prefecture set up the Lake Biwa Comprehensive Conservation Plan (Mother Lake 21) in which all stakeholders in the basin – residents, enterprises, water use associations, municipalities, prefectures and national government – were prompted to participate in conservation actions such as advocating farmers to introduce environmentally-friendly agriculture, and advising residents to reduce pollutants in domestic wastewater. Participation is encouraged within the institutional system at each lake-inflow river basin level based on the plan. The plan also stipulated that it be reviewed and modified every ten years.

**[ The Key ]**

Residents in the basin recognized the problem of water quality in Lake Biwa as their own problem, and they started citizens' campaigns. This movement not only had an effect on prefectural government and the establishment of ordinances but it forced the prefecture to approach national government for further action. Mother Lake 21, which was established as a consequence of such activities, encouraged the participation of all stakeholders in the basin, and stipulated that it should be reviewed and modified periodically.

- >>> [1.1.2] Consider a significant change in the basin as a chance to move IWRM forward, and recognize and understand such changes as early as possible.
- >>> [3.1.1] Prepare a framework for stakeholder participation to build consensus among stakeholders.
- >>> [4.2.2] Continuously monitor and evaluate the effectiveness of the IWRM activities (plans, projects, infrastructure, legal framework, organizations, etc) in the basin.
- >>> [5.1.1] Advocate the importance of water resource management at the basin level and promote coordination among all sectors to be addressed in policies and national strategies.

**[ Conditions and limitations in applying the KFS ]**

**[ Ideas for enhancing the applicability of the KFS ]**

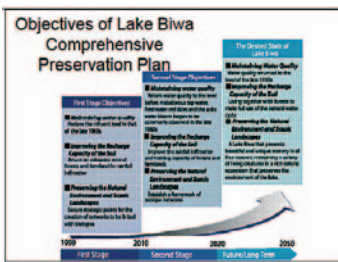


Fig. 5.4.5 Objectives and road map of Mother Lake 21

**Participation by stakeholders at Inflow River Sub Basin level in Lake Biwa Catchment Area**

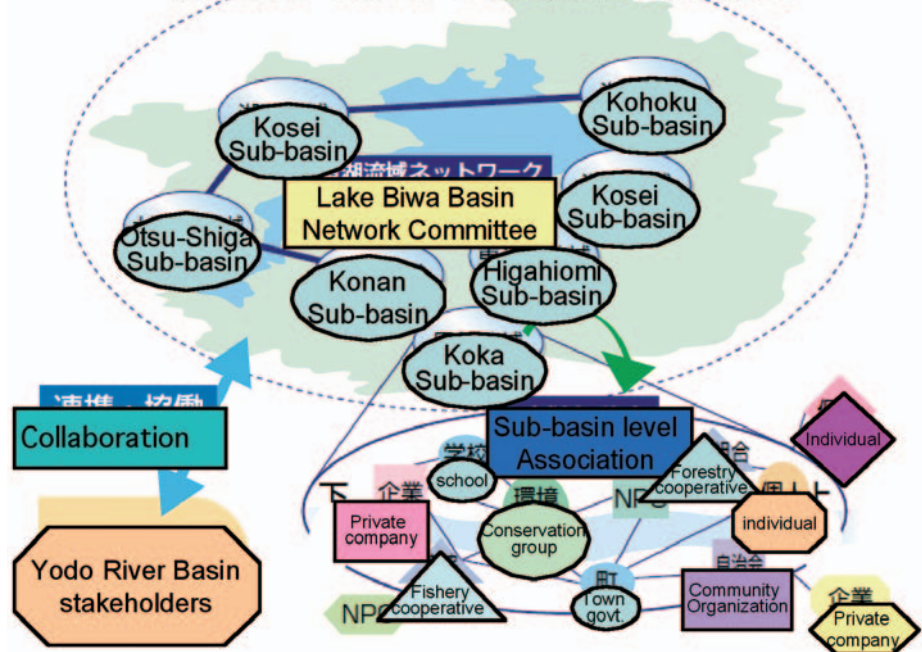
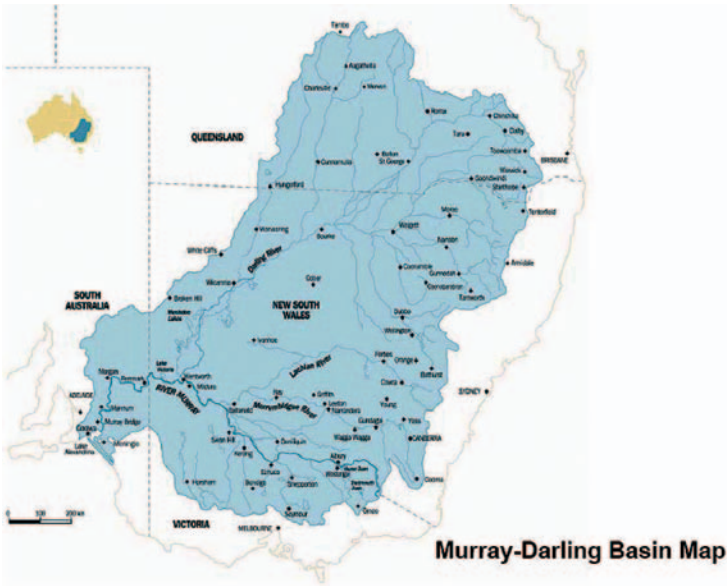


Fig. 5.4.6 Structure of stakeholders' participation)

## 5.5 MURRAY-DARLING RIVER (AUSTRALIA)

### 5.5.1 Case Story (Murray-Darling Basin)

Facts	Ref. to KFS
<p><b>I. Background/problem/issues</b></p> <p>The Murray-Darling Basin (MDB) is the sixth largest river basin in the world covering 1,073,000 sq. kilometers. It supports a population of approximately two million, in addition to another million who are externally dependent. The majority of the land is arid or semi-arid, with evaporation (mean of 1,200 mm/year) generally exceeding rainfall (mean of 450 mm/year). Flow is highly variable with annual runoff ranging from 2,500 to 40,000 GL, averaging 24,000 GL, of which about 11,250 GL/year is diverted mainly for irrigation. There has been no substantial flows to the sea for a number of years. The difference between inflows and diversions is lost through evaporation and seepage. Much of the basin is also characterized by a very low gradient with a decrease in elevation of only 200 m over 1,000 km. Consequently, the basin has little capacity to flush itself of salts and sediments, making the system more vulnerable to water quality issues.</p>  <p style="text-align: right;"><b>Murray-Darling Basin Map</b></p> <p style="text-align: center;"><b>Fig. 5.5.1 Murray-Darling River Basin</b></p> <p>The basin produces approximately 40 per cent of the nation’s agricultural income. As well as being a major source of Australia’s irrigation water, the basin is also the major source for stock and domestic water supply in South Australia. Approximately two thirds of the basin’s flow (90–95 per cent) is primarily diverted for irrigation. This water diversion has generated many economic and social benefits, however this on top of widespread native vegetation clearing has led to a drastic decline in the ecological health of the basin’s rivers and wetlands. A number of catchments and aquifers in the MDB suffer from over-use of their water resources.</p>	

Facts	Ref. to KFS
<p>Until recently, in Australia the states have been responsible for the management of water resources. This has been a fundamental challenge for the MDB as it comprises parts of five separate jurisdictions. With the new institutional arrangements for managing the MDB, created by the Commonwealth government's Water Act 2007/8 and a referral of powers by the states, this has now changed. The new organization, which has replaced the Murray-Darling Basin Commission, is the Murray-Darling Basin Authority.</p> <p>Previously, the institutional and regulatory fragmentation made it difficult to effectively address the basin's key natural resource management problems. The key challenges for the MDB include over-allocation of water resources, increasing conflict between competing water users in the face of climate variability, and restoring the environmental condition of the system.</p>	
<p><b>2. Management phases and institutional strengthening (top-down but bottom-up enablement)</b></p> <p>The management of the MDB has evolved through time following a spiral of management whereby the river basin organization matures in response to new economic, social, political, and environmental pressures. The first phase of the MDB's spiral of management begun over a century ago due to conflicts over the use of the River Murray waters between the states of New South Wales, Victoria and South Australia. Each of the states wanted to secure its rights for using the water for their own citizens. At the time, New South Wales (NSW) and Victoria wanted to develop the river for irrigation, whereas South Australia wanted the river developed for navigation. The Commonwealth government previously had no rights in managing the water resources of the basin.</p> <p>The first River Murray Waters Agreement, which set out the water entitlement of each state, was signed by the Federal, NSW, Victoria and South Australia governments in 1915. The agreement also gave provision for the regulation of the river through the construction of a number of weirs, storages and locks. A number of amendments were made to the agreement in parallel to changes in community values and the economy. For much of the twentieth century, the management of the basin focused on water quantity. It wasn't until the 1982 amendment that the River Murray Commission's role was extended to deal with water quality issues.</p> <p>Problems of environmental degradation escalated and it was eventually recognized that such issues extended across state boundaries and thus cooperation between states was needed. The federal and relevant state governments negotiated the Murray-Darling Basin Agreement in the mid-1980s, which aimed to coordinate and promote effective planning and management of the basin. The River Murray Water Agreement was replaced by the Murray-Darling Basin Agreement in 1992, which was ratified in 1993 by all contracting governments giving it full legal status. The 1992 agreement aimed to 'promote and co-ordinate effective planning and management for the equitable, efficient and sustainable use of the water, land and other environmental resources of the Murray-Darling Basin through the creation of water sharing arrangements and water management process'.</p> <p>The resulting partnership between the Commonwealth, New South Wales, Victoria, South Australia and Queensland governments has provided for an integration of policies and programs across the basin. Three institutions were established to support the implementation of the agreement:</p>	

Facts	Ref. to KFS
<ul style="list-style-type: none"> <li>• The Murray-Darling Basin Ministerial Council – the decision-making body.</li> <li>• The Murray-Darling Basin Commission – the executive and advisory arm of the Council.</li> <li>• <u>The Community Advisory Committee – who provide the Council with advice from a community standpoint.</u></li> </ul> <p>These have now been replaced by similar bodies under the Commonwealth Water Act 2007/8 with the key difference that the Commonwealth or national government now plays a much more dominant role. With the exception of a few key issues the role of the states is now advisory. However, even though the Commonwealth controls high-level policy under the new arrangements the states are still responsible for implementation.</p> <p>The Natural Resources Management Strategy is a framework for achieving the aim of the MDB Agreement (now the Water Act 2007/8). The strategy recognizes that a community-government partnership is necessary for achieving sustainable resource management in the basin and empowers the community to tackle local issues in a coordinated and integrated manner. The government currently supports community-led planning and the implementation of on-ground works with more than 1000 Landcare Groups in the basin.</p> <p><u>Public education was seen as an important part of the process. It was needed to ensure that people in communities in the Murray-Darling Basin understood the significance of environmental conservation in terms of river basin management as well as the importance of the changes put into practice in the basin's water resources management. Educational programs were implemented to enhance public awareness and to help increase understanding of the people in the communities. A particularly successful programme is 'Special Forever', which was implemented jointly by Murray-Darling Basin Commission and the Primary English Teaching Association in the early 1990s and still continues today.</u></p> <p>Between 1993 and 1995, an audit of water use in the MDB was carried out, which found that a continuing increase in water diversions threatened the ecological integrity of the river system and its ability to support the region's economic and social resources. Subsequent to these findings, an upper limit on future surface water diversions, referred to as the Cap, was implemented in 1996. The Cap restricts further increase in water diversions associated with 1993/1994 levels of development. Under the Cap, new developments were possible as long as the water is acquired through water purchases from existing developments or improved water efficiency. Under the Water Act 2007/8 a more comprehensive cap will be introduced (see below).</p> <p>In 1994, the Council of Australian Governments (COAG), which consists of the Prime Minister, State Premiers, Chief Ministers and the President of the Australian Local Government Association, agreed on a national reform of the water industry. Sustainable reform was to be achieved through establishing water allocations and entitlements that were separate from land tenure, water trading, securing water property rights, allocating water for ecosystems, institutional reform, community consultation, education and research. The 2004 National Water Initiative is the blueprint for Australia's water reform and aims to develop national regulatory standards and improve the economic efficiency and environmental sustainability of the water industry. COAG allocated AUS\$500 million to purchase water for the</p>	<p>KFS 5.5.2 (1)</p> <p>KFS 5.5.2 (2)</p>

Facts	Ref. to KFS
<p>environment in the MDB. COAG also signed the agreement to expand interstate water trading in permanent water entitlement. Water trading within states has been possible since the late 1980s, and a pilot interstate water-trading project allowing limited interstate trade of permanent water entitlements has been implemented since 1998. Water trading allows the trade of long-term (permanent entitlements) and short-term (seasonal allocations) water rights between licensed users, which improves water efficiency by transferring water to its highest value use.</p> <p>The water resources problems of the MDB have been further exacerbated by the recent widespread drought of southern and eastern Australia. From 2001 to 2007, the MDB recorded its equal driest six-year period (BOM, 2007), including 2006, which had the lowest rainfall levels recorded since 1900. Extremely low inflows were threatening the security of the urban water supply in the River Murray. <u>In order to address this critical situation, the contingency planning process was established to ensure that the critical human needs are first met regardless of the established sharing arrangement between the jurisdictions (with any additional usage to be repaid later when more normal rainfall conditions return.) Water trading played a critical role under this special arrangement by allowing economically effective use of limited water resources and reducing the economic impact of the drought by 50 per cent.</u></p> <p>This latest drought spurred concern over critical water shortages in the region and prompted the Prime Minister to announce AUS \$10 billion National Plan for Water Security (NPWS) in early 2007. This was effectively a plan for a new governance arrangement for the MDB, such that the Commonwealth government will take over the management from the competing state governments. The NPWS also includes improving water efficiency through modernization of irrigation infrastructure, a new sustainable Cap on surface and groundwater use, addressing water over-allocation, and the establishment of the Murray Darling Basin Authority (MDBA) to act as an independent body to develop and implement the new Basin Plan. Agreement was finally reached by all the states for the Commonwealth take over in March 2008. The Environmental Water Scientific Advisory Committee, consisting of a panel of scientific experts, was appointed in November 2008 to help ensure that the best possible outcomes for MDB rivers and wetlands are achieved from the use of water purchased.</p> <p>A spiral of management is clearly demonstrated in the progression of the management system of the MDB. The management of the basin was initially state-based, focusing on consumption and navigation issues (Craik and Cleaver, 2008). The declining ecological health of the system along with the increasing awareness of the interconnectedness of environmental problems led to the management system gradually evolving to an integrated, basin-wide natural resources management system.</p>	<p>KFS 5.5.2 (3) KFS 5.5.2 (4)</p>
<p><b>3. How did the MDBC and now the MDBA facilitate IWRM?</b></p> <ul style="list-style-type: none"> <li>• Basin-wide natural resource management policies, e.g. Basin Salinity Management Strategy, Native Fish Strategy, Algal Management Strategy, Floodplain Wetlands Management Strategy, Human Dimension Strategy.</li> <li>• Facilitate stakeholder engagement through the CAC and Landcare.</li> <li>• Bottom up, consensus-based policy development.</li> <li>• Top-down governmental and institutional mechanisms.</li> <li>• Long-term planning – ‘Environmental Watering Plan’, ‘Environmental Management Plans’.</li> <li>• Adaptive management framework – Assess-Plan-Implement-Monitor-Evaluate cycle.</li> </ul>	



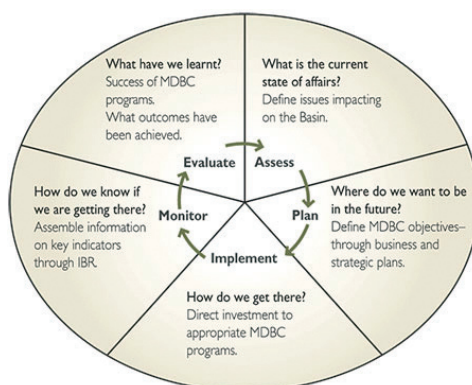


Fig. 5.5.2 Management Framework

#### 4. Performance and accountability

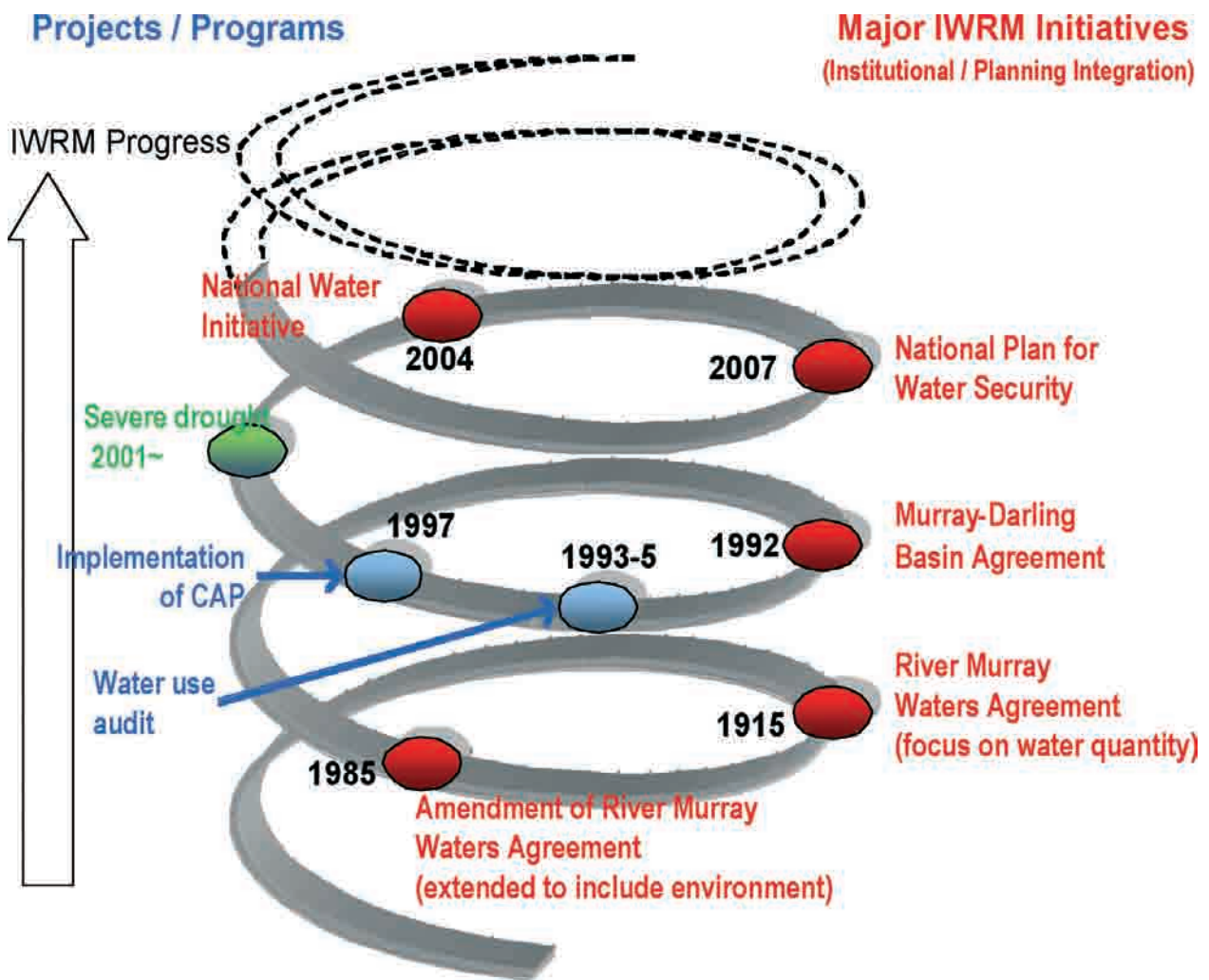
The Sustainable Rivers Audit (SRA) is a comprehensive monitoring program launched by the MDBC to assess the ecological health of the Basin's 23 river valleys and regions using quantitative data gathered by the state agencies. The SRA collects data on environmental indicators ('Themes') – Hydrology, Fish and Macroinvertebrates – using standardized protocols for both sampling and analysis throughout the MDB. The condition ratings of the themes are combined to assess ecosystem health, which is then related to a benchmark 'reference condition'. The first SRA report was completed in 2008 and prior to this there were no basin-wide assessments of river condition for the MDB. SRA reports will be released every three years, providing information about trends in river health and helping to develop and monitor management strategies.

The new MDBA is moving towards having an Integrated Basin Reporting framework, so that the environmental, social and economic outcomes of the various programs managed previously by the MDBC can be considered jointly, rather than in isolation, as it had been done up until recently. The reporting process can play a key role in adaptive management; it enables review of plans and programs through documentation of monitored results, and an evaluation of progress towards meeting set targets. Currently, this type of reporting is carried out annually but unevenly by the Catchment Management Authorities (CMAs) to account for their activities and achievements. The MDB is composed of 17 CMAs.

#### 5. Challenges

- Cross-jurisdictional policy and legal arrangements.
- Policy coherence and coordination amongst catchment management authorities, and with state and federal departments.
- Public involvement in policy and planning frameworks.
- More research and training in developing water plans and capacity building amongst water planners.
- Reducing scientific uncertainty and increasing transparency of the process for determining environmental allocations and ecological objectives.
- Institutional capacity (financial, human, intellectual) of catchment-based institutions (Hussey and Dovers, 2007).

