A spiral approach to IWRM: the *IWRM Guidelines at River Basin Level*

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Abstract The principles and concepts of IWRM have been widely recognized, but the implementation of IWRM is not progressing satisfactorily in many basins. A mechanism to translate the principles into practical applications has been needed. As a tool to fill the gap, the set of *Guidelines for IWRM at River Basin Level* was developed, introducing a "spiral model" and "keys for success", etc. The evolutionary, adaptive implementation of the IWRM process is illustrated by the spiral model, and keys for success can be used for overcoming difficult situations at each step in the practical process that begins with "recognizing/identifying" pressing issues or needs, then "conceptualizing" the problem itself and formulating possible solutions, "coordination and planning" among stakeholders in order to reach an agreement, and "implementing/monitoring/evaluating" the plan and its outcomes. This paper is an introduction to the Guidelines through a case study of the IWRM process for the Tone River in Japan.

Key words IWRM; integrated water resource management; guidelines; river basin; spiral model; process; keys for success; sector perspectives; tools

INTRODUCTION

Background to the Guidelines

The *Integrated Water Resources Management* (IWRM) *Guidelines at River Basin Level* have been written as a contribution by UNESCO/IHP, in cooperation with the Network of Asian River Basin Organizations (NARBO), to the World Water Assessment Programme (WWAP). The first set of the Guidelines was launched at the Fifth World Water Forum in March 2009 in Istanbul, Turkey (Table 1).

The purpose of developing these Guidelines is to raise awareness of the importance of an integrated approach to water resources management at the river basin level and to address the practical implementation of IWRM.

These Guidelines provide the necessary information to help water managers implement IWRM in line with their own set of circumstances. They consist of the fundamental concepts of IWRM as well as providing insights to the perspectives of various stakeholders with regard to water issues, keys for success for overcoming problems, and good examples where such keys for success have been applied.

IWRM is essentially a user-friendly and cooperative approach that is an alternative to the activities previously carried out by individual water sectors acting in their own interests, with very little interaction with one another. The Guidelines invite each sector to fruitfully participate and cooperate in IWRM, with a practical road map so as to contribute to achieving both private and public benefits in a sustainable manner.

A river basin approach in the implementation of IWRM is being recognized as a comprehensive basis for managing water resources more sustainably and will thus lead to social, economic, and environmental benefits. However, actual progress towards implementing IWRM varies enormously and depends on the area, capacity, political will, and the understanding of IWRM concepts and their implementation. Hence, the Guidelines have been split up into separate stand-alone parts. They have been designed to enable readers to go to specific sections of the publications depending on their specific needs and circumstances without necessarily having to read the entire document (UNECO & NARBO, 2009a).

Table 1 Recent historical events related to the IWRM initiatives.

1972	First appearance of terminology "IWRM" at UN Conference on the Human Environment, Stockholm, Sweden
1992	Formulation of principles for IWRM as "Dublin Principles" at the International Conference on Water and the Environment, Dublin, Ireland
2000	First definition of IWRM by the Global Water Partnership in Technical Advisory Committee Background Papers No. 4 *IWRM*
2002	Agreement about development of IWRM plan by 2005 in Johannesburg Plan of Implementation, at WSSD, Johannesburg, South Africa
2004	Not a "vision" but a "pragmatic and principled approach" in Water Resources Sector Strategy, World Bank
2008	International recommendation for promotion of IWRM in the G8 Hokkaido Tokyo Summit Leaders' Declaration, Hokkaido, Japan
2009	Launch of practical guidelines for implementation of UNESCO *IWRM Guidelines at River Basin Level* at the 5th World Water Forum, Istanbul, Turkey

Interactions between the River Basin Approach and different administrative levels

IWRM strives for effective and reliable delivery of water services by coordinating and balancing the various water-using sectors – this is an important part of sustainable water management.

Although an "enabling" institutional infrastructure is a desirable prerequisite for implementing IWRM, it is not enough for the practical execution of effective water management – that is, for the efficient and reliable delivery of water-dependent services such as hydropower, municipal and industrial water supply and irrigation water, or even environmental flows and flood damage reduction. It is at the river basin scale that cooperation schemes, wide-ranging efforts such as coordination, collaboration and joint action are currently implemented. In some cases, cooperation has resulted in the establishment of standing institutional structures through which government can interact regularly. However, institutional arrangements to facilitate a fully implemented IWRM approach at a river basin level have not emerged, primarily because the concept is complex and requires a very high level commitment and follow-through.

Food security, gender, health, environment, industry and many other objectives are closely related to sound water resources management. Water managers, especially those in developing nations, constantly face the question of how these challenges of providing for diverse and competing needs, in the face of increasing scarcity and climate variability, can be successfully addressed in a socially acceptable and economically efficient manner, within the resource constraints of their respective systems. Maintaining the consecutive public consultative process with concerned stakeholders is a fundamental aspect of the evolution of the IWRM process as proposed in these Guidelines.

Ideally, the implementation of water resources management and basin level planning should be linked to national strategies and policies that explicitly link the various levels of governmental and private sector decision making. A key aspect of IWRM requires that the national government(s) create an enabling environment, including a legal framework, to facilitate a multi-sectoral coordinated basin-level approach. The responsibilities of the different levels of administration and relevant stakeholders and their relationships and roles within the river basin management need to be clearly defined. The principle of "subsidiarity", however, requires that the implementation of projects and operation of water functions need to be the responsibility of the appropriate institution or organization in the basin, which is empowered to manage the tasks and has the authority to influence policy. Although the ideal of a perfect IWRM system does not exist, sound water management improves imperfect policies and makes them work better to deliver vital services (Fig. 1; UNESCO & NARBO, 2009b).

