

Cluster Strategy
for
Practical Integrated Water Resources Management
to Resolve Water-related Issues in the Field
~Toward a society where all people have secure and
sustainable access to water resources ~

Japan International Cooperation Agency
(JICA)

Water Resources Group,
Global Environment Department



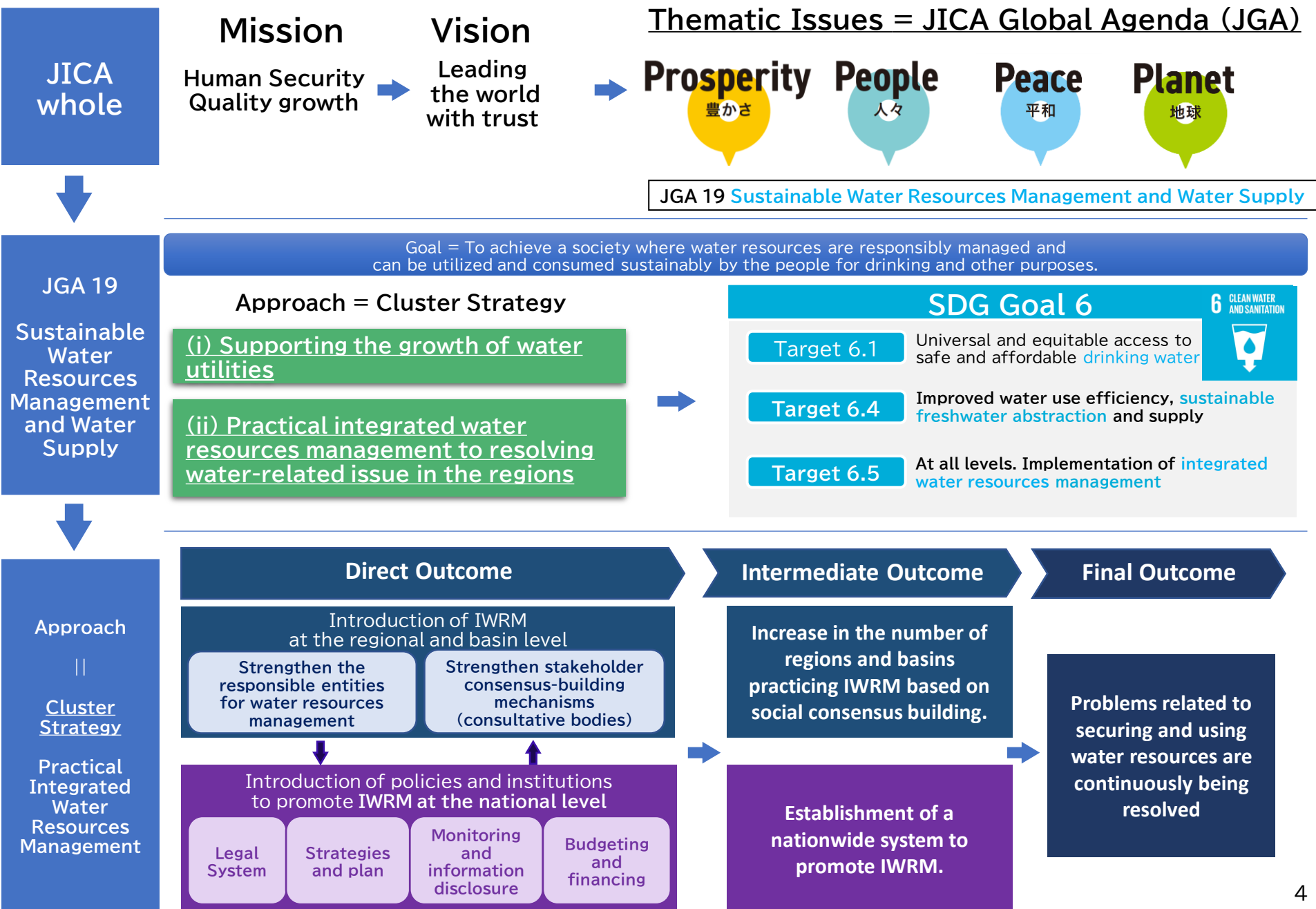
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1. What is the JICA Global Agenda / Cluster Strategy?