Facts	Ref. to KFS
<p><b>References</b></p> <p>Craik, W. and Cleaver, J. (2008) Institutions and incentives for promoting better policies and outcomes: challenges of achieving environmental outcomes that require coordination across multiple jurisdictions. Murray-Darling Basin Commission. MDBC Publication No: 45/08.  <a href="http://www.mdbc.gov.au/__data/page/15/Institutions_and_incentives_for_promoting_better_policies_and_outcomes.pdf">http://www.mdbc.gov.au/__data/page/15/Institutions_and_incentives_for_promoting_better_policies_and_outcomes.pdf</a></p> <p>Hussey, K. and Dovers, S. (2007) Managing Water for Australia: the Social and Institutional Challenges. CSIRO Publishing, Victoria.</p> <p>Murray Darling Basin Commission website: <a href="http://www.mdbc.gov.au">www.mdbc.gov.au</a></p> <p>Murray Darling Basin Commission Annual Report:  <a href="http://www.mdbc.gov.au/subs/annual_reports/ar0405/5_corporate_governance.htm">http://www.mdbc.gov.au/subs/annual_reports/ar0405/5_corporate_governance.htm</a></p> <p>National Library of Australia Interview with Bruce Campbell, Aug 18, 2008</p> <p>National Water Commission Australian Water Markets Report 2007-2008</p> <p>Connell, D. (2007) Water Politics in the Murray-Darling Basin.</p>	



**Fig. 5.5.3** IWRM spiral of Murray-Darling River

Interviewee: Mr. Daniel Connell, Mr. Peter Crabbe, Ms. Rebecca Nelson  
(Murray Darling Basin Authority)]

[Interviewer: Junko Sagara (CTI Engineering)]

[Report: Prof. Anthony Jakeman (Member of the Steering Committee),  
Ms. Serena Chen (Australian National University), Mr. Junko Sagara (CTI Engineering)]

### 5.5.2 Extracted Key for Success

#### (I) Extracted Key for Success from Murray-Darling Basin Reference to 5.5.1 Case Story (Murray-Darling Basin)

<p><b>[ Title ]</b>  <b>Community consultation and participation in decision-making</b></p>
<p><b>[ Situation ]</b>  <b>Promoting and coordinating planning and management within the basin</b>          Problems of environmental degradation escalated in the basin, and it had become apparent that such issues extended across state boundaries and thus cooperation between states was needed. Institutional framework for basin management cooperation among states had to be reformed to address the environmental problems requiring coordinated and effective planning and management of the basin.</p>
<p><b>[ Problem ]</b>  <b>Equitable, efficient and sustainable use of the water, land and other resources needed to be ensured across the basin</b>          In addressing the water needs of each states as well as the environmental degradation issue, which extends across state boundaries, cooperation between states needed to be strengthened.</p>
<p><b>[ How the problem was overcome ]</b>  <b>Community consultation and participation was ensured in decision-making through major community engagement components established within the overall institutional framework</b>          The Community Advisory Committee (now re-titled the Basin Community Committee under the Water Act 2007/8) has been a major community engagement component in the Murray-Darling Basin.          In 1992 the River Murray Water Agreement was agreed by the relevant states to promote and coordinate effective planning and management for equitable, efficient and sustainable use of the water, land and other environmental resources of the basin through the creation of water-sharing arrangements and water management process. The Murray-Darling Basin Ministerial Council, the Murray-Darling Basin Commission (MDBC) and the Community Advisory Committee (CAC) were established to support the governance of the Agreement.          The CAC was appointed to advise the Ministerial Council on natural management issues in the basin from a community perspective, including indigenous issues. The CAC facilitates stakeholder engagement programs as well as providing two-way communication between the basin community and the MDBC and Ministerial Council. The CAC disseminates information to the community of decisions made by the Ministerial Council to help increase understanding, and thus ownership and adoption of the decisions.          The CAC (now BCC) is led by community leaders who have high credibility among the community members.</p>
<p><b>[ The Key ]</b>  <b>In order to ensure equitable, efficient management, and the sustainable use of water resources, transparency and accountability as well as adequate community consultation and participation, are important factors in a decision-making process. By defining community consultation and the participation process within the overall institutional framework, the community was empowered and the ownership and adoption of the decisions made by the Ministerial Council was enhanced.</b>          &gt;&gt;&gt; [3.1.2] Ensure involvement of all relevant stakeholders.  <b>CAC was led by community leaders who had high credibility among the community. They are individuals who are well versed with the issues in the basin and are capable of working with people from all backgrounds; from the local farmers to scientists to politicians. The efforts of such charismatic individuals greatly contributed to the water reform in Murray-Darling Basin.</b>          &gt;&gt;&gt; [3.1.3] Select lead coordinator(s) (organization or individual) whom the maximum possible stakeholders participating in the process can accept.</p>
<p><b>[ Conditions and limitations in applying the KFS ]</b></p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b></p>

**(2) Extracted Key for Success from Murray-Darling Basin** Reference to 5.5.1 Case Story (Murray-Darling Basin)

<p><b>[ Title ]</b>  <b>Enhancing public awareness</b></p>
<p><b>[ Situation ]</b>  <b>Ensuring public awareness and support in implementing policy changes</b>          Problems of environmental degradation escalated and it had become apparent that such issues extended across state boundaries and thus cooperation between states was needed. The institutional framework for basin management cooperation among states had to be reformed in order to address the environmental problems, which required support from the public.</p>
<p><b>[ Problem ]</b>  <b>It was vital that people in the basin understood the importance of the changes implemented in the basin’s water resources management</b>          It was vital that communities in the Murray-Darling Basin understood the significance of environmental conservation in river basin management, and the importance of the changes implemented. Education was seen as particularly important.</p>
<p><b>[ How the problem was overcome ]</b>  <b>Public awareness was enhanced through an environmental education program implemented in primary schools</b>          Special Forever is an environmental communications project jointly initiated by the Murray-Darling Basin Commission and the Primary English Teaching Association in 1993. Every year, approximately 20,000 primary school students across the basin participate in Special Forever learning about the unique environments that make up their local area and the Murray-Darling basin as a whole as well as the severity of the problems it faces. By targeting primary school students, it created greater discussion on the basin in families as parents worked together with the children on the projects.          Currently the public in the Murray Darling Basin has a high level of awareness and is generally supportive of the policies implemented in the basin for enhancing its sustainability. It has also led to raising the profile of the Murray-Darling Basin. Although it was intended that the project should run for only two years, it created such enthusiasm amongst schools, students and communities within the Murray-Darling Basin that it successfully continues to this day.</p>
<p><b>[ The Key ]</b>  <b>Through interactive educational activities targeting primary school children, greater awareness on the environmental issues in the basin, not only among children but also their families, was achieved.</b>  <b>What and how the children learn influences the ways in which they interact with their local environment throughout their lives. It also leads to greater awareness and engagement on the part of their families and communities on river basin issues. It is important to make environmental education locally relevant.</b>          &gt;&gt;&gt; [1.3.2] Facilitate awareness-raising through the utilization of topics, materials and processes familiar to the public including those who are usually outside of the water sector.          &gt;&gt;&gt; [1.3.3] Introduce educational activities on water and IWRM, focusing particularly on women and children.</p>
<p><b>[ Conditions and limitations in applying the KFS ]</b>          The program can be effectively implemented through an organization such as a teaching association.          An essential feature of the success of Special Forever is the use of a national professional organization such as the Primary English Teaching Association. This has ensured an extremely high level of quality assurance and adherence to current national best practice in teaching.</p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b>          Make local water and environmental issues as key components of primary education.</p>

**(3) Extracted Key for Success from Murray-Darling Basin**

Reference to 5.5.1 Case Story (Murray-Darling Basin)

<p><b>[ Title ]</b>  <b>Contingency measures to secure critical water demands</b></p>
<p><b>[ Situation ]</b>  <b>Addressing crisis water shortage situation due to severe drought</b>  From 2001 to 2007, the MDB recorded its equal driest six-year period (BOM, 2007), including 2006, which had the lowest rainfall levels recorded since 1900. Extended dry periods together with a high pressure on the system due to high irrigation water demand and high temperature was causing severe water shortages in the basin.</p>
<p><b>[ Problem ]</b>  <b>With the severe water shortage condition, the provisions under the existing water-sharing agreement among states could not ensure provision of water for critical urban needs</b>  The Murray-Darling Basin system had never experienced such pressure on the system. The commission predicted that if the low inflow continued there was a high chance that the reserves would become empty and that some of the critical urban water requirement in South Australia wouldn't be met. The existing water allocation needed to be reviewed.</p>
<p><b>[ How the problem was overcome ]</b>  <b>A contingency water allocation arrangement was agreed by the relevant states with the fundamental principle that critical human needs will be provided regardless of jurisdiction</b>  Building upon the existing water allocation agreement, a special water-sharing arrangement was agreed upon by the relevant states as a contingency measure. The fundamental principle agreed was that critical human needs will be provided regardless of jurisdiction. An equal amount of water was allocated for all states with a small entitlement for the environment, recognizing that the environment will also be under severe stress under such circumstances. The agreement was reached on a promise that any losses or gains in the distribution resulted from this special arrangement will be accounted for once more water becomes available in the basin. Such an arrangement was possible because of the existing framework for cooperation among the states and that in general they have come together in a spirit of cooperation.</p>
<p><b>[ The Key ]</b>  <b>The fundamental principle identified that critical human needs were the first priority and every effort was to be made to provide water regardless of jurisdiction. Coordination among stakeholders through a political process is crucial especially at a time of crisis. One cannot predict and prepare for all possible extreme events in the future; however, it is desirable to have flexibility for securing critical water needs in times of extreme events such as droughts, as well as a coordination framework among the stakeholders that allows for such an arrangement. The negative impacts due to such extreme events have to be endured by all the stakeholders in the basin. Therefore the arrangement must be socially justifiable and equitable in nature, and the transparency in the process needs to be ensured.</b>  &gt;&gt;&gt; [1.2.1] Identify potential priority areas (critical locations and key issues) for IWRM implementation in the basin.  &gt;&gt;&gt; [3.2.4] Consider ways, including policy interventions, to secure water supply at extreme events.</p>
<p><b>[ Conditions and limitations in applying the KFS ]</b>  A good working relationship and a spirit of coordination exists among stakeholders through a political platform for transboundary water. Addressing a crisis situation in a cooperative manner requires a good working relationship and a spirit of coordination among stakeholders. Political commitment is crucial to make such arrangements work.</p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b>  True public participation of water user groups.</p>

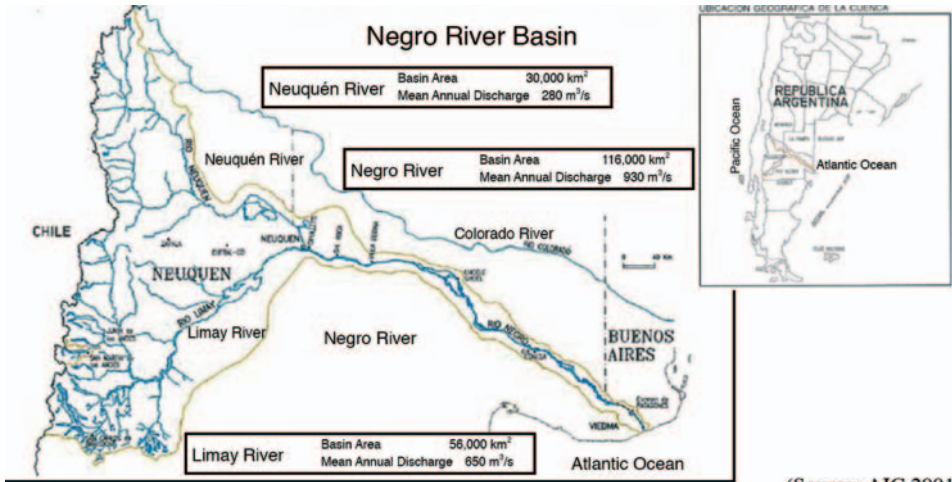
#### (4) Extracted Key for Success from Murray-Darling Basin

Reference to 5.5.1 Case Story (Murray-Darling Basin)

<p><b>[ Title ]</b> <b>Reducing the economic impacts of severe water shortages</b></p>
<p><b>[ Situation ]</b> <b>Addressing crisis water shortage situation due to severe drought</b> From 2001 to 2007, the MDB recorded its equal driest six-year period (BOM, 2007), including 2006, which had the lowest rainfall levels recorded since 1900. Extended dry periods together with a high pressure on the system due to high irrigation water demand and high temperature was causing severe water shortages in the basin.</p>
<p><b>[ Problem ]</b> <b>The economic impacts due to prolonged droughts needed to be minimized</b> The basin produces approximately 40 per cent of the nation's agricultural income, and is a major source of irrigation water as well as for stock and the domestic water supply. Due to the severe and prolonged drought period, the basin's economic activities were being impacted. It was ensured that water was allocated for critical needs and that the benefits of limited water be maximized.</p>
<p><b>[ How the problem was overcome ]</b> <b>Water trading played a fundamental role in meeting critical and high value water uses</b> The government introduced a national water initiative in 2004 and prime water security plan in 2007 to buy back water entitlement in order to increase water security for water users including for the environment, in addition to introducing water saving technologies. Water trading allows the trade of long-term (permanent entitlements) and short-term (seasonal allocations) water rights between licensed users, which improves water efficiency by transferring water to its highest value use. Water trading within states had been possible since the late 1980s. Interstate water trading was first implemented as a pilot project in the 1998, and full implementation was agreed in 2004. Trading activity increased as a consequence of the drought, especially during the summer months, the highest demand season. In the 2007–8 fiscal year, about 30 per cent of water used was traded, and it is estimated that economic impacts of droughts was reduced by 50 per cent. Governments in recent years have also sought to increase environmental water flows in the basin by purchasing water access entitlements from willing sellers, which has been heightening water demand and mobilizing the water market. The total value of the transactions in the 2007–8 fiscal year was estimated to be approximately AUS \$1.68 billion across the country, and much of that took place in the Murray-Darling Basin.</p>
<p><b>[ The Key ]</b> <b>Water trading provided incentives among the users to conserve water as well as to use it for more economically valuable activities, mitigating the severe economic impacts of droughts.</b> &gt;&gt;&gt; <b>[3.2.8] Consider introducing incentives for coordinating water uses in case of emergency situations such as drought.</b></p>
<p><b>[ Conditions and limitations in applying the KFS ]</b> <b>An information management system and infrastructure that allow management of water trading and actual water transfers.</b></p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b> Policy controls to ensure water is traded in an environmentally sustainable manner. The effectiveness of water trading may be enhanced by introducing water banks, whereby bidders can buy and sell water on-line. An on-line water bank provides an opportunity for transparent and open water trading among users.</p>

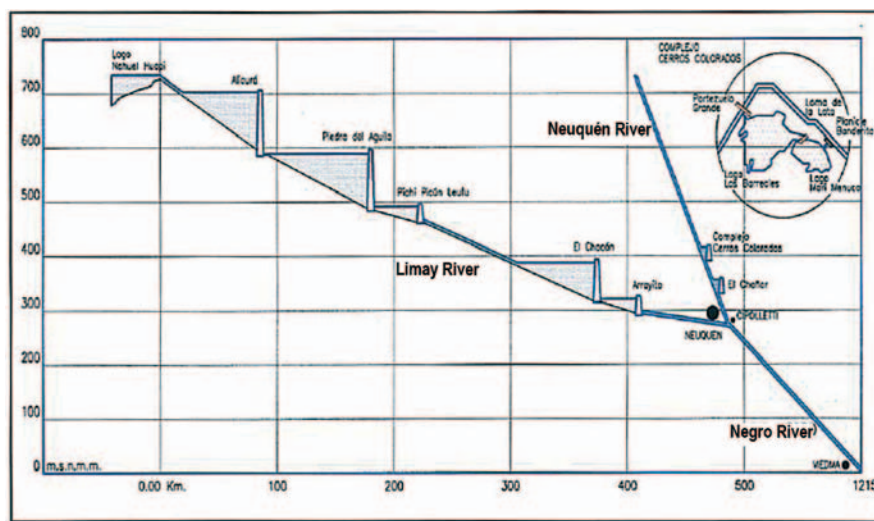
## 5.6 NEGRO RIVER (ARGENTINA)

### 5.6.1 Case Story (Negro River)

Facts	Ref. to KFS
<p><b>I. Main challenges in the middle of twentieth Century</b></p> <p>The Negro River Basin is located in northern Patagonia, Argentina, and has an area of 116,000 sq. kilometers. It encompasses the territory of the Neuquén province and a part of the Río Negro and Buenos Aires provinces (AIC, 1997, 1998a). The upper basin on the eastern slopes of the Andes has dense forests, with heavy rainfall and snowfall, close to 3,000 mm/year. The middle and lower basins extends to the Patagonian steppe in the east. The shrubby vegetation and pastures belong to a rainfall regime not greater than 200 mm/ year.</p>  <p style="text-align: right;">(Source: AIC 2001)</p> <p style="text-align: center;"><b>Fig. 5.6.1</b> Negro River Basin</p> <p>The Negro River runs through arid tablelands in a valley of varying width. It has a reduced slope and numerous secondary branches that are in spate with high waters. The mean annual discharge is 930m<sup>3</sup>/s. The Limay and Neuquén rivers are its main tributaries with basin areas of 56,000 and 30,000 sq. kilometers and mean annual discharges of 650 and 280m<sup>3</sup>/s, respectively.</p> <p>The Neuquén gets flooded from both rain and snow. The first flood occurs in winter, mainly in May–August when 80 to 90 per cent of the yearly precipitation occurs. Much of it accumulates as snow in the upper basin (AIC, 1997). The rain in the middle and lower zones produces the winter flood. The second more moderate flood generally occurs at the end of spring (November–December), mainly from snowmelt.</p> <p>A hydrological regime of mixed rain and snowfall origin also characterizes the upper reaches of the Limay River and its main tributary, the Collón-Curá. This is further attenuated by the presence of natural lakes located at the headwaters of almost all their important tributaries (AIC, 1997). The winter flood is from rainfall while the late spring flood is from snowmelt.</p> <p>The main challenges in water resources management in the middle of twentieth century were flood control and the increase in demand for power generation for development (Pochat, 2001).</p> <p><b>Flood control:</b> Fear of the Limay and Neuquén floods grew with the increasing pace of development of the Negro valley (AIC, 1998b). Peak discharges greater than 5,000 m<sup>3</sup>/s caused by simultaneous floods in both rivers occurred in the Negro in 1899, 1915, 1932, 1937, 1940, 1945 and 1958.</p>	



**Hydroelectric production:** Since 1967, the development of electricity generation has been carried out by a national state-owned company, Hidronor S.A. In order to meet with the demands since the end of the 1960s, many dams were constructed mainly for flood control and hydropower generation. Currently, the total installed capacity of hydropower generation is 4,460 Mw, and the mean annual energy generation is 13,652 Gwh, equivalent to about 50 per cent of the country's hydroelectric energy production and about 20 per cent of Argentina's interconnected system generation. The estimated hydroelectric potential is about 33,000 Gwh/year (Pochat, 2001).



(Source: AIC 2001)

**Fig. 5.6.2 Dams in the Negro River Basin**

Controlling floods on the Neuquén River is a dam built in 1915 called Ingeniero Rodolfo E. Ballester. A canal with a projected capacity of 2,000 m<sup>3</sup>/s discharges the flood waters to a natural depression, the Pellegrini lake, which has an area of 100 sq. kilometers.

Towards the end of the 1960s, it was decided to construct the El Chocón-Cerros Colorados hydraulic development complex, mainly to control floods. The complex comprises three different water works on the Neuquén River: the Portezuelo Grande Dam, the Loma de la Lata control structure and the Planicie Banderita power plant (479 Mw). A compensating dam, El Chañar, constructed afterwards, gives greater independence to the operation of the power plant.




On the Limay, El Chocón was the first water work constructed to control flood. At maximum normal operating level its reservoir can store 20,000 hm<sup>3</sup>. From May to August, the level is kept 3.5 m lower, leaving a volume of 2,800 hm<sup>3</sup> available to accommodate probable floods. It also has a powerhouse with an installed capacity of 1,200 Mw.

The Arroyito Dam, built in order to regulate the El Chocón discharges, plays no role in flood control. Its power plant has an installed capacity of 120 Mw.

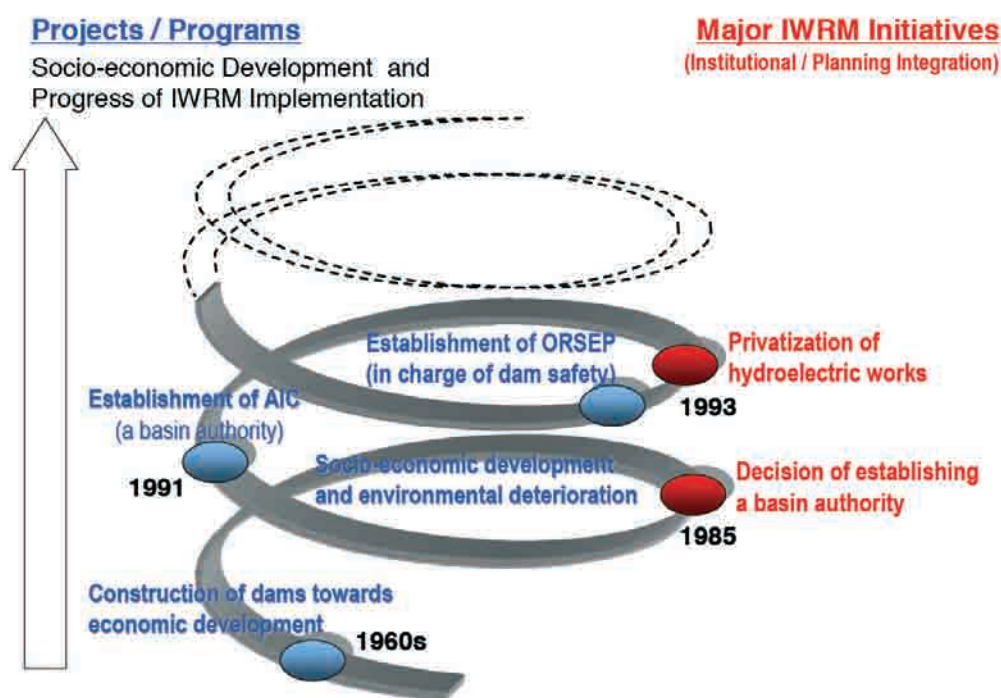
The Alicurá Dam, further upstream on the Limay River, has a powerhouse with an installed capacity of 1 000 Mw. Piedra del Águila and Pichi Picón Leufú dams downstream of Alicurá, have power plants with installed capacities of 1,400 and 261 Mw, respectively.

Facts	Ref. to KFS
<p><b>2. Recognition of new needs and problems</b></p> <p>Following development in the basin, other needs for water resources were raised such as irrigation and water supply for urban and industrial use. The development of urban areas caused the partial deterioration of water quality. Furthermore, the environmental situation in and along the river was altered due to the construction and operation of the dams.</p> <p>In terms of environmental deterioration, this basin is far better than other zones in Argentina (AIC, 1997). However, the disposal of untreated domestic waste is causing partial deterioration of water quality. The fragility of some mountainous areas and the torrential character of runoff contribute to high soil erosion, a phenomenon aggravated in large areas by excessive sheep grazing. The flood control works have substantially modified the natural hydrological regime and have brought about alterations in the environment. The disappearance of important floods has suppressed the self-cleaning effect in the river beds. The exploitation of the Neuquénian hydrocarbon basin, widely extended in the region, is a permanent threat to vegetal and animal species as well as surface and groundwater sources. Excess salinity in the agricultural drainages is altering the water resource quality. Uncontrolled utilization of agrochemicals and pesticides, and inadequately treated industrial wastes, are others sources of water pollution.</p> <p>The size of the dams and reservoirs constructed in the area, as well as the major increase in population living downstream, has made dam safety a primary concern of the community. For many years the Federal Government, through Hidronor S.A., was in charge of the design, construction and operation of these developments. The existence of large dams raised another fear: a dam break could cause a flood far greater than any historical flood, and greater than the probable maximum flood. The design of a dam should study the possible catastrophic situations and include action plans for emergencies (ORSEP, 1998).</p>	
<p><b>3. Approach for integrated management and the impact of the national policy for privatization</b></p> <p>In order to deal with those new challenges in terms of water resources management, the Negro river basin riparian provinces, Neuquén, Río Negro and Buenos Aires, together with the national government, decided in 1985 to establish an institution. A treaty creating the <i>Autoridad Interjurisdiccional de las Cuencas de los Ríos Limay, Neuquén y Negro</i> (AIC) (Interjurisdictional Authority of the Limay, Neuquén and Negro River Basins) was signed on 16 November 1985. The treaty was ratified by laws of the three provinces in 1986 and a National Law in 1990.</p> <p><u>Although AIC commenced activities in 1991, its importance was reinforced in 1993 during the time of the privatization of the hydroelectric works in the basin and the far-reaching changes in the regulation of the electric system at national level (AIC, 1998a). The provinces participated in working out the guidelines on subjects related to water management schemes and aspects of environmental management for the preparation of the hydroelectric concession contracts. Following special agreements with the Secretary of Energy of the national government, the AIC was defined as the Authority of Application as regards concession contracts in matters dealing with water management and environmental protection.</u></p> <p>Also in 1993, and on the basis of an agreement between the Federal Government and the Provincial Governments of Río Negro, Neuquén, and Buenos Aires, the <i>Organismo Regional de Seguridad de Presas Comahue</i> (ORSEP Comahue) (Dam Safety Regional Bureau Comahue) was created by National Executive Decree. This institution, the first of its kind in Argentina, is responsible for the technical regulatory functions and the supervision of the structural safety of the dams and reservoirs in the region (ORSEP, 1998). In 1999 it became a Regional Directorate within the national <i>Organismo Regulador de Seguridad de Presas</i> (ORSEP) (Dam Safety Regulating Bureau).</p>	KFS-5.6.2 (I)

Facts	Ref. to KFS
<p><b>1) AIC: Basin authority</b></p> <p>AIC was formally constituted on 20 March 1991, with a Governing Council consisting of the Minister of the Interior and the governors of Buenos Aires, Neuquén and Río Negro. The decisions of the Governing Council are executed by an Executive Committee comprising one representative from each signing party of the treaty.</p> <p>AIC has the following functions:</p> <ol style="list-style-type: none"> <li>a) Carries out studies and research that evaluate the resource and respects the principle of rational use, and allows an efficient and adequate distribution that satisfies the needs of regional development.</li> <li>b) Establishes a program of use and distribution of water resources.</li> <li>c) Controls the fulfillment by the signatory parts of the regime.</li> <li>d) Studies and analyzes the works, their behavior and the effects of implemented developments.</li> <li>e) Decides on the hydropower works to be installed in the basin.</li> <li>f) Carries out studies on the ecosystems of the basin.</li> <li>g) Carries out research and surveys, executes projects and purchase, builds, operates and maintains installations to detect and/or control the pollution of the basin water resources. Proposes to the signing states the adoption of regulations and actions aimed to prevent, void and correct polluting processes.</li> <li>h) Resolves on granting of concessions and permissions for navigation.</li> <li>i) Establishes technical regulations for determination of the bank line, separating public and private properties of the basin watercourses.</li> <li>j) Carries out research in order to propose measures to preserve the river banks.</li> <li>k) Centralizes the existing and future information related to the resource – meteorological, hydrographic, hydrometric, hydrogeologic, or any other necessary data.</li> <li>l) Stores and provides the information required by the provincial, inter-provincial and national bodies.</li> <li>m) Administers the funds related to the Authority.</li> <li>n) Proposes taxes and other revenue raising measures to the parties.</li> </ol> <p><u>Initial funding for AIC's activities was raised from compulsory contributions from the concessionaires of the hydroelectric power plants. The amount was spent on systematizing and defense works in several reaches of the rivers. The contracts also stipulate another permanent contribution, proportional to the value of the total energy generated.</u></p> <p>AIC has been playing an important role in facilitating integrated water management. Although so far it has been working mainly within the intergovernmental sector, it is now fostering a greater participation of other stakeholders of the basin, such as users organizations, non-governmental organizations, universities, and so on through representatives from the three provincial governments.</p> <p><b>2) ORSEP: Organization in charge of dam safety</b></p> <p>ORSEP Comahue was organized into different sectors: three technical areas that comprise administration and accounting, legal advice, and internal auditing. It also has advisers on geology, hydromechanics, and social communication. The technical team is made up of twelve permanent qualified professionals with more than ten years experience on dam engineering. Consulting services are eventually contracted for specific issues. Functioning expenses are financed with contributions from the National Treasure as well as taxes on hydroelectric generation, as stated in the concession contracts.</p>	<p>KFS-5.6.2 (2)</p>