Structure of the Guidelines

The Guidelines comprise two parts. Part 1 provides basic principles of IWRM mainly targeting policy makers, and explains the benefits of IWRM at river basin level and the need to promote it

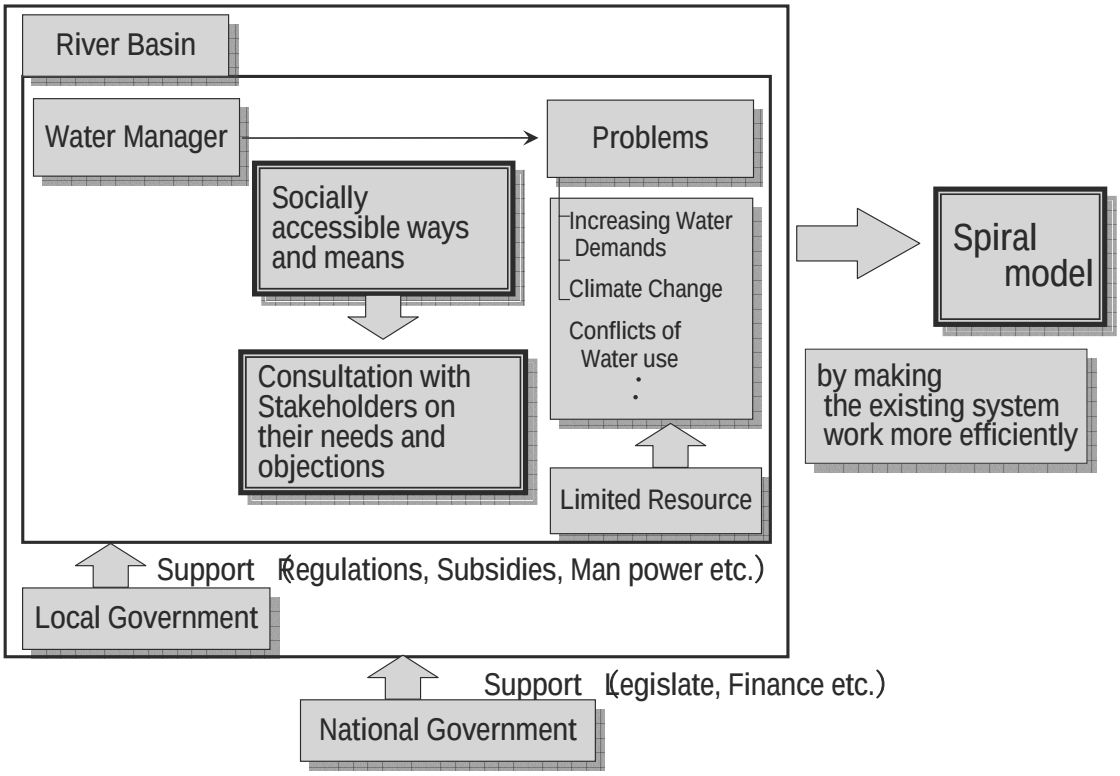

Fig. 1 Interactions between the River Basin Approach and different administrative levels.

at the policy level. It also proposes a spiral model of IWRM, which illustrates the evolving and dynamic nature of the IWRM process. Part 2 comprises three sub-parts, which are presented as three separate publications (Fig. 2):

– Part 2-1 *The Guidelines for IWRM Coordination* for those involved in IWRM coordination.
– Part 2-2 *The Guidelines for Flood Management* for IWRM practitioners involved in flood management.
– Part 2-3 *Invitation to IWRM for Irrigation Practitioners* for irrigation water managers.

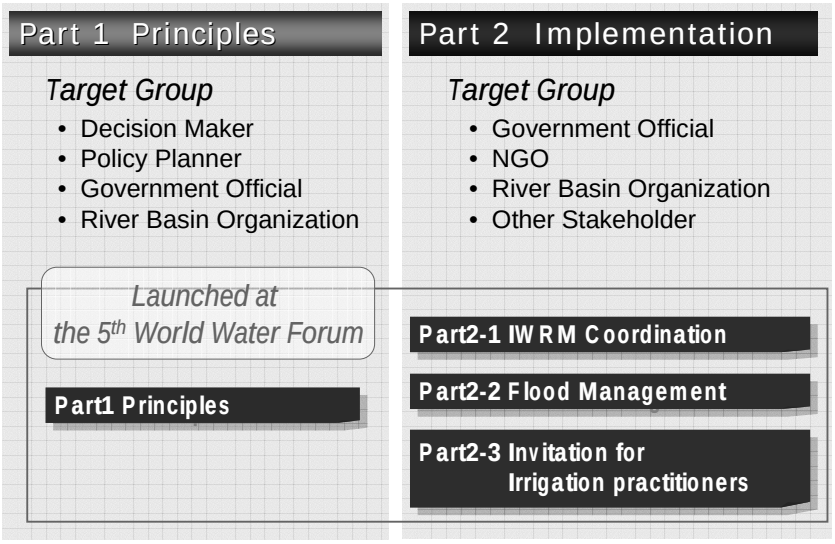

Fig. 2 Composition of the *IWRM Guidelines at River Basin Level*.

Both Part 2-1 and Part 2-2 are intended for use either as introductory guidance for those tackling IWRM for the first time, or as training material for intermediary water managers and trainers of IWRM. For IWRM experts, these parts can be used as a reference guide to tackle the various issues and problems they face in their IWRM activities.