The Positioning of the Cluster Strategy "Practical Integrated Water Resources Management"



What is JICA Global Agenda (JGA) and Cluster Strategy?

Issue-specific business strategies
= JICA Global Agenda (JGA)

Twenty cooperation strategies for global issues in categories

Prosperity

豊かさ

1

Urban/Regional Development

2

Transportation

3

Energy and Mining

4

Private Sector Development

5

Agriculture and Rural Development

People

人々

6

Health

7

Improving Nutrition

8

Education

9

Social Security / Disability and Development

10

Sport and Development

Planet

地球

16

Climate change

17

Natural Environment Conservation

18

Environmental Management

19

Sustainable Water Resources and Water Supply

20

Disaster Risk Reduction through Pre-disaster Investment and Build Back Better

Peace

平和

11

Peacebuilding

12

Governance

13

Public Finance and Financial Systems

14

Gender and Development

15

Digital for Development

Agenda Setting

Setting objectives and goals to achieve together

Platform

Creating a place where diverse partners gather and co-create

Market Creation

Creating business opportunities

Finance Mobilization

Mobilizing Funds to Solve Issues

Approach = Cluster Strategy

① Supporting the Growth of Water Utilities

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

Cluster Strategy for
Supporting the Growth of
Water Utilities



(ii) Practical integrated water
resources management to
resolving water-related issue in
the regions

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 -



JGA Purpose and Goals, Targets

Contribution to the
SDGs

**SUSTAINABLE
DEVELOPMENT
GOALS**



To address these
global challenges,
the international
community must
unite under common
goals and mobilize a
diverse range of
resources.



Collaborate and co-
create with diverse
domestic and
international partners to
maximize impact on
development issues



2. Purpose and Overview of the Cluster Strategy

Purpose and Overview of the Cluster Strategy

Solving the challenges of securing and using water resources through practice of integrated water resources management

To realize **a society in which water resources can be secured and used sustainably,**

JICA aims to resolve conflicts of stakeholders and create a state of continuous resolution of the community's water issues, **considering the multiple sectors involved in the integrated process.**

So, JICA promotes utilizing Japan's experience, knowledge, and technology in water resources,

- **Strengthening responsible entities and consultative bodies at the regional and basin levels**
- **Spiral up the process of** through practice
- **Practicing at the regional and basin levels and strengthening policies and institutions at the national level**