Facts	Ref. to KFS
<p>The main responsibilities and activities of ORSEP can be summarized as follows:</p> <ul style="list-style-type: none"> <li>• Supervision of concessionaires' monitoring work.</li> <li>• Supervision and approval of projects and performance of remedial measures.</li> <li>• Appointment of independent consultants for periodic dam inspections and precise definition of their scope.</li> <li>• Management of a database with all monitoring records.</li> <li>• Preservation of technical documents.</li> <li>• Supervision on implementing and updating an Emergency Action Plan.</li> <li>• Promotion of a constant communication program to inform people about dam safety issues (ORSEP, 1998).</li> </ul> <p><u>Under the contracts of concession, the operating companies are obliged to take all necessary steps to maintain the physical integrity, the proper functioning, and the safety of the hydroelectric complex, costs which are borne by the concessionaires. The corresponding concessionaires or the Federal Government – depending on each particular case – bear the cost of remedial works, as follows:</u></p> <ol style="list-style-type: none"> <li>a) Works that originate from problems on dam performance, dam operation or lack of maintenance are borne by the concessionaires.</li> <li>b) Works that originate from changes or updating of design during the first ten years of the concession are borne by the Federal Government. Five percent of the annual cost is transferred to the concessionaire who, after thirty years, is expected to bear the total cost.</li> </ol> <p>ORSEP always verifies and approves all the projects and works carried out. The entity is entitled to require technical inspections of any of the works by independent consultants. These inspections should be afforded by the concessionaires (ORSEP, 1998).</p> <p><u>The Comahue Regional Directorate of ORSEP has developed a wide-ranging public relations programme addressed to all the communities in the region, which goes beyond its specific remit to maintain a high level of safety in the dams and reservoirs. This program involves, <i>inter alia</i>, the holding of public meetings, briefings for the press and for educationalists, and the maintenance of permanent contacts with the media and the world of public relations. At the same time, it takes part in meetings of Civil Defense organizations and university seminars, and it is present at every kind of formal gathering where these topics are raised.</u></p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div data-bbox="213 1429 501 1848">  <p>Sign indicating evacuation direction at a dam break (Toyama)</p> </div> <div data-bbox="531 1581 847 1794">  <p>Field study by school students (ORSEP 2008)</p> </div> <div data-bbox="879 1469 1134 1794">  <p>Booklet "Learning how to live together with dams"(ORSEP)</p> </div> </div> <p style="text-align: center;"><b>Photo. 5.6.1</b> ORSEP public relations programme</p> <p>The new system, which involves a state regulatory entity and private concessions, has shown a significant improvement in dam safety supervision, implementation of remedial work, and emergency action plans.</p>	<p>KFS-5.6.2 (2)</p> <p>KFS-5.6.2 (3)</p>

Facts	Ref. to KFS
<p><b>References</b></p> <p>This Case Study has been prepared on the basis of these valuable publications:</p> <p>AIC (Autoridad Interjurisdiccional de las Cuencas de los Ríos Limay, Neuquén y Negro), 1997. La cuenca de los ríos Limay, Neuquén y Negro, AIC, Cipolletti.</p> <p>– 1998a. Trianuario. Primera edición. Período 1993/96, AIC, Cipolletti.</p> <p>– 2001. “El control de las crecidas – Sistema de Emergencias Hídricas y Mitigación del Riesgo”, AIC, Cipolletti.</p> <p>– 1998b. Secretaría Técnico-Institucional, El control de las crecidas. Sistema de emergencias hídricas y mitigación del riesgo, AIC, Cipolletti.</p> <p>ORSEP, 1998, Dam safety in the Comahue Region of Argentina, F.L.Giuliani and C.A.Yema, Organismo Regional de Seguridad de Presas del Comahue-ORSEP Comahue.</p> <p>ORSEP booklet, “Aprendiendo a convivir con las presas”, <a href="http://www.orsep.gov.ar/archivos-pdf/convivir-presas.pdf">http://www.orsep.gov.ar/archivos-pdf/convivir-presas.pdf</a></p> <p>ORSEP, 2008, “Gestión 2003-2007, ORSEP-Organismo Regulador de Seguridad de Presas”, <a href="http://www.orsep.gov.ar/archivos-pdf/libro-institucional.pdf">http://www.orsep.gov.ar/archivos-pdf/libro-institucional.pdf</a></p> <p>Pochat, V., 2001. River basin management in Argentina: An analysis of the Negro basin, in “Integrated River Basin Management. The Latin American Experience”, A.K.Biswas and C.Tortajada editors, Oxford University Press, New Delhi.</p>	



**Fig. 5.6.3** IWRM spiral of Negro River

[Interviewees: Mr. Ing. José Luis Valicenti, Mr. Ing. Aníbal Ginés Asensio, Mr. Jorge A. P. Fouga (AIC\*1), Mr. Ing. Carlos Alberto Rocca, Mr. Ing. Oscar Elpidio Navarro, Mr. Ing. Felipe Ricardo Budén (HISSA\*2), Mr. Ing. Gustavo L. Franke (ORSEP\*3), Mr. Ing. Néstor Srebernic, Mr. Ing. Fabián Restelli (HEC\*4)]

[Interview & Report: Víctor Pochat, Member of the Steering Committee, Mr. Masato Toyama, CTI Engineering]

\*1 AIC: Autoridad Interjurisdiccional de las Cuencas de los Ríos Limay, Neuquén y Negro

\*2 HISSA: Hidronor Ingeniería y Servicios S.A.

\*3 ORSEP: Organismo Regulador de Seguridad de Presas

\*4 HEC: Hidroeléctrica El Chocón S.A.

### 5.6.2 Extracted Key for Success

#### (I) Extracted Key for Success from Negro River

Reference to 5.6.1 Case Story (Negro River)

##### [ Title ]

**National policy and needs are important to promote an integrated approach**

##### [ Situation ]

###### **New problems after basin development**

In order to meet the socio-economic demands and needs for development in the basin since the end of the 1960s many dams were constructed for flood control and hydropower generation. Following the development in the basin, additional needs for water resources were raised such as irrigation and water supply for urban and industrial use. The development of urban areas caused partial deterioration of water quality. Furthermore, the environmental situation in and along the river was altered due to the construction and operation of dams.

##### [ Problem ]

###### **Institutional changes with establishment of a basin authority**

In order to deal with the new challenges faced by water resources management, the Negro river basin riparian provinces, Neuquén, Río Negro and Buenos Aires, felt the necessity for a strong coordinated authority and thus decided in 1985 to establish an institution together with national government. A treaty creating the *Autoridad Interjurisdiccional de las Cuencas de los Ríos Limay, Neuquén y Negro* (AIC) (Interjurisdictional Authority of the Limay, Neuquén and Negro River Basins) was signed in 1985. Although the AIC commenced activities in 1991, its importance was reinforced in 1993 during the time of privatization of the hydroelectric works in the basin and the far-reaching changes in the regulation of the electric system at the national level.

##### [How the problem was overcome ]

###### **Reinforcement of the basin authority according to national needs**

The provinces participated in working out the guidelines on subjects related to water management schemes and aspects of environmental management for the preparation of the hydroelectric concession contracts. Following special agreements with the Secretary of Energy of the national government, AIC was defined as the Authority of Application of the concession contracts in matters dealing with water management and environmental protection.

Initial funding for AIC's activities was raised from compulsory contributions from the concessionaires of the hydroelectric power plants. The amount was spent on both systematizing and defense works in several reaches of the rivers. The contracts also stipulate an additional permanent contribution, proportional to the value of the total energy generated.

##### [ The Key ]

**The AIC, the basin authority, was established according to the pressing needs/intention of governments at national and provincial levels. It plays a role at the coordination level.**

- >> **[5.1.1] Advocate the importance of water resource management at the basin level and promote coordination among all sectors to be addressed in policies and national strategies.**
- >> **[5.2.2] It is advisable to define in the legislative framework: a coordination mechanism, consensus building, and implementation/evaluation of IWRM related plans.**

##### [ Conditions and limitations in applying the KFS ]

Change of national policy or government intentions, including those at provincial level, is a good opportunity to start or push forward an IWRM approach.

##### [ Ideas for enhancing the applicability of the KFS ]

Although AIC has been working mainly within the intergovernmental sector, it is now fostering greater participation of other stakeholders in the basin such as users organizations, non-governmental organizations, and universities through representatives from the three provincial governments.

<p><b>[ Title ]</b>  <b>Securing permanent finance for coordination activities</b></p>
<p><b>[ Situation ]</b>  <b>Establishment of new institutions after the privatization of the hydropower scheme</b></p> <p>In order to deal with the new challenges faced by water resources management, the Negro river basin riparian provinces, Neuquén, Río Negro and Buenos Aires, decided to establish an institution in 1985 together with the national government. A treaty creating the <i>Autoridad Interjurisdiccional de las Cuencas de los Ríos Limay, Neuquén y Negro</i> (AIC) (Interjurisdictional Authority of the Limay, Neuquén and Negro River Basins) was signed in 1985. Although the AIC commenced activities in 1991, its importance was reinforced in 1993 during the time of the privatization of the hydroelectric works in the basin and the far-reaching changes in the regulation of the electric system at the national level.</p> <p>Conversely, on the basis of an agreement between the Federal Government and the Provincial Governments of Río Negro, Neuquén, and Buenos Aires, the <i>Organismo Regional de Seguridad de Presas Comahue</i> (ORSEP Comahue) (Dam Safety Regional Bureau Comahue) was created by National Executive Decree. This new institution, the first of its kind in Argentina, is responsible for technical regulatory functions as well as the supervision of the structural safety of the dams and reservoirs in the region and is therefore the body responsible for enforcing compliance within the structural norms and standards, as determined by the concessionary contracts drawn up by the Federal Government and private international consortia.</p>
<p><b>[ Problem ]</b>  <b>Affordable funding at the initial stage</b></p> <p>It is difficult to secure funding to start coordinating functions at the initial stage of the IWRM approach.</p>
<p><b>[How the problem was overcome ]</b>  <b>Governmental support and compulsory contributions</b></p> <p>Initial funding for AIC's activities was raised from compulsory contributions from the concessionaires of the hydroelectric power plants. The amount of contribution corresponds to 0.5 per cent of power generation and is spent on both systematizing and defense works in several reaches of the rivers. The contracts also stipulate an additional permanent contribution, proportional to the value of the total energy generated.</p> <p>As for dam safety, either the corresponding concessionaires or the Federal Government – depending on each particular case – bears the cost of remedial works as follows:</p> <ol style="list-style-type: none"> <li>Works that originate from problems on dam performance, dam operation or lack of maintenance are borne by the concessionaires.</li> <li>Works that originate from changes or updating of design during the first ten years of the concession are borne by the Federal Government. Five percent of the annual cost is transferred to the concessionaire who, after thirty years, is expected to bear the total cost.</li> </ol>
<p><b>[ The Key ]</b>  <b>Permanent support by the public is the key to securing the funds needed for coordination. It is desirable for governments to contribute funds towards coordination particularly at the initial stage.</b>  <b>&gt;&gt; [5.3.1] Secure financial resources for IWRM coordination in order to promote IWRM in the basin.</b></p>
<p><b>[ Conditions and limitations in applying the KFS ]</b>  <b>Setting up of an institutional mechanism for funding including compulsory contributions. At the initial stage, the main users, or the richest sectors, have a role in contributing considerable financial support.</b></p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b>  Beyond the implementation phase, there are several possible financing options such as sharing part of the cost among stakeholders or by establishing a fund. Either way, securing sustainable funds is crucial to the success of IWRM.</p>

**(3) Extracted Key for Success from Negro River**

Reference to 5.6.1 Case Story (Negro River)

<p><b>[ Title ]</b>  <b>Share information broadly with the public</b></p>
<p><b>[ Situation ]</b>  <b>Operation and maintenance of dams and dam safety as a matter of concern</b>  A series of significant hydropower schemes including large dams has been constructed since the end of the 1960s. The dams have played an important role in the development of both the area and the whole country. The dimensions of these dams and reservoirs upstream have made dam safety an important issue in the community. For the past 25 years the Federal Government, through its state-owned corporation, Hidronor S.A., was in charge of the design, construction and operation of the hydraulic developments in the region, including dam safety issues.</p>
<p><b>[ Problem ]</b>  <b>Privatization and division of the operation of hydropower schemes</b>  As a result of the modernizing reforms and the re-structuring of national assets carried out by the Federal Government, the operation of the Comahue region's hydropower schemes was privatized in 1993.</p>
<p><b>[How the problem was overcome ]</b>  <b>Establishment of a special agency for dam safety and the promotion of information sharing</b>  On the basis of an agreement between the Federal Government and the Provincial Governments of Río Negro, Neuquén and Buenos Aires, the <i>Organismo Regional de Seguridad de Presas Comahue</i> (ORSEP Comahue) (Dam Safety Regional Bureau Comahue) was created by National Executive Decree. This new institution, the first of its kind in Argentina, is responsible for technical regulatory functions as well as the supervision of the structural safety of the dams and reservoirs in the region and is therefore the body responsible for enforcing compliance within the structural norms and standards, as determined by the concessionary contracts drawn up by the Federal Government and private international consortia.  The establishment by the state of a specific organization dealing with the supervision of dam safety and regulation of the large hydropower complex of the Comahue region has been an important institutional development in Argentina. The new system comprising a State regulatory entity and private concessions has resulted in significant improvements in terms of dam safety supervision, implementation of remedial work, and emergency action plans.  In addition to regulation and supervision, ORSEP pays special attention to communicating dam safety conditions to the public through both information dissemination and the promotion of educational activities such as the production of several booklets and field studies for school students. Experience has shown that this policy has had a positive effect as opposed to the lack of information that existed in the past.</p>
<p><b>[ The Key ]</b>  <b>A specific agency responsible for dam safety has been gathering and disseminating information on dam safety and the risk of dam break to the public through a website, booklets for students, signage in towns indicating evacuation procedures in case of a dam break, and so forth.</b>  &gt;&gt; [1.3.1] Proactively disclose information is a fundamental activity in IWRM.  &gt;&gt; [1.3.3] Introduce educational activities on water and IWRM, focusing particularly on women and children.</p>
<p><b>[ Conditions and limitations in applying the KFS ]</b>  Promoting information and educational activities to facilitate public awareness needs funding at a certain level.</p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b>  Prepare a funding mechanism to secure continuity and sustainability.</p>



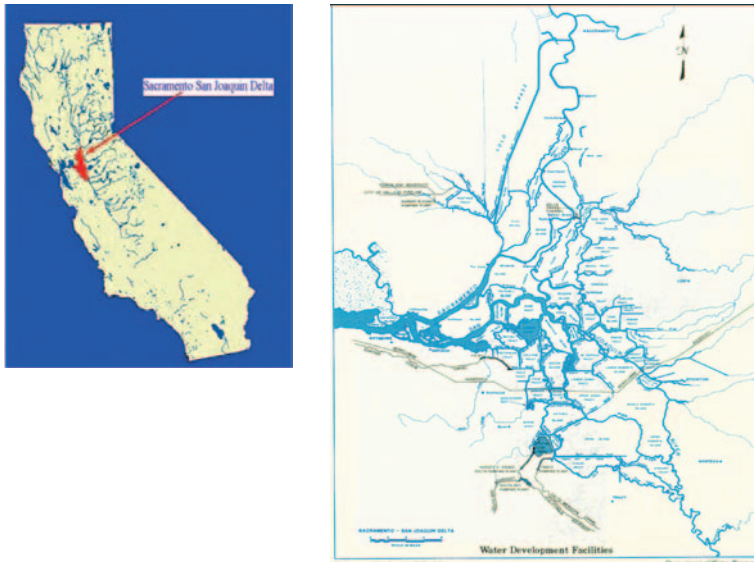
## 5.7 SACRAMENTO - SAN JOAQUIN RIVER (UNITED STATES OF AMERICA)

### 5.7.1 Case Story (Sacramento - San Joaquin River)

Facts	Ref. to KFS
<p><b>I. Introduction – California Water Projects: Central Valley Project (CVP) and State Water Project (SWP)</b></p> <p>There is a growing dilemma faced by California’s water supply and demand: precipitation and runoff are high in Northern California and the eastern side of California (Fig. 5.7.1) while the demand centres are in the semi-arid part of Southern California comprising Los Angeles and the San Diego Area as well as the San Francisco Bay Area (Fig. 5.7.2). The issue is therefore how to supply water from Northern California to the demand area in Southern California, and more importantly, how can the water be used more efficiently in order to relieve the ecological stresses of Northern California’s Delta area.</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="276 734 628 1211"> <p>STATE OF CALIFORNIA PRECIPITATION</p> </div> <div data-bbox="735 734 1088 1211"> </div> </div> <p><b>Fig. 5.7.1</b> California’s Water Supply    <b>Fig. 5.7.2</b> California’s Water Demand (Courtesy of District of Water Resources, State of California)</p> <p>The conventional way of dealing with this dilemma was to construct a series of dams and canals to convey water from north to south California. These projects were built over a 50-year period and funded by a combination of local, state, and federal agencies (Fig. 5.7.3).</p> <p>The earliest projects were built by local entities. The city of San Francisco built the Hetch Hetchy Aqueduct in 1923, which included the O’Shaughnessy Dam. The Hetch Hetchy Valley was flooded in order to supply water from eastern Sierra Nevada to San Francisco. Other early projects include the Los Angeles Aqueduct built by Los Angeles in 1913; and the Colorado Aqueduct, which commenced deliveries from the Colorado River and was built by the Metropolitan Water District of Southern California in 1941. The purpose of these projects was to supply water to urban areas, and for irrigation.</p> <p>In the 1920s, California undertook a study and determined that additional water projects were needed to specifically convey water to the Northern Sacramento Valley and Northern San Joaquin Valley. The projects were designed to provide additional irrigation water for an expanding farming community. The state intended to build these projects and sell bonds in the early 1930s. However, due to the severe economic depression of the 1930s, the projects could not be financed. The Federal Government therefore stepped in and took over construction as part of the ‘New Deal’ economic public works program. This project was called the Central Valley Project (CVP) and was operated by the U.S. Bureau of Reclamation. This water was heavily subsidized by the Federal Government so that farmers could obtain water at a fairly low price, which led to inefficiencies in its use. This project was completed between the late 1940s and early 1950s.</p>	

Facts	Ref. to KFS
<p>After completion of CVP, water demand still continued to increase due to rapid population growth following World War II. In 1957, the first California Water Plan revealed the need for additional water projects to move water from Northern California to Southern California. In 1960, voters approved a US\$1.76 billion bond to establish the State Water Project (SWP). Though the initial facilities, including the Oroville Dam and the California Aqueduct, were completed in 1973, the expansion of SWP facilities continues and about US\$10 billion has been spent to construct, operate and maintain the project and repay the bonds.</p> <p>The main purpose of SWP is to supply water for mostly urban and industrial uses. The project diverts and stores surplus water during wet periods and distributes it to areas of need in Northern California, the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and Southern California. In addition, other project benefits include flood control, power generation, recreation, fish and wildlife enhancement, and water quality improvement in the Sacramento – San Joaquin Delta.</p> <div data-bbox="359 875 940 1473" data-label="Figure"> </div> <p data-bbox="405 1485 1007 1552">Fig. 5.7.3 California Water Project (Courtesy of District of Water Resources, State of California)</p>	
<p><b>2. The Sacramento - San Joaquin Delta</b></p> <p>The Sacramento – San Joaquin Delta (hereinafter ‘the Delta’) is located at the confluence of Sacramento and San Joaquin rivers (Fig.5.7.4). It has an area of about 738,000 acres (about 3,000 sq. kilometers), of which 520,000 acres is used for agriculture. Forty-seven per cent of state runoff passes through the Delta and about 65 per cent of runoff, which flows into the Delta, is conveyed to Central and Southern California. Water released at upstream reservoirs is pumped from the south Delta (The Harvey O. Banks Delta Pumping Plant and the Tracy Pumping Plant) into the California Aqueduct and CVP canals. Hence the Delta is the hub of state and federal water projects. These projects supply water for 23 million Californians, and provide irrigation water to 6 million of acres agricultural land.</p>	

The Delta is an estuarine marsh and brackish-water region. There is a network of channels and sloughs that intersect the land in the Delta, which are 'islands'. It is also known as an important fish habitat. A combination of both fresh and salt water as well as the flat topology of the Delta creates a unique estuarine habitat. Examples of the several fish species that live in the Delta are Chinook salmon and Delta smelt. Many species are in decline and are protected by state and federal laws for endangered species.



**Fig. 5.7.4** The Delta (Sacramento - San Joaquin Delta)

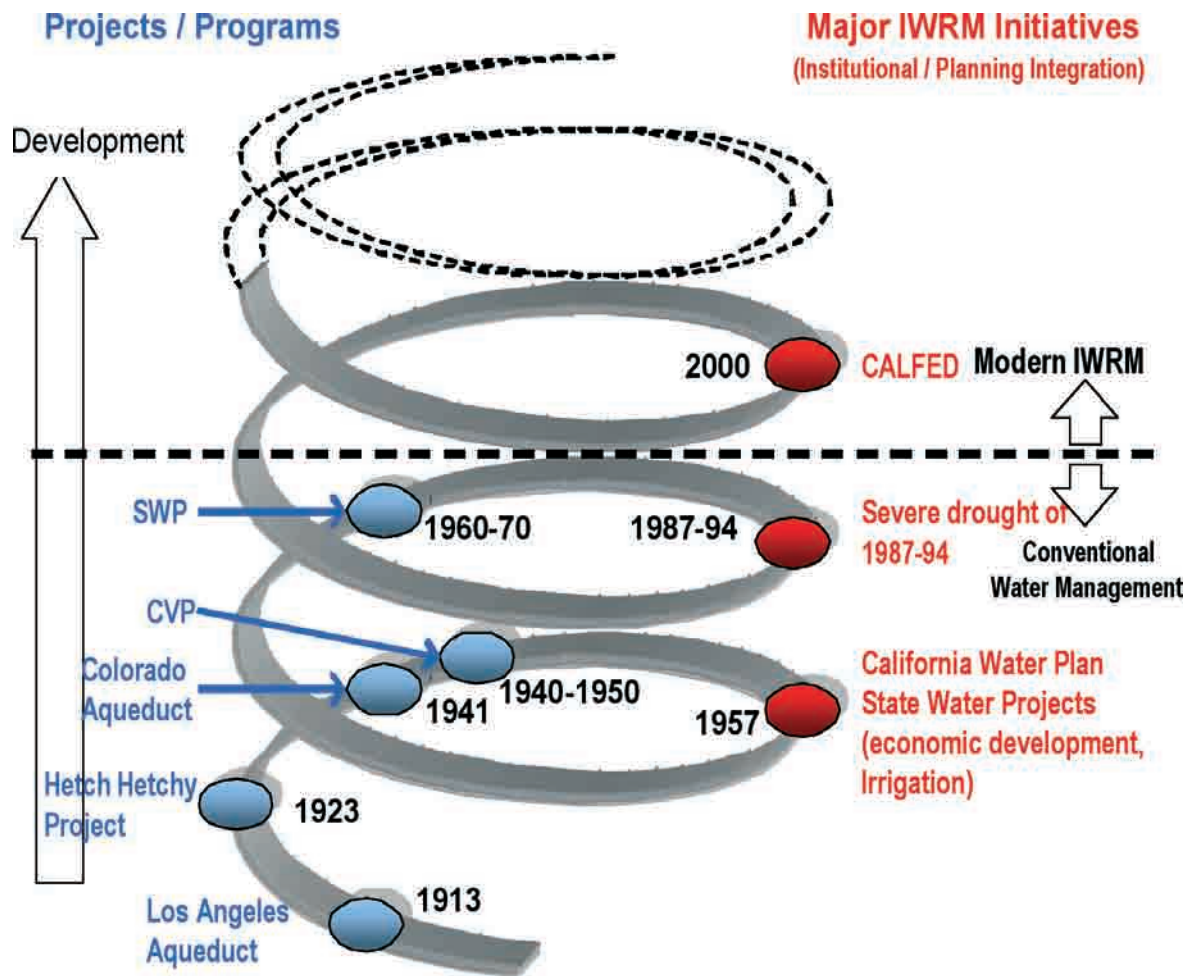
(Courtesy of District of Water Resources, State of California)

Furthermore, the Delta area occasionally suffers from flooding, as a result the islands are surrounded by 1,100 thousand miles (1,800 km) of levees in order to protect the agricultural lands (Fig.5.7.5). Recently, the risk of flooding has grown due to a combination of land subsidence, sea level rise, and levee instability. In addition, seismic issues appear to be one of the main concerns because of the likelihood of a major earthquake within the next thirty years. It is anticipated that sea level rise will continue to be a significant factor because of climate change.