Part 2-3: *Invitation to IWRM for Irrigation Practitioners* is prepared from the perspective of irrigation water managers as representatives of water users. This document invites them to actively participate in IWRM.

The "Sector Perspectives" sections provide insights on what individual sectors are typically thinking. What is described in these sections may not be complete, but they are invaluable in that they enable us to understand, at least to some extent, how other sectors perceive water management and how this relates to IWRM.

The core of Part 2 is the "Keys for Success" section, which can be used in practice to help IWRM succeed at the basin level. Some of the keys for success are extracted from good practice examples of IWRM implementation in several different river basins worldwide (Fig. 3; UNESCO & NARBO, 2009b).

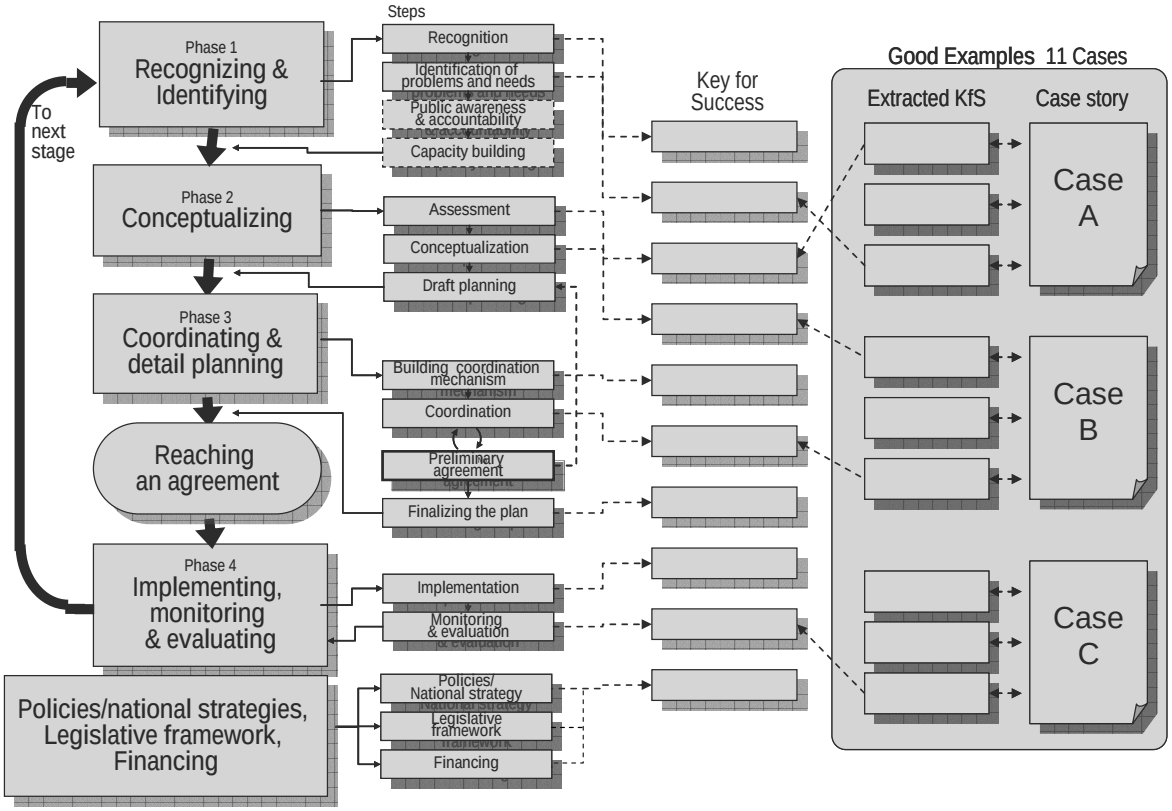

Fig. 3 Structure of Part 2 of the Guidelines.

THE IWRM SPIRAL CONCEPTUAL MODEL

An evolutionary and adaptive implementation of IWRM at the river basin level

The evolutionary and adaptive implementation of the IWRM process presented in these Guidelines is illustrated by the spiral model. In this model, water resources development in a basin, along with management principles and objectives, evolves over time as new demands and needs emerge, and innovative solutions are added at each stage. The spiral model (Fig. 4) is a convenient graphical conceptualization of the iterative, evolutionary, and adaptive management process, adjusting to

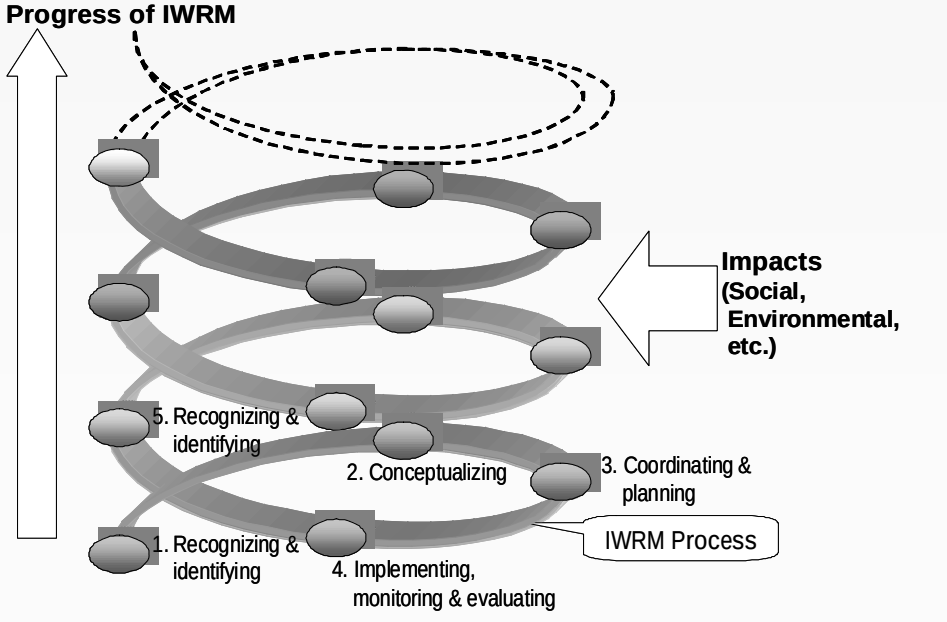

Fig. 4 IWRM spiral model.