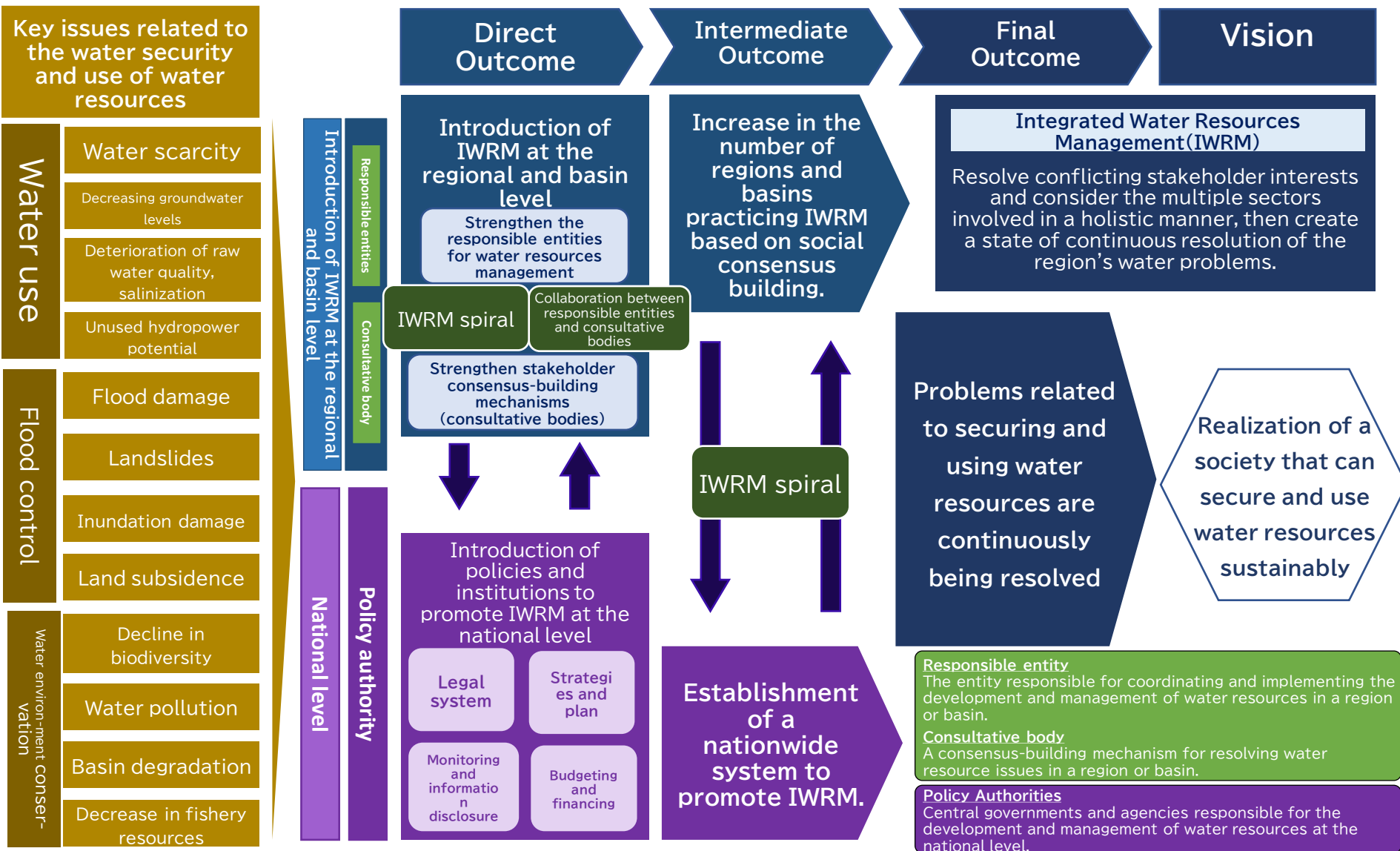
[Goal by 2030]

(Regional and basin level) Benefit more than 200 million people through practices in more than 10 regions and basins.

(National level) More than 200 administrative officers will be trained.

Overview of the Cluster Strategy

"Practical Integrated Water Resources Management"



Related SDG Goals and Targets

Goal 6 = Ensure access to water and sanitation for all

6 CLEAN WATER AND SANITATION



Goal 6 Targets

- 6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all
- 6.4 By 2030, substantially increase water-use efficiency across all sectors and **ensure sustainable withdrawals and supply** of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
- 6.5 **By 2030, implement **integrated water resources management** at all levels, including through transboundary cooperation as appropriate**
- 6.A By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies
- 6.B Support and strengthen the participation of local communities in improving water and sanitation management

[Other relevant SDGs]



What is Integrated Water Resources Management (IWRM)?

Integrated Water Resources Management(IWRM)

Resolve conflicting stakeholder interests and consider the multiple sectors involved in a holistic manner, then create a state of continuous resolution of the region's water problems.

Definition by Global Water Partnership (GWP)

The 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.**

Official Development Assistance (ODA) White Paper (2006)

Create a state of continuous resolution of the region's water problems while comprehensively considering the following

- ① All forms and stages of water **in the hydrological cycle**
- ② **Various sectors** related to water
- ③ **Democratic participatory approach** including stakeholders at all levels

Positioning and necessity of the Cluster Strategy

Key issues related to the water security and use of water resources

Water use	Water scarcity	【Intrinsic factors】 <ul style="list-style-type: none"> Conflicts among water users Upstream/downstream conflicts Trade-offs between objectives Lack of scientific data Lack of consensus-building mechanisms Lack of regulations and institutions Lack of strategies and plans Lack of information disclosure Lack of financial resources
	Decreasing groundwater levels	
	Deterioration of raw water quality, salinization	
	Unused hydropower potential	
Flood control	Flood damage	
	Landslides	
	Inundation damage	
	Land subsidence	
Water environment conservation	Decline in biodiversity	
	Water pollution	
	Basin degradation	
	Decrease in fishery resources	

Divisions, Conflicts, Trade-offs

Initiatives under this Cluster Strategy

Resolve conflicting stakeholder interests and consider the multiple sectors involved in a holistic manner, then create a state of continuous resolution of the region's water problems.