**Fig.5.7.5** Aerial photo of the Delta

Facts	Ref. to KFS
<p>The issues in the Delta are complex and affect different aspects of water management such as urban water use, flood control, and aquatic environmental needs. Due to these conditions, the operation of both CVP and SWP is clearly difficult and the fact that the management of these projects is separated – CVP is operated by the U.S. Bureau of Reclamation while SWP is operated by the Department of Water Resources, State of California – makes it difficult to coordinate operations. However, one positive development arose in 1995 when the operations of both projects were housed in the same building thereby facilitating the daily decision process and information exchange. The projects' daily operation could therefore be linked.</p>	<p>KFS-5.7.2 (1)</p>
<p><b>3. CALFED and Delta Vision</b></p> <p>California suffered severe drought from 1987 to 1994. Water availability decreased to such an extent that some agricultural users received no water deliveries from SWP. At that time, conflicts over the Endangered Species Act and Delta water quality between the state and the federal government appeared resulting in confusion in water use and environment protection strategies during this critical drought period. Lessons learned from this confusion led to the establishment of CALFED, a consortium of federal and state government, and a CALFED Record of Decision (ROD) was signed in 2000. In the ROD, the agreed key objectives in the implementation of the Bay – Delta Program were:</p> <ol style="list-style-type: none"> <li>1) Water Supply Reliability.</li> <li>2) Ecosystem Restoration.</li> <li>3) Water Quality.</li> <li>4) Levee System Integrity.</li> </ol> <p>Furthermore, the state government organized a task force to develop a durable vision for the sustainable management of the Delta (the Delta Vision). Its goal is to manage the Delta over the long-term in order to restore and maintain identified functions and values that are deemed important to the environmental quality of the Delta and the economic and social well-being of the people in the state. In December 2008, a Strategic Implementation Plan was also developed.</p>	<p>KFS-5.7.2 (2)</p>



**Fig.5.7.6 IWRM spiral of Sacramento – San Joaquin River**

[Interviewee: Mr. Stephan Kashiwada, Mr. Kamyar Guivetchi, Mr. Paul Marshall, Mr. Michel Miller, Ms. Tracie Billington, Mr. Meritt Rice (DWR\*1), Mr. Michael Deering, Mr. Tomas Evans (HEC\*2), Mr. Francis Piccola, Ms. Alicia Kirchner, Mr. Miki Fujitsubo (SPK\*3)]

[Interviewer: Mr. Yasuhiro Ochii, Mr. Koichi Takano (Japan Water Agency)]

[Report: Dr. Eugene Z. Stakhiv (Co-chair of the steering committee), Mr. Yasuhiro Ochii, Mr. Koichi Takano (Japan Water Agency)]

\*1 DWR: Department of Water Resources, State of California

\*2 HEC: Hydrologic Engineering Center, US Army Corps of Engineers

\*3 SPK: Sacramento District, US Army Corps of Engineers

## 5.7.2 Extracted Key for Success

### (I) Extracted Key for Success from Sacramento - San Joaquin River

Reference to 5.7.1 Case Story (Sacramento - San Joaquin River)

#### [ Title ]

**Achievement of efficient IWRM for complex multiple-purpose water uses**

#### [ Situation ]

**The drought of 1987–94 required and catalyzed fundamental changes in California’s water management**

Despite repeated attempts by the California legislature to address the increasing competition for water among the urban, agricultural and ecological interests, the problems were not resolved until a severe drought forced greater cooperation among those interests to more effectively manage this limited resource.

Various legislative initiatives in the late 1950s clarified water allocation and priorities for users, as well as secured water rights and financing from the CVP. The vast infrastructure that was built up in California provided the flexibility and reliability for various water users and a growing population. The progressive development of the water resources base in California reached a limit, and the drought of 1987–94 brought in a new era of IWRM resulting in greater cooperation and more efficient demand management in terms of water conservation, increased pricing of subsidized water, more effective contingency drought management, and more integrated operation of the water infrastructure.

#### [ Problem ]

**As projects were operated and managed by different bodies, linkages to project operation was ineffective**

CVP and SWP were implemented by different agencies: the U.S. Bureau of Reclamation for CVP, and the Department of Water Resources, State of California for SWP. Water is pumped at the southern Delta into canals by both projects and issues such as environmental protection in the Delta reached crisis point such that coordinated and careful operation was needed.

#### [ How the problem was overcome ]

**In 1995, the operation room of both projects was housed in the same building thereby facilitating the daily decision process and information exchange. The projects’ daily operation could therefore be linked**

By having the operations room of both projects in the same building, operations could be simultaneously linked. The formulation of the daily decision process achieved information sharing among the different agencies (Fig.5.7.7).

#### [ The Key ]

**Progressive water development, i.e. the expression of supply and availability for various users must be linked with coordinated management for greater reliability and delivery of services, and more efficient water conservation. The drought of 1987–94 created the conditions under which the basic principles of IWRM could be instituted.**

>> **[1.1.2] Consider a significant change in the basin as a chance to move IWRM forward, and recognize and understand such changes as early as possible.**

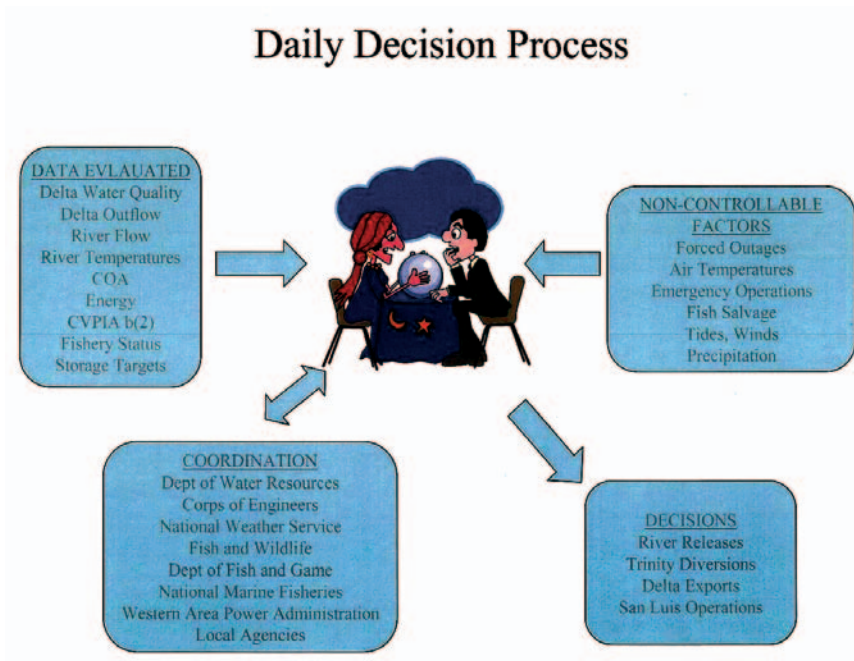
#### [ Conditions and limitations in applying the KFS ]

Anticipate and capitalize on instituting major reforms precipitated by major hydrometeorological episodes (droughts, floods, major infrastructure investments). Changes in water management are an evolutionary process applied at various levels of government and based on an accumulation of numerous ideas, which have been tested and peer-reviewed. The basic point is that basin development and management plans must be prepared in advance; they must be sorted in terms of priorities based on cost-effectiveness, and must be politically negotiated and prepared for any eventuality.

**[ Ideas for enhancing the applicability of the KFS ]**

Major catastrophic changes such as massive urban flooding, levee breaks, and failure of existing institutions to cope with those catastrophes offer a new platform for introducing the best of the tested ideas, regulatory reforms, legislative initiatives and technologies and, most importantly, to build the necessary political coalitions to implement those changes. However, these ideas and options for reform must be compiled, discussed and debated in advance of and in expectation of a more intense drought or larger flood of record.

[ Attachment Materials ]



**Fig. 5.7.7** Daily Decision Process

(Source: Courtesy of Department of Water Resources, State of California)

**(2) Extracted Key for Success from Sacramento - San Joaquin River**

Reference to 5.7.1 Case Story (Sacramento - San Joaquin River)

**[ Title ]****Effectively coordinating and integrating water management of different levels of government****[ Situation ]****Conflicts among users appeared explicitly due to severe drought**

California suffered severe drought from 1987 to 1994. Water supply greatly decreased such that agricultural water use was severely constrained. At that time, conflicts over the Endangered Species Act and Delta water quality between the state and the federal government occurred and resulted in confusion about priorities in water use and environmental protection strategies.

By the 1980s, a vast and complex water management infrastructure was built up in California consisting of levees, aqueducts, canals, reservoirs and pipelines that provided the water supply for the rapidly growing large urban centres in Southern California, and fed the growing agricultural sector in the Central Valley of California. Agricultural irrigation demands accounted for 85 per cent of the total water use in California.

The extended drought of 1987–94 severely stressed their complex system and forced the various levels of government and management agencies to cooperate and coordinate the operation and management of their respective projects. CALFED was created as the coordination entity, which brought in a new era of cooperation and integrated water management.

**[ Problem ]****Although there were several epochs of comprehensive water development plans (CVP, SWP), there was no effective comprehensive water management plan that kept up with the growing demands and conflicts among users**

The progressive transfer of water from Northern California severely stressed the hydroecology of California's rivers and the Sacramento – San Joaquin Delta area. Although there were many legislative efforts to reform the fragmented system of federal, state and local water management institutions, it was not until the severe drought of 1987–94 that a degree of cooperation was forced in order to resolve the conflicts among users during periods of scarcity, and to improve water management at all levels of state and federal regulatory agencies.

**[ How the problem was overcome ]****Formulation of a management framework and operational plan was based on an equitable consideration of multiple goals that preceded longer-term coordination**

As a result of lessons learned from these conflicts, a consortium of the federal and the state government CALFED was established and a CALFED Record of Decision (ROD) was signed that instituted these priorities and institutional relationships.

In the ROD, the agreed key objectives in the implementation of the Bay – Delta Program were:

- 1) Ensure Water Supply Reliability.
- 2) Provide for Ecosystem Restoration.
- 3) Protect Water Quality.
- 4) Ensure Levee System Integrity.

Furthermore, the State Government organized a task force to develop a durable vision for the sustainable management of the Delta (the Delta Vision). Its goal is to manage the Delta over the long-term in order to restore and maintain identified functions and values that are deemed to be important to the environmental quality of the Delta and the economic and social well-being of the people in the state. In December 2008, a Strategic Implementation Plan was also developed. These plans were developed with considerable public input to further improve integrated water management.

**[ The Key ]****CALFED was organized on the basis of an existing, physically integrated water delivery infrastructure, whose management and operation was not well-coordinated. The drought forced the different agencies and regulatory bodies to work together more effectively and efficiently**



in order to manage and conserve those resources, to improve the delivery of services, and to improve reliability and safety of the infrastructure.

>> [3.1.1] Prepare a framework for stakeholder participation in order to build consensus among stakeholders.

### [ Conditions and limitations in applying the KFS ]

All developed and most developing nations have existing institutions that manage some aspect of water resources – mostly in a fragmented decision-making structure. IWRM requires a much higher degree of coordination among those agencies, as well as an agreement as to common goals and priorities for management. These agencies, at all levels of government, must cooperate more effectively so as to achieve greater efficiency in managing resources, especially during crisis periods of floods and droughts, and failures of existing infrastructure. The existing institutional infrastructure is the logical and most effective starting point for implementing IWRM, and catastrophes are events that should catalyze a higher degree of integration among the existing agencies.

### [ Ideas for enhancing the applicability of the KFS ]

The ‘subsidiarity principle’ suggests that a higher degree of coordination can be catalyzed at the level where management, i.e. the delivery of services, is most effective, as in the case of California’s state government, which brought state, local and federal agencies to both the CALFED process and to devise the ‘Delta Vision’. Moreover, IWRM can be organized at the national/federal level through an organized, hierarchical framework which begins with a statement of national water policy, followed by a national water management planning effort that coordinates the activities of the principal actors in various water use sectors (energy, agriculture, environment, urban uses, industry, etc.).

## [ Attachment Materials ]

### Delta Vision’s 12 Integrated and Linked Recommendations

1. Delta ecosystem and a reliable water supply for California are the primary, co-equal goals for sustainable management of the Delta.
2. The California Delta is a unique and valued area, warranting recognition and special legal status from the State of California.
3. The Delta ecosystem must function as an integral part of a healthy estuary.
4. California’s water supply is limited and must be managed with significantly more efficiency to be adequate for its future population, growing economy and vital environment.
5. The foundation for policy making on California water resources must be the longstanding constitutional principles of ‘reasonable use’ and ‘public trust;’ these principles are particularly important and applicable to the Delta.
6. The goals of conservation, efficiency and sustainable use must drive California water policies.
7. A revitalized Delta ecosystem will require reduced diversions, or changes in patterns and timing of those diversions, upstream, within the Delta and exported from the Delta at critical times.
8. New facilities for conveyance and storage, and better linkage between the two, are needed to better manage California’s water resources the estuary and exports.
9. Major investments in the California Delta and the statewide water management system must be consistent, and integrate specific policies in this vision. In particular, these strategic investments must strengthen selected levees, improve floodplain management, and improve water circulation and quality.
10. The current boundaries and governance system of the Delta must be changed. It is essential to have an independent body with authority to achieve the co-equal goals of ecosystem revitalization and adequate water supply for California while also recognizing the importance of the Delta as a unique and valued area. This body must have secure funding and the ability to approve spending, planning and water export levels.
11. Discouraging inappropriate urbanization of the Delta is critical both to preserve the Delta’s unique character and to ensure adequate public safety.
12. Institutions and policies for the Delta should be designed for resiliency and adaptation.

**Fig. 5.7.8** Delta Vision’s Recommendations


### Near -Term Actions to Protect the Delta

1. State government should immediately began acquiring title or easements to floodplains, establish flood bypasses where feasible and discourage residential building in flood-prone areas. Land that could provide flood protection is currently being threatened by urban development.
2. The Governor should immediately issue an Executive Order that provides guidance consistent with this vision on inappropriate land development in the Delta.
3. State government should promptly set appropriate standards for all levee improvements to protect heavily populated areas and key parts of the water delivery system and other infrastructure. The state of California should also use available bond funds to address strategic levee and floodplain improvements.
4. State government should embark upon a comprehensive series of emergency management and preparation actions within a few months; California cannot wait for a flood before planning a response.
5. State government should promptly incorporate expected sea level increases into decision-making and improve knowledge of constructing more secure and affordable levees.
6. High priority ecosystem revitalization projects should be pursued aggressively by the responsible agencies and departments, upon direction by the Governor.
7. Improvements in the current water conveyance and groundwater surface water storage systems should be pursued as rapidly as possible by the responsible agencies and departments, upon direction by the Governor.

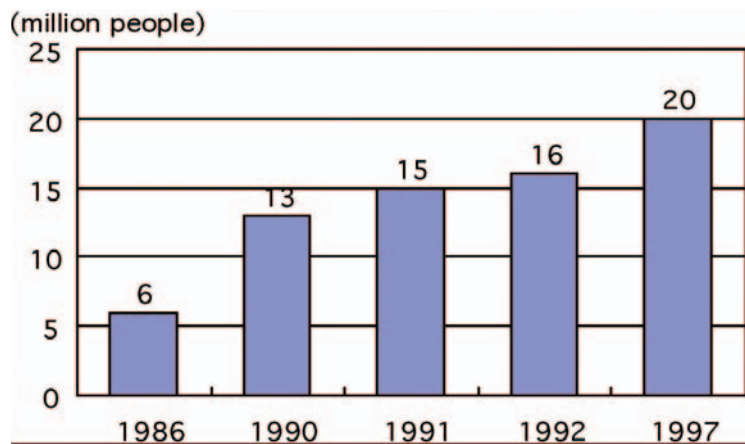
Fig. 5.7.9 Near-Term Actions to Protect the Delta

## 5.8 TAMA RIVER (JAPAN)

### 5.8.1 Case Story (Tama River)

Facts	Ref. to KFS
<p><b>1. Characteristics of the Tama Basin</b></p> <p>The Tama River flows from its source in Mount Kasatori in Yamanashi Prefecture down to Tokyo Bay at the river mouth at Haneda. Its total length is 138 km with the river basin area spanning 1,240 sq. kilometers. The Tama River, which has about 20 million visitors annually, has several major features in the areas of flood control, water usage, and environmental preservation. In terms of flood control, as shown by the Komae Flood of 1974, the Tama River is set at a relatively steep slope compared with other rivers in the capital region (Fig. 5.8.1), making it especially susceptible to flooding. In terms of river use, it faces issues such as water intake in the upstream areas and the inflow of treated sewage water in the midstream areas. In terms of environmental preservation, authorities implemented the Tama River Environment Management Plan in 1980, the first of its kind in Japan, based on direct dialogue with local residents.</p> <p>These kinds of efforts to manage the Tama River, through the collaboration of residents and local government agencies, are considered to be the most progressive in Japan.</p>  <p><b>Fig. 5.8.1</b> Tama River</p>	
<p><b>2. River management and environmental conservation through dialogue with residents</b></p> <p>The Tama river basin was rapidly urbanized from the 1960s. The use of riparian zones by communities as well as environmental conservation soon became major issues. At the beginning of the 1970s, while Tama River's riparian zones were being progressively developed and utilized, civil societies became concerned of the decreasing areas of natural land, and civil movements started to appear opposing the development of ecologically diverse riparian zones into sports areas. Furthermore, public activities to protect the river also began to appear.</p> <p>This context led to the development of the Tama River Environmental Management Plan in 1980, which was a result of direct dialogue between the administrative agency and the residents of the basin, and discussed the state of Tama River's riparian zones as a precious open space in an urban setting. The plan is based on 3 principles:</p> <ol style="list-style-type: none"><li>1) provide a place for interaction between the Tama River and its residents;</li><li>2) maintain the Tama River's unique characteristics; and,</li><li>3) utilize the Tama River's unique characteristics.</li></ol>	

Facts	Ref. to KFS
<p>It provided provisions for the conservation of the natural environment and the sustainable utilization of Tama River, as shown below. They clearly stated their commitment to ecological conservation some twenty years before biodiversity was internationally recognized.</p> <ul style="list-style-type: none"> <li>• Five zones were identified: a human developed zone, a facility utilization zone, an environmental improvement zone, an environmental utilization zone, and an environmental conservation zone.</li> <li>• Eight functional spaces were attributed: an evacuation space, a local facility recreational space, a wide-area facility recreational space, a sports/health management space, a natural recreational space, an educational space, an information space, and an ecological maintenance space.</li> </ul> <p>In 1986, the Minister for Construction, the governor of Tokyo Metropolitan Government, the governor of Kanagawa prefecture, and heads of related municipalities assembled for the Tama River Summit and announced a Tama River Summit Declaration, which called for “passing on the Tama River to the next generation where everyone can get acquainted with water and greens”. They recognized that the environment was an issue that concerned and spanned generations two years ahead of the Earth Summit in Rio de Janeiro, where ‘sustainable development’ was first recognized internationally.</p> <p>In response to this declaration, the Ministry of Construction, the Tokyo Metropolitan Government, Kanagawa Prefecture, Yamanashi Prefecture, and related municipalities in the basin established the Tama River Basin Council in 1987 in order to promote measures to improve the Tama River environment and to enhance the interaction of people with water and the environment. They also established the Tama River Week whereby residents and the administrative agencies together implemented awareness-raising measures.</p> <p>Furthermore, in 1998, residents, academic experts, basin municipalities, river managers, and other concerned stakeholders established a Tama River Basin Roundtable in order to promote continuous exchange of information and opinions on Tama River improvement and the basin environment so as to build a collaborative framework with a deeper relationship of trust, and to facilitate loose-knit consensus-building towards a ‘good river/good city’ management approach.</p> <p>The Tama River was transformed into a place where everyone who enjoys the river can participate in various activities such as children who began to play in the water again. As a result, the number of people using the river had increased from 6 million to 20 million in one year.</p> <p>Volunteering activities by civil societies and NGOs are also very active in the Tama River. Not only do organizations with same values work under an alliance but also organizations with different objectives, such as organizations targeting environmental conservation, social welfare and sports, collaborate with one another in their activities. There are at least 200 existing organizations, and there are also organizations that provide networks for various civil groups to exchange information.</p>	



**Fig. 5.8.2** Change in number of people using Tama River (river section under ministry's direct control)

### 3. The Fundamental Spirit of Direct Dialogue

'3 principles, 7 rules' were laid out as the fundamental spirit for dialogue between the residents and the administrative agencies. As it was supposed that consensus would not be achieved from the outset, all parties agreed on the importance of discussing the issues on an equal footing while aiming for consensus. The word 'loose-knit consensus' was borne from the civil groups.

KFS-5.8.2 (1)

#### 3 principles

- 1) Speak freely.
- 2) Discuss thoroughly.
- 3) Build consensus.

#### 7 rules

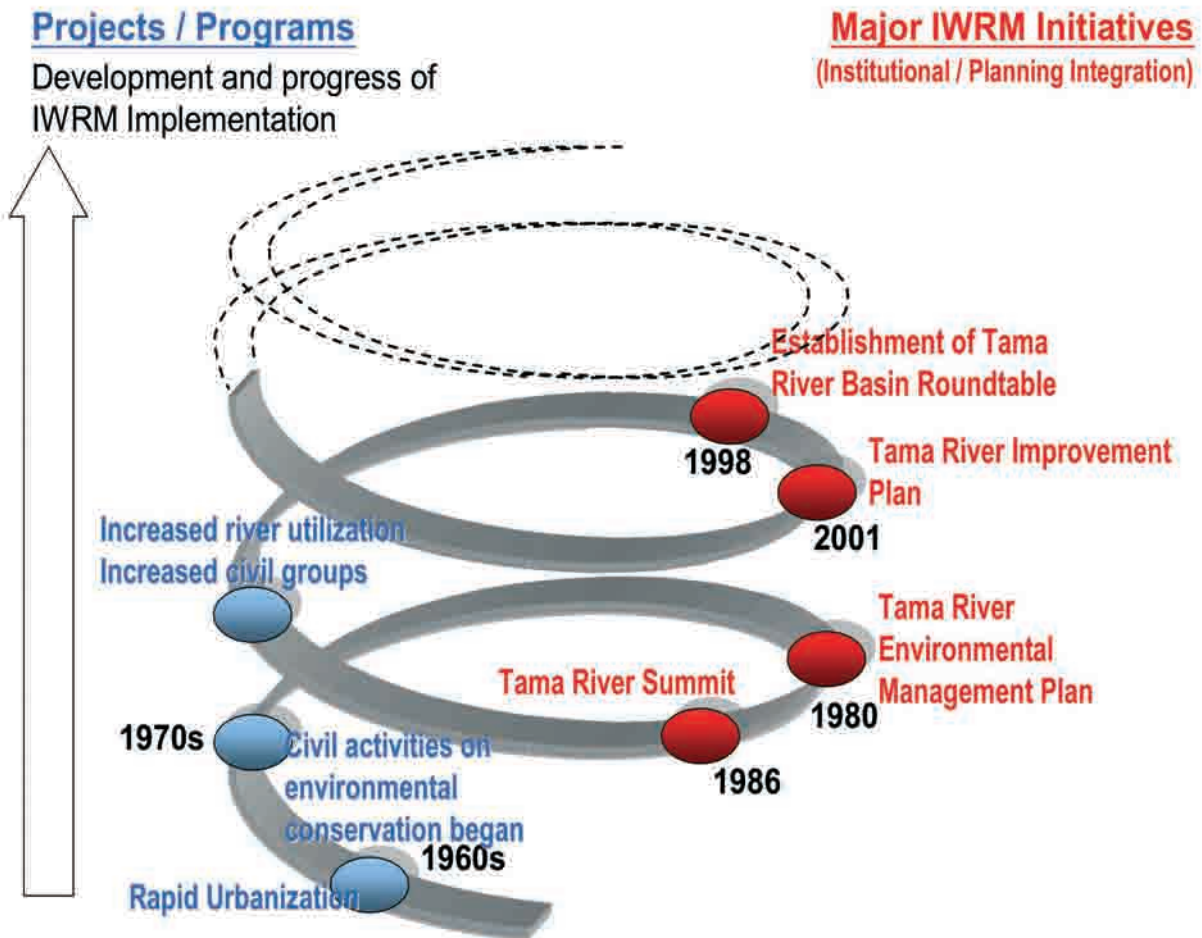
- 1) Opinions of participants do not represent the official opinion of their organizations.
- 2) Do not target specific individual or organization.
- 3) Discuss under the spirit of fair play.
- 4) Respect demonstrative data during discussion.
- 5) Identify the problems and aim towards agreement.
- 6) Any problems under dispute will be treated from an objective standpoint.
- 7) When preparing a programme, distinguish them into long-term and short-term programs, and try to make realistic recommendations.