new needs, circumstances, and societal goals. The spiral evolutionary model reflects progressive positive changes in historical water resources development and management and offers the following advantages:

- It allows IWRM actions to be started at any point of the evolutionary process.
- It builds capacity over time.
- It promotes cooperation and integration.
- It promotes the pursuit of better solutions that adapt to changing circumstances and values.
- It facilitates consensus building and stakeholder ownership at each "turn of the spiral".
- It illustrates IWRM as an incremental, step-by-step process, and therefore provides a practical framework for looking ahead and planning for successive "turns of the spiral".

Water resource systems are directly and indirectly affected by the interaction of numerous human-related drivers of economic, social, and demographic functions, including climate change as an uncertain driver. Water managers should understand how different drivers of change affect the hydrology and therefore affect the related water demands and functions of the inhabitants in the basin. Setting up a viable IWRM framework is necessary as a platform for adapting to changes where the adaptation responses to those changes can be prioritized. Reassessment of basin hydrology improves understanding of a changing water cycle and can be an opportunity to consider and address special drivers such as climate, land-use changes, and the agricultural footprint in the evolving step-by-step IWRM process.

Within a country or a river basin, different areas have diverse water problems and challenges. Each country and river basin must chart its own vision and plans based on its unique situation. A fully integrated approach to managing water in a basin may not be immediately possible. However, this does not prevent embarking on IWRM at the basin level whether the process is well developed or not.

Although their existence is not essential to begin the IWRM process at the river basin level, river basin organizations provide a good institutional mechanism to facilitate implementation. The application of IWRM by basin organizations varies according to each river basin's specific conditions and requirements. Many river basins have set up coordinating bodies to facilitate river basin management. These may take the form of informal committees or authorities with important mandates and authorization (UNESCO & NARBO, 2009b).

IWRM implementation process and phases

One turn of the spiral includes such phases as:

– recognizing/identifying pressing issues or needs,
– conceptualizing the problem itself and locating possible solutions,
– coordinating and planning among stakeholders to reach an agreement, and
– 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.

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 water managers to understand the issues and problems existing in the basin, leading to recognition/ identification of the need for introducing an IWRM approach. Water managers 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 (Fig. 5).

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 a rapid increase in demands, or by increasing concerns over new issues, such as climate change.

The stage changes when recognition of the need for change arises. 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.

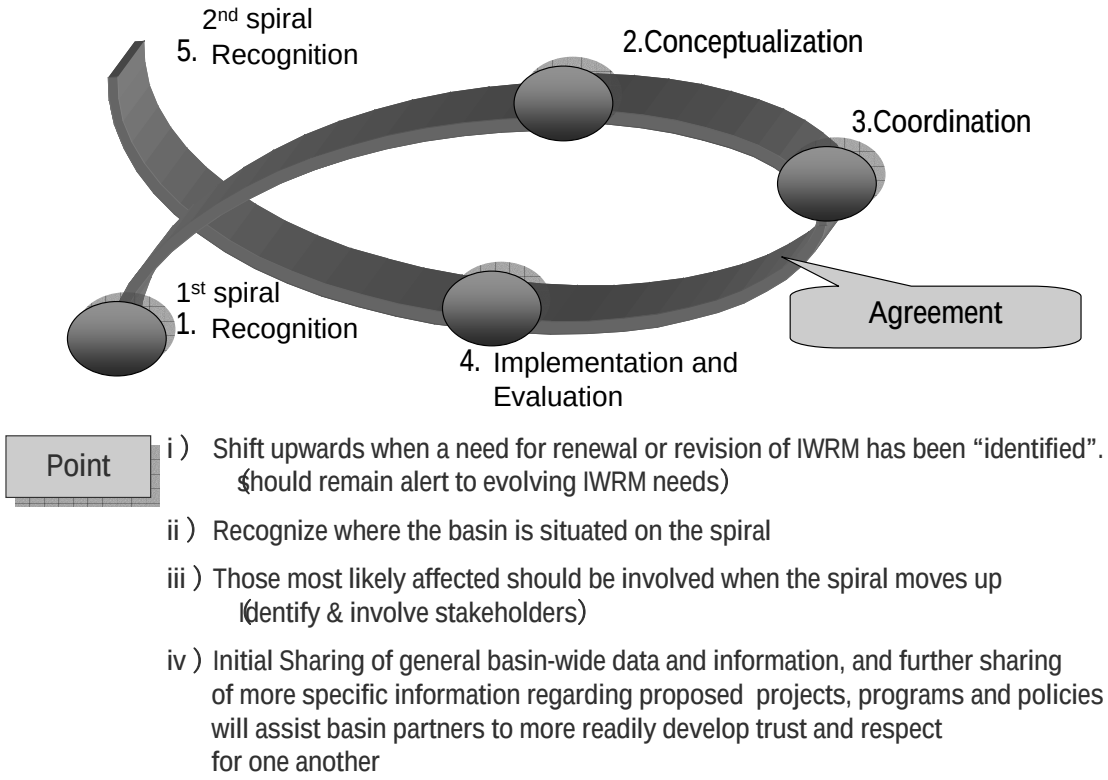

Fig. 5 The IWRM process and phases in the spiral model.

