

JICA Global Agenda for No. 19 Sustainable Water Resources Management and Water Supply

Cluster Strategy for Practical Integrated Water Resources Management to Resolve Water-related Issues in the Regions

- Toward a society where all people have secure
and sustainable access to water resources -



Japan International Cooperation Agency (JICA) works toward the achievement of the Sustainable Development Goals (SDGs).

2023.11

1. Purpose

1.1 Purpose of the “Cluster¹ Strategy”

This Cluster Strategy aims to achieve the vision of creating a society in which water resources can be secured and used sustainably, where issues related to water security and use of water resources are continuously solved based on Integrated Water Resources Management (IWRM). It contributes to the objective of the JICA Global Agenda “Sustainable Water Resources Management and Water Supply²”, which is to achieve a society where water resources are responsibly managed and can be utilized and consumed sustainably by the people for drinking and other purposes. It also contributes to the Cluster Strategy “Supporting the Growth of Water Utilities,” which is included in the Global Agenda, by sustainably securing water resources for the supply of drinking water.

The realization of the objectives and vision of this Cluster will contribute to the achievement of SDG Target 6.5: “Implement integrated water resources management at all levels.” And contribute to sustainable social and economic development, freeing people from insecurity caused by water scarcity and conflicts of interest, and improving their economic and social well-being.

1.2 Overview

Increased demand for water due to population growth and economic development, as well as climate change and other factors, have led to various problems in water security and use of water resources, such as water shortages, deterioration of water quality, flooding, land subsidence, and reduction of biodiversity. Countermeasures include water resource development, water-saving irrigation, improvement of flood control facilities, groundwater regulation, and water pollution control measures. However, effective measures may not be taken due to conflicts among stakeholders, trade-offs over water allocation among water users, trade-offs among objectives such as water use, flood control, and environmental conservation, lack of scientific data, and

¹ “Cluster” denotes a group of development cooperation projects and activities that share a common purpose and development scenario. JICA facilitates the formation of clusters among partner countries and organizations, based on JICA Global Agenda, with a view to vitalizing global collaboration.

² The Global Agenda “Sustainable Water Resources Management and Water Supply” sets two Cluster Strategies: “Practical Integrated Water Resources Management to Resolve Water-related Issues in the Field” dealing with water resources management and “Supporting the Growth of Water Utilities” dealing with drinking water supply.

lack of consensus-building mechanisms. As a result, problems such as water shortages, disasters, impediments to economic growth, and conflicts over water resources may become increasingly serious. In addition, the water-energy-food nexus³ is becoming more important. As large-scale new water resource development, such as dam construction, declines, more emphasis is being placed on equitable distribution of existing water resources, more efficient water use (water conservation), and water resource development with less environmental and social impacts. In addition to planning and implementing water resource development plans, new water resource management is required.

This Cluster Strategy is based on the concept of IWRM, which is incorporated in the SDG targets, to resolve conflicts among stakeholders (conflict management), to take into account the multiple sectors involved comprehensively, and to create a state of continuous resolution of local water issues. The positioning and necessity of this cluster as described above is illustrated in Figure 1.

IWRM is defined as “a process which promotes the coordinated development and management of water, land, and related resources, to maximize the resultant economic and social welfare equitably without compromising the sustainability of vital ecosystems”⁴. More specifically, it is to maximize the economic and social welfare equitably without compromising the sustainability of vital ecosystems, based on comprehensive and planned development and management of water resources based on trust building and social consensus building⁵ among stakeholders through (1) giving integrated consideration to all forms and stages of the hydrological cycle in the natural system (such as land and water, water quantity and quality, surface water and groundwater), (2) giving consideration to a cross-sectoral approach among various sub-sectors related to water (river/flood control, water supply and sewage, agricultural water, industrial water, water for the ecosystem, etc.), and (3) a participatory approach including all levels of stakeholders such as central government, local governments, the private sector, NGOs and inhabitants⁶.

³ The concept of water, energy, and food resources as composite problems that are connected to each other and that require solutions because of potential trade-offs and conflicts among these resources, such as the need for irrigation water and energy to increase food production and the development of hydropower as a renewable energy source that affects the use of irrigation water.

⁴ Defined by the Global Water Partnership (GWP), which advocates for the concept of IWRM.

⁵ Consensus building with an unspecified number of people where the discussion process is open to society.

⁶ Partially modified from the description in the “Japan’s Official Development Assistance White Paper 2006”

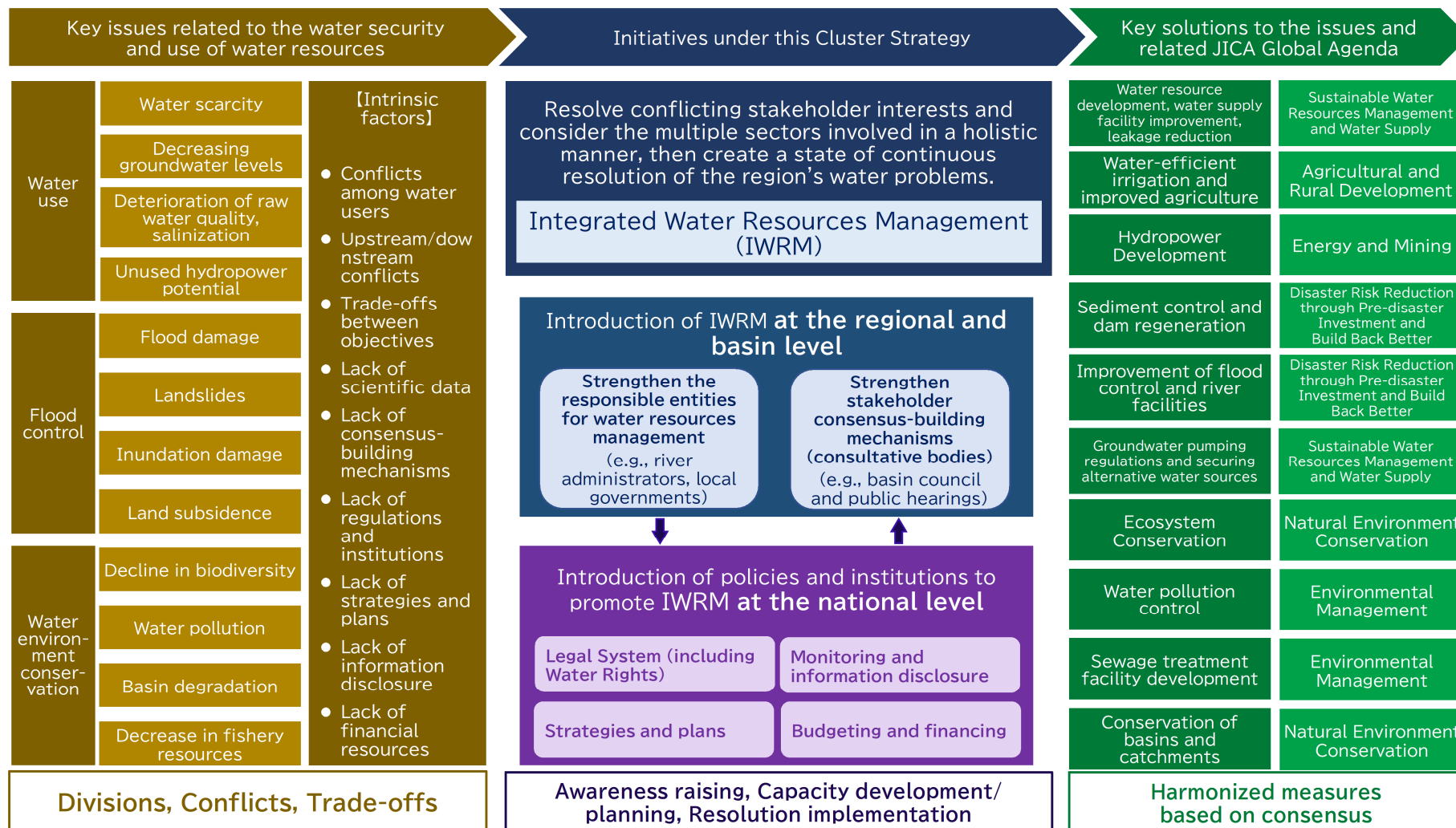


Figure 1 Positioning and Necessity of the Cluster Strategy

This Cluster Strategy emphasizes not only the dissemination of the philosophy of IWRM, but also the resolution of specific problems surrounding securing and using water resources faced by the people in the regions and basins through the practice of IWRM. To this end, two layers are considered: the practice of IWRM at the regional and basin levels, and the establishment of policies, institutions, etc. at the national level. Corresponding to each layer, the Cluster Strategy aims for “a state in which the number of regions and basins adopting IWRM increases” and “a state in which institutions promoting IWRM are introduced nationwide” as intermediate outcomes.

In practice at the regional and basin levels, the emphasis is on developing entities responsible for promoting the development and management of water resources while coordinating stakeholders, building consensus-building mechanisms (consultative body) to enable stakeholders to share issues, build trust, and agree on solutions, and ensuring that issues are resolved through the implementation of infrastructure development and other problem-solving measures. In addition, since issues surrounding water resources change with social and environmental changes, people’s changing needs, etc., it is not enough to solve an issue only once; new issues need to be solved while improving the problem-solving process. This spiraling up (IWRM spiral) will be strengthened.

For the establishment of policies, institutions, etc. at the national level, emphasis will be placed on the development of legal systems, including the water rights system, strategies and plans, data monitoring, information disclosure, and budget allocation and funding by the policy authorities. In addition, by sharing and institutionalizing practices at the regional and basin levels across the country, or by applying institutions at the national level to the regional and basin levels to help solve problems, the goal is to improve specific efforts at the regional and basin levels, as well as policies and institutions at the national level, while mutually influencing each other.

Through “Practical Integrated Water Resources Management”, which has the above three characteristics of (1) strengthening responsible entities and consultative bodies at the regional and basin levels, (2) spiraling up the process of problem-solving through practice, and (3) practicing at the regional and basin levels and strengthening policies and institutions at the national level, JICA aims to solve water resources problems faced by regions and basins and build a society where all people have secure and sustainable access to water resources.

JICA will implement its cooperation in more than 10 regions and basins and benefit

more than 200 million people⁷ living in the target regions and basins by 2030. In addition, JICA will train more than 200 government officials from policy authorities. JICA also aims to achieve greater development impact by implementing solutions such as improving facilities in collaboration with other partners; promoting development in related sectors (agricultural water, water supply and sanitation, flood control, etc.); pursuing initiatives to link regional and basin-level practices with national-level institutional development and to replicate them in other regions and basins; and disseminating knowledge at the global level.

2. Current Situation and Development Approaches

2.1 Growing Water Resource Problems and the Need for IWRM

In 2020, annual global water use was 4,000 km³, of which 72% was for agricultural use, 16% for industrial use, and 12% for domestic use⁸. As of 2010, there was said to be a 7% shortage of stably available global water resources relative to these water demands, but some predict that this shortage will grow to 40% by 2030 due to increased water demand⁹. Water shortages overseas will affect Japan, which is dependent on imports, and will also be a factor in regional instability. In addition, hydropower is a renewable energy source and is attracting attention as a climate change mitigation measure. There is a renewed push to promote the development of hydropower, not only because of its role as a baseload power source, but also because pumped storage can be used as a grid regulator, which has the side effect of increasing the amount of variable renewable energy sources such as solar and wind power.