The typical planning process, led by administrative agencies, tended to be regarded as 'persuading' residents instead of 'explaining' to residents, and it was for this reason that conflicts occurred in some situations. On the other hand, the approach implemented in the case of the Tama River provided information to civil groups and residents before the administrators had made up their mind. This enabled civil groups and residents to discuss any issues, or what they saw as problems, using their networks, and this encouraged them to communicate their opinions. This made it possible to exchange opinions while respecting the position and opinions of others, which also led to the build-up of trust.

KFS-5.8.2 (2)



## IWRM Spiral of the Tama River basin



**Fig.5.8.5** IWRM Spiral of the Tama River basin

[Interviewee: Yutaka Hosomi, Director of Disaster Prevention and Relief Division, Ministry of Land, Infrastructure, Transport and Tourism, former Director of KEIHIN Work Office, MLIT] Retrospective view on planning of river infrastructure development project for Tama River system (KASEN (River), 2001.6)

[Interviewer: Toshio Okazumi, Director for International Water Management Coordination, River Bureau, MLIT]

## 8.2 Extracted Key for Success

### (1) Extracted Key for Success from Tama River

Reference to 5.8.1 Case Story (Tama River)

<p><b>[ Title ]</b>  <b>Rules for coordination and consensus-building in developing the River Improvement Plan</b></p>
<p><b>[Situation]</b>          The Tama River, which has about 20 million visitors annually, has several major features in the areas of flood control, water usage, and environmental preservation.          The Tama River is susceptible to flooding due to its relatively steep slope compared with other rivers in the capital region. In terms of river use, upstream water intake and discharge of treated sewage water are issues in the midstream region. In terms of environmental preservation, authorities implemented the Tama River Environment Management Plan in 1980 based on direct dialogue with local residents, the first of its kind in Japan..</p>
<p><b>[Problem]</b>          Tama river basin was rapidly urbanized from the 1960s. The use of riparian zones by communities and environmental conservation became major issues          At the beginning of the 1970s, while Tama River's riparian zones were being progressively developed and utilized, civil societies became concerned of the decreasing areas of natural land, and civil movements started to appear opposing the development of ecologically diverse riparian zones into sports areas. Furthermore, public activities to protect the river also began to spring up. There was a need for river improvements in collaboration with the residents. The major challenge was how to collaborate with the numerous civil groups in preparing the river improvement plan, and how to achieve consensus.</p>
<p><b>[ How the problem was overcome ]</b>          The '3 principles, 7 rules' were laid out as the fundamental spirit for dialogue between residents and the administrative agencies.  <b>• 3 principles:</b>          1) Speak freely.          2) Discuss thoroughly.          3) Build consensus.  <b>• 7 rules:</b>          1) Opinions of participants do not represent the official opinion of organizations they represent.          2) Do not target specific individual or organization.          3) Discuss under the spirit of fair play.          4) Respect demonstrative data during discussion.          5) Identify the problems and aim towards agreement.          6) Any problems under dispute will be treated from an objective standpoint.          7) When preparing a programme, distinguish them into long-term and short-term programs and try to make realistic recommendations.          A plan for river improvement in the next twenty to thirty years was developed through collaboration with the various stakeholders including residents, municipalities, academic experts, and other concerned stakeholders through a process described below:  <ul style="list-style-type: none"> <li>• Grass roots discussion: took place as much as possible at the actual sites. The options even included a zero option of 'do nothing': It presented the option selected by the administrators and the reason behind its selection.</li> <li>• Joint secretariat with civil groups: meetings were jointly chaired in a round table manner.</li> <li>• Proactive participation of municipalities and civil groups: the opinions of the residents were collected through 'River Inspection Tours'. Civil groups organized workshops and prepared their proposals.</li> <li>• Consensus-building for the plan is a step-by-step process: a draft plan was presented several times in a phased manner.</li> </ul> </p>
<p><b>[The Key ]</b>  <b>A place for direct dialogue with residents/civil groups was agreed, and principles and rules were established and shared with the residents/civil groups for negotiation. The residents/civil groups and the administrative agencies worked together in preparing the river improvement plan.</b></p>



- >> [2.2.2] It is desirable to start considering the mechanism and course of action for stakeholder participation from the conceptualization phase.
- >> [3.1.1] Prepare a framework for stakeholder participation in order to build consensus among stakeholders.
- >> [3.2.1] Coordinate in such a way that the resulting changes will be favorable for and equitable among stakeholders.
- >> [3.3.1] Develop a plan that is appropriate and acceptable for all stakeholders at the time of the agreement.

**[ Conditions and limitations in applying the KFS ]**

Instead of leaving it to the administrators, stakeholders gradually gain a sense of cooperation and participation for river management.

**[ Ideas for enhancing the applicability of the KFS ]**

‘Loose-knit consensus-building’: as it is supposed that consensus would not be achieved from the outset, discuss on an equal footing and aim for consensus through discussion. Do not try to agree on every detail but try to agree on the basic principles. This facilitates and deepens the discussion and will eventually lead to building consensus.

**(2) Extracted Key for Success from Tama River**

Reference to 5.8.1 Case Story (Tama River)

**[ Title ]**

**Ensuring complete accountability by disclosing all information**

**[ Situation ]**

The basin residents had a high level of interest for the environmental conservation of Tama River. There are over 2,000 existing civil groups, and possibly many more in the basin

There are a variety of organizations with diverse values. They focus on various areas such as natural environment, social welfare or sports.

**[ Problem ]**

**The typical planning process is led by administrators without consultation with residents/civil groups. Such a process appears to be ‘persuading’ residents rather than ‘explaining’ to them. It can become a source of conflict.**

**[ How the problem was overcome ]**

- **The draft plan was presented to residents/civil groups in a phased manner before endorsement by the administrator. Thorough discussion was ensured, especially in the initial ‘preliminary draft plan summary’ phase.**
- The topics of the discussion were made available on the Internet so that the general public were regularly informed. The various opinions received were also presented with an explanation of whether the opinions were reflected in the draft plan as well as its justification. The entire discussion process was made available to the public to ensure transparency.
- This gave the residents/civil groups an opportunity to discuss any issues as to the problems they saw, and this encouraged them to communicate their opinions. This made it possible to exchange opinions while respecting the position and opinions of others, which also led to the build-up of trust.

**[ The Key ]**

**All information related to the consensus-building process was disclosed on the Internet from the initial planning stage, and opinions were collected in order to reach consensus.**

**>> [1.3.1] Proactively disclose information, as it is a fundamental activity in IWRM.**

**[ Conditions and limitations in applying the KFS ]**


In the case of the Tama River, there was a high level of interest in the water uses among the residents, and numerous civil groups were actively involved with the river.

**[ Ideas for enhancing the applicability of the KFS ]**

Information disclosure that allows one to see the entire decision-making process.

## 5.9 TONE RIVER (JAPAN)

### 5.9.1 Case Story (Tone River)

Facts	Ref. to KFS
<p><b>1. 'Water Stress' in National Capital Region (Tokyo and its suburbs) during high economic growth period</b></p> <p>Since 1958 Tokyo has suffered from a chronic restriction of the water supply. This is especially acute during the summer months when water tank trucks are busy transporting and supplying water to local residents. Although the construction of Ogochi Dam was completed in the Tama river in 1957, supplying water at 150 per cent of the planned amount of water to Tokyo, the supply simply could not keep up with the demand. Moreover, as in the case of industrial water, land subsidence occurred caused by the excessive pumping of groundwater. Losses and damages spilled over to all the Tokyo urban districts and were spreading wider and affecting more people.</p> <p>Meanwhile, the Sumida River travelling through the urban districts was responsible for the nauseating odors from the waste water coming from households and factories (at this time fish no longer inhabited the river). The Sumida River and its surrounding environment had deteriorated to such an extent that Tokyo City was forced to improve the environment not least because they were hosting the Tokyo Olympic Games (in 1964).</p> <p>Furthermore, in the Tone River, river bed degradation had accelerated such that the water level in the river had sunk even lower. It was therefore unreasonable to draw water from the river. This was further compounded by recurrent droughts and the situation only worsened. Under such urgent circumstances in the Great Tokyo Metropolitan area, the Tokyo metropolitan government sought a new water source in the Tone river basin for both urban water and water for river purification purposes. Meanwhile in the Saitama Prefecture, a need to unify intake facilities had become a concern in the prefectural government.</p>	
<p><b>2. Pipeline route (Dekishima Plan)</b></p> <p>In 1958 a plan (Fig.5.9.1) was announced whereby the water produced in upstream dams would be taken upstream of the river area, with the water being conveyed via a pipeline to the existing purification plant. The reasons outlined were as follows:</p> <ol style="list-style-type: none"> <li>1. Pipeline (tunnel) would be advantageous as it required less land.</li> <li>2. Good water quality can be maintained by drawing water from the upstream river.</li> <li>3. Water quality would be least affected by conveying water via pipeline.</li> </ol>	
	
<p><b>Fig. 5.9.1 Dekishima Plan</b></p>	

Facts	Ref. to KFS
<p><b>3. The Water Resources Development Promotion Law and The Water Resources Public Corporation Law</b></p> <p>In order to develop water resources for the entire river basin, the government decided to establish an implementation body on the basis that an integrated plan for both flood control and water use had be ensured. According to this policy, the Ministry of Construction, the Ministry of International Trade and Industry, the Ministry of Agriculture, Forestry and Fisheries, and the Ministry of Health and Welfare requested a budget in the 1961 fiscal year so that they could begin to develop water resources from their own standpoints. The Ministry of Finance however insisted that the plans be unified, if they wished their request to be granted. Despite this situation, the ministries were still separated into two groups: the Ministry of Construction, and a union of the other ministries, which was in charge of the water use sectors.</p> <p>In April 1961, an order was made by the Prime Minister to unify the ideas and an <u>Economic Planning Agency led the coordination task among ministries. As there was a strict time limitation – there were only three years left before the Tokyo Olympic Games – the agency had no other option but to submit the bill to the Diet immediately. As a consequence, an agreement was reached and in November 1961 the Water Resources Development Promotion Law and the Water Resources Development Public Corporation Law came into effect.</u></p> <p>In April 1962 the Water Resources Bureau was set up within the Economic Planning Agency and, in May of the same year, the Water Resources Development Public Corporation was founded.</p>	<p>KFS-5.9.2(1)</p>
<p><b>4. Utilization of existing canal route (Improving the Minumadai Canal Plan)</b></p> <p>In June 1961 a plan (Fig. 5.9.2) was announced whereby an intake unification barrage would be constructed near the existing intake gate of the irrigation canal (Minumadai Canal) so as to stabilize the intake of water, while agricultural and urban water would be conveyed using the existing canals. In this plan, a new purification plant was to be constructed in the northern part of Itabashi, Tokyo, from which urban water was conveyed. The reasons given to support the plan were as follows:</p> <ol style="list-style-type: none"> <li>1. Taking water from the upstream river on a large scale for the urban water supply will create predominance over vested water rights of downstream farmers and would therefore disregard vested rights.</li> <li>2. Unification of water intake facilities and water intake would enable the integration and rationalization of water use.</li> <li>3. As water can be supplied to areas traversed by the canal, Saitama Prefecture would also benefit.</li> <li>4. As most of the construction works will be so-called ‘open works’, it was possible to shorten the construction time.</li> <li>5. By proceeding with the construction of the connecting canal between the existing canal and the new water purification plant, water could be sluiced in an emergency, which would help to temporarily supply water to Tokyo where people suffered from chronic water shortages.</li> <li>6. This plan would connect two water supply systems in Tokyo, which are geographically separated by its water source – The Tama river basin and the Edo river basin. With this plan, water can be shared between the two water supply systems. This plan was thus able to ensure a flexible water supply.</li> </ol>	


Facts	Ref. to KFS
 <p data-bbox="448 837 1023 871"><b>Fig. 5.9.2</b> Improving the Minumadai Canal Plan</p>	
<p data-bbox="167 920 868 954"><b>5. Utilization of the Ara River route (Middle Course)</b></p> <p data-bbox="167 990 1267 1126">In 1962 the Tone River system was designated for the first time as a river system on the basis of the Water Resources Development Promotion Law. The Water Resources Development Public Corporation started to conduct a survey, which they summarized with the following issues:</p> <ol data-bbox="167 1131 1267 1406" style="list-style-type: none"> <li>1. It is necessary to shorten the construction time so that the Tokyo Olympic Games would be held in autumn (in 1964) without fail.</li> <li>2. Coordination is required with mid and downstream stakeholders to obtain water rights for drawing water from the Tone River.</li> <li>3. When constructing the connected canal, it is necessary to gain approval from Saitama prefectural government.</li> <li>4. Certain measures for the future need to be addressed as water demand is likely to greatly increase in the future.</li> </ol> <p data-bbox="167 1440 1267 1612"><u>For those reasons, the Water Resources Development Public Corporation devised a plan (Fig. 5.9.3) entitled 'Utilization of the Ara River'. It included the unification of intake facilities (barrage construction) and the construction of a 14 km long canal connecting the Tone River and the Ara River. At the endpoint of the canal, water is discharged into the Ara River and conveyed along the river until it is taken up again from Akigase to Tokyo.</u></p> <p data-bbox="167 1646 1267 2027">In March 1963 the Tone connected canal construction project was included in the Water Resources Development Basic Plan of the Tone River System as a result of long and patient coordination with the water users as well as the many liaison meetings among ministries initiated by coordinators. Issues such as water operations, cost allocation, and ownership rights were discussed together with the water users, and amendments to the original draft repeatedly incorporated. As a result of these efforts, a detailed plan was formulated and the implementation plan was confirmed. Moreover, as Saitama prefectural government recognized the implementation of the plan as a humanitarian issue, and the water users clarified their position to the Saitama government, they eventually reached an agreement. From 1964, an emergency water sluice was temporarily set-up and in April 1968, it was finally terminated.</p>	<p data-bbox="1294 1440 1390 1503">KFS-5.9.2(2)</p>



Fig. 5.9.3 Utilize the Ara River Plan

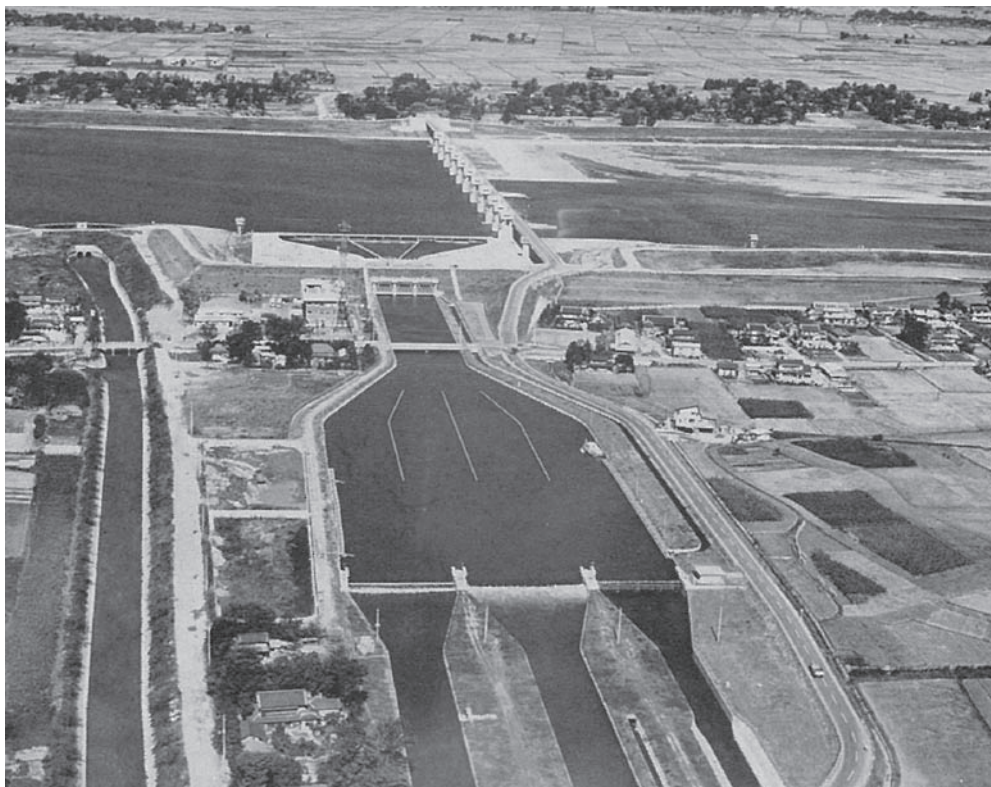
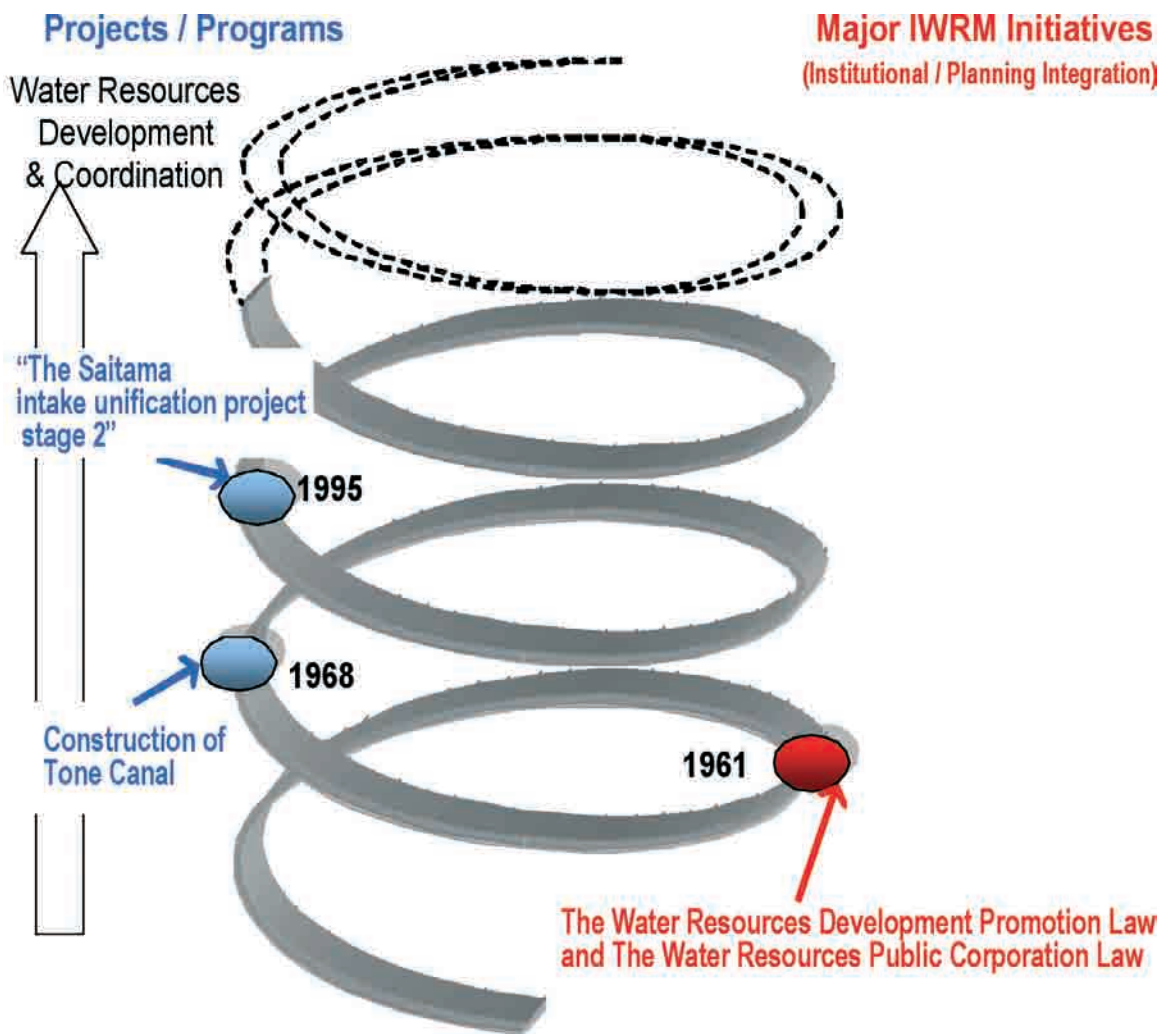


Photo 5.9.1 Tone Canal (Tone Barrage)

Facts	Ref. to KFS
<p><b>6. After Completion of the Tone Canal (Turning to the Next Spiral)</b></p> <p>The Tone canal project played an important role not only in terms of the stable intake of water, thanks to the construction of the intake unification barrage, but also in terms of the water supply to Tokyo from the Tone River.</p> <p>Minumadai Canal originally had a water intake facility near the existing Tone diversion barrage but changed its watercourse from the old intake facility to the intake unification barrage (Tone diversion barrage). As a sediment basin was constructed between the barrage and the canal, sediment was not taken from the river, which accelerated the degradation of the canal-bed. Meanwhile, urbanization spread around the Minumadai canal irrigation area from the late 1950s such that 150 to 300 hectares of cultivated land was converted into urban areas as well as a total of 1,884 hectares over a period of ten years from 1960 to 1969.</p>	
<p><b>7. Increasing demand for urban water and the utilization of agricultural water through modernization of facilities</b></p> <p>In 1970, the Ministry of Agriculture, Fishery and Forestry (MAFF) began an investigation into the utilization of agricultural water. The rapidly urbanized areas were targeted <u>with the purpose to identify the amount of water possible to convert from agricultural water use to urban water use.</u> In 1974, as the demand for urban water increased, Saitama prefecture started unofficial discussions with MAFF regarding the project and in 1976, the Tokyo metropolitan government also showed concern for the project.</p> <p>As the coordination process continued among stakeholders, the ‘Saitama intake unification project stage 2’ was set up in 1979 (‘stage 2’ does not include intake unification but it does include the modernization of canal facilities).</p>	KFS-5.9.2 (3)
<p><b>8. Agreement to cost allocation</b></p> <p>As this project was jointly planned between the agricultural water sector and the urban water sectors, discussions about cost allocation began in 1979. In May 1979 MAFF showed the basic principle for cost allocation: <u>the cost allocation of both the agricultural water use and urban water use sectors ranged across all sections including one for agricultural use only (except the section for urban water use only). This is due to the fact that urban water supply can only be achieved by modernizing all sections of the canal.</u> This principle was accepted by sectors of both agricultural water use and urban water use. Thus, agreement of the project was reached in September 1979 and construction was completed in 1995.</p>	KFS-5.9.2 (3)



**Fig. 5.9.4** IWRM spiral of Tone River

[Interviewee: Hiroshi Ugata (former Tokyo Prefecture Official), Shigemaro Nishina (former Saitama Prefecture Official), Tetsuya Ishii (former director of Tone Canal Control Center, WARDEC\*1)]

[Interviewer: Toshiyuki Yoshioka, Yasuhiro Ochii, Hideaki Yamamoto, Takeshi Miyashita, Koichi Takano and Akira Nishimura (Japan Water Agency)]

[Report: Shinsuke Ota (Co-chair of the steering committee), Toshiyuki Yoshioka, Yasuhiro Ochii, Hideaki Yamamoto, Takeshi Miyashita, Hiroyoshi Tanaka, Koichi Takano and Akira Nishimura (Japan Water Agency)]

\*1 WARDEC: Water Resources Development Public Corporation (now Japan Water Agency)

## 5.9.2 Extracted Key for Success

### (I) Extracted Key for Success from Tone River

Reference to 5.9.1 Case Story (Tone River)

<p><b>[ Title ]</b>  <b>Foundation of the coordination and implementation body</b></p>
<p><b>[ Situation ]</b>  <b>It was necessary to unify two ideas for establishing public corporation</b>          Water demand increased due to rapid economic growth, which was exacerbated by severe drought in Tokyo. In addition, the water shortage problem needed to be resolved in time for the Tokyo Olympic Games. In order to develop water resources for the entire river basin, the government decided to take urgent action by developing an integrated basin-wide water resources development project through coordination among ministries in charge of each sector – the ministries were separated into two groups: the Ministry of Construction focused on establishing the Water Resources Development Public Corporation, and a union of the other ministries focused on establishing the Canal Project Public Corporation. It was therefore necessary to combine these ideas into one.</p>
<p><b>[ Problem ]</b>  <b>Coordination didn't proceed due to the uncooperative attitude of sectors</b>          Though it was clear that the efficiency level would be raised by unifying these plans, each ministry insisted that their vested rights would be violated, thus they were uncooperative during the planning process.</p>
<p><b>[ How the problem was overcome ]</b>  <b>Time limitation and stating clear coordination methods among ministries achieved progress</b>          In April 1961, under the jurisdiction of the Prime Minister, the Economic Planning Agency (EPA) started to coordinate among ministries, with only three years left to the Tokyo Olympic Games. As the deadline approached, the agency had no other option but to submit the bill to the Diet immediately. In the process, the EPA proposed the following:</p> <ol style="list-style-type: none"> <li>1) EPA will preside water resources policy, the implementation of each project will be negotiated by related ministries responsible for their sector with the ministries enjoying equal status.</li> <li>2) Coordination will be practiced by the Water Resources Bureau within EPA, which is composed of officials seconded from related ministries.</li> <li>3) The implementation body, the Water the Resources Development Public Corporation (WARDEC), will be governed by EPA and its obligation will be carried out by the seconded personnels from the related ministries.</li> </ol> <p>As a consequence, in November 1961, the Water Resources Development Promotion Law and the Water Resources Development Public Corporation Law came into effect. In April 1962 the Water Resources Bureau was set up within EPA and in May of the same year, the Water Resources Development Public Corporation was founded.</p>
<p><b>[ The Key ]</b>  <b>The EPA, under the jurisdiction of the Prime Minister, stipulated the implementation of fair coordination, which led to the foundation of the IWRM coordination body and implementation body. Furthermore, the Water Resources Bureau within EPA, the coordination body, and the Water Resources Development Public Corporation, the implementation body, became a multi-disciplinary organization composed of officials seconded from related ministries. Although they pushed their opinions as representatives of their own ministries at first, they quickly realized the mutual benefits to be gained from compromise through coordination, and they became united and promoted project coordination. Moreover, they occasionally persuaded their own ministries of the advantages.</b></p> <p>&gt;&gt; [3.1.3] Select a lead coordinator(s) (organization or individual) whom the maximum possible number of stakeholders participating in the process can accept.</p> <p>&gt;&gt; [5.2.2] It is advisable to define frameworks for coordination, consensus building and implementation/evaluation of IWRM-related plans in legislation.</p>
<p><b>[ Conditions and limitations in applying the KFS ]</b>          It was achieved because of the severe time limitations imposed by the major national and/or regional events (such as the Olympic Games in this case).</p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b></p>



## (2) Extracted Key for Success from Tone River

Reference to 5.9.1 Case Story (Tone River)

### [ Title ]

**Project planning, coordinating multiple sectors, and conflict resolution**

### [ Situation ]

**Coordination among sectors was needed because of the time limitation**

The Tokyo Metropolitan Government intended to convey raw water directly to a purification plant from both upstream of the river and a dam reservoir; the initial plan (Dekishima Plan) was proposed by the Ministry of Construction. Conversely, as there were no advantages for agricultural water users in the initial plan, a counter-proposal was planned by the Ministry of Agriculture, Fishery and Forestry.