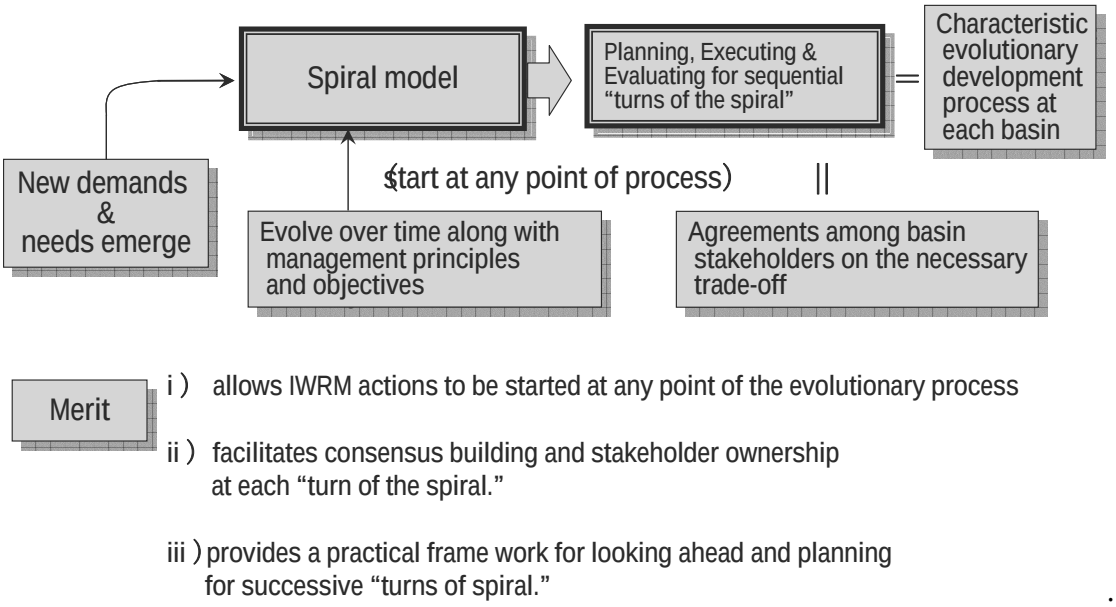

Fig. 6 Concept of IWRM spiral and process.

"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"?" and "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 the readers of the Guidelines in the spiral. It is suggested that looking at different phases or steps in the IWRM process by flipping back and forth through the Guidelines may help the readers (Fig. 6; UNESCO & NARBO, 2009b).

The case study described in Table 2 and related figures introduces an adaptation of the IWRM spiral and process model to an actual river basin through an IWRM study of the Tone River in Japan.

Table 2 Tone River case study.

Facts	Process
1 "Water Stress" in National Capital Region (Tokyo and its suburbs) during high economic growth period 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% of the planned amount 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 Tokyo urban districts and were spreading wider and affecting more people. Meanwhile, the Sumida River, running through the urban districts was responsible for nauseating odours from the wastewater 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). 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 Greater 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 prefecture government.	The 1st Spiral, Recognizing Phase

2 Pipeline route (Dekishima Plan)

The 1st Spiral, Conceptualizing Phase

In 1958 a plan (Fig. 7(a)) 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: (1) Pipeline (tunnel) would be advantageous as it required less land. (2) Good water quality can be maintained by drawing water from the upstream river. (3) Water quality would be least affected by conveying water via pipeline.

3 Utilization of existing canal route (Counter Proposal)

In June 1961 a plan (Fig. 7(b)) 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: (1) Taking water from the upstream river on a large scale for the urban water supply (Dekishima Plan) will create predominance over vested water rights of downstream farmers and would therefore disregard vested rights. (2) Unification of water intake facilities and water intake would enable the integration and rationalization of water use. (3) As water can be supplied to areas traversed by the canal, Saitama Prefecture would also benefit. (4) As most of the construction works will be so-called “open works”, it was possible to shorten the construction time. (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. (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.

4 The Water Resources Development Promotion Law and The Water Resources Public Corporation Law

The 1st Spiral, Coordinating Phase

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 to 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.

In April 1961, an order was made by the Prime Minister to unify the ideas and an 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.

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.

5 Utilization of the Ara River route (Middle Course)

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: (1) It is necessary to shorten the construction time so that the Tokyo Olympic Games would be held in autumn (in 1964) without fail. (2) Coordination is required with mid and downstream stakeholders to obtain water rights for drawing water from the Tone River. (3) When constructing the connected canal, it is necessary to gain approval from Saitama prefectural government. (4) Certain measures for the future need to be addressed as water demand is likely to greatly increase in the future.