However, water is a renewable resource that circulates the globe. The amount of water taken from rivers is less than 10% of the annual runoff¹⁰, and technologies have been established to treat and reuse water once it has been used. Therefore, there is no absolute shortage of water resources on the planet as a whole. The problems are

⁷ The population of the target region/basin will be counted, as they are considered to receive some benefits in terms of water security and use through cooperation to promote IWRM.

⁸ Ministry of Land, Infrastructure, Transport and Tourism. Current status of water resources in Japan, 2022 edition (in Japanese). Statistics are from AQUASTAT of Food and Agriculture Organization of the United Nations (FAO).

⁹ The 2030 Water Resources Group. Charting Our Water Future. 2009.

¹⁰ Oki, T. ; Kanae, S. Global Hydrological Cycles and World Water Resources. Science. 2006, vol. 313, no. 5790, pp.1068-1072, DOI: 10.1126/science.1128845.

geographic unevenness in the availability of water resources, temporal unevenness such as the existence of rainy and dry seasons and annual variations in precipitation, and the cost of water transportation and water treatment. As a result, there are water shortages in arid and semi-arid regions and urban areas where water demand is concentrated, and where water resources are not available when needed in the required quantity.

The effects of climate change are making the uneven distribution of water resources more pronounced in time and space. According to the Intergovernmental Panel on Climate Change (IPCC), droughts and extreme rainfall are increasing in parts of inland Asia and southern Africa¹¹. It has been noted that the increase in heavy rainfall is likely to reduce available water resources in these regions, as runoff will be discharged through rivers in the absence of dams and other storage facilities.

The uneven distribution of water resources and the worsening problems related to water supply and demand have created trade-offs among regional and basin stakeholders, leading to conflicts of interest. Examples include conflicts among water users over the allocation of limited water, conflicts between water users and the flood control sector over dam operations¹², conflicts between upstream and downstream states over dam construction and water withdrawal in international rivers, and excessive groundwater pumping and resulting land subsidence. In these issues, there are multiple stakeholders and sectors involved, the people causing the problem are often different from those affected, and trade-offs often occur among the stakeholders.

To secure and use water resources sustainably under such circumstances, it is necessary to involve stakeholders and comprehensively address issues, including multiple related sectors, both water quantity and quality, and both surface water (rivers and lakes) and groundwater, to resolve or mitigate trade-off relationships and conflicts of interest, to build social consensus, and to distribute water fairly.

In regions where the absolute volume of water resources is insufficient, water resources development through dams, reservoirs, water conduit projects, groundwater development, etc. will continue to be necessary, but these development projects will have negative impacts, such as the relocation of residents due to dam construction, reduced flow in the source river, and impacts on traditional water users. It is necessary to avoid or mitigate the negative impacts of water resource development and to

¹¹ Intergovernmental Panel on Climate Change (IPCC). Sixth Assessment Report (Working Group I). 2021

¹² A trade-off relationship arises because it is better to store as much water as possible in dams to secure water for irrigation, etc., but from the perspective of flood control, it is better to lower the water level in dams before the rainy season to secure flood control capacity.

promote projects while building consensus among relevant stakeholders.

Therefore, the concept of IWRM is becoming more and more important.

2.2 Trends in International Efforts for IWRM

The concept of IWRM has its origins in the United Nations Conference on the Human Environment held in Stockholm in 1972. Until then, the dominant paradigm was that water was a resource to be developed and infrastructure development was emphasized through an engineering approach of supplying the required amount of water in response to projected water demand. However, as water demand increased and water resources development progressed, concerns about environmental conservation and democratic resource management emerged.

The “Dublin Principles” adopted at the “International Conference on Water and the Environment” held in 1992 include the principle that “water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels,” which has remained a common underlying tone to this day. This has remained a common thread to this day. It is also reflected in the Action Plan “Agenda 21” adopted at the “United Nations Conference on Environment and Development” (Earth Summit) held in Rio de Janeiro in June of the same year, in the phrase “application of integrated approaches to the development, management and use of water resources”.

In 1996, the World Bank, the United Nations Development Programme (UNDP), the Swedish International Development Agency (SIDA), and others joined forces to establish the Global Water Partnership (GWP) in Stockholm. The GWP is an international network to promote international action based on the concept of IWRM.

The Japanese government’s sectoral development policy, the “WASABI (Water and Sanitation Broad Partnership Initiative),” published by the Ministry of Foreign Affairs in 2006, listed “promotion of IWRM” as the first of five specific actions. The “Hashimoto Action Plan¹³” released by the “UN Secretary General’s Advisory Board on Water and Sanitation” in the same year also lists IWRM as one of the six actions.

Although the concept of IWRM has gained wide international acceptance, the issues surrounding water resources and the organizations and stakeholders involved have regional characteristics such as natural conditions, society, culture, traditions, values,

¹³ The name derives from former Prime Minister Ryutaro Hashimoto, who was the chair at the time.

politics, economy, and technological capabilities. According to Biswas (2008)¹⁴, although the importance of the concept of IWRM is touted, there are many difficulties with the concept alone in practice in the field, in that appropriate water resources management must be considered in light of local conditions. Therefore, there is a need for effective IWRM practices to solve local water problems.

In recent years, private companies are also increasing their sustainability and ESG awareness efforts, including the “CDP Water Security”¹⁵ and the “Taskforce on Nature-related Financial Disclosures (TNFD)”¹⁶, which call for disclosure of information on the impact of corporate activities on nature including water and water resources. In response, some companies are actively working to conserve and recharge local water resources based on the concept of “Water Stewardship”¹⁷, which involves not only managing water for their operations but also taking responsibility for local water resources. Others are setting goals for “Water Positive,” which involves not only saving water and reusing wastewater to supply more water than is consumed but also investing in areas where water shortages are a problem.

2.3 Positioning of IWRM in the SDGs

IWRM is incorporated into Target 6.5 “By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate” in SDG Goal 6 (clean water and sanitation). It is also closely related to other targets in Goal 6, as well as Goals 2 (zero hunger), 3 (good health and well-being), 7 (affordable and clean energy), 11 (sustainable cities and communities), 13 (climate action), and 15 (life on land).

Indicator 6.5.1 has four elements to measure the degree of IWRM, and governments respond to a questionnaire consisting of 33 items: (1) Enabling environment (7 items), (2) Institutions and participation (11 items), (3) Management instruments (9 items), and (4) Financing (6 items), scoring from 0 (not implemented) to 100 (fully implemented)¹⁸. The questionnaire includes questions on the status of implementation at the national

¹⁴ Biswas, A. K. Integrated Water Resources Management: Is It Working?. Water Resources Development. 2008, 24, 1, pp.5-22.

¹⁵ The UK-based non-profit organization CDP’s corporate water risk disclosure program. CDP evaluates companies’ water security efforts and discloses information mainly to investors. The name “CDP” is derived from “Carbon Disclosure Project,” which was used when it was first established in 2000.

¹⁶ An international initiative launched in 2021 to establish a framework for the private sector to properly assess and disclose risks and opportunities related to natural capital and biodiversity.

¹⁷ A program proposed by the World Wildlife Fund (WWF).

¹⁸ Levels of IWRM implementation is established according to the score, with scores from 0 to 10 classified as “very low,” 11 to 30 as “low,” 31 to 50 as “medium-low,” 51 to 70 as “medium-high,” 71 to 90 as “High,” and 91 to 100 as “very high.”

level and the regional/basin level (“Other levels” or “Subnational/Basin/Aquifer level”). However, the progress has been slow and according to the UN progress monitoring, while SDG Target 6.5 aims for a score of 100 on the implementation of IWRM in 2030, the current average implementation score is only 54, indicating that achieving Target 6.5 will be difficult at the current pace. Of the 173 countries that reported monitoring data to the UN in 2017 and 2020, only 66 countries were judged to be close to achieving the target or to have made considerable progress, while the remaining 107 countries were classified as having made limited or moderate progress. In addition, of the 185 countries that reported monitoring data for 2020, 87 countries (47%) had a score of 50 or less. An increase in this indicator value means that a system to promote IWRM is in place, including mechanisms to ensure stakeholder participation and institutions to coordinate interests across sectors.

2.4 IWRM in Japan

In Japan, there are several central ministries involved in water resources, including the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), which is responsible for river management, flood control and sewerage, the Ministry of Agriculture, Forestry and Fisheries (MAFF), which is responsible for agricultural water, the Ministry of Health, Labor and Welfare (MHLW)¹⁹, which is responsible for water supply, the Ministry of Economy, Trade and Industry (METI), which is responsible for hydropower generation and industrial water, and the Ministry of the Environment (MOE), which is responsible for ecosystem and water pollution. In addition, local governments are also involved in water resources. Although many organizations are involved, according to the River Law, the Minister of MLIT for Class A river systems, prefectural governors for Class B river systems, and municipal mayors for other river systems are designated as “River Administrators” and are responsible for planning for flood control, water utilization, and water environment conservation, as well as managing water resources, including granting water use rights, which clearly defines the responsible entity to coordinate the many sectors and stakeholders involved in water resources. The River Law also stipulates that, at the stage of formulating river improvement plans, the opinions of academic experts should be heard as necessary, that necessary measures should be taken to reflect the opinions of concerned residents, such as holding public hearings, and that the opinions of the heads of local governments should be taken. Therefore, river basin committees are established and public hearings are held. Thus, in Japan, for rivers that are major water sources, the entities responsible for the management of

¹⁹ Drinking water supply is scheduled to be transferred to the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) and the Ministry of Environment (MOE) in April 2024.

water resources (River Administrators), including planning and granting water rights, and the opportunity for listening to the opinions of stakeholders are functioning. In addition, the Basic Act on Water Cycle enacted in 2014 established a system to promote water cycle-related measures in a comprehensive and integrated manner. These measures promote IWRM, and the score of SDG indicator 6.5.1 is very high at 95 (in 2020).

Well-known examples of cases in which one can learn about the process and results of dealing with problems with water resources include the Tsurumi River basin that runs through Tokyo and Kanagawa Prefecture (comprehensive water master plan), the Yoshino River basin in Shikoku (Yoshino River Comprehensive Development), Kumamoto City (groundwater management), and Edogawa and Koto wards in Tokyo (land subsidence), which are also used in JICA's training programs.

2.5 History of JICA's Cooperation Approach to the Water Resources Sector

Since the 1960s, JICA has supported the formulation of comprehensive plans for the development and management of water resources on a basin-by-basin basis through Development Studies (now called Technical Cooperation for Development Planning) and utilized the results of these studies to implement dam construction, flood management, irrigation development, and water supply and sewerage improvement through Japanese ODA loans in numerous cooperation projects. The plan initially focused on facilities, such as the construction of a multi-purpose dam, but later began to emphasize non-structural measures, such as the development of legal systems, organizational reinforcement, and early warning systems, as well as the participation of residents.

The development of National Water Resources Master Plans covering the entire country has also been implemented in nine countries, including the Philippines, Vietnam, Malaysia, and Kenya. Although the plans incorporate IWRM in that they were formulated by taking a comprehensive view of various sectors and coordinating them, the involvement of stakeholders and consensus building was insufficient²⁰.