### [ Problem ]

**Both respective ministries insisted on their countermeasures from their own standpoint raising objections to the adverse side's countermeasures, and no compromise seemed possible**

The Tokyo Metropolitan Government insisted on their minimum requirements: to meet the time limitation and to convey water to the existing purification plant. It rejected the countermeasures because they didn't meet with their requirements. Meanwhile, the agricultural sector insisted that the water supply networks would be needed to connect with each other and that their plan would help. The situation led to a deadlock.

### [ How the problem was overcome ]

**The middle course proposed by the implementation body was acceptable to each sector**

The Water Resources Development Public Corporation indicated a middle course called 'Utilization of the Ara River'. It included the unification of intake facilities (construction of a barrage) and the construction of a 14 km long canal, which would connect the Tone River and the Ara River. At the endpoint of the canal, water is discharged to the Ara River and conveyed along the river until it is taken up again from Akigase to Tokyo.

Though this plan was not an ideal plan for either sector, it could be favorable to all the sectors; the Tokyo Metropolitan government could take water in the upper stream of the Ara River rather than at the point proposed in the counter proposal. Also, water quality in the urban river could be achieved. The stabilization of intake of agricultural water was also accomplished by constructing the barrage in the Tone River. Therefore, a preliminary agreement was reached, however Saitama prefecture (representing the agricultural sector) had difficulty in paying the cost and this stalled the agreement. For this reason the Tokyo Metropolitan Government proposed a cost allocation plan to the agricultural sector such that the Tokyo Metropolitan Government would pay the same amount as if it implemented the project itself, which was accepted by the agricultural water sector. This allowed the project to go ahead not least because of the urgency of the situation and the pressure felt by the Tokyo Metropolitan Government.

### [ The Key ]

**As the plan covered the minimum requirements and was acceptable to both the Tokyo Metropolitan Government and the agricultural sector, the resulting changes for both sectors were considered favorable.**

>> **[3.2.1] Coordinate in such a way so that resulting changes will be favourable for and equitable among stakeholders.**

**Accepting that the Tokyo Metropolitan Government deemed the project to be of high priority, it proposed a cost allocation method to the agricultural sector in which the Tokyo Metropolitan Government offered to pay more than the usual cost allocation methods would have applied.**

>> **[3.4.1] Determine the cost allocation acceptable to all stakeholders by ensuring that it is justifiable.**

### [ Conditions and limitations in applying the KFS ]

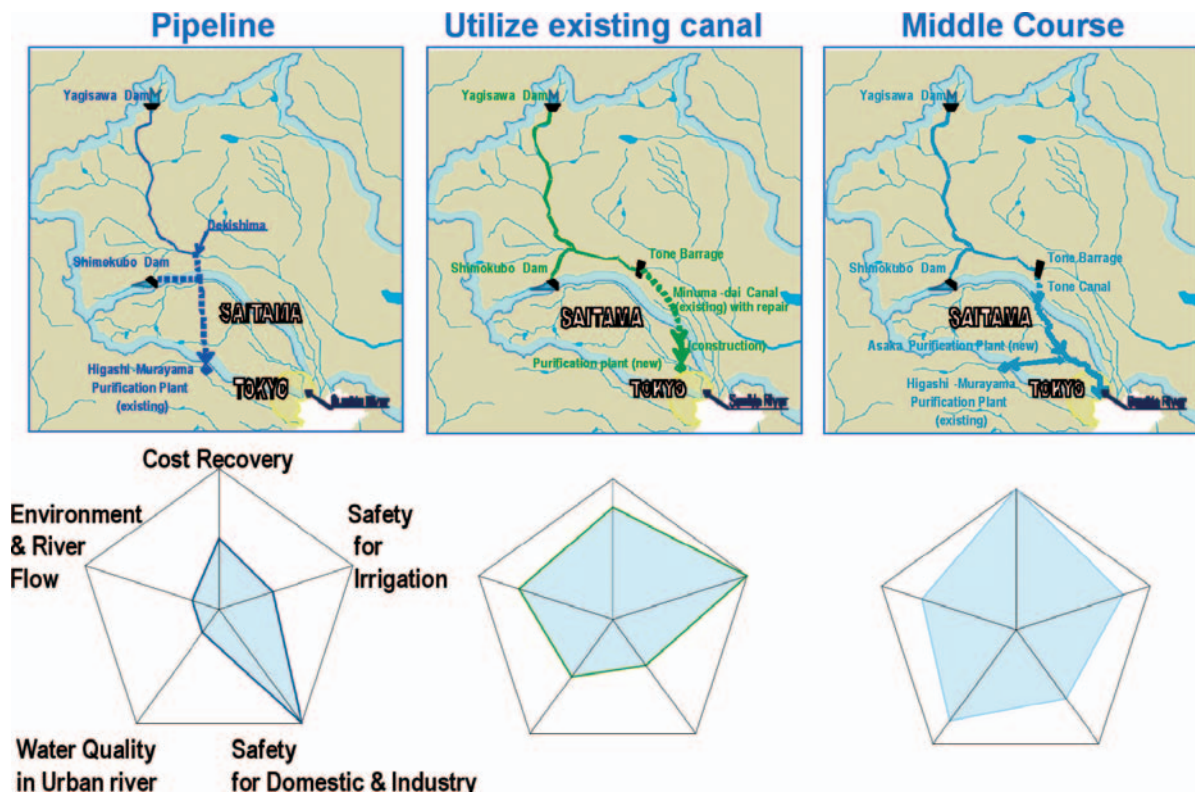
In case the situation comes to a deadlock.

1. All the stakeholders recognize the deadlock situation.
2. The proposed alternative is realistic and considerably improves the present situation for each stakeholder.
3. Share of the cost is kept within reasonable limits for all stakeholders.

**[ Ideas for enhancing the applicability of the KFS ]**

By visualizing the degree of satisfaction of all the sectors for each alternative plan, each stakeholder recognizes his position and accepts the proposal.  
Make use of the Pentagram

**[ Attachment Materials ]**



**Fig. 5.9.5** Visualization of Evaluation results – Pentagram

### (3) Extracted Key for Success from Tone River

Reference to 5.9.1 Case Story (Tone River)

#### [ Title ]

**Improvement of water budget in the basin without the construction of new facilities (such as dams)**

#### [ Situation ]

**A phase of transferring water entitlement to urban water sector from the agricultural sector**

Minumadai Canal originally had a water intake facility near the existing Tone diversion barrage but changed its watercourse from the old intake facility to the intake unification barrage (Tone diversion barrage). As a sediment basin was constructed between the barrage and the canal, sediment was not taken from the river, which accelerated the degradation of the canal bed.

Meanwhile, urbanization spread around the Minumadai canal irrigation area from the late 1950s such that 150 to 300 hectares of cultivated land was converted into urban areas as well as a total of 1,884 hectares over a period of ten years from 1960 to 1969.

#### [ Problem ]

**Water users' association insisted no water could be transferred to urban water use without incentives**

Water users' association insisted that no water rights could be transferred to urban water users because of the necessity to supply water to paddy fields. The embankment was made from earth and farmers needed to maintain a certain level of water in the canals, which they drew from the canals. They also had to consider seepage losses. Although modernization of the canals was supposed to resolve the problems, the agricultural sector were not given any incentives to justify paying the costs.

#### [ How the problem was overcome ]

**Transfer of water rights was achieved by modernizing the irrigation canals and incentives were awarded to the agricultural sectors**

Modernization of the irrigation system by lining the canals and equipping check gates made it possible to transfer the water rights from the agricultural sector to the urban water sector. Coordination between the agricultural sector and urban water users was achieved through agreement on the basic principle for cost allocation; the cost of modernizing the entire irrigation system was partly allocated to the urban water users. This was because transferring water rights can only be accomplished if the entire irrigation system was modernized and if efficiency in agricultural water use was achieved.

This balanced the demand and supply in the basin without the need to implement a new water resources development infrastructure. Transferring water rights contributed to water management efficiency in the basin.

#### [ The Key ]

**Recognition of the demand change in the basin, as agricultural water use decreased and urban water use increased. Transferring water rights not by constructing new facilities but by improving existing facilities was the best solution to ensure the appropriate balance in water resources management in the basin reflecting the change in demand**

>> [2.2.4] Take into account the appropriate balance among water related sectors in the basin.

>> [3.4.3] Operate existing facilities in an integrated manner.

**The rule for cost allocation was decided by stakeholders by taking into account the plan's characteristics despite the fact that the agricultural sector didn't feel the necessity for canal modernization.**

>> [3.4.1] Determine the cost allocation acceptable to all stakeholders by ensuring it is justifiable.

#### [ Conditions and limitations in applying the KFS ]

A sector hoping to realize a plan should understand the demand dynamics.

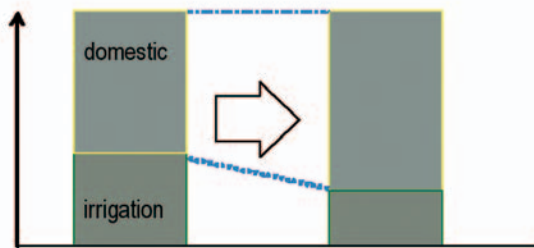
1. Potential needs should be grasped.
2. Proposal should be realistic.
3. Share of the cost is kept within reasonable limits for all stakeholders.

#### [ Ideas for enhancing the applicability of the KFS ]

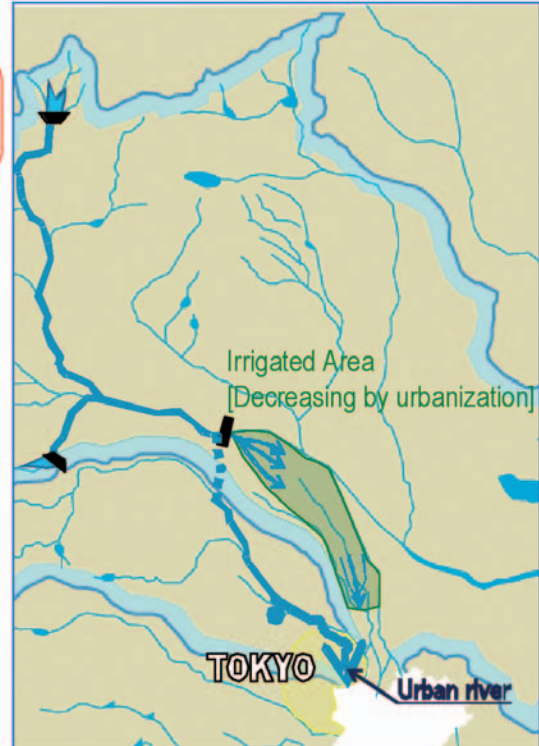
[ Attachment Materials ]

## Re-allocation of water by irrigation canal improvement

Conversion of irrigation water right to municipal use was planned.



Cost for improvement is paid by domestic water users.



☒ Lining to decrease seepage loss



☒ Constructing check gates in order to raise the water level in the canal.



Fig. 5.9.6 Re-allocation of water by canal improvement

## 5.10 VOLTA RIVER (BENIN, BURKINA FASO, CÔTE D'IVOIRE, GHANA, MALI, AND TOGO)

### 5.10.1 Case Story (Volta River)

Facts	Ref. to KFS
<p data-bbox="169 439 368 470"><b>1. Introduction</b></p> <p data-bbox="169 506 1222 712">The Volta River Basin, which covers an estimated area of 400,000 sq. kilometers of the sub-humid to arid West-African savannah zone, is shared by six countries, namely: Benin, Burkina Faso, Ghana, Mali, Côte d'Ivoire, and Togo. The climate of the basin ranges from arid in the far north of Burkina Faso (mean precipitation &lt;500 mm/yr), to semi-arid in the middle part of Burkina Faso (~700 mm/yr) to sub-humid in southern Ghana (up to 1500 mm/y).</p> <div data-bbox="504 730 1008 1413" style="text-align: center;"> </div> <p data-bbox="352 1440 1074 1471"><b>Fig. 5.10.1</b> Map of Volta Basin showing political boundaries</p> <p data-bbox="169 1507 1222 2056">The International Union for Conservation of Nature (IUCN) has since 2004 been implementing the 'Volta Water Governance Project' commonly known by its French acronym PAGEV (<i>Projet d'Amélioration de la Gouvernance de l'Eau dans le Bassin de la Volta</i>) aimed at addressing some of the water management challenges in the basin. PAGEV is focusing more specifically on Burkina Faso and Ghana where 85 per cent of the basin surface area is located. The implementing agencies are: IUCN-PACO, Directorate General of Water Resources (DGRE) of Burkina Faso and Water Resources Commission (WRC) of Ghana. The project is funded by the Swedish International Development Cooperation Agency (Sida) and The Netherlands Directorate General for International Development Cooperation (DGIS), and benefits from substantial in-kind contributions from the governments of Ghana and Burkina as well as from the West Africa Water Partnership of the Global Water Partnership (GWP/WA). The first phase of the project (PAGEV-1) officially ended in September 2007, and the promising results realized motivated additional funding from Sida to enable IUCN to consolidate and extend these achievements in a 15-month transition period (October 2007 to December 2008) prior to a possible second phase.</p>	

Facts	Ref. to KFS
<p><b>2. Issues of Volta Basin</b></p> <p>The Volta River is a key socio-political resource linking people of varying cultures and backgrounds, and presenting opportunities for cooperation as well as many livelihood opportunities for the rapid development of the riparian countries of the basin. Like other shared basins in Africa, the Volta is confronted by a number of water management challenges including:</p> <ul style="list-style-type: none"> <li>• rapid population growth;</li> <li>• soil and land degradation;</li> <li>• extreme climate variability;</li> <li>• risks of conflicts resulting from diverging upstream-downstream interests; and</li> <li>• lack of mechanisms for public participation in decision making.</li> </ul> <p>Erratic climate variability and poor soil quality have forced the local communities to follow unsustainable development paths including farming on the river banks and setting of bushfires and deforestation, which have altered the key eco-hydrological processes of the river damaging its ecosystems and the services they provide.</p>	
<p><b>3. Strategic approach of PAGEV</b></p> <p>The IUCN/PAGEV strategies have focused on combining the long-term benefits of ecosystem conservation with immediate impacts on meeting the livelihood needs of marginalized communities, and are based on three key components, namely: the compilation of knowledge and decision-support information to support planning and decision making; community based IWRM actions to promote local participation in transboundary waters management; and improving institutional and legislative instruments to promote transboundary cooperation. IUCN/PAGEV facilitated the establishment of multi-stakeholder platforms at various levels in Burkina Faso and Ghana to win support for ecosystem restoration, including: the creation of village committees where communities worked together on riverbanks protection, and the establishment of national and local transboundary forums to resolve water use conflicts at the local level.</p>	
<p><b>4. Key outputs from the project implementation</b></p> <p><b>24 km of river banks reforested</b></p> <p>By the end of 2007, 175 farmers cultivating on the river banks in seven pilot villages in Burkina Faso and Ghana were motivated to reforest a 16 km stretch of the river banks by growing trees for fuel and fruits. In August 2008 some plants lost to flooding in 2007 were replaced, and 77 new farmers joined the project to reforest an additional 8 km of the river banks with mixed species of plants, including <i>Nauclea latifolia</i>, <i>Leucaena leucocephala</i>, <i>Parkinsonia</i>, <i>Acacia</i>, and grafted mangoes.</p> <div data-bbox="491 1668 871 1939" data-label="Image"> </div> <p><b>Fig.5.10.2</b> 3D view from IKONOS imagery</p>	<p>KFS 5.10.2 (2)</p>



Facts	Ref. to KFS
<p>In addition, alternative livelihood options are being explored with women as major beneficiaries. Twenty women and four men benefited from a small ruminants/ livestock rearing pilot initiated by NGOs with technical support of the officers from Livestock/Veterinary Services. Each beneficiary received a pair of sheep or goat parent stock in April 2008 for rearing, the proceeds of which would be paid into the group accounts to benefit other members of the river banks protection committee in subsequent years.</p> <p><b>Transboundary cooperation enhanced</b></p> <p>PAGEV is promoting effective participation of local communities in transboundary water governance through the platforms established for the operations of the stakeholders' forums. The river banks protection committee of each of the eight communities has nominated three representatives as the official spokespersons at the respective national forums. The national forums are providing platforms for the local communities to share their concerns with the heads of local authorities. A joint local transboundary committee has also evolved from the two national forums to coordinate joint activities across borders, solve any local level water use problems and disputes, and strengthen cooperation between the two countries. The local transboundary forum has developed and adopted statutes and conventions to guide their operations.</p>	<p>KFS 5.10.2 (1)</p>
<p><b>5. Key lessons</b></p> <ul style="list-style-type: none"> <li>• PAGEV implementation has helped to mobilize partnership with ministries, and decentralized local government agencies, NGOs and civil society. The joint activities have reinforced the cooperation and exchange of information between institutions in both countries, thus creating an enabling environment for transboundary water resources management.</li> <li>• Through education and public awareness, the local communities learn of the potential benefits to be derived from creating buffer zones on the banks of the Volta River and introduction of 'economic' trees, PAGEV has managed to convince the communities to give up part of the lands along the river banks on which they used to farm for the conservation of the river banks.</li> <li>• Communities are willing to participate in water and other natural resources conservation interventions when the outcomes of participation are clearly and directly linked to the improvement of their livelihoods. Conscious efforts must be made to integrate livelihood needs of communities into IWRM by including income-generation, safe water supply, and hygiene education in the water resources management interventions.</li> <li>• Strengthening of technical level cooperation could lead to an improvement in information-sharing (e.g. flood warning from operators of Bagré Dam) and provided the impetus to building trust.</li> </ul>	<p>KFS 5.10.2 (2)</p>
<p><b>6. Possible Future Directions</b></p> <ul style="list-style-type: none"> <li>• Presently, transboundary coordination of management of the Volta River Basin has evolved, and all six riparian states in the Volta Basin have signed protocols to form the Volta Basin Authority (VBA). IUCN/PAGEV will strengthen collaboration with VBA and other new initiatives (UNEP/GEF-Volta and Volta-Hycos projects) to ensure the replication of PAGEV experiences in other riparian states of the basin.</li> <li>• The linking of poverty alleviation to water and soil conservation has already influenced the operations of agricultural programmes in the basin. The creation of buffer zones initiated under PAGEV is being replicated by the Regional Directorates of Agriculture and other community based projects from the regions straddling the border between Burkina Faso and Ghana as part of support to communities to improve small-scale irrigation for food security. National ownership of the PAGEV interventions is thus assured with greater involvement of these technical structures.</li> </ul>	

[Report: Kwame Odame-Ababio (IUCN-PACO, Ouagadougou, Burkina Faso)]



### 5.10.2 Extracted Key for Success

#### (I) Extracted Key for Success from Volta River

Reference to 5.10.1 Case Story (Volta River)

<p><b>[ Title ]</b>  <b>Mobilizing stakeholders from the community, national and transboundary levels for shared waters management</b></p>
<p><b>[ Situation ]</b>  <b>The Volta River is a key socio-political resource linking people of varying cultures and backgrounds, presenting opportunities for cooperation as well as many livelihood opportunities for the rapid development of the riparian countries of the basin.</b></p> <p>The International Union for Conservation of Nature (IUCN) has since 2004 been implementing the ‘Volta Water Governance Project’ (PAGEV) aimed at addressing some of the water management challenges in the basin. PAGEV is focusing more specifically on Burkina Faso and Ghana where 85 per cent of the basin surface area is located. The implementing agencies are IUCN-PACO, Directorate General of Water Resources (DGRE) of Burkina Faso, and Water Resources Commission (WRC) of Ghana. The project is funded by the Swedish International Development Cooperation Agency (Sida) and The Netherlands Directorate General for International Development Cooperation (DGIS), and benefits from substantial in-kind contributions from the governments of Ghana and Burkina as well as from the West Africa Water Partnership of the Global Water Partnership (GWP/WA).</p>
<p><b>[ Problem ]</b>  <b>There were risks of conflicts resulting from diverging upstream-downstream interests, and lack of mechanisms for public participation in decision-making.</b></p>
<p><b>[ How the problem was overcome/addressed ]</b></p> <ul style="list-style-type: none"> <li>• Multi-stakeholder platforms were established at various levels, including village committees where communities worked together on river banks protection, and national and local transboundary forums to resolve water use conflicts at the local level.</li> <li>• Joint activities were enforced for corporation and exchange of information between institutions of each country.</li> <li>• Conscious efforts were made to integrate livelihood issues into the community-based actions to support income generation especially for women.</li> <li>• Cooperation was formalized through MOUs or collaborative agreements at all levels</li> </ul>
<p><b>[ The key ]</b>  <b>Established multi-stakeholder in which representatives of local communities were nominated by the spokesman at the national forums. Gender perspectives were also integrated in community actions by setting a concrete number of women as executive members and beneficiaries of the project.</b></p> <p>&gt;&gt; <b>[3.1.1] Prepare a framework for stakeholder participation to build consensus among stakeholders</b></p>
<p><b>[ Conditions and limitations in applying the KFS ]</b></p> <ul style="list-style-type: none"> <li>• Human and institutional capacities exist to implement the programmes.</li> <li>• Building trust among communities so that they co-exist peacefully (preventing ethnic conflict).</li> <li>• Climate remains stable (non-occurrence of extreme climate change and variability, drought and floods).</li> </ul>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b></p>

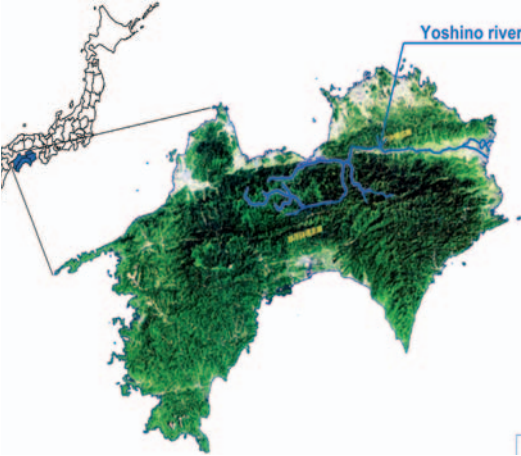

**(2) Extracted Key for Success from Volta River**



Reference to 5.10.1 Case Story (Volta River)