For those reasons, the Water Resources Development Public Corporation devised a plan entitled *Utilization of the Ara River* (Fig. 7(c). 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.	An example of source of a Key for Success
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.	Reaching an agreement, and Implementing Phase
6 After Completion of the Tone Canal 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. 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 1884 ha over a period of ten years from 1960 to 1969.	(Turning to the Next Spiral) The 2nd Spiral, Recognizing Phase
7 Increasing demand for urban water and the utilization of agricultural water through modernization of facilities 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 with the purpose to identify the amount of water possible to convert from agricultural water use to urban water use. 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. As the coordination process continued among stakeholders, the *Saitama Intake Unification Project Stage 2* was set up in 1979 (Stage 2 did not include intake unification but it included the modernization of canal facilities).	The 2nd Spiral, Conceptualizing Phase
8 Agreement to cost allocation 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: 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 was due to the fact that urban water supply could only be achieved by modernizing all sections of the canal. 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.	The 2nd Spiral, Coordinating Phase, reaching an agreement, and Implementing Phase
9 Anti-earthquake countermeasures The recent problem is a need for anti-earthquake countermeasures given the high possibility of earthquake occurrence estimated in this area. Additionally, urbanization around the diversion canal has increased the risks of inland flooding. Now, the Japan Water Agency is preparing a project for reinforcement of facilities along with dialogues between water users and government organizations.	(Turning to the Next Spiral) The 3rd Spiral, Recognizing and Conceptualizing Phases

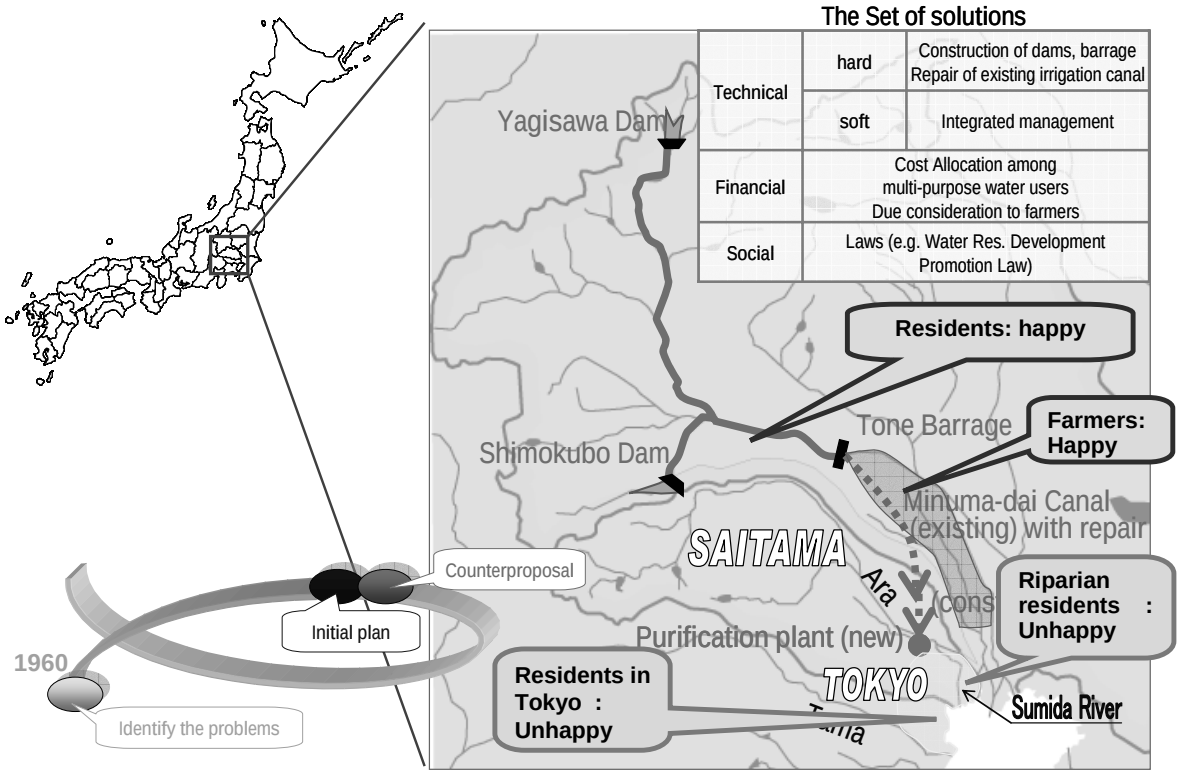

Fig. 7(a) Dekishima Plan.