However, as survey, planning, and infrastructure development based on those plans have progressed, the development of water resources has advanced, and the importance of water resource management based on the coordination of interests has increased. In addition, the problem of lack of progress in project implementation even

²⁰ JICA. Study on approach for integrated water resources management: review of the JICA master plan of national water resources management. 2011.

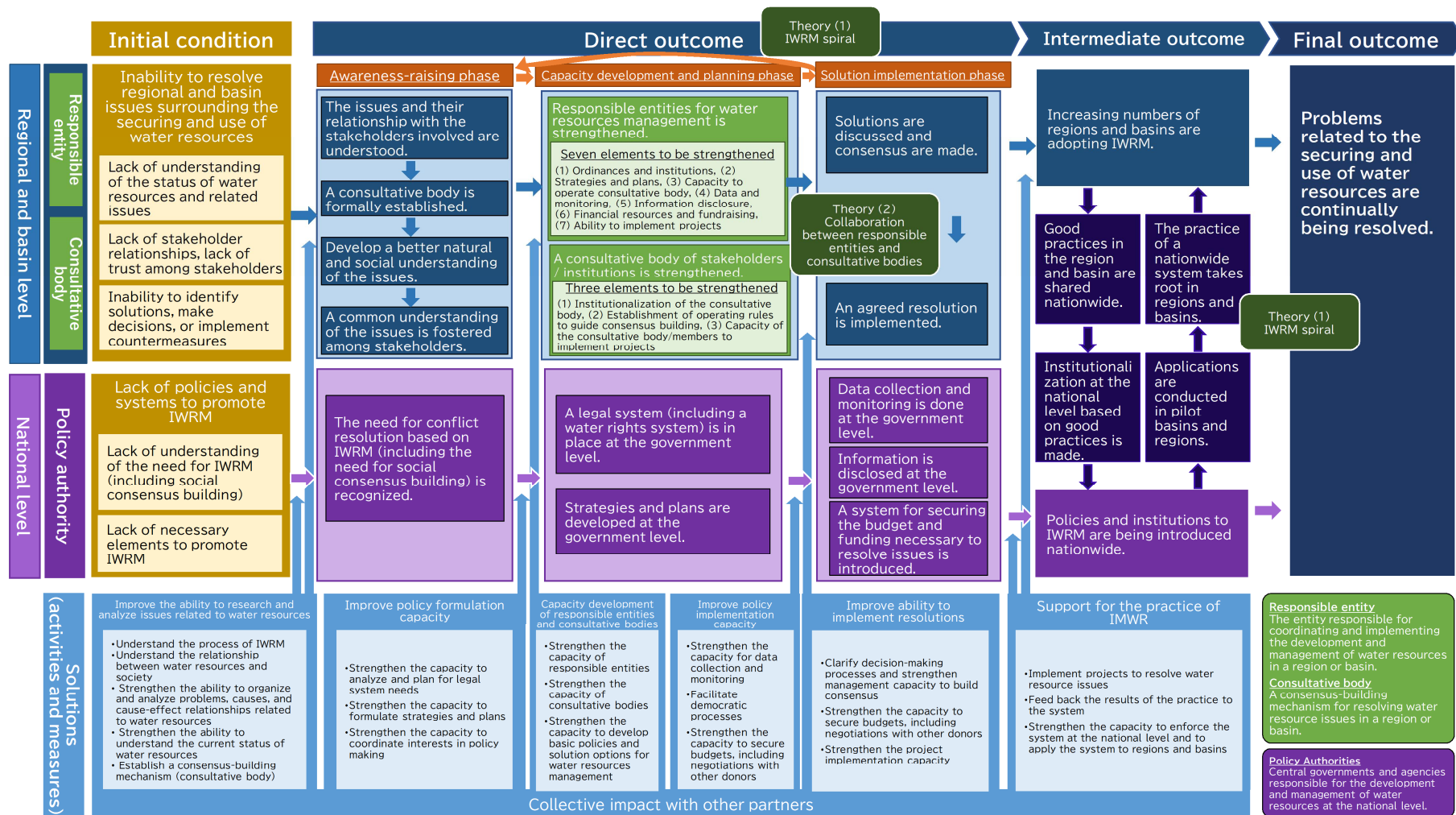
after plans have been formulated has also become apparent. Therefore, the need for the development of legal systems and organizations, as well as the development of a project promotion system based on the coordination of interests, has been recognized. Therefore, since the 2010s, there has been increasing cooperation to strengthen the capacity to solve specific issues based on the concept of IWRM.

3. Development Scenario and Key Concepts

3.1 Development Scenario

This cluster strategy aims to adopt IWRM at the regional and basin levels and to install institutions to promote IWRM at the national level (Intermediate Outcomes) to achieve a state in which problems related to the security and use of water resources are continuously solved (Final Goal). The three steps of social change until these are achieved are assumed to be “Step 1: Awareness-raising phase,” “Step 2: Capacity development and planning phase,” and “Step 3: Solution implementation phase.”

The process of IWRM is not a single-line scenario in which one problem is solved and the process is complete. It needs to be a spiral-like development (the IWRM spiral) in which the process of identifying problems and stakeholders and solving problems is repeated, evolving from addressing simple problems that are easy to solve to addressing more complex problems with more causal relationships and interests that are more difficult to solve or emerging problems. Therefore, instead of going through the process of change from Step 1 to Step 3 only once, the process of Step 1 to Step 3 should be repeated to deal with more complex and challenging issues on water resources. A theory of change of the scenario is shown in Figure 2.



*IWRM: Integrated water resources management

Figure 2 Theory of Change of the Cluster Strategy

【Social change steps and solutions (activities and measures)】

Initial Condition

The initial condition is assumed to be that the need for IWRM is not understood and problems surrounding water resources are not resolved. Specifically, the following situations are observed: problems are not considered as problems even if they exist, priority is subordinated to the development of other sectors, the status of water resources and problems are not understood, relationships with stakeholders are not established, there is no trust among stakeholders, solutions to problems are not clear, inability to make decisions, inability to implement countermeasures, etc.

Step 1: Awareness-raising phase

The need to solve problems on water resources based on social consensus building through IWRM is understood at this stage in countries where IWRM has not yet been adopted. Since there are differences among countries and regions in the penetration of democracy and the relationship between residents, NGOs, etc. and government agencies, it is necessary to understand the society of the country/region concerned and promote the participation of stakeholders step by step, starting from an acceptable level.

At the regional and basin levels, the relationship between the water issues and their stakeholders will be understood, and mechanisms for building social consensus (basin councils, etc.) will be formed. In addition, understanding of the issue will be deepened from both the natural scientific and social aspects, and a common understanding of the issue among stakeholders will be fostered. The solutions needed include the following: training on the process of IWRM; collecting information on water resources in the region and basin and understanding the current status of problems; analyzing the causes and causal relationships of problems that need to be addressed; clarifying the organizations involved and organizing the division of roles through stakeholder analysis; and establishing a consensus-building mechanism (consultative body). In this process, it is important to work to foster trust among stakeholders. Stakeholders should be organized in a matrix as shown in Table 1 to understand each other's interests and relationships, which will lead to consensus building. In regions and basins that are in the initial stages of beginning to implement IWRM, creating small successes in solving problems will increase awareness of the benefits of IWRM and create momentum for addressing more complex and challenging problems.

Table 1 Stakeholder Analysis Matrix (Example)

Water-Resource Management Level (Vertical Relationships)	Related Sectors (Horizontal Relationships)	a) Water Utilization	b) Environment	c) Flood Control	d) Urban
		a1) Agriculture a2) Domestic a3) Industry a4) Energy	b1) Water quality b2) Ecosystem conservation and restoration	c1) Flood c2) Inundation c3) Sediment Management	Cross-cutting issues
1) Direct stakeholders					
2) Local communities with indirect interests					
3) The organization responsible for planning and implementation					
4) Scientific and objective third party					

At the national level, policy authorities will develop awareness of the need for IWRM. The solutions required include training on the process of IWRM, collecting information on water resources nationwide and identifying the current status of the problem, clarifying the agencies involved and their roles, and identifying the legislation, strategies, and plans needed to solve the problem.

On the other hand, in countries that have begun to address issues based on IWRM but are experiencing the need to address more challenging or new issues, at this stage, a deeper understanding of these new issues that need to be addressed will be developed and causal relationships and stakeholders will be analyzed.

Step 2: Capacity development and planning phase

At the regional and basin levels, the entity is legally defined as responsible for understanding the status of water resources and coordinating interests to promote the development and management of water resources (responsible entity), and the mechanism for consensus building among stakeholders (consultative body) are strengthened. The responsible entity may be defined as a basin management agency or river administrator, or it may be a local government, which is often different from the central government policy authorities. Without a legally clear responsible entity, it is difficult to coordinate multiple sectors and stakeholders, and to formulate and promote plans for the development and management of water resources, preventing excessive use of water resources while adjusting water rights and other water users' rights. In addition, the responsible entity alone may not be able to develop and manage water

resources based on social consensus, reflecting the voices of stakeholders and the characteristics of the region or basin, and there is a risk that some people may be harmed or left behind. Therefore, there is a need for a mechanism where stakeholders can share their opinions and build consensus on solutions to problems. IWRM in a region or basin will be realized when the responsible entity and the consultative body function as two wheels and can solve problems related to water resources on their own.

The seven main elements to be strengthened by the responsible entity in Step 2 are as follows.

- ① **Ordinances and institutions (including coordination of water use rights at the regional and basin levels)**: As ordinances and regulations applicable to a region or basin, it is necessary to clarify the implementation system for water resources management, regulations for water withdrawal and groundwater pumping, mechanisms for coordinating interests such as consultative bodies, strategies and plans to be established, financial resources, etc. The need for institutionalization is often recognized in problem-solving in a region or basin, or arrangements are made in local ordinances or pilot projects. It is a particularly important responsibility of the responsible entity to coordinate the rights of water users to water use²¹, considering the availability and variability of water resources, and to ensure the sustainable use of water resources and the conservation of the aquatic environment and ecosystems. In addition, even when legal systems exist, they often do not function effectively, and support may be needed to strengthen enforcement systems. It is desirable to manage water resources on a watershed basis, but the boundaries of municipalities and other administrative structures are generally not on a watershed basis. The legal status of responsible entities should be clarified so that management can be carried out on a watershed basis.
- ② **Strategies and plans**: To coordinate various sectors and stakeholders, strategies and plans for water resource management need to be developed, often on a watershed basis in the form of a basin management plan or similar. In the early stages, issues are not well understood, and as a result, effective strategies and plans to resolve issues may not exist, or even if they are developed, they may not have a legal status. Therefore, the planning capacity should focus on the following: problem analysis based on scientific data, management for consensus building,

²¹ In Japan, there is a well-established water rights system that applies to the entire country, but in developing countries, even if there is a system, it may not function effectively or the system may be underdeveloped. Therefore, regulations regarding water use may be established on a regional or watershed basis. Even in Japan, regulations on groundwater use may be established on a regional basis.

coordination with stakeholders, formulation of basic policies for water resource management, consideration of engineering and agronomic technical alternatives necessary to resolve issues and conflicts, and formulation of problem-solving measures.