Integrated Water Resources Management (IWRM)

Introduction of IWRM at the regional and basin level

Strengthen responsible entities for water resources management
(e.g., river administrators, local governments)

Strengthen stakeholder consensus-building mechanisms (consultative bodies)
(e.g., basin council and public hearings)

Introduction of policies and institutions to promote IWRM at the national level

Legal System (including Water Rights)

Monitoring and information disclosure

Strategies and plans

Budgeting and financing

Awareness raising, Capacity development/ planning, Resolution implementation

Key solutions to the issues and related JICA Global Agenda

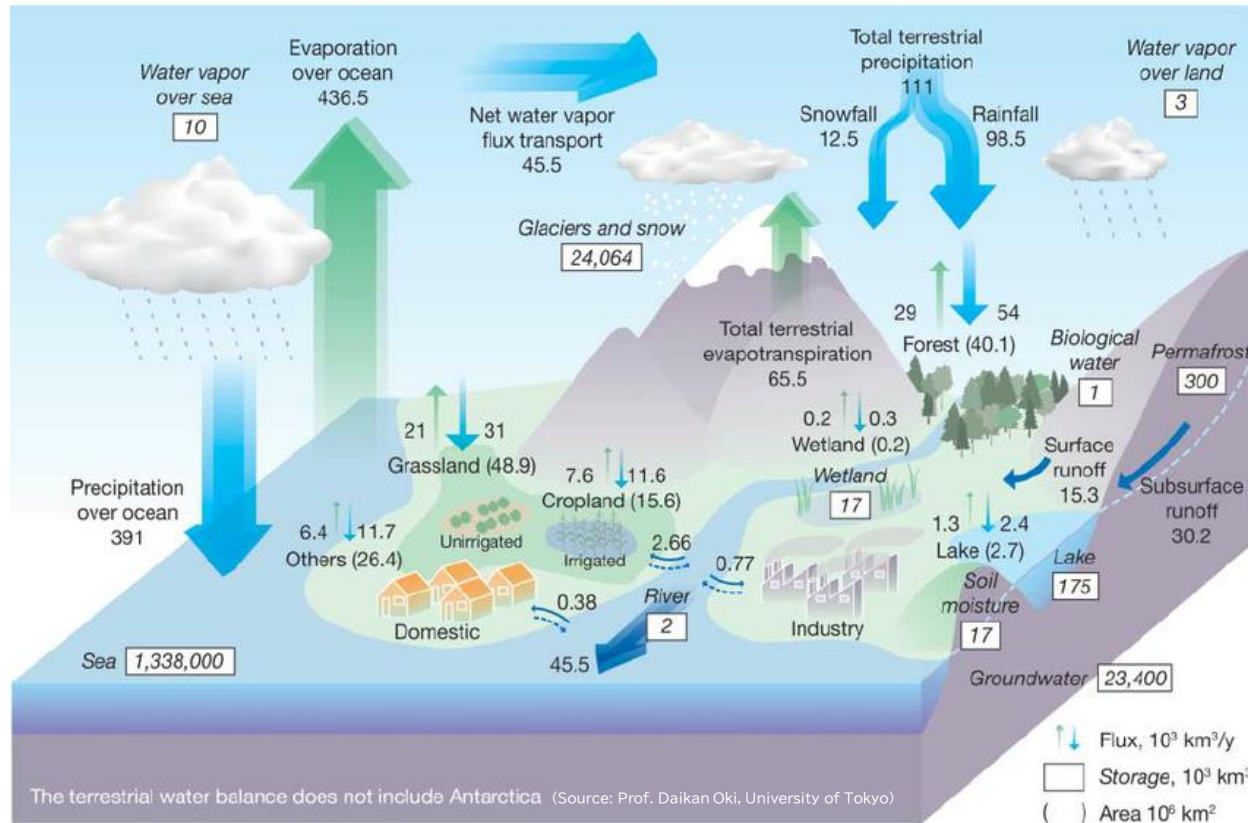
Water resource development, water supply facility improvement, leakage reduction	Sustainable Water Resources Management and Water Supply
Water-efficient irrigation and improved agriculture	Agricultural and Rural Development
Hydropower Development	Energy and Mining
Sediment control and dam regeneration	Disaster Risk Reduction through Pre-disaster Investment and Build Back Better
Improvement of flood control and river facilities	Disaster Risk Reduction through Pre-disaster Investment and Build Back Better
Groundwater pumping regulations and securing alternative water sources	Sustainable Water Resources Management and Water Supply
Ecosystem Conservation	Natural Environment Conservation
Water pollution control	Environmental Management
Sewage treatment facility development	Environmental Management
Conservation of basins and catchments	Natural Environment Conservation