<p><b>[ Title ]</b>  <b>Causing motivation for ecosystem conservation</b></p>
<p><b>[ Situation ]</b>  For many years the basin remained one of the few transboundary river basins in Africa without formal legal and institutional arrangements to manage disputes, and spearhead prudent and sustainable utilisation of the water resources in the basin. Limited consultation and coordination between Burkina Faso and Ghana (the two main riparian countries) combined with uncoordinated policies and development initiatives were serious threats to the sustainable management of the Volta River Basin.</p> <p>From mid-2004, IUCN initiated the three-year ‘Project for Improving Water Governance in the Volta Basin’ (commonly referred to as PAGEV) in response to the need for transboundary coordination and cooperation regarding the management of the water resources of the Volta Basin. PAGEV is part of the worldwide Water and Nature Initiative (WANI) that seeks to demonstrate how to mainstream the ecosystem approach into river basin planning and management. The project is developed and executed jointly by IUCN/BRAO and GWP/WA and involves two countries in the Volta Basin, Burkina Faso and Ghana who together share nearly 85 per cent of the basin area.</p>
<p><b>[ Problem ]</b>  The basin is shared by six countries that share rapid population growth, soil and land degradation, and extreme climate variability. They forged unsustainable development paths such as farming on the river banks, setting of bushfires, and deforestation.</p>
<p><b>[ How the problem was overcome/addressed ]</b></p> <ul style="list-style-type: none"> <li>• There was a focus on combining the long-term benefits of ecosystem conservation with immediate impacts on meeting the livelihood needs of marginalized communities such as income-generation, water supply and hygiene education in the water resources management.</li> <li>• Through education and public awareness, local communities learned of the potential benefits to be derived from creating buffer zones on the banks of the Volta River, and with the introduction of ‘economic’ trees, PAGEV has convinced the communities to give up part of the lands along the river banks which they used for farming for the conservation of the river banks.</li> <li>• Targeted skills training was conducted such as soil fertility improvement, trees management, and the construction of improved local stoves.</li> </ul>
<p><b>[ The key ]</b>  <b>Conscious efforts must be made to integrate livelihood needs of communities into IWRM by including income generation, safe water supply and hygiene education in the water resources management interventions.</b>  &gt;&gt; <b>[3.2.6] Acting as the representative of the environmental sector.</b></p> <p><b>Promote hygiene education in water resources management interventions and women’s participation in local communities, together with reducing water collecting chores for women and children by providing small facilities for safe water supplies.</b>  &gt;&gt; <b>[1.3.3] Introduce educational activities on water and IWRM, focusing particularly on women and children.</b></p>
<p><b>[ Conditions and limitations in applying the KFS ]</b>  Limited/poor commitment to protect plants, monitor and enforce regulatory measures.</p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b></p>

## 5.1 I YOSHINO RIVER (JAPAN)

### 5.1 I.1 Case Story (Yoshino River)

Facts	Ref. to KFS
<p><b>I. Introduction</b></p> <p>In 1945, after World War II, Japan lost 25 per cent of its social capital and there was an urgent need for counter measures to beat inflation and combat the low unemployment rate. There was also a serious need to secure food, to rehabilitate land, and to secure electricity. The situation was the same in Shikoku region (Fig. 5.1 I.1). In September, it was hit by a massive typhoon and in December of the following year a severe earthquake struck. Japan therefore desperately sought a solution to recover from both WWII and the natural catastrophes. Flood control was required for land rehabilitation, and agricultural and domestic water was needed for food production and urbanization. Hydropower generation was also needed to avoid the risk of electricity shortages. The Yoshino River Comprehensive Development was called upon in order to resolve these problems, and because the river is one of the largest in Shikoku.</p> <p>The Ministry of Construction (MOC, now reformed to Ministry of Land, Infrastructure, Transport and Tourism, MLIT) surveyed the river for the purpose of flood control, as did the Ministry of Agriculture, Fishery and Forestry (MAFF) for agricultural water; prefectures in Shikoku for domestic supply; the Ministry of International Trade and Industry (MITI, now reformed to Ministry of Economy, Trade and Industry) for industrial water; and electricity companies for hydropower generation. However, they tended to formulate plans to suit their own needs. The four prefectures in Shikoku (Fig. 5.1 I.2), namely Kagawa, Tokushima, Ehime and Kochi, also conducted surveys of the river and formulated their own individual plans.</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p><b>Fig. 5.1 I.1</b> Map of Shikoku</p> </div> <div style="text-align: center;">  <p><b>Fig. 5.1 I.2</b> Prefectures in Shikoku</p> </div> </div>	

Facts	Ref. to KFS
<p><b>2. Initial Plan</b></p> <p>In 1950, the Initial Plan (Fig. 5.11.3) was released to the public by the Economic Stabilization Agency (now re-titled the Economic Planning Agency, also linked to the Cabinet Office). This plan is based on work carried out by the electricity companies, which took into consideration the plans of other sectors. This was meaningful because Sameura Dam was to be integrated into the plan and the plan was, with the wisdom of hindsight, the prototype of the Yoshino River Comprehensive Development Project (YCDP). However, all the dams set in the plan were mainly designated for hydropower generation, and water use, including agricultural and urban water was as a consequence relegated to second after hydropower generation. In this plan, the reliability of water use was dependent on the hydropower-generating scheme. This plan was therefore rejected by the water use sectors.</p>  <p><b>Fig. 5.11.3</b> Initial Plan</p>	
<p><b>3. The Second Plan</b></p> <p>In 1951, the Economic Stabilization Agency released the Second Plan of YCDP (Fig. 5.11.4). It is a trial plan from the point of view of technical feasibility. In the plan, Sameura Dam was set up as a multi-purpose dam whose purpose included flood control, urban and agricultural water distribution, and hydropower generation. It also included the construction of several dams and diversion pipelines for hydropower generation. The diverted water was destined for use as agricultural and urban water following electricity generation.</p>  <p><b>Fig. 5.11.4</b> The Second Plan</p>	

Facts	Ref. to KFS
<p>Ehime and Kagawa prefecture agreed with the plan because they needed to divert water from the Yoshino River, but Tokushima prefecture, which is located downstream of Yoshino River and seemingly affected by the diversion, was against the plan. Kochi prefecture was neither 100 per cent against the plan nor necessarily behind the plan. As the prefectures were still suffering from severe financial crises, there was still a long way to go to reach consensus.</p>	
<p><b>4. Agreement to the basic data of hydrologic balance</b></p> <p>In 1958, the Shikoku regional bureau of MOC organized a workshop so as to agree with the basic data of hydrologic balance in the basin as a whole. In the workshop, all the data observed by each sector as well as the correlation between data, were analyzed. As a consequence, in 1959, the 'basic flow data for YCDP' was agreed by all the stakeholders and released to the public. Thus the basic data, as a means of conflict resolution, was established.</p>	<p>KFS-5.11.2 (1)</p> <p>KFS-5.11.2 (2)</p>
<p><b>5. Shikoku Comprehensive Development Council</b></p> <p>In 1960, the Shikoku Regional Development Promotion Law was enacted and the council, based on the law the Shikoku Comprehensive Development Council was founded. The council was composed of members of Parliament, central government representatives, prefectural governors, and academic experts. The council shared the basic vision of 'co-operative competition', which convinced four prefectures to cooperate towards comprehensive development and at the same time jointly compete with other developing regions in order to move forward. Therefore, from the point of view of promoting comprehensive resources in the region including water resources development especially the Yoshino River, the plan was discussed within this framework. This enhanced the discussion among the prefectures and opened up the possibility of reaching consensus for YCDP.</p> <p>The working group was to be set up at the first meeting. It was composed of prefecture members, regional bureaus, and electric power companies. Its purpose was to examine and share the basic data for the plan, to clearly define the plan, and to build consensus among members. Discussion in this working group proceeded in parallel with discussion in the council and this enhanced the coordination.</p> <p>Coordination for cost allocation also proceeded. The reimbursement scheme, in which the project implementation unit, in this case the Water Resources Development Public Corporation (WARDEC, and now reformed to Japan Water Agency (JWA)), pays the initial (construction) cost in advance by using revenue bonds, while the water supplier pays afterwards (after the supplier receives the payments by water users), was adopted by the YCDP, and in order to reduce the initial cost burden for each prefecture. Furthermore, the new method of cost allocation, such as the Separable Cost Remaining Benefit (SCRB) Method, was also adopted.</p> <p>As a consequence of this strict coordination, in 1966 the YCDP reached an agreement and in 1975 the construction of Sameura Dam, Ikeda Dam, and Kagawa canal was completed.</p>  <p><b>Fig. 5.11.5 The Final Plan</b></p>	

## Facts

## Ref. to KFS



Photo 5.11.1 Sameura Dam

### 6. After Completion of YCDP

The Yoshino River Comprehensive Development Project was completed in 1975, and moved on to the next stage of operation and management of the facility. Coordination in time of extraordinary droughts did not appear successful due to the long and confused coordination process in the agreement. At Dozan river basin, which is a sub-basin of the Yoshino River, the Shingu Dam and diversion pipeline were also completed as one of the components of YCDP. At the same time, the route of the maintenance flow to Yoshino River, which had traditionally been supplied from the Dozan river basin, was changed from Sameura Dam and therefore no maintenance flow was secured downstream of Shingu Dam (see Fig. 5.11.6).

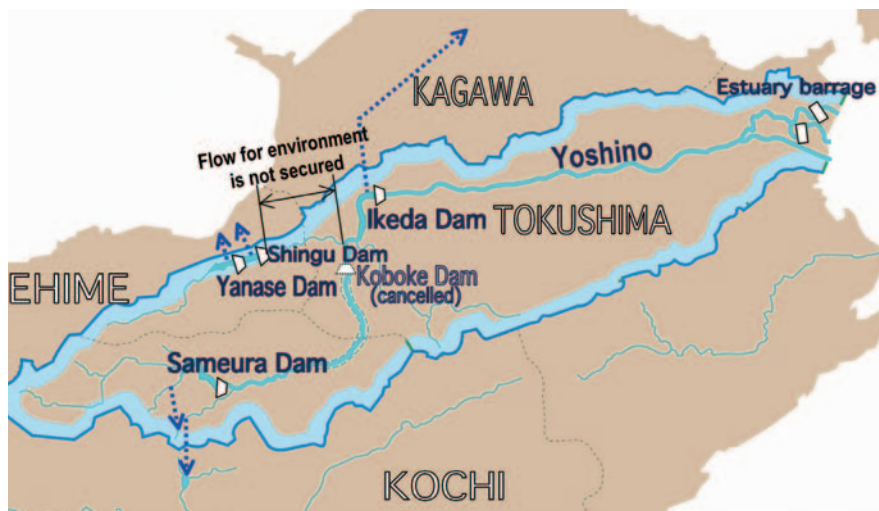


Fig. 5.11.6 Arrangement of facilities in 1975

**7. Conciliation Council for Water Use in the Yoshino River**

As the specifications of facilities in the YCDP was decided in terms of economic efficiency, there is a limit to its potential and it cannot cover all unexpected climate conditions. Hence, even before the completion of YCDP, it was recognized among stakeholders that there was a lack of knowledge among the users and that water was a finite resource requiring counter measures against extraordinary drought.

In March 1975, before the completion of YCDP, the 'Conciliation Council for Water Use in the Yoshino River' was set-up by the regional bureaus of central government, prefectures, electric companies, and other stakeholders. In the council, efficient water use in each sector was discussed. Sharing information and opinions among stakeholders were also included as important principles.

By virtue of creating a mechanism for discussion among stakeholders, a relationship built on trust among stakeholders was created. This had a positive influence on drought conciliation. In concrete terms, an agreement on the water use scheme to be applied during droughts was smoothly implemented in advance of the drought.

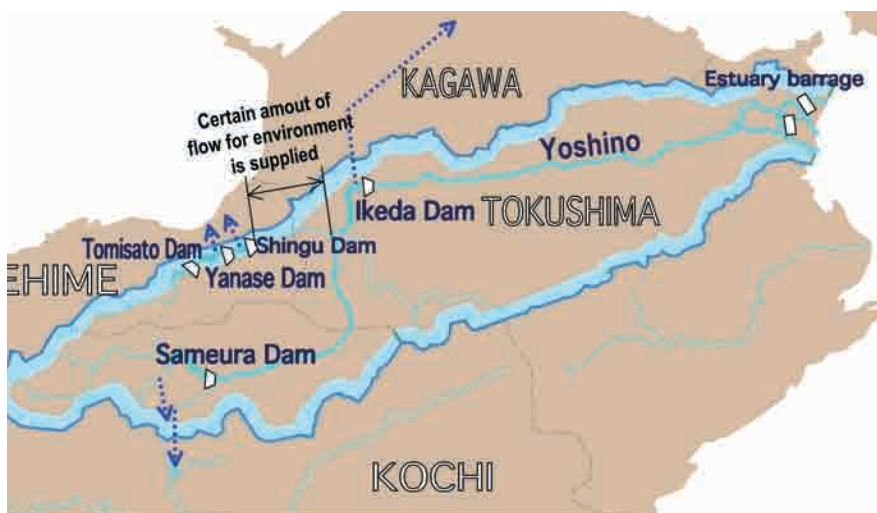
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**8. Completion of Tomisato Dam and supply of flow for the environment**

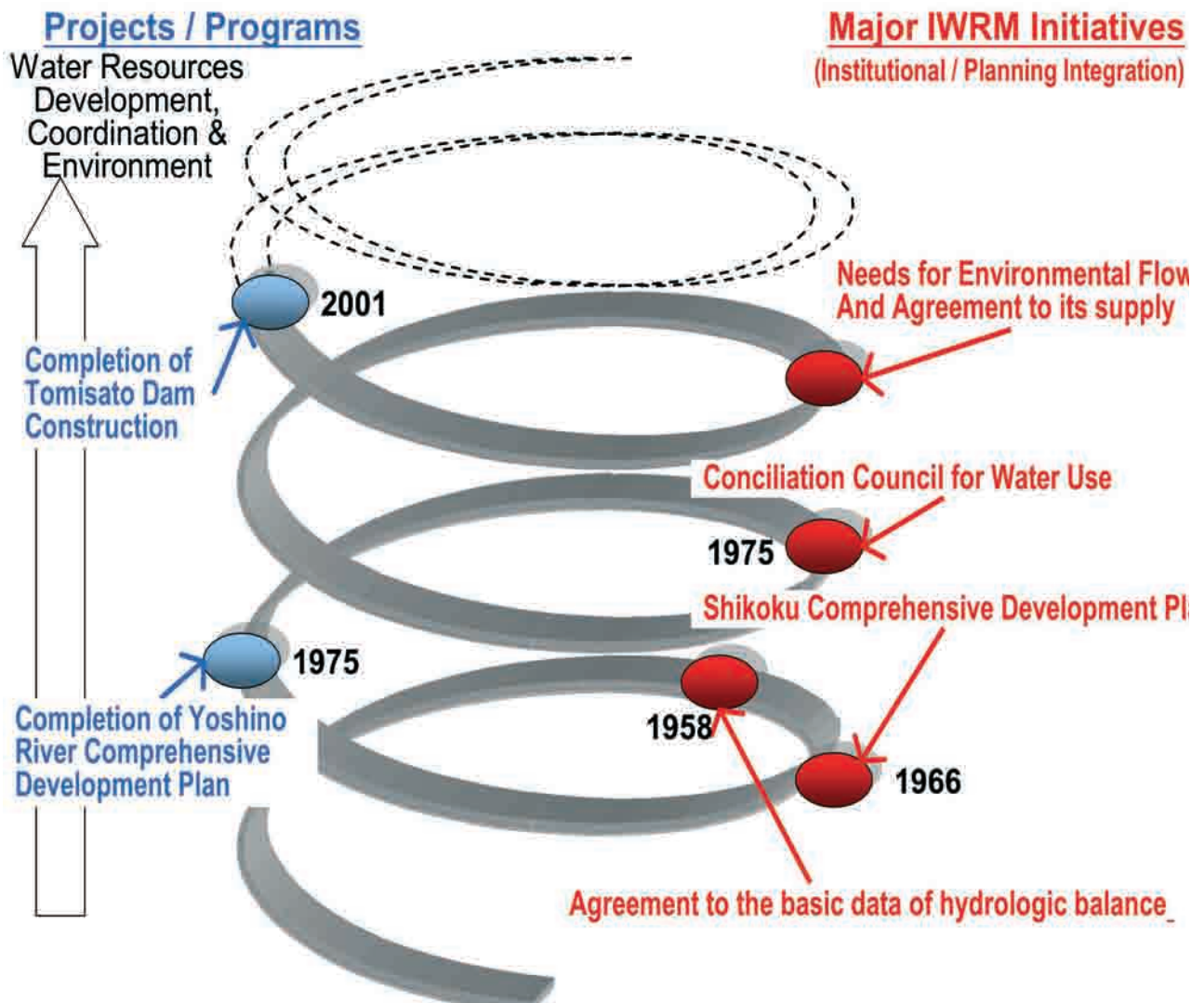
At Dozan river basin, which is a sub-basin of the Yoshino river, Shingu Dam and diversion pipeline were also completed as one of the components of YCDP. At the same time, maintenance flow supplied from Dozan river basin to Yoshino river was changed in order to have the water transferred from Sameura Dam, therefore maintenance flow was not secured downstream of the Shingu Dam. Riparian residents downstream of Shingu Dam required maintenance flow supply after completion of YCDP.

Tomisato Dam was completed in 2001, since then a certain amount of the environment flow was discharged from Shingu Dam. This was carried out because the hydropower generation company provided a quantity of water to riparian residents as flow for the environment. However, the maintenance flow was not yet secured so the riparian residents still suffered a shortage of the required quantity of water.

KFS-5.11.2(4)



**Fig. 5.11.7** Arrangement of facilities after completion of Tomisato Dam



**Fig. 5.11.8** IWRM spiral of Yoshino River

[Interviewee: Tomonobu Abe, Toshiyuki Hayash (Yoshino river bureau, JWA)]  
 [Interviewer: Toshiyuki Yoshioka, Yasuhiro Ochii, Makoto Nagasawa, Koichi Takano (Japan Water Agency)]

[Report: Shinsuke Ota (Co-chair of the steering committee), Toshiyuki Yoshioka, Yasuhiro Ochii, Makoto Nagasawa, Tomonobu Abe, Toshiyuki Hayashi, and Koichi Takano (Japan Water Agency)]



## 5.11.2 Extracted Key for Success

### (1) Extracted Key for Success from Yoshino River

Reference to 5.11.1 Case Story (Yoshino River)

<b>[ Title ]</b> <b>Formulating the water budget for an integrated plan</b>
<b>[ Situation ]</b> <b>Though each sector proposed a plan that considered their own interests, coordination for a multi-purpose and basin-wide plan stalled</b> In the Yoshino river basin there were at first plans to construct hydropower generation dams. Other sectors began formulating plans afterward for their own purposes. Prefectures in Shikoku were also formulating plans and although ideas for the Yoshino River Comprehensive Development were proposed, the parties persisted with their opinion and an agreement was not reached.
<b>[ Problem ]</b> <b>Each sector had determined its basic data for the plan, which was based on their respective data</b> Each sector had respectively implemented water flow observation though the method differed depending on the various purposes, i.e. observation of daily average flow for the purpose of constructing hydropower generation dam, and that of hourly flow data for flood control. Therefore, plans based on their own data were not understood by other sectors.
<b>[ How the problems were overcome ]</b> <b>Each sector recognized that discussion would fail without first sharing common data sets</b> In 1958, Shikoku Regional Bureau of Ministry of Construction was separated from Chugoku-Shikoku Regional Bureau. It proposed that all sectors collect data and conduct analysis and extrapolation of the data in order to balance water budgets in the basin.  Recognizing that their plans wouldn't be understood by other sectors if the data used were inconsistent, all the sectors accepted to work together towards data unification. As a result, the 'basic flow data for YCDP' was released to the public. During this process, coordination for comprehensive development wasn't carried out but this co-work was meaningful in that it represented the beginnings of coordination.
<b>[ The Key ]</b> <b>The proposal by Shikoku Regional Bureau of Ministry of Construction to work out common data sets and to recognize the importance of all stakeholders ensured that all parties participated in the process, which paved the way for further coordination in YCDP.</b> <b>&gt;&gt;[1.2.1] Identify potential priority areas (critical locations and key issues) for IWRM implementation in the basin.</b> <b>&gt;&gt;[1.3.1] Proactively disclose information as it is a fundamental activity in IWRM.</b>
<b>[ Conditions and limitations in applying the KFS ]</b>
<b>[ Ideas for enhancing the applicability of the KFS ]</b>

[ Attachment Materials ]

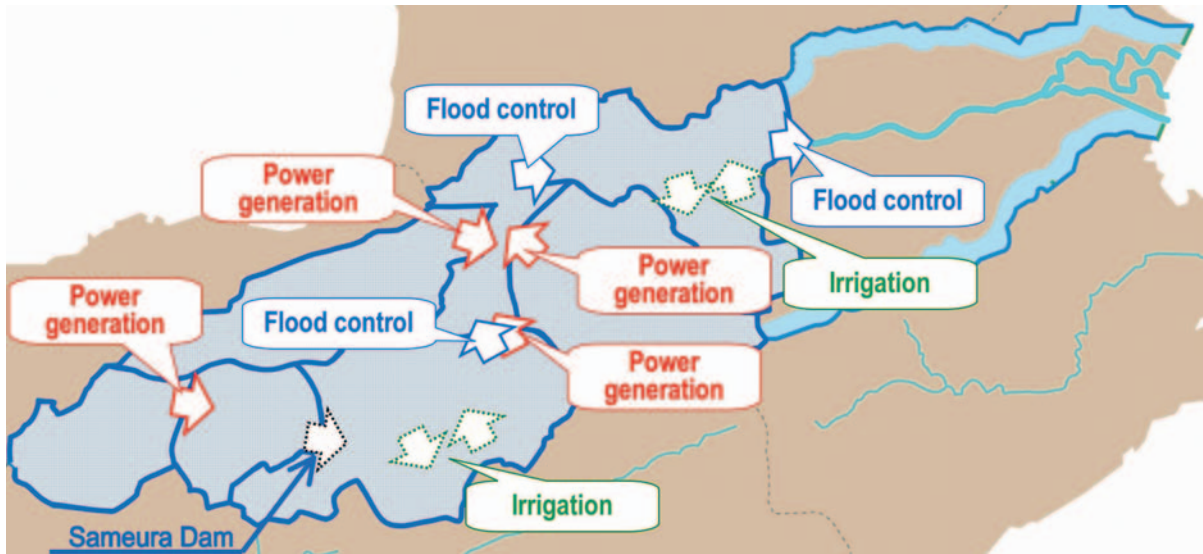


Fig. 5.11.9 Collected data of discharge observation points for an understanding of the hydrological balance

## (2) Extracted Key for Success from Yoshino River

Reference to 5.11.1 Case Story (Yoshino River)

<p><b>[ Title ]</b> <b>Practical coordination mechanism by working group</b></p>
<p><b>[ Situation ]</b> <b>All sectors were preparing to coordinate with each other to formulate the river basin management plan</b></p> <p>Whole regions in Shikoku were still under developed and each prefecture on Shikoku Island was formulating the basin management plan based only on their own concerns and initially did not attempt to coordinate with the others. The river basin management plan should be formulated in a cooperative manner for mutual economic prosperity by utilizing resources in the entire region.</p>
<p><b>[ Problem ]</b> <b>Coordination didn't proceed due to the uncooperative attitude of sectors</b></p> <p>The initial plan of 1950 was released to the public by central government. This is based on the plan made by electricity companies that took into consideration other sectors' plans. All the dams proposed in the plan were principally planned for hydropower generation and water use, including agricultural and urban water, consequently came second. As a result, this plan was not agreed by the water use sectors and was considered a missed opportunity. In 1955, a second plan was released. It was a trial plan from the viewpoint of technical feasibility so an agreement was not reached.</p>
<p><b>[ How the problems were overcome ]</b> <b>Credibility was produced by working out the plan with all stakeholders.</b></p> <p>In 1960, Shikoku Regional Development Promotion Law was enacted based on the law and the council called 'Shikoku Comprehensive Development Council' was founded. From the viewpoint of promoting comprehensive resources development in the region, water resources development plan - especially for the Yoshino river - was discussed in this framework with social fairness.</p> <p>The working group was set up for drafting. It was composed of members of prefectures, regional bureaus and electric power companies. The purpose was to examine and share the basic data for the plan, to work out the plan and through building consensus among members. Co-work by the members, who actually represented their organization, facilitated substantial coordination.</p>
<p><b>[ The Key ]</b> <b>As a framework for discussion, a council, together with the third party, created a top-down system based on the law. At the same time, and in order to shape the discussion, a working group composed of representatives of users organizations was set up. Coordination within the working group, which was a bottom-up activity, led to an agreement being reached.</b></p> <p>&gt;&gt; [3.1.1] Prepare a framework for stakeholder participation in order to build consensus among stakeholders.</p>
<p><b>[ Conditions and limitations in applying the KFS ]</b> <b>Establishing a working group as well as consensual agreement on the basic data is a necessity</b></p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b></p>

[ Attachment Materials ]

## Shikoku Comprehensive Development Council

Based on Shikoku Regional Development Promotion Law

Purpose; To promote regional comprehensive development of Shikoku from the viewpoint of infrastructure, natural resources (including water resources)

Stipulates; Establishment of Comprehensive Development Plan including Yoshino river Comprehensive Development Plan (YCDP)