- ③ **Capacity to operate consensus-building mechanisms (consultative bodies):** To promote social consensus-building by stakeholders, it is necessary to establish consensus-building mechanisms (consultative bodies), such as basin committees and public hearings, to ensure an opportunity where stakeholders can appropriately express their views and have their opinions heard.
- ④ **Data and monitoring:** When a problem has become apparent but no action has been taken, data on the issue is often not collected and organized. In addition, when there are conflicting interests, there may be conflicting views on the reliability and interpretation of data and information, making it difficult to initiate constructive discussions. The responsible entity is required to collect scientific and objective data that stakeholders can trust and to monitor changes in such data to understand the issues, consider countermeasures, and facilitate consensus-building among stakeholders. Scientific and objective data are important to find solutions to conflicts of interest and trade-offs and to build consensus. In addition to organizing natural scientific data such as meteorological and hydrological information, it is also necessary to clarify the social and cultural background and stakeholders in the target region or basin, and to clarify the structure and causal relationships of water issues.
- ⑤ **Information disclosure:** Information disclosure has a significant impact on building trust among stakeholders. If the responsible entity discloses only the information that is convenient for itself and hides other information, it will undermine the trust among stakeholders, resulting in the failure of projects to proceed and problems to be resolved. Stakeholders should consult with each other regarding the content, scope, and method of disclosure of information to be made public, and then gradually expand the scope of disclosure to ensure that all information needed by stakeholders is made public promptly.
- ⑥ **Financial resources/funding:** It is necessary to create a situation where the necessity and priority of measures to solve problems are understood, a plan to secure funding is in place, the organization responsible for budget measures is clear, and the necessary budget is secured. To this end, it is important to involve ministries and departments related to budget measures in the process of problem analysis and consideration of countermeasures, and to create a situation of

collaboration. It is also necessary to be able to reach out to many potential sources of funds, for example, by providing accurate information to development partners on issues, measures to address them, costs, etc., to obtain support, and by seeking investment from the private sector based on CSR and Water Stewardship concepts. When the responsible entities and consultative bodies are functioning and a consensus of stakeholders is formed, the feasibility of the project will increase and it will be easier to raise financial resources.

- ⑦ **Ability to implement projects:** The responsible entity needs to have the ability to implement measures to solve problems and to enforce ordinances and institutions. Specifically, this includes the implementation of projects such as water resources development and river improvement (project planning, procurement, implementation supervision, etc.), coordination of water withdrawal during drought, crackdown on illegal activities and various inspections, and awareness-raising activities. In addition, the competent authorities, local governments, and related organizations (usually participate in IWRM as members of a consultative body) in each sector must make decisions on and implement their respective projects under the agreement of the consultative body and coordination by the responsible entity. The responsible entity is also responsible for coordinating and facilitating the implementation of such projects by other entities.

There are three main elements that the consultative body should strengthen in Step 2.

- ① **Institutionalization of consultative bodies:** For the responsible entities to formulate plans and make decisions, it is necessary to consider the opinions of stakeholders. Therefore, a consultative body should be institutionalized to provide opportunities for stakeholders to express their opinions and to build consensus. If not institutionalized, problems will arise, such as the voices of many stakeholders not reaching the responsible entity, only a few stakeholders conducting sporadic activities and transmitting their claims, or the discussions becoming like protests against the government and not constructive discussions based on trust. Potential members of the consultative body include water users, NGOs, government agencies, local authorities, representatives of concerned residents, research institutions, the private sector, development partners, and others. In recent years, there have been examples of private companies working to solve local water-related problems not only as water users but also from an ESG and CSR

perspective, and they should be actively involved as important actors that can also serve as a source of funding.

- ② **Establishment of operating rules to guide consensus building:** Since it is important for a consultative body not only to hold discussions but also to guide consensus building, operating rules are necessary for this purpose. The following are some of the ways to manage the process of designing consensus building: making a list of stakeholders who should be involved so that they can participate (Stakeholder Analysis); analyzing what opinions stakeholders have (Interest Analysis); clarifying the goal of the discussion and sharing it among participants; making sure that everyone can express their opinions fairly and that the opinions expressed are shared among the participants; sharing information and operating transparently so that participants do not distrust each other; and sharing rules among participants for conducting discussions. In addition, it is necessary to create an environment in which the consultative body can operate smoothly, for example, by securing a budget for operations and establishing a secretariat. To resolve conflicts, strategies such as those shown in Figure 3 can be considered, especially approaches that aim for cooperation (Win-Win) or compromise (Win-Win/ Lose-Lose). Leading to coordination (Win-Win) may include the development and allocation of new water resources, combining development projects in different sectors (e.g., water utilization and flood control projects), exchanging water resources and other non-water benefits (e.g., electricity generated by hydropower, monetary compensation, etc.), and setting an agenda where the interests of the parties involved are aligned (e.g., regional economic development).
- ③ **Capacity of the consultative bodies/members to implement projects:** In the activities of the consultative body, it is necessary to create a spiral in which the consultative body does not stop at discussions, but instead implements solutions based on agreements, even small ones, and when the effects are felt, the significance of the consultative body is recognized, which leads to more active activities. In some cases, the consultative body itself implements projects, while in other cases, the organizations that are members of the consultative body (sector-based organizations, NGOs, private companies, etc.) implement projects based on their scope of jurisdiction and interests.

The solution needed to strengthen responsible entities and consultative bodies at the regional and basin levels is to strengthen the above elements mainly through on-the-job training as the responsible entities and consultative bodies work together to solve water problems in their regions and basins.

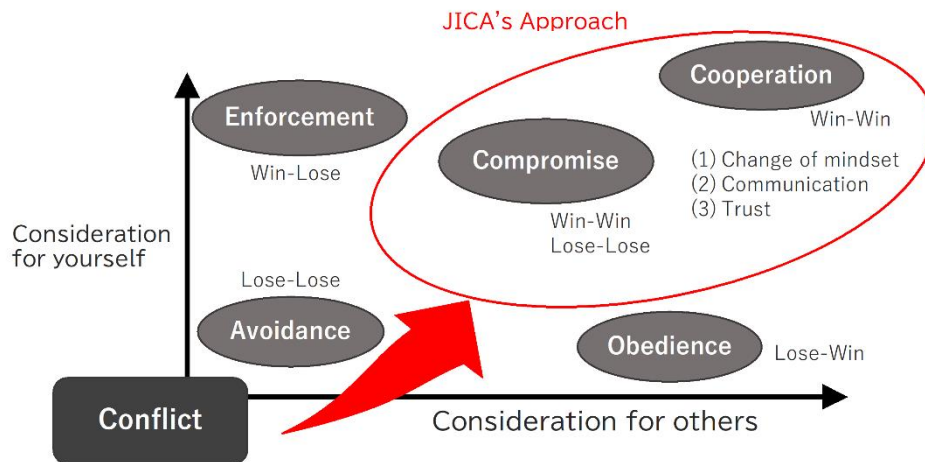


Figure 3 Approaches to resolving conflicts²²

At the national level, policy authorities need to develop the legal system, including the water rights system, and to develop strategies and plans.

- ① **Legal system (including water rights)**: Legislation or government ordinances applicable nationwide should clarify the objectives of water resource management, implementation system, licensing mechanism, rights, and regulations such as water rights (e.g., water withdrawal from rivers and pumping of groundwater), interest coordination mechanism of consultative bodies, strategies and plans to be established, financial resources, etc. In many cases, the general framework is established at the national level by law or government ordinance, and the details are further supplemented in the form of ordinances and other regulations in the regions and basins. Although the central government often has laws related to the development and management of water resources, there is often no mechanism for coordinating the ministries and agencies responsible for each sector, or no defined mechanism for reflecting the opinions of stakeholders, so it is necessary to include a system to promote IWRM.
- ② **Strategy and plan**: At the national level, a strategy and plan should be developed that defines the basic policy, priority measures, implementation system, and budgetary measures necessary to promote IWRM.

The solutions needed to achieve this are to strengthen the capacity for analyzing the

²² Yuka Suzuki. Conflict Management. Jiyukokuminsya, 2008 (in Japanese). partially modified.

need for a legal system and drafting laws and regulations, the ability to formulate strategies and plans, and the ability to coordinate interests in policy making.

Step 3: Solution implementation phase

At the regional and basin levels, examples of problem-solving are accumulated as activities such as planning and prioritization of measures to solve problems and building social consensus are carried out, and agreed-upon solutions are implemented. The solutions needed include clarifying the decision-making process, strengthening management capacity for consensus building, strengthening the capacity to secure budgets, including negotiations with development partners and financial authorities, strengthening the capacity to implement projects, including project planning and procurement, and implementing projects that lead to solutions to the problems.

At the national level, monitoring, information disclosure, and budget allocation/funding will be promoted. A water resources monitoring system will be established in cooperation with the responsible entities in the regions and basins, and data will be consolidated and made publicly available for use in policymaking and interest adjustment. In addition, the necessary budgetary and financing systems will be established to promote the development and management of water resources. The necessary solution is to strengthen these elements mainly through on-the-job training.

【Interaction between practices in local regions and basins and the development of policies and institutions at the national level】

Problems related to water resources often emerge in conflicts over water allocation, conflicts over development projects, declining groundwater levels, land subsidence, water pollution, etc., in a region or basin, and efforts to solve these problems often take the lead. Such precedents are shared nationwide and reflected in policies and institutions at the national level to help solve similar problems in other regions and basins, or to help prevent similar problems from occurring beforehand.

On the other hand, policies and institutions may be introduced at the national level first and then applied to regions and basins, or the central government may compile a collection of case studies of initiatives in regions and basins and disseminate good practices throughout the country, thereby helping to solve problems in regions and basins. In this way, there is an evolving relationship between practices in a region or basin and the development of policies and institutions at the national level, which provide feedback to each other so that problems can be solved and prevented in a better way.

As the adoption of IWRM in the region and basin increases in this manner, and

policies and institutions are developed at the national level, efforts to solve problems based on IWRM will become an ongoing process.

3.2 Key Concepts of Development Scenario

(1) IWRM Spiral

UNESCO's "IWRM Guidelines at River Basin Level"²³ advocates the internationally accepted Integrated Water Resources Management Spiral (IWRM Spiral), as shown in Figure 4, and presents good practices. This spiral represents how the problem-solving process from (a) to (d) below evolves from application to relatively simple problems to more complex and challenging problems, improving the ability to deal with problems through IWRM and solving newly emerged problems related to water resources.

- (a) Recognizing the need for IWRM and identifying the problem.
- (b) Conceptualizing ways to solve problems.
- (c) Coordinating with stakeholders and planning in concrete terms.
- (d) Implementing, monitoring, and evaluating the plan through consensus among the stakeholders involved.

The development scenario assumes that the practice of IWRM based on this spiral will be implemented at the regional and basin levels, and that the process from Step 1 to Step 3 will be repeated. Not only countries in the early stages of implementing IWRM, but also those that have implemented it but are faced with the need to address more complex and challenging issues, will be targeted for cooperation. It is also envisaged that a similar spiral of development of IWRM will emerge between practices at the regional and basin levels and the development of policies and institutions at the national level.