Harmonized measures based on consensus



3. Current Situation in Developing Countries and JICA's Approaches

Circulation of water resources on the earth



The amount of runoff into the river is much greater than the current water withdrawals.

However, they are **unevenly distributed in time and space**, That's why the issues of water shortages, flooding occur.

To address those issues, **Integrated Water Resources Management (IWRM)** is important.

The amount of water flowing in rivers at a moment

2,000 km^3

Annual outflow

45,500 $\text{km}^3 / \text{year}$

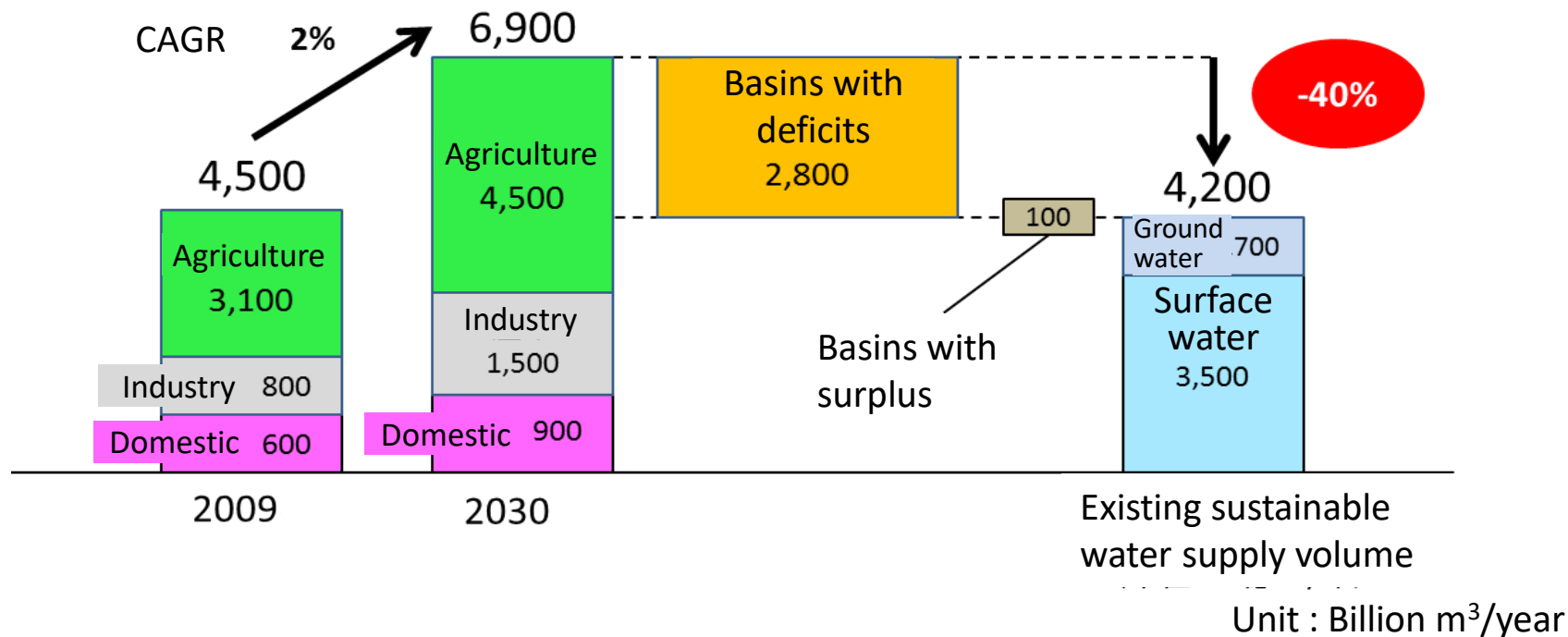
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3,800 $\text{km}^3 / \text{year}$