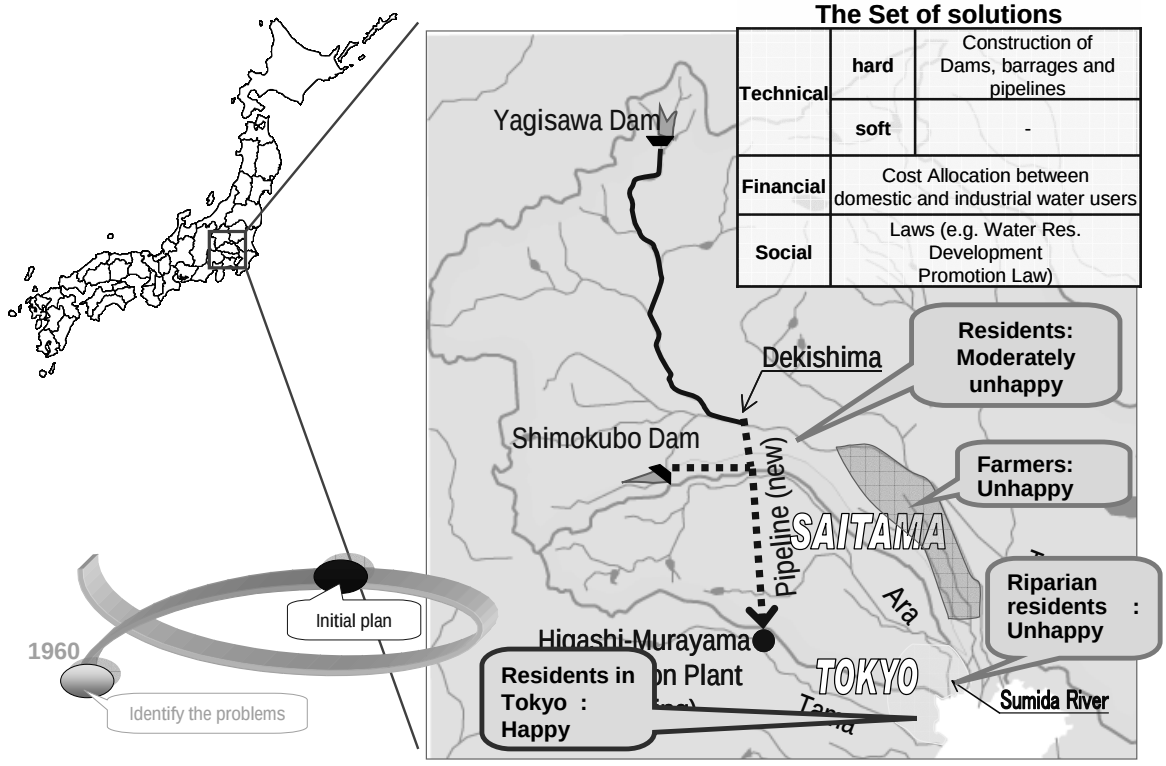

Fig. 7(b) Counter Proposal.

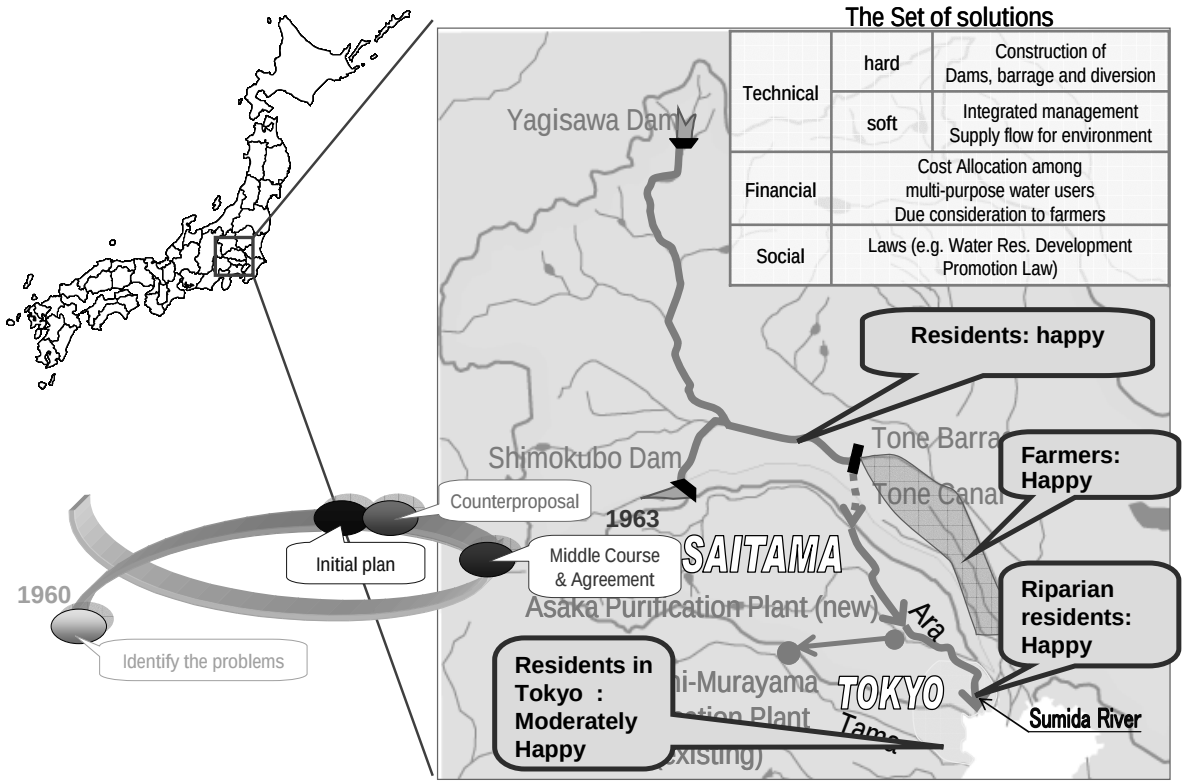

Fig. 7(c) Middle-course.

The overview of the IWRM process for the Tone River is illustrated in Fig. 8 adapting the spiral model, and Table 3 gives the keywords of each phase in the process from the 1st to the 3rd spiral.