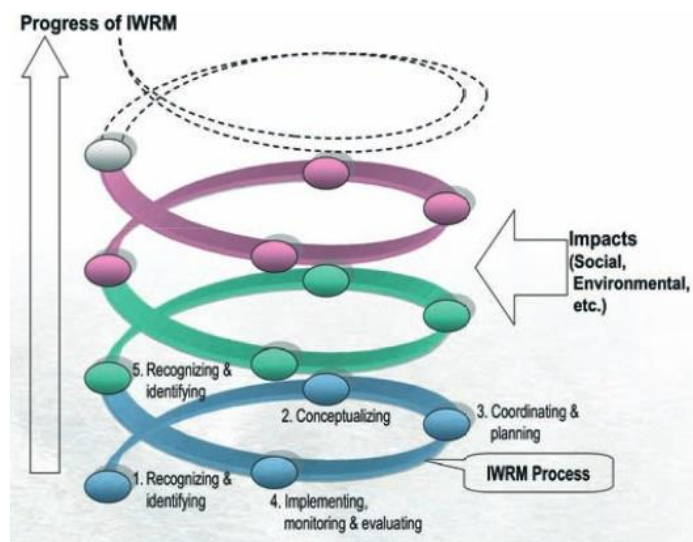


Figure 4 Conceptual diagram of the IWRM spiral²³

²³ UNESCO. IWRM Guidelines at River Basin Level, Part 1, Principles. 2009.

(2) Collaboration between responsible entities and consultative bodies

The development scenario is based on the assumption that strengthening responsible entities and consultative bodies is important for IWRM at the regional and basin levels. Evidence for this assumption is provided in a paper by Nagata et al. (2021)²⁴. To resolve conflicts of interest over water resources, the entities implementing water resources management and the stakeholders must have a correct scientific understanding of water resources and, at the same time, understand the social context in which the conflicts occur. A consultative body of stakeholders needs to be formed based on such recognition. However, it is not enough to simply establish a platform for stakeholders to gather; it is important that each stakeholder implements the solutions agreed upon in the consultative body and feeds back the results to the consultative body for continuous implementation and improvement of the solutions. Such step-by-step consensus building and problem-solving is important, and it is necessary to accumulate small successes, in other words, to repeat the practice of IWRM. By repeating this cycle, the stakeholders will realize that the agreements reached by the consultative body are being implemented in practice that the water resources problems are being improved, and the consensus-building mechanism will operate voluntarily and sustainably. The specific activities of the responsible entities and the consultative bodies through the practice of such IWRM are shown in Figure 5.

²⁴ Nagata, K., Shoji, I., Arima, T., Otsuka, T., Kato, K., Matsubayashi, M., Omura, M. Practicality of integrated water resources management (IWRM) in different contexts. *International Journal of Water Resources Development*, 38, 5, 2021.

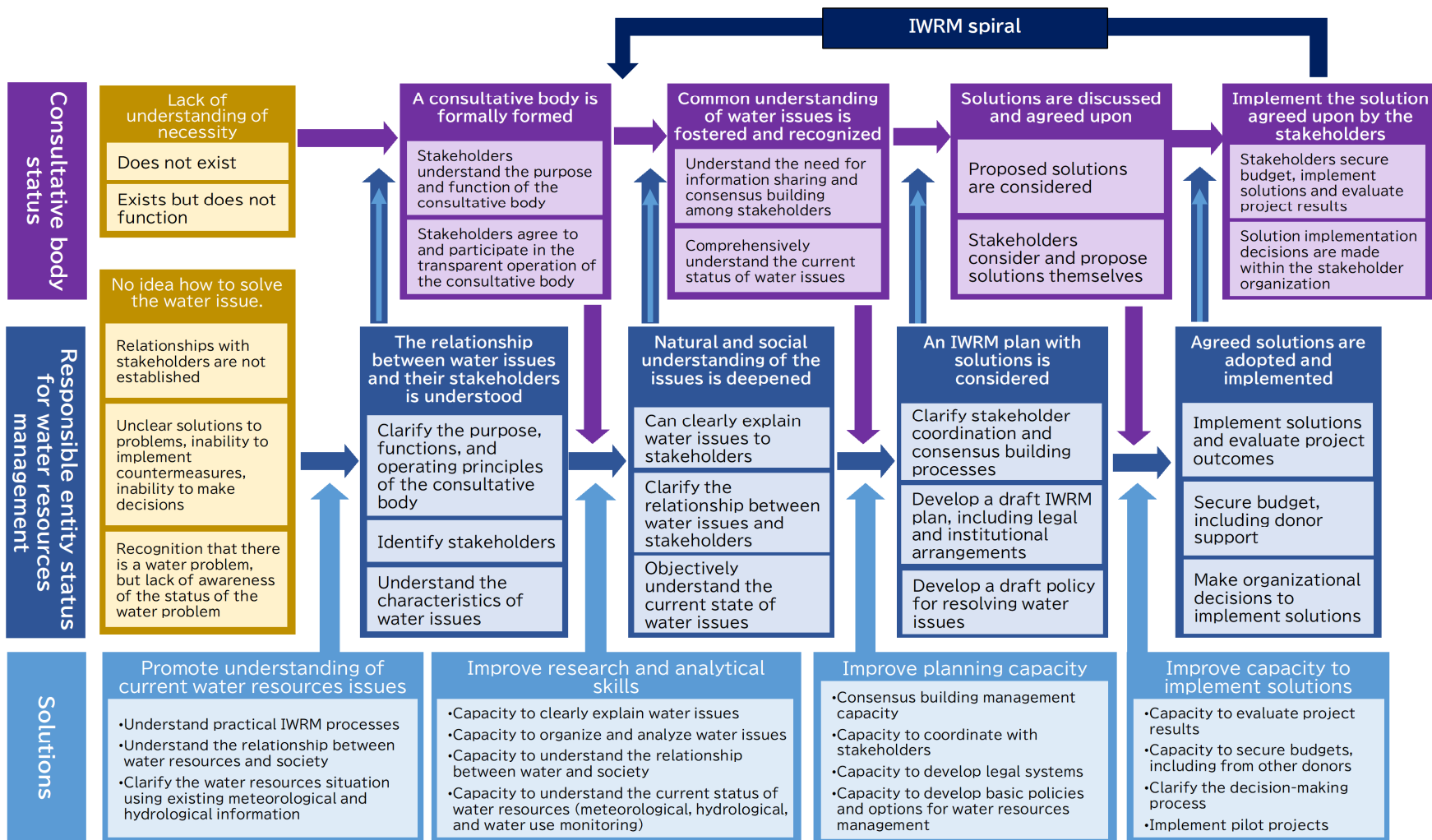


Figure 5 Process of IWRM practice through collaboration between responsible entities and consultative bodies

(3) Japan's Experience in Water Resources Management

Since ancient times, development in Japan has focused on irrigation water and flood control, but there were constant water-related conflicts, such as water disputes between upstream and downstream farmers and conflicts between the right bank and left bank of rivers over flood control projects. In the Meiji period (1868-1912), the River Law was enacted in 1896 and a River Administrator was established, but it was designed with flood control projects in mind, and conflicts between power companies and water users continued thereafter. As the development of water resources progressed, the need to coordinate projects among various sectors increased, and with the enactment of the Act on Specified Multipurpose Dams in 1957 and the new River Law in 1964, a system was established in which major rivers are consistently managed by the national government as a River Administrator for the entire river system, and projects are implemented by coordinating the various sectors.

Meanwhile, water resource problems became apparent in various regions and basins, and various measures were taken that led to the development of a nationwide system. In the 1960s, serious health hazards caused by factory and mining effluents led to the social problems of pollution represented by Minamata disease and Itai-itai disease, and based on the reflection of these problems, a legal system for the prevention of water pollution was established. The large opposition movement to the construction of the Matsubara and Shimouke dams on the Chikugo River system in the late 1950s and 1960s, led to the recognition of the need for compensation for residents affected by the project. In addition, legal systems such as the Act on Special Measures for Water Source Areas were developed. In response to land subsidence, which has become more serious in metropolitan areas such as Tokyo and Osaka, local governments have taken local measures such as ordinances to regulate excessive groundwater pumping and groundwater monitoring. In the Tsurumi River Basin, which flows through Tokyo and Kanagawa Prefecture, urbanization has caused severe flood damage, and as a countermeasure, the concept of comprehensive flood protection measures, based on consultation across administrative boundaries, was introduced, combining river improvement, flood control areas, green space preservation, and stormwater control ponds in a comprehensive manner, not only in the river itself, but in the entire river basin. This basin-based thinking led to the formation of a comprehensive "Water Master Plan" through the Model Regional Plan for Biodiversity Conservation, which paved the way for the revision of the River Act. The issues surrounding the construction of the Nagaragawa River Mouth Barrage, which was the subject of a long campaign of opposition from the 1960s to the 1990s, resulted in a

major point of contention regarding the disclosure of information and the consideration of the opinions of stakeholders. The 1997 Amendment to the River Law established the development and preservation of the river environment as the purpose of the law, the establishment of the basic policy of river improvement and the river improvement plan, and the hearing of the opinions of stakeholders in the formulation of river improvement plans.

Thus, it was recognized the importance of promoting collaborative actions among different sectors and stakeholders based on the concept of IWRM, through trial-and-error measures to solve water resources management problems that arose in the regions and basins. This resulted in a nationwide system of strengthening the entities responsible for water resources management and introducing a consensus-building mechanism to listen to the opinions of stakeholders.

(4) Experience of JICA projects

JICA has experience in implementing projects with the main objective of promoting IWRM.

In Sudan, “The Project for Enhancement of Integrated Water Resources Management” (2016-2023) was implemented. In North Kordofan State, the target area for the pilot activities, there was concern about the declining groundwater level, but no scientific data was available, and stakeholders had only a vague awareness of the problem. In addition, there was no consultative body that would allow stakeholders to discuss the problem and consider solutions. Therefore, the first step was to strengthen the capacity of the state government, which is the main entity responsible for water resource management, to monitor water resources and to establish a system to confirm the decline of groundwater levels based on data objectively. The project then institutionalized the State Water Resources Council to share data with stakeholders, identify problems, and discuss solutions. During the project period, the State Water Resources Council was formally institutionalized, and through the Council, the recognition of problems was shared, necessary policies were discussed, and specific activities were initiated to improve the efficiency of water resources use, such as identifying the appropriate amount of irrigation in agricultural areas. In this way, the project has achieved results in establishing a system infrastructure to promote IWRM in North Kordofan State.

In Jakarta, land subsidence has become a serious problem. However, there was no consensus among stakeholders on the causes and direction of solutions, and no effective action had been taken. In response, JICA repeatedly raised awareness through seminars about the subsidence damage in Tokyo and Bangkok, where JICA

had cooperated in the past, and the measures taken to prevent subsidence. JICA also identified the Jakarta Special Provincial Government, which is responsible for regulating groundwater pumping, and the Ministry of Public Works and Housing, which is responsible for securing alternative water sources, as the responsible entities, and elicited high-level commitments and built consensus on the need for such measures.

On this basis, the “Project for Promoting Countermeasures against Land Subsidence in Jakarta” (2018-2022) was launched, which used scientific data obtained from satellites, subsidence observation wells, etc., and established an implementation system involving many departments of the Ministry of Public Works and Housing, the responsible entity, and the Jakarta Special Provincial Government, and established a “Planning and Implementation Committee”, a consultative body of stakeholders for subsidence, to ensure that the measures would continue after the project was completed. Currently, these responsible entities and consultative bodies are promoting an action plan to control land subsidence (Figure 6).