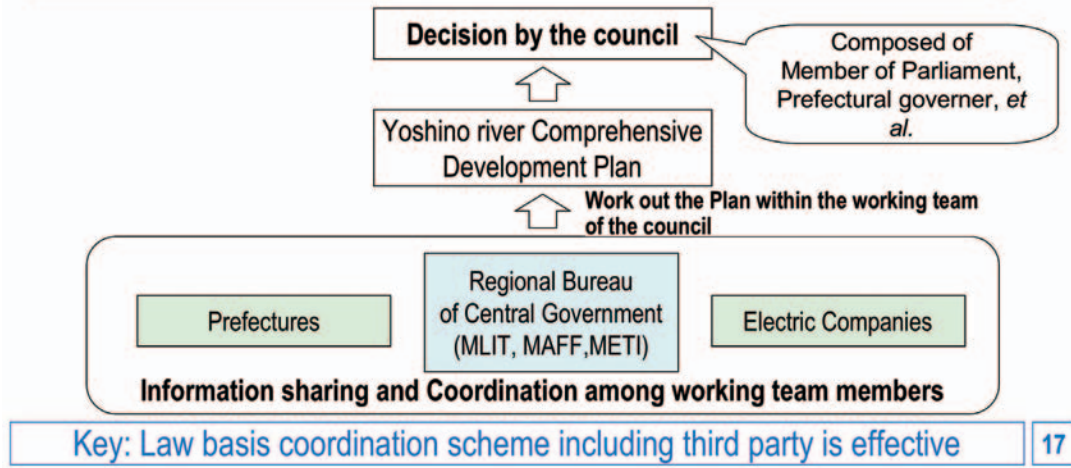


Fig. 5.11.10 Shikoku Comprehensive Development Council

### (3) Extracted Key for Success from Yoshino River

Reference to 5.11.1 Case Story (Yoshino River)

<p><b>[ Title ]</b> <b>Creating a mechanism for drought conciliation</b></p>
<p><b>[ Situation ]</b> <b>The river comprehensive development project was finally completed after a long heated debate among the regions</b> The Yoshino River Comprehensive Development Project was completed in 1975. Consequently, the next stage of operating and managing the facility was reached.</p>
<p><b>[ Problem ]</b> <b>Coordination in time of extraordinary drought was inefficient due to the protracted and confused coordination process outlined in the agreement</b> As the specifications of facilities in the YCDP was decided in terms of economic efficiency, there is a limit to its potential and it cannot cover all unexpected climate conditions. Hence, even before the completion of YCDP, it was recognized among stakeholders that there was a lack of knowledge among the users and that water was a finite resource requiring counter measures against extraordinary drought.</p>
<p><b>[ How the problems were overcome ]</b> <b>Credibility was raised by creating a mechanism that allowed stakeholders to discuss water use while ensuring accountability</b> In March 1975, before completion of the YCDP, the 'Conciliation Council for Water Use in the Yoshino River' was set-up based on the necessity to prepare stakeholders for unexpected droughts. In the council, water and its effective use by each sector was discussed regularly. Sharing information and opinions among stakeholders raised credibility and resulted in coordinated drought conciliation. In times of drought, the council meets more frequently and coordinated and appropriate drought conciliation measures are introduced as the drought situation worsens.</p>
<p><b>[ The Key ]</b> <b>Stakeholders recognized the importance of maintaining good relationships particularly as the region had suffered severe water shortages. The YCDP coordination process led to the creation of the council and well-organized drought conciliation</b> &gt;&gt; [1.1.2] Consider a significant change in the basin as a chance to move IWRM forward, and recognize and understand such changes as early as possible. &gt;&gt; [3.2.4] Consider ways, including policy interventions, to secure water supply during extreme events. &gt;&gt; [4.1.2] Keep the coordination scheme for planning and share information among stakeholders.</p>
<p><b>[ Conditions and limitations in applying the KFS ]</b> <b>All the sectors recognize the characteristics of the area, which calls for tremendous effort if they fail to coordinate during severe droughts</b></p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b> <b>Drought conciliation rule should be discussed before the onset of drought</b> 1. Agreement to drought conciliation rule in advance.</p>

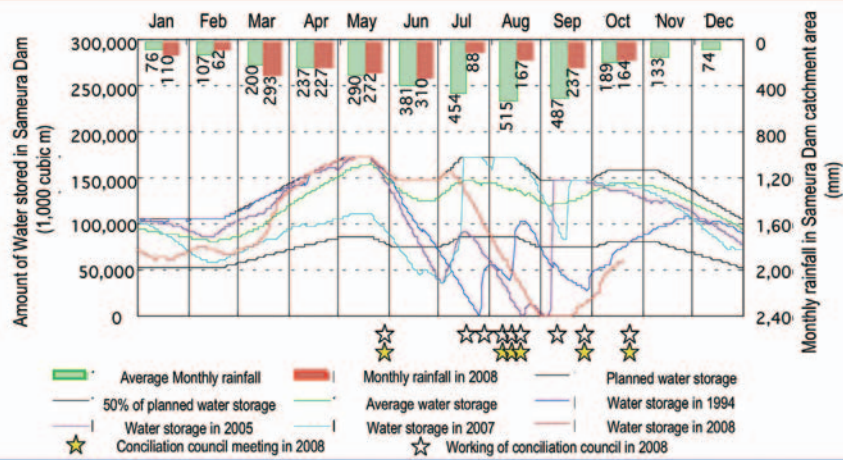
[ Attachment Materials ]

## Creation of mechanism for drought conciliation

Conciliation Council for Water Use in the Yoshino River

Purpose; To discuss comprehensive water use

Stipulates; Information sharing among all the water users and a river administrator  
Drought conciliation in case of droughts



Key : Continuous information sharing among stakeholders is necessary

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Fig. 5.11.11 Conciliation Council for Water Use in the Yoshino River

<p><b>[ Title ]</b>  <b>Securing flow for the environment so as to improve IWRM in the next stage</b></p>
<p><b>[ Situation ]</b>  <b>The maximum level of water was diverted according to the river comprehensive development project</b>          At Dozan river basin, which is a sub-basin of the Yoshino River, Shingu Dam and diversion pipeline were completed as components of YCDP. At the same time, the route of maintenance flow to Yoshino River, which had traditionally been supplied from the Dozan river basin, was changed from Sameura Dam and therefore no maintenance flow was secured downstream of Shingu Dam.</p>
<p><b>[ Problem ]</b>  <b>Riparian residents in downstream felt dissatisfaction with the project</b>          Since no maintenance flow was secured downstream of Shingu Dam, riparian residents downstream were unable to obtain the required maintenance flow after completion of YCDP.</p>
<p><b>[ How the problems were overcome ]</b>  <b>Discretion was given to downstream riparian residents by supplying them with flow for the environment as a result of a project compromise</b>          Through coordination of the Tomisato Dam, the hydropower generation company offered a certain amount of water to riparian residents as flow for the environment, which was agreed by the stakeholders. Tomisato Dam was completed in 2001 and from that time onwards an agreed amount of flow for the environment has been discharged from Shingu Dam.</p>
<p><b>[ The Key ]</b>  <b>The management body of the YCDP recognized that counter measures were needed by society for environmental conservation. It also reviewed the ‘abandoned’ measures in the YCDP in keeping with the changing times. By deciding to supply water for the environment based on this recognition, YCDP improved coordination in the construction of the next facility, the Tomisato Dam</b>          &gt;&gt; [1.2.1] Identify potential priority areas (critical locations and key issues) for IWRM implementation in the basin.          &gt;&gt; [4.2.3] Examine evaluation results and identify/analyze changes occurring in the basin through broad and long-term perspectives at each turning point of the IWRM process. Translate it into a driving force to improve IWRM into the next stage.</p>
<p><b>[ Conditions and limitations in applying the KFS ]</b>  <b>Project compromise by the project implementation body was necessary for mediation</b>          1. To reach an agreement with the stakeholders, who were dissatisfied with the former agreement, the project implementation body needed to concede benefits to the stakeholder even if they lose out on their considerable advantages.          2. The compromise should be acceptable to the project implementation body.</p>
<p><b>[ Ideas for enhancing the applicability of the KFS ]</b></p>

Attachment Materials ]



Fig. 5.11.12 Arrangement of facilities in 1975 (after completion of YCDP)



Fig. 5.11.13 Arrangement of facilities after completion of the Tomisato Dam



# 6. Useful Tools for implementing IWRM

Useful Tools provide useful ideas/information for explaining or understanding complex issues that one might face during IWRM implementation. Good utilization of these tools will allow for the effective and efficient implementation of IWRM.

## 6.1 PENTAGRAM

The pentagram is a useful tool for comparing alternative plans. The five axes represent the indices to be compared and the evaluation results are plotted on the axis. The plotted points are then connected to create a pentagram. If there are six indices then it will become a hexagram. You can set the number of indices as appropriate for your needs. The better balanced and larger the created diagram, the better the proposed plan.

A pentagram can be created as follows:

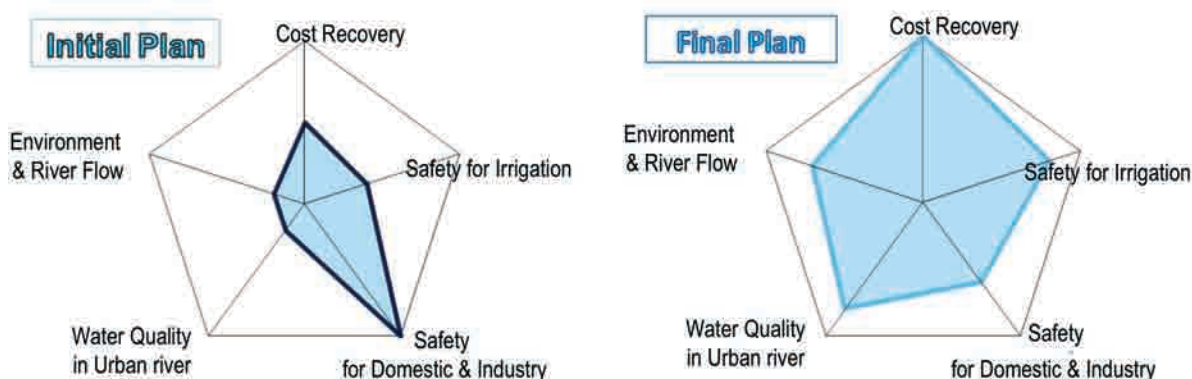
1. Create a regular polygonal shape with  $n$  vertices.
2. Connect each of the vertices with the centre point of the polygon (referred to as axes hereafter).
3. Label each axis with an evaluation index.
4. Plot on the axes the evaluation results for each index. The vertex point is the perfect score while

the worst score is located in the centre of the polygon.

5. Connect the plotted points on the axes by straight lines and create a polygon with  $n$  vertices.
6. Complete the pentagram by colouring the inside of the polygon.
7. Create a pentagram for each of the plans.

The selection of evaluation indices and the scale on the axis are important in creating and using a pentagram. The evaluation indices should be able to represent the extent to which the problems can be solved by implementing the proposed plan. They also represent the levels of stakeholder satisfaction. However, the interests of one stakeholder/sector do not have to be represented by only one index. An issue of large influence or a stakeholder related to multiple issues may be represented by multiple indices. This can be adjusted as appropriate to the situation.

One thing should not be forgotten; the scale set for each of the indices must be comparable or must possess the same level of importance. Otherwise the pentagrams cannot be compared from the 'well-balanced' standpoint.



■ Fig. 6.1 Pentagram

## 6.2 VISUALIZATION

### 6.2.1 Water-use status and ‘high-stress areas’

When the water resources and the water-use status in the basin are to be assessed under Phase I: ‘Recognizing & identifying’, visualization of basin situation can be useful in determining high-stress areas or important locations to be addressed in allocation and coordination of water resources.



Fig. 6.2 Visualization of State of Water Use

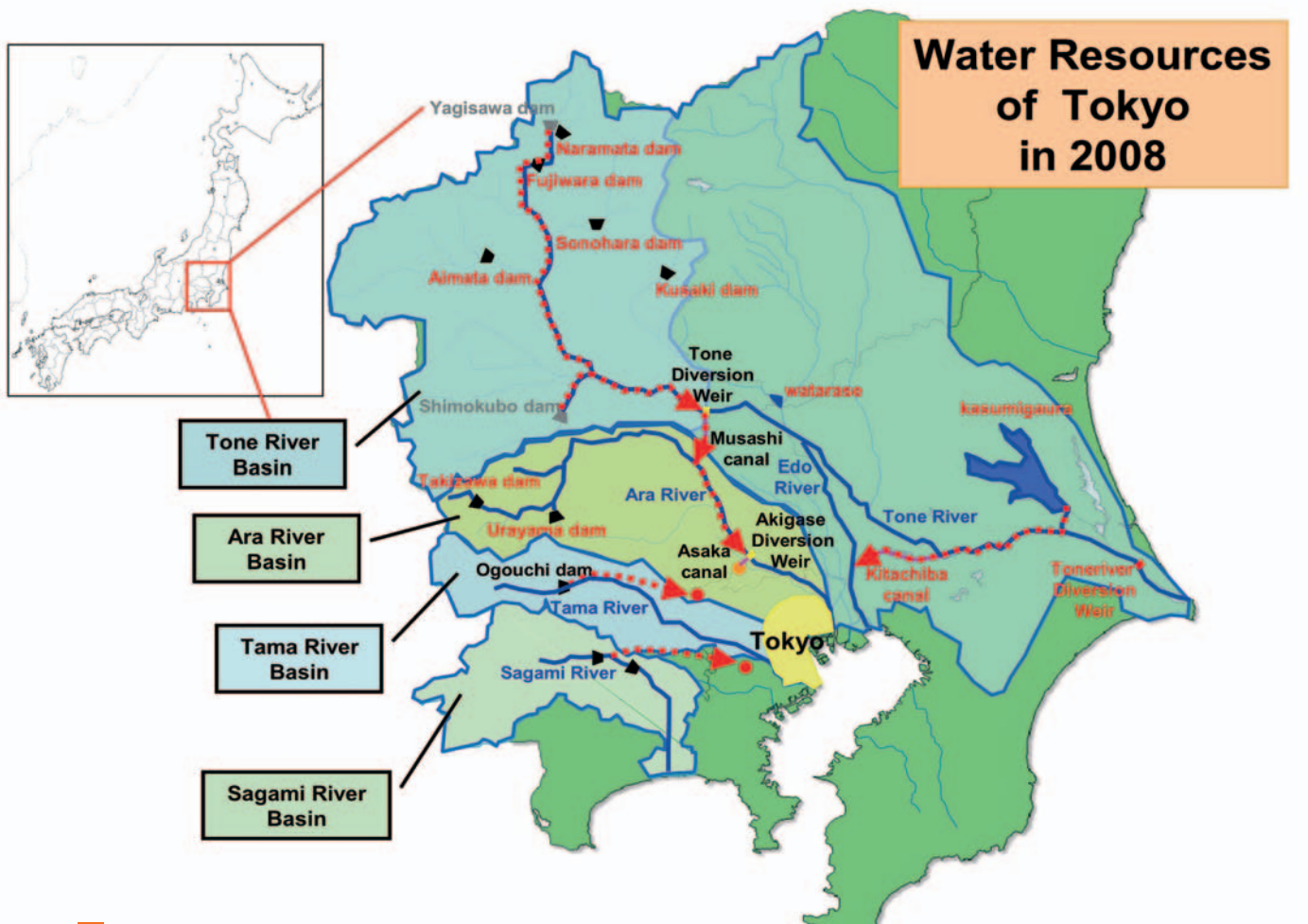


Fig. 6.3 Visualization of ‘High Stress Area’

### 6.2.2. Sectors' budget conditions

One of the important conditions for sectors to consider when participating in a project is their financial condition. If the managers in charge of coordinating an IWRM project are aware of the financial conditions of the sectors involved when preparing the project implementation plan, this can greatly facilitate the coordination process.

Fig.6.4 shows the annual budget situation of a particular sector. This sector is already participating in Project A and Project B, the costs of which have already been defined up to Year 3 (3). When the coordinator proposes Project C it would be in the interest of the sectors to know when the project begins or when the payment of project costs will begin. It is easy to see from Fig 6.4 that the sector is very unlikely to have the capacity to make payments in Year 1 (1), but this will be more likely from Year 2 (2).

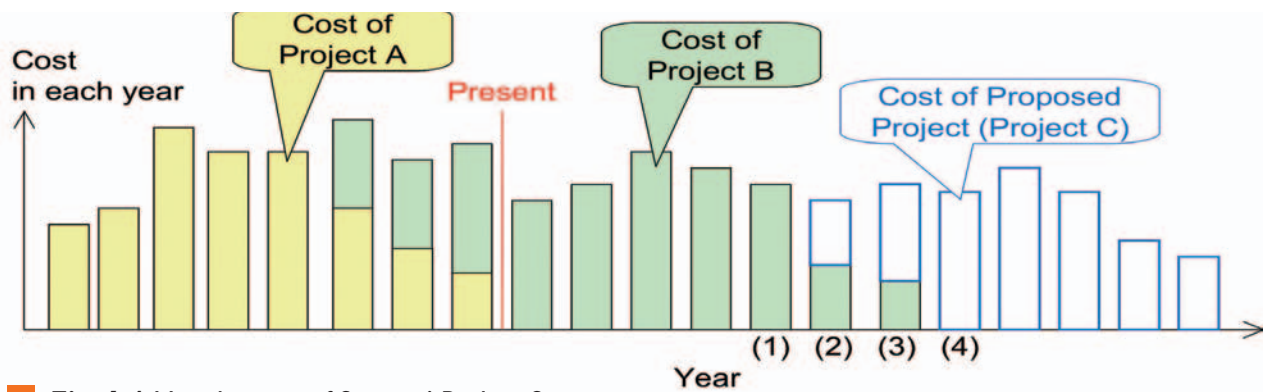


Fig. 6.4 Visualization of Sectors' Budget Situation

### 6.2.3. Planning framework

In water resources development, a master plan is generally developed before individual projects are

planned and implemented. It is useful to visualize such planning frameworks and flows in order to better understand the overall frame and structure of water resources development.

## Shikoku Comprehensive Development Council

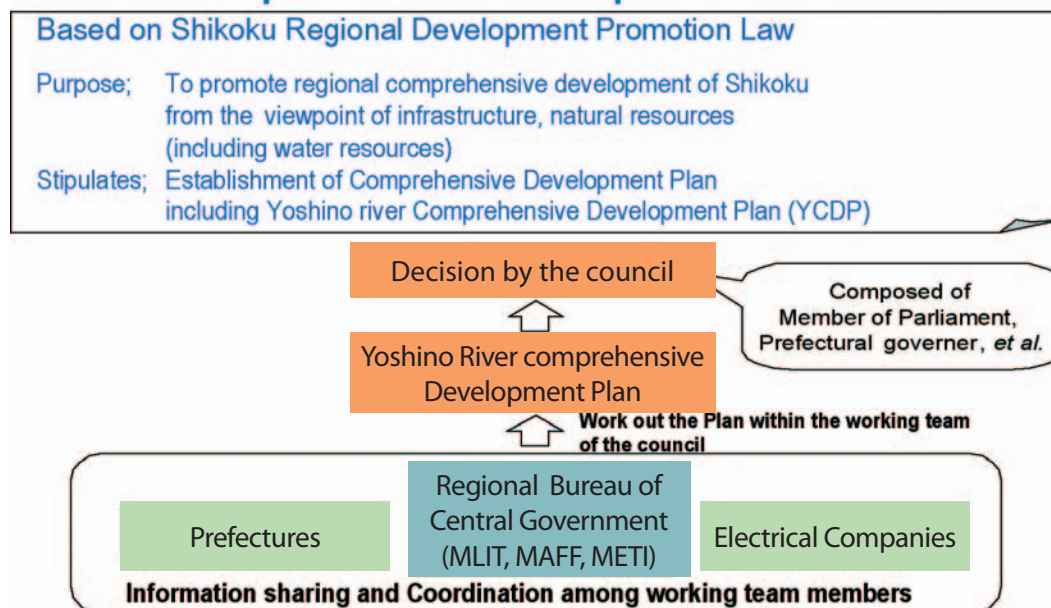


Fig. 6.5 Visualization of Framework of Planning

### 6.3 COST ALLOCATION METHOD

When a multi-purpose infrastructure development is jointly implemented, the cost allocation among sectors must be agreed upon. Generally sectors are divided into the groups that have the same purpose, and a cost is allocated to each of the purposes. If a sector has multiple purposes that sector is included in each of the relevant purpose groups.

There are various methods for allocating costs for individual purposes, such as total amounts of water allocated, and the separable cost remaining benefit method, which considers the level of commitment for each purpose. In Japan, the separable cost remaining benefit method is used with additional improvements.

The separable cost remaining benefit method considers the minimum cost to be covered by the purpose groups and the remaining costs separately. The minimum cost to be covered by a purpose group is determined by the additional cost induced by adding that purpose to the project purposes (separable costs). The remaining cost (non-separable cost) is allocated among the purpose groups in the following manner:

- Determine for each purpose group the cost of implementing the project individually (provisionally estimated cost) and the justifiable investment amount, and select the lesser of the two.
- Deduct the separable cost from the cost above for each purpose group.
- Allocate the remaining cost among purpose groups in proportion to the amount determined above.

If the project is an advance investment for a purpose group the interest rates during the period of time, where the facility is being unused, must be deducted from the cost allocation. If the levels of priority in participating in the project by purpose groups differ, this also has to be accounted for through methods such as priority payment. The priority payment method allocates costs by purpose groups with a higher priority covering their provisionally estimated costs and the purpose group with the least priority covering the remaining cost.

The separable costs remaining benefit method or the priority payment method are generally employed to allocate costs among multiple purpose groups. There are also examples where the priority payment method is used to allocate costs among sectors with the same purpose but with varying levels of priority. It is important that cost allocation is agreed upon by all relevant sectors.

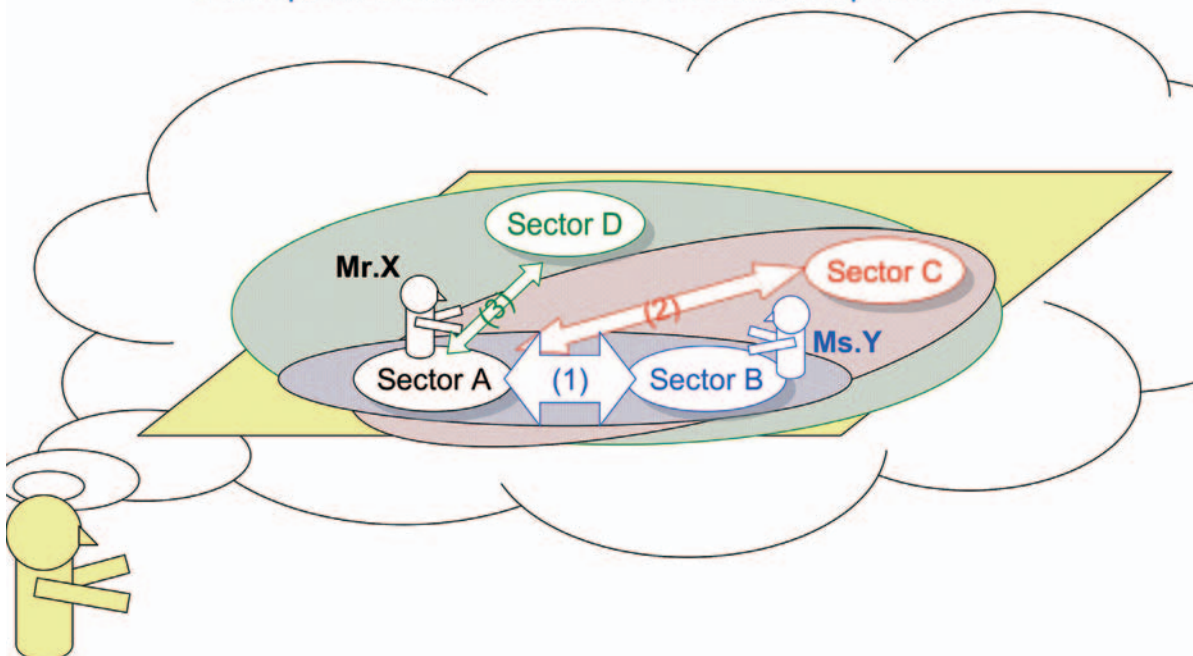
## 6.4 GRASPING THE POSITIONING OF STAKEHOLDERS AND THEIR MUTUAL RELATIONSHIPS

egies for stakeholder involvement effectively and efficiently. Such efficiency is improved further if a key person is identified and involved.

Understanding the positioning and relationships of and among stakeholders is useful in laying out strat-

### Example of an useful materials — Chart of stakeholders

- ✓ To grasp position of each stakeholder and mutual relations
- ✓ To find who is the key person in the stakeholder.
- ✓ Participants will increase as the coordination proceeds.



■ **Fig. 6.6** Grasping Positioning of Stakeholders and their Mutual Relationships