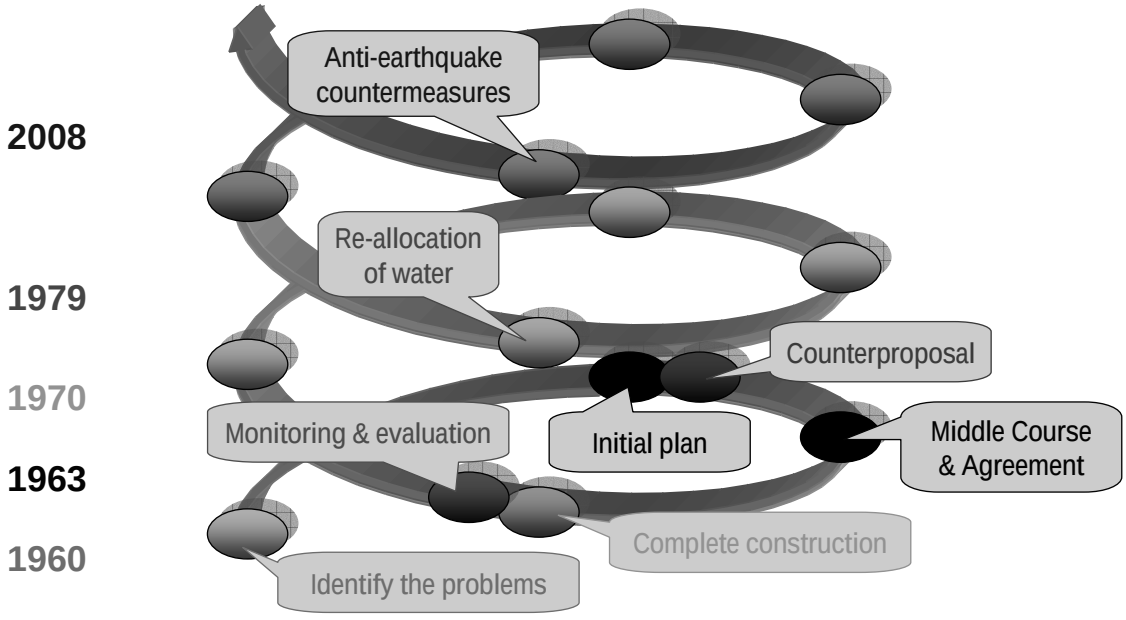

Fig. 8 IWRM process (Tone River).

Table 3 Summary of IWRM Process (Tone River).

1st	1960–1970	Recognizing	Severe water stress in Tokyo (Tokyo the desert)
		Conceptualizing	Construction of dams and conveyance system, prevention of land subsidence, mitigation of water pollution, solution of unstable irrigation
		Coordinating	Initial plan (Pipeline) VS Counter proposal, Establishment of special institutional framework, and
		(Agreement)	Devising a middle course
		Implementing	Tentative solution for "Tokyo the desert"
2nd	1970–1990	Recognizing	Degradation of facilities and urbanization in surrounding region
		Conceptualizing	Modernization of facilities and water re-allocation
		Coordinating (Agreement)	Hard negotiation for cost allocation, and Acceptable and justifiable allocation proposed
		Implementing	Balanced water management in Tokyo and surrounding area
3rd	1990–2010	Recognizing	Possibility of huge earthquake
		Conceptualizing	Technical study and dialogues with stakeholders

KEYS FOR SUCCESS

The case study 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.

The portions with the most critical points in the case study (Table 2) and the process (Table 3) are underlined, and Table 4 is the re-arranged and summarized facts using the format of Extracted Keys for Success.

The Extracted Key for Success illustrates why the Key for Success has been implemented and what the thought process behind it has been. 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.

In Table 4, two extracted Keys for Success are modified in general terms (Fig. 9). KFS3.2.1 is one of the most characteristic suggestions for the overall coordination among various keys for success introduced in the Guidelines. KFSs are arranged in accordance with the phase where the KFS is to be adopted in the IWRM process.

Many of the keys for success have been proven in practice and are linked to Good Examples in the Guidelines. 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. 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.

A Key for Success is a key that can be used to help make IWRM succeed in practice. 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 (UNESCO & NARBO, 2009b).

Table 4 Extracted Keys for Success of the Tone Case Study.

[Title] Project planning, coordinating multiple sectors, and conflict resolution.	Type of problem to solve
[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.	Description of the situation
[Problem] Both parties 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 did not meet with their requirements. Meanwhile, the agricultural sector suggested that there was a need to strengthen Tokyo's water supply networks and it was favourable for the new water purification plant to be connected to improved irrigation canal. The situation led to a deadlock.	Problem encountered
[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 was discharged to the Ara River and conveyed along the river until it was taken up again from Akigase to Tokyo. Though this plan was not an ideal plan for either sector, it could be favourable 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 improved. 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.	Measures taken to overcome the problem
[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 favourable. >> [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.	Wisdom behind the measures taken in a generalized terms KFS3.2.1 KFS3.4.1
[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.	Conditions and limitations, tools to enhance the application of the KFS, etc.

3.3 Coordinating and detail planning
3.3.2 Coordination

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

Why?☞ • 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.

How?☞ • 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.
• 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.

Fig. 9 Keys for Success (3.2.1).

FUTURE PLAN

Capacity development for facilitators

In a training course for water managers, a set of thought-out planning and thought-provoking methods is quite important. In order to understand the real meaning of the Guidelines it is very important to get the idea of “key for success”. It is recommended that trainees first practice a well prepared case study, then are guided how to find the “key for success” in the story. There should be good facilitators with skills to lead the trainees.

Sequels to the Guidelines

The steering committee of the *IWRM Guidelines at River Basin Level* is in the process of producing an additional volume on Environment as well as a policy brief on Adaptation to Climate Change.

Environment is an important and basic objective of IWRM. Environmental perspectives should exist in every sector and their intention for environmental sustainability should be coordinated among the water-related sectors.

IWRM is also recognized in the context of dealing with climate change adaptation and adaptive management. There is a need for a paradigm shift for economic justification of projects under climate uncertainty, and development of a new generation of risk-based hydraulic designs and tools in order to develop more resilience in society through IWRM at the river basin level.

REFFERENCES

UNESCO & NARBO (2009a) *Introduction to the IWRM Guidelines at River Basin Level*. A side publication of the World Water Assessment Programme (WWAP), UNESCO and NARBO.

UNESCO & NARBO (2009b) *IWRM Guidelines at River Basin Level* (Part1, Part2-1, Part2-2, Part2-3). A contribution to the World Water Assessment Programme (WWAP), UNESCO and NARBO.