In Bolivia, the “Project for Capacity Development on Integrated Water Management in Cochabamba” (2016-2023) conducted pilot projects to analyze the factors hindering the resolution of water issues such as groundwater management and water pollution, and to conduct case studies to solve individual issues in depth. As a result, using the lessons learned from the pilot projects, the capacity of the local administrator in charge of water resources management was strengthened so that the administrator of the Cochabamba Department, the entity responsible for water resources management, was able to take on the role of managing the “Rocha River Basin Inter-Organization Platform,” a consultative body, and working with various stakeholders. For example, participatory monitoring, in which residents and government officials observe the same sites to foster a common understanding, is practiced to reduce distrust of government and encourage collaboration to solve problems.

JICA will continue to implement projects on IWRM and strengthen the rationale for the scenarios in this Cluster Strategy by systematically organizing the lessons learned from the projects, etc., publishing them in papers, and presenting them at international conferences.

JICA's approach to land subsidence countermeasures in Jakarta, Indonesia

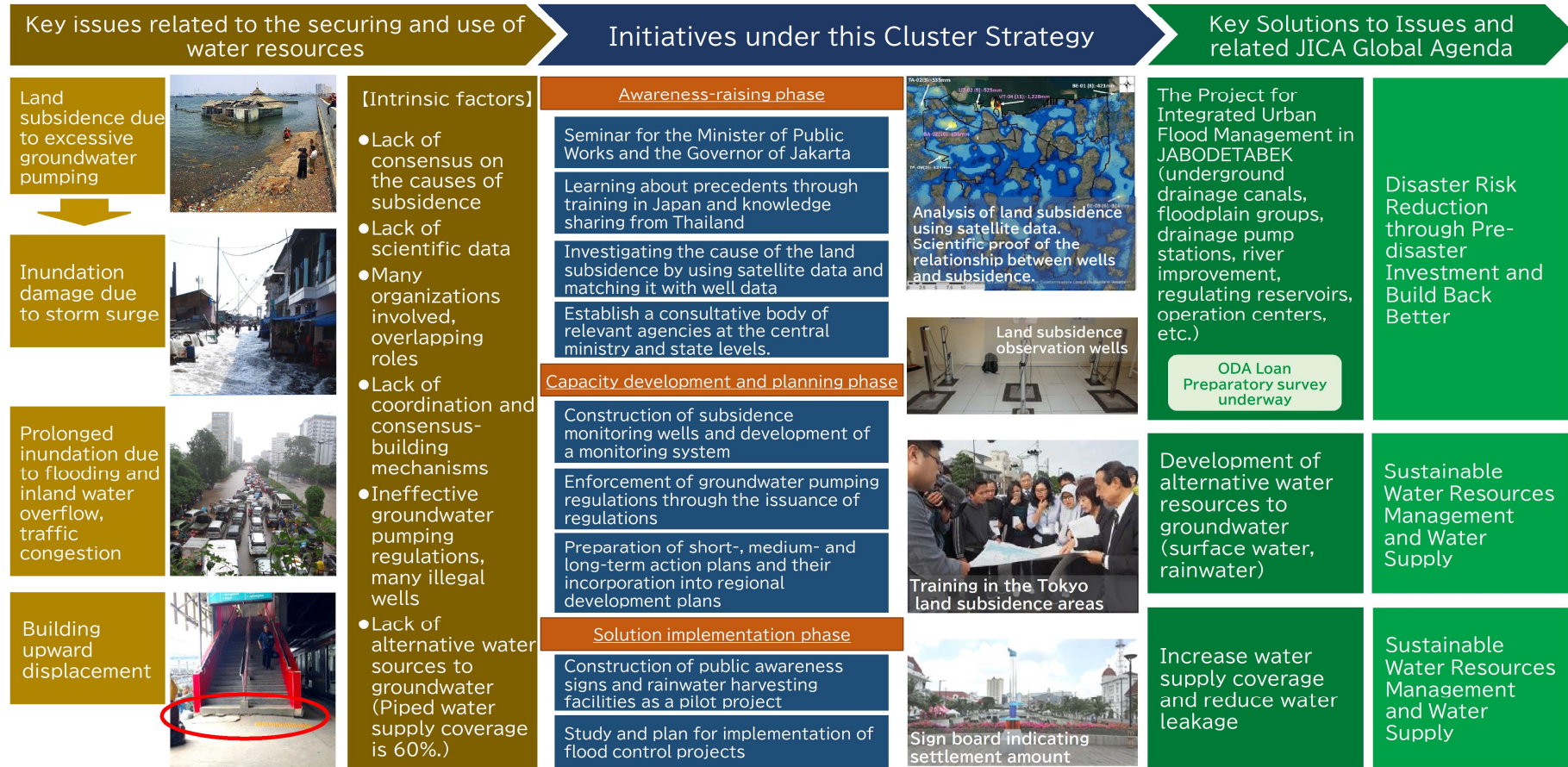


Figure 6 JICA's approach to land subsidence countermeasures in Jakarta, Indonesia

4. Implementation Direction

4.1 Partnership with Partner Countries

(1) Main target countries (regions)

This Cluster Strategy is aimed at countries (regions) that have the potential to strengthen IWRM, taking into account the status of the problems related to the use of water resources that they face and the status of their IWRM practices. In general, the following criteria will be applied in making this assessment.

- A certain degree of progress has been made in the development of water resources in the target country (region), and water resources management, including the coordination of interests and the prevention and resolution of conflicts over water resources, has become important.²⁵
- A situation has arisen in which ministries and administrative agencies in the target country (region) need to coordinate their efforts to manage water resources across sectors.

In terms of JICA's input, JICA will focus on and allocate resources for cooperation at the regional and basin levels to promote practical IWRM that goes beyond conceptual discussions on IWRM and emphasizes initiatives that help solve specific problems faced by people in the regions and basins. To increase development impact, JICA will target regions and basins of a certain size, address typical water resource challenges common to many countries and regions, and disseminate methodologies and lessons learned to other countries and regions facing the same challenges. JICA will also work with other development partners and encourage partner countries to take action. The countries and regions covered by completed, ongoing, and emerging projects, and the water resource issues they face, are listed in Tables 2 and 3.

Cooperation in the field of IWRM amounts to an annual investment of about 500 million yen from FY2021 to FY2023²⁶, which is only about 10% of the investment in technical cooperation for drinking water supply. However, given the importance of this field, JICA will actively formulate projects and aim to expand the scale of our input.

²⁵ With increasing urbanization and population growth, water for domestic and industrial use, food (irrigation) and energy (hydropower) is or will be scarce, flooding and inundation are common, and environmental degradation due to water pollution is severe, etc.

²⁶ Scale of operations limited to cooperation in the field of IWRM with a focus on interest coordination addressed in this Cluster Strategy.

Table 2 Cooperation at the regional and basin level

Country	Region	Major Water Resource Issues
Sudan	Bara groundwater basin, North Kordofan State	Groundwater management and allocation
Thailand, Laos, Cambodia, Vietnam	Mekong River Basin	International river management, environmental and social impacts of dams, sediment management, biological resources management, and saltwater intrusion
Bolivia	Rocha River Basin, Cochabamba Department	Water pollution
Indonesia	Jakarta, other cities	Land subsidence
Cuba	Six groundwater basins selected from the provinces of Artemisa, Mayabeque, and Havana	Groundwater management and salinization
Iran	Cephidrude River Basin	Upstream and downstream water allocation
Morocco	Pilot basins with dams experiencing sedimentation progression	Integrated watershed sediment management

Table 3 Cooperation at the national level

Country	Region	Major Water Resource Issues
Bolivia	Nation-wide	Groundwater management
Philippines	Nation-wide	Water resources development and management

(2) Promote sustainability initiatives, including climate actions and biodiversity conservation

In promoting IWRM, it is essential to promote sustainability in terms of climate change mitigation, and environmental sustainability including biodiversity conservation, human rights and gender, and governance.

Climate change will have a significant impact on water resources through changes in temperature and the atmospheric water cycle. The Working Group 2 (WG2) report of the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) details the impacts of climate change on water resources. Although local lifestyles and production have adapted to the climate, there is concern that a

changing climate will force changes in traditional ways of doing things (Oki 2012)²⁷ and that conflicts over water will intensify as the amount of allocable water resources changes, so adaptation measures, especially those based on projections of long-term impacts and risks, should be put in place. Important adaptation measures include IWRM planning, water cycle analysis, water source selection, basin conservation, ecosystem protection, land use policies, groundwater recharge and conservation, and other measures to strengthen community resilience. Mitigation measures should also be promoted, such as the use of hydropower as a renewable energy source, the preservation of watersheds that contribute to the absorption of greenhouse gases, and the development and use of water resources with lower energy consumption.

The development and management of water resources also affect the natural environment and biodiversity of a river basin. The Global Assessment Report on Biodiversity and Ecosystem Service of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) mentions IWRM as a useful cross-cutting approach to freshwater management, and it is important to consider not only water use and flood control, but also water environment and basin conservation. In recent years, “Nature-based Solutions (NbS)” and “green infrastructure” have also attracted attention.

It is also necessary to avoid or mitigate situations where the benefits of water resource development and management are skewed towards certain groups, where vulnerable groups such as indigenous peoples and the poor face high opportunity costs in accessing water, or where only large downstream cities benefit while water source areas are affected by developments such as dams. Furthermore, it is necessary to ensure the meaningful participation of women, indigenous peoples and others in discussions and decision-making in the consultative bodies. It is important to take into account human rights, vulnerable groups and gender perspectives, and to ensure that no particular group is excluded from the membership of the consultative body and from the decision-making process in the social consensus building that IWRM seeks to achieve.

From a governance perspective, particular attention should be paid to meaningful participation and transparency in the functioning of consultative bodies, and the identification and disclosure of scientific and quantitative data, given the emphasis on information disclosure and consensus building among stakeholders in IWRM.

²⁷ Oki Taikan. *The Water Crisis: The Real Story*. Shinchosha. 2012. (in Japanese)

(3) Effective use of JICA's various schemes

For countries/regions in “Step 1: Awareness-raising Phase” in the development scenario, it is effective to promote awareness in a step-by-step manner, starting with dispatching experts and conducting basic surveys, holding seminars, etc., and providing opportunities to observe Japanese case studies by utilizing JICA's Knowledge Co-Creation Program (KCCP) (Training in Japan). A KCCP “Practical Integrated Water Resources Management” will be used as an important input to promote the Cluster Strategy, including the content to disseminate the concept of the cluster strategy and to formulate projects by ex-participants. Collaboration with researchers through the Science and Technology Research Partnership for Sustainable Development (SATREPS) and other programs will also be pursued to generate scientific and objective data and structure issues related to water resources.

In “Step 2: Capacity development and planning phase”, technical cooperation plays an important role in supporting the capacity development of responsible entities and consultative bodies. It is also effective in formulating a medium- to long-term basic plan (master plan), such as a water resources management plan for the whole country or a specific region or basin, linking it to investments by other development partners or the private sector, and implementing pilot projects under technical cooperation to verify the effectiveness of measures while providing on-the-job training for capacity strengthening, and then scaling up through financial cooperation.

In “Step 3: Solution implementation phase” and the subsequent phases toward intermediate outcomes, problems are solved by implementing projects based on consensus building, and this experience leads to further strengthening of the responsible entities and consultative bodies, so financial cooperation for implementing projects is to be actively utilized.

(4) Promote collaboration with other Global Agenda/Clusters

IWRM is closely linked to many sectors, including food production, private sector development, energy, river basin conservation, aquatic ecosystem conservation, water pollution control, flood control, climate change, etc. Agricultural water use accounts for more than 70% of total water use in the sector. Therefore, the Cluster Strategy aims to increase its development impact by linking it to other related JICA Global Agendas and Cluster Strategies. Since it will be important to implement measures by various sectors, local governments, and related organizations that make up a consultative body, JICA will actively cooperate with other sectors, accumulate knowledge through study groups, etc., and form multi-sector projects. In addition, when conducting large-scale regional and urban development, consideration for water resources is essential. Therefore,

development scenarios will be shared with relevant departments and offices of JICA to promote collaboration and co-creation.

Specific solutions include water-efficient irrigation, improving water supply and sewerage, introducing water pollution control regulations, conserving forests, wetlands and the natural environment in the basin, developing flood control facilities, constructing and improving hydropower facilities, developing multi-purpose river facilities, and controlling sedimentation and rehabilitating dams. By strengthening the responsible entities and consultative bodies through this Cluster Strategy, and by developing institutions, plans and data, it will be easier to implement projects in these individual sectors, and to coordinate and facilitate the projects of development partners.

In addition, there also exist interest coordination mechanisms, responsible entities, and consultative bodies in related sectors, such as “Integrated Lake Basin Management (ILBM)” for water pollution control in lakes and local farmers’ water users’ associations for irrigation water management. The knowledge and infrastructure of initiatives in these sectors will be also utilized.

(5) Effective methods in the management of the consultative body and consensus-building process

To solve regional and watershed water problems, it is necessary to solve problems through social consensus building that brings together the necessary stakeholders. Studies theorizing the consensus-building process have reported the following: 1) the importance of local knowledge, such as the accumulated wisdom and knowledge of local people, as a complement to scientific evidence; 2) the importance of a process that respects diverse opinions and values as well as agreed outcomes, which is an important element for a consensus to be accepted by society; 3) when social consensus building is positioned as a creative process, not just a forum for avoiding conflict and consolidating opinions, it will lead to higher quality consensus building²⁸. The research team at Wageningen University in the Netherlands has also organized principles and tools for making multi-stakeholder consultative mechanisms work, including the use of systems thinking and adaptive management techniques²⁹. Given

²⁸ Toshio KUWAKO. Project Management for Social Consensus Building. Corona Publishing Co.,Ltd. 2016. (in Japanese) Tomoki TAKADA. Mitsuyo TOYODA. Junzo SAGO. Motoki SEKI. Kazuya AKIYAMA. Toshio KUWAKO. A Study on the Structure of Consensus Building Processing Social Infrastructure Development. Japanese Journal of JSCE (The Japan Society of Civil Engineers). 2012, 68, No.1, 27-39.

²⁹ Brouwer H. and Woodhill, J with Hemmati M., Verhoosel K. and van Vugt S., The MSP Guide - How to design and Facilitate Multi-stakeholder Partnerships, WAGENINGEN Integrated Water Resources Management in Practice - Better water management for development, Third Edition. 2019.

the importance of the role of civil society and the need for multisectoral cooperation across many institutions, this knowledge should also be used. Use this academic knowledge on social consensus-building and effective methods in the management of consultative bodies and consensus-building processes that incorporate social science methods of analysis.

(6) Use of innovative tools, including DX

JICA will actively use innovative tools, including DX, to collect data on water resources, promote social consensus building, and compile lessons learned on applicability and considerations for developing countries, for further use and replication.

- **Satellite and Earth Observation Data:** Scientific and objective data can be collected over a wide area. The following remote sensing technologies are used: observation of land subsidence by Interferometric SAR (InSAR) analysis using the Synthetic Aperture Radar (SAR) of the Advanced Land Observing Satellite “Daichi” (ALOS), the Global Satellite mapping of Precipitation (GSMaP), estimation of evapotranspiration using data from the Global Change Observation Mission -Climate “SHIKISAI” (GCOM-C), and observation of land water such as groundwater using the GLACE satellite, which measures the Earth’s gravity field. In addition, the Data Integration and Analysis System (DIAS), developed and operated by Japan as an information system that collects and integrates global environmental big data (observation information, forecast information, etc.) for analysis and contributes to solving global issues such as climate change, will be used.
- **Modeling Technology:** Various models have been developed and are widely used to simulate the response of hydrology and water resources to weather and climate change, and to predict the impact of changes by human society (construction of reservoirs, water use, etc.). These models can support rational decision-making by visualizing the process of the water cycle, predicting future problems to be solved, and clarifying the effects of countermeasures.
- **Decision Support Tools (DSS):** Various tools have been developed to support stakeholder consensus building, including (1) stakeholder analysis; (2) data collection, organization, storage, and visualization; (3) scenario generation; and (4) simulation and optimization of water resource management.
- **Digital platforms for citizen participation:** As digital technology has advanced, digital platforms for citizen participation have been created, and efforts are underway to integrate the physical meeting process with digital platforms to ensure transparency in the discussion and consensus-building process, information sharing,

and participation by a wide range of people.

- **Citizen Science:** With the proliferation of smartphones and advances in various sensors, citizens and scientists can collaborate to enable citizens to easily monitor water quality, soil moisture, water levels, etc. and aggregate the data. Although citizen science has some challenges, such as data quality, the participation of citizens in generating their data has the effect of increasing awareness and involvement in water resource issues and promoting consensus building.

(7) Transboundary basin

Transboundary basin issues, such as international rivers and transboundary groundwater, are issues of water allocation and control between countries, and conflict resolution requires both diplomatic negotiations between governments (high politics or first track) and collaboration and trust building among scientists, engineers, practitioners, and others (low politics or second track)³⁰. In addition, responsible entities are often dispersed among the governments of different countries in the basin, and although consultative bodies may exist as coordinating bodies within the basin, in practice they often have limited authority and do not function well enough³¹. It is difficult to make a consultative bodywork in a transboundary basin, but the role of the responsible entity in each country is even more important to make the consultative bodywork.

Considering that Japan has no international watersheds and lacks knowledge and experience in their management, and that JICA is an implementing agency for development cooperation, JICA will focus on the second track³² and work to develop responsible entities in each country. For the first track, JICA will provide information to the Japanese government, which is responsible for it. For the time being, JICA will focus its efforts on the Mekong River Basin, which Japan has historically been deeply involved in the development of, and will collect and share objective data and scientific

³⁰ Mikiyasu NAKAYAMA. Problems and Issues of International River Basins. The Study on Development Assistance in Water Sectors. Institute for International Cooperation, JICA. 2002.

³¹ For example, the Mekong River Commission (MRC) exists in the Mekong River Basin, but the actual decision-making authority rests with the governments of each country, and the MRC's authority is rather limited, making it difficult for it to function effectively to solve problems. In addition to the cooperation for the MRC, cooperation that builds on bilateral cooperation with the countries in the basin is considered necessary.

³² In addition to supporting scientific and quantitative analysis of the damage, causes and solutions to specific problems in international river basins, JICA will examine both the "engineering approach", in which the progression of the problem is halted through infrastructure development, etc., without compromising the vested interests of other countries in the basin, and the "concessionary approach", in which concessions of some vested interests are sought from either country in exchange for some benefits, from both mitigation and adaptation approaches to the problem.

knowledge, and establish a network of experts to contribute to solving problems, including cooperation with the Japan-Mekong cooperation promoted by the government.

4.2 Activities for Maximizing Development Impacts

From the perspective of agenda setting (Thought Leader), knowledge co-creation (Platformer), fund mobilization (Mobilizer), and market creation (Market Maker), efforts are made to maximize impact and achieve the outcome.

(1) Agenda Setting (Thought Leader)

【Disseminate the concept of practical IWRM】

JICA will organize knowledge through practices in JICA projects and knowledge management activities such as project research, and widely disseminate the concept of practical IWRM through presentations at international conferences and submissions to international academic journals.

In 2019, JICA and GWP jointly hosted a seminar at the Stockholm World Water Week to introduce JICA's concept of practical IWRM to practitioners and experts from various countries. In addition, the cooperative approach to practical IWRM developed through discussions was published in the International Journal of Water Resources Development, an international academic journal in the field of water resources management²⁴.

【Promotion of Collaboration with Development Partners】

The concept of this Cluster Strategy and examples of initiatives will be shared with GWP and other development partners who are working to promote IWRM, and to promote collaboration to solve water issues.

The GWP is an organization based on a network of experts whose mission is to advance governance and management of water resources for sustainable and equitable development and is an important development partner with which JICA should actively cooperate in promoting cooperation in the field of IWRM. In cooperation with the "Technical Committee" established by the GWP at the global level, the "Country Water Partnership (CWP)" established in each country, and other expert networks, JICA will collaborate with GWP, which has strengths such as the communication capabilities to disseminate JICA's practical integrated water resource approaches, useful resources and networks in the region, basin and countries, and methods and tools such as "Collaborative Modelling".

In the target countries (regions) of JICA cooperation, local scenarios based on the

Cluster Strategy will be shared with other development partners. By making the responsible entity and the consultative body a common platform for solutions and promoting the participation of development partners in the consultative body, the projects and funds of other development partners will also be induced, thereby expanding collaboration in solving problems related to water resources.

【Promoting Collaboration with Experts and Researchers】

Many researchers are engaged in R&D and application of remote sensing, modeling, and social consensus building necessary for IWRM. JICA will incorporate the results of the latest research by collaborating with them. The use and support of networks among researchers is also effective.

(2) Knowledge co-creation (Platformer)

【Creating knowledge from experience in water resources management】

JICA will develop knowledge of good practices and lessons learned from Japanese experiences and JICA's cooperation, and apply them to human resources development and projects. JICA will utilize the project research "Japan's Experience on Water Resources Management" (2021)³³, deepen cooperation with national and regional domestic partners, and disseminate Japanese knowledge useful for solving problems in developing countries.

【Sharing and networking across national boundaries】

JICA will share experiences, raise awareness, and motivate people across countries by organizing or participating in international forums, etc. JICA will involve relevant Japanese ministries and agencies, experts, consultants, and other players of development cooperation to share scenarios, case studies, and knowledge of the Cluster Strategy. In addition, by forming a cross-national network, JICA will inspire mutual learning and cooperation outside of JICA's cooperation.

JICA will reorganize the Knowledge Co-Creation Program "Practical Integrated Water Resources Management" into contents based on the concept of this Cluster Strategy. Promote human resource development by utilizing the contents and human networks developed through the technical cooperation projects included in this cluster and the country-specific training programs implemented within them.

In addition, the South-South Cooperation by the responsible entities which are partners of JICA's cooperation will be promoted to share their knowledge and

³³ https://openjicareport.jica.go.jp/618/618/618_000_1000047169.html

experience with other countries³⁴.

【Promote the understanding and development of domestic bearers】

JICA will share the Cluster Strategy with key players in JICA's cooperation, such as consultants and experts from relevant ministries and agencies, to obtain an understanding of the Cluster Strategy, and to stimulate cooperation that contributes to the Cluster's goals. JICA will provide opportunities to learn not only engineering knowledge but also social science approaches, and develop experts who will be responsible for building social consensus. In addition, JICA will strengthen cooperation with universities to increase the academic resources in this field and to expand the network of such personnel with other partner countries³⁵.

(3) Fund mobilization (Mobilizer)

【 Forming financial cooperation through multisectoral cooperation and mobilizing funds in cooperation with various actors】

To solve water problems in the region, JICA aims to promote both non-structural support through the capacity development of responsible entities and consultative bodies for water resource management, and structural support such as the development of facilities to solve water problems in an integrated manner. By establishing a mechanism for building a social consensus to solve the problem through non-structural support, the feasibility of the facility development project with financial assistance will be enhanced. JICA will mobilize funds to increase the impact of its projects by involving not only JICA's projects but also those of partner agencies, other development partners, private companies, NGOs, universities, civil society organizations (CSOs), etc.

JICA will consider modalities such as Japanese ODA Loans, Grant Aid, Private Sector Investment Finance, and Public-private Partnership Projects, as well as sectors such as irrigation, environmental management, flood control, and energy, etc., comprehensively in supporting the structural aspects such as facility development.

(4) Market creation (Market Maker)

【Promote the participation of domestic and foreign development actors (private companies, etc.)】

The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) has established

³⁴ As an example of what has already been done, officials from related ministries involved in JICA-supported land subsidence countermeasures in Thailand shared their knowledge and experience with Indonesia.

³⁵ Chuo University, Nagasaki University, Nihon University, etc., have already cooperated with JICA.

the “Council for Vitalizing Overseas Expansion by Japanese Companies in the Field of Water Resources” and is formulating projects involving the Japan Water Agency and the private sector. Among the technologies in which Japan has an advantage are dam rehabilitation and upgrading (dam regeneration), which can help reduce conflicts of interest by creating new water resources for development and increasing flood control capacity while minimizing environmental and social impacts, and sedimentation control. JICA will utilize the results of the project formation and preparation of technical documents by the Council.

In addition, JICA will create opportunities for matchmaking between stakeholders in developing countries and those in the domestic private sector through training programs, etc., utilize promising technologies and products in technical cooperation, and disseminate information on the needs of developing countries.

In recent years, ESG has gained momentum, and some companies, such as beverage companies, are making efforts to manage water resources in developing countries. JICA will encourage private companies in target regions and basins to participate in these efforts and encourage them to invest in solving water resource issues.

5. Goal, Targets, and Indicators

5.1 Goal/Targets and Indicators

The final goal, intermediate and direct targets, and their indicators for achieving the objectives and vision of this cluster are as follows.

<Final goal>

- **Problems related to securing and using water resources are continually being resolved.**

<Indirect Targets>

<Indirect Target (1)> (Regional and basin level)

- **Increase in the number of regions and basins practicing IWRM based on social consensus building.**

<Indicator> (collectively pursued with external organizations)

With JICA's cooperation and collaboration with partners, the number of countries improving their “subnational/basin/aquifer level” IWRM implementation score under SDG indicator 6.5.1 will increase.

<Indirect Target (2)> (National level)

● Establishment of a nationwide system to promote IWRM

<Indicator> (shared with external organizations)

With JICA's cooperation and collaboration with partners, the number of countries improving their "national level" IWRM implementation score under SDG indicator 6.5.1 will increase.

<Direct Target>

(Regional and basin level)

● Strengthening the responsible entities

<Indicator> With JICA's cooperation and collaboration with partners, responsible entities will be strengthened in more than 10 regions and basins by 2030³⁶.

*"Strengthened" refers to the implementation of any of the following that had not been implemented previously: ordinance and institutional development, strategy and plan formulation, operation of consensus building mechanisms (consultative bodies), data collection and monitoring, information disclosure, and financial resources and fund procurement.

● Strengthening the consultative bodies

<Indicator> With JICA's cooperation and collaboration with partners, new consultative bodies will be organized³⁷ or functioning³⁸ in more than 10 regions and basins by 2030.

*"Functioning" means that it is institutionalized, operating rules have been established to guide consensus building, and meetings are held regularly to discuss and reach consensus on solutions to issues surrounding water resources.

● Implement solutions based on social consensus-building

<Indicator> With the cooperation of JICA and collaboration with partners, solutions based on social consensus building will be implemented in more than 10 regions and basins by 2030³⁹.

*Pilot projects, financial cooperation, etc. will be utilized.

³⁶ This is accomplished primarily through activities in the Step 2 Capacity development and planning phase.

³⁷ This is accomplished primarily through activities in the Step 1 Awareness raising phase.

³⁸ This is accomplished primarily through activities in the Step 2 Capacity development and planning phase.

³⁹ This is accomplished primarily in the Step 3 Solution implementation phase.

(National level)

● **Strengthening the policy authorities**

<Indicator> With JICA's cooperation and collaboration with partners, more than 200 administrative officers⁴⁰ will be trained by 2030⁴¹.

5.2 Monitoring Framework

Monitoring shall be conducted using the following "Monitoring Table".

⁴⁰ Aggregate administrative officers by gender, and if there is a male bias, work to train female administrative officers.

⁴¹ This is accomplished through Steps 1 - 3.

【Cluster-wide Goal/Targets and Indicators】 : Subject of performance evaluation

Goal/Targets and Indicators	<p>(1) Final Goal Problems related to securing and using water resources are continually being resolved.</p>
	<p>(2) Indirect Target < Indirect Target (1) > (Regional and basin level) Increase in the number of regions and basins practicing IWRM based on social consensus building. <Indicator> With JICA's cooperation and collaboration with partners, the number of countries that improve their "subnational/ basin/ aquifer level" IWRM implementation score under SDG Indicator 6.5.1 will increase.</p> <p>< Indirect Target (2) > (National level) Establishment of a nationwide system to promote IWRM. <Indicator> With JICA's cooperation and collaboration with partners, the number of countries that improve their "national level" IWRM implementation score under SDG indicator 6.5.1 will increase.</p>
	<p>(3) Direct Target (Regional and basin level)</p> <ul style="list-style-type: none"> ● Strengthening the responsible entities <Indicator> With JICA's cooperation and collaboration with partners, responsible entities will be strengthened in more than 10 regions and basins by 2030. *"Strengthened" refers to the implementation of any of the following that had not been implemented previously: ordinance and institutional development, strategy and plan formulation, operation of consensus building mechanisms (consultative bodies), data collection and monitoring, information disclosure, and financial resources and fund procurement. ● Strengthening the consultative bodies <Indicator> With JICA's cooperation and collaboration with partners, new consultative bodies will be organized or functioning in more than 10 regions and basins by 2030. *"Functioning" means that it is institutionalized, operating rules have been established to guide consensus building, and meetings are held regularly to discuss and reach consensus on solutions to issues surrounding water resources. ● Implement solutions based on social consensus-building <Indicator> With JICA's cooperation and collaboration with partners, solutions based on social consensus building will be implemented in more than 10 regions and basins by 2030, benefiting more than 200 million people living in the target regions and basins. *Pilot projects, financial cooperation, etc. will be utilized. <p>(National level)</p> <ul style="list-style-type: none"> ● Strengthening the policy authorities <Indicator> With JICA's cooperation and collaboration with partners, more than 200 administrative officers will be trained by 2030.

【Monitoring Indicators】 : The following indicators are applied to monitor the outcomes of respective projects and the overall progress of the strategy.

<p>(4) Intermediate outcomes</p>	<p>【Initial condition】 Regional and basin issues surrounding securing and using water resources cannot be resolved. Policies and systems to promote IWRM are not in place.</p>	<p>【Intermediate outcome (1)】 (Regional and basin level) More regions and basins are adopting IWRM.</p>	<p>【Intermediate outcome (2)】 (National level) Policies and institutions promoting IWRM are being introduced nationwide.</p>
<p>(5) Monitoring Indicators of intermediate outcomes</p>	<p>-</p>	<p>(Regional and basin level) With JICA's cooperation and collaboration with partners, the number of countries improving their "subnational/basin/ aquifer level" IWRM implementation score under SDG indicator 6.5.1 increases.</p>	<p>(National level) With JICA's cooperation and collaboration with partners, the number of countries improving their "national level" IWRM implementation score under SDG indicator 6.5.1 increases.</p>
<p>(6) Immediate outcomes</p>	<p>-</p>	<p>(Regional and basin level)</p> <ul style="list-style-type: none"> • The relationship between the issues and their stakeholders is understood. • A consultative body is formally formed. • Natural and social understanding of the issues is deepened. • A common understanding of the issues is developed among stakeholders. • The entity responsible for water resource management is strengthened. • A consultative body of stakeholders/institutions is strengthened. • Solutions are discussed and agreed upon. • Agreed solutions are implemented. 	<p>(National level)</p> <p><Administrative authority></p> <ul style="list-style-type: none"> • The need to resolve conflicts based on IWRM (including the need for social consensus building) is recognized. • Legal systems (including water rights systems) are developed at the government level. • Strategies and plans are developed at the government level. • Data collection and monitoring at the government level are implemented. • Information disclosure at the government level is implemented. • Budgeting and financing systems necessary to solve the problems are introduced.

<p>(7) Monitoring indicators of direct outcomes</p>	<p>-</p>	<p>(Regional level) <Responsible entity></p> <ul style="list-style-type: none"> • With JICA's cooperation and collaboration with partners, responsible entities will be strengthened in more than 10 regions and basins by 2030. <p><Consultative body></p> <ul style="list-style-type: none"> • With JICA's cooperation and collaboration with partners, new consultative bodies will be organized or functioning in more than 10 regions and basins by 2030. <p><Implementation of solutions based on social consensus building></p> <ul style="list-style-type: none"> • With JICA's cooperation and collaboration with partners, solutions based on social consensus building will be implemented in more than 10 regions and basins by 2030, benefiting more than 200 million people living in the target regions and basins. 	<p>(National level) <Administrative authority></p> <ul style="list-style-type: none"> • With JICA's cooperation and collaboration with partners, more than 200 administrative officers will be trained by 2030.
<p>(8) Solution (Output of activities)</p>	<p>-</p>	<ul style="list-style-type: none"> • Understand the process of IWRM. • Understand the relationship between water resources and society. • Strengthen the ability to organize and analyze problems, causes and causal relationships related to water resources. • Strengthen the ability to understand the current status of water resources. • Establish a consensus-building mechanism (consultative body). • Strengthening the capacity of responsible entities. • Strengthen the capacity of the consultative body. • Strengthen the capacity to develop basic 	<ul style="list-style-type: none"> • Understand the process of IWRM. • Understand the relationship between water resources and society. • Strengthen the ability to organize and analyze problems, causes and causal relationships related to water resources. • Strengthen the ability to understand the current status of water resources. • Establish a consensus-building mechanism (consultative body). • Strengthen the capacity to analyze the need for legal systems and draft laws and regulations. • Strengthening the capacity to formulate strategies and plans.

		<p>policies and solution options for water resources management.</p> <ul style="list-style-type: none"> • Clarify the decision-making process and strengthen management capacity for consensus building. • Capacity to secure budget, including negotiations with other donors. • Strengthen the project implementation capacity. • Implementation of projects to solve water resource problems. • Feedback on the results of the practice to the system. 	<ul style="list-style-type: none"> • Strengthen the capacity to coordinate interests in policy making. • Strengthen the capacity for data collection and monitoring. • Promote democratic processes. • Strengthen the capacity to secure budgets, including negotiations with other donors. • Implement projects to solve water resource problems. • Feedback on the results of the practice to the system. • Strengthen the capacity to enforce the system at the national level and to apply the system to regions and basins.
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