Annual water intake

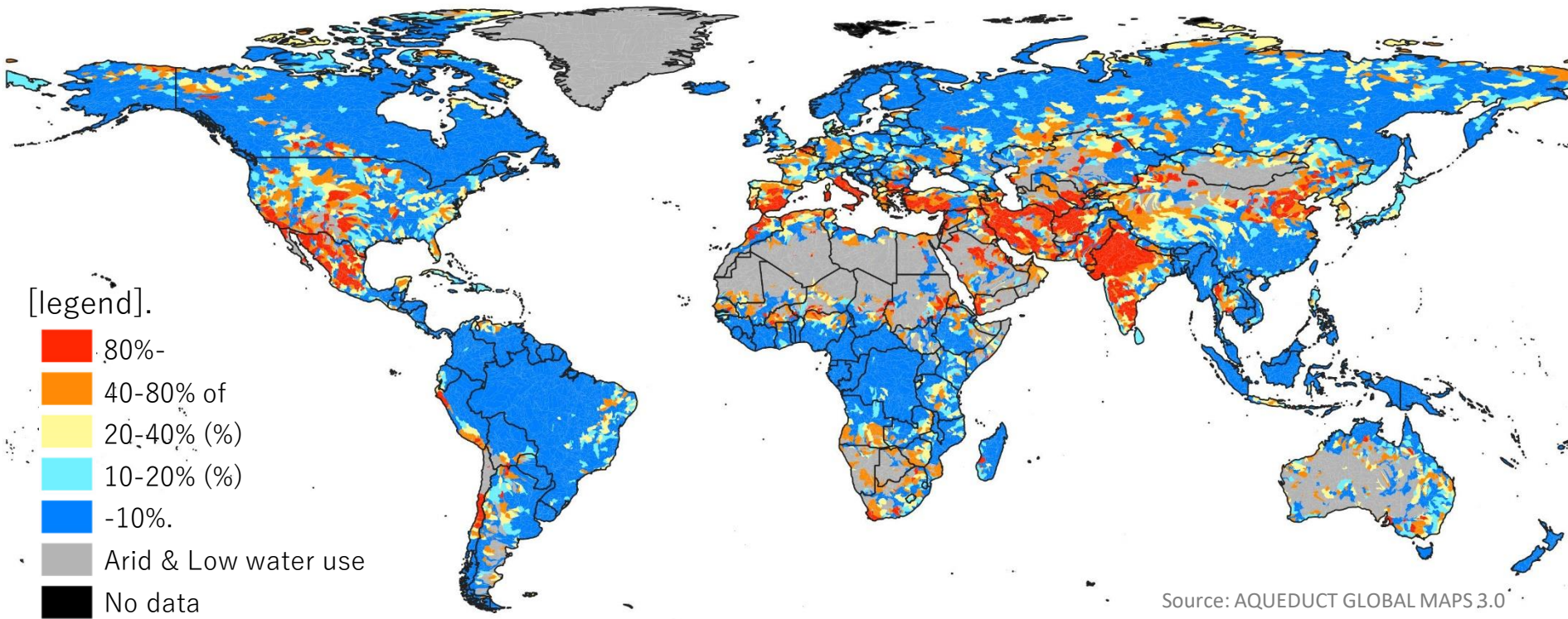
Tightening water supply and demand / Increasing water stress

- The United Nations estimated that **more than 2.9 billion people were affected by water shortages** as of 2015.
- Some estimates indicate that **water resources will be 40% short of water demand by 2030**, and the tightness of water supply and demand is serious.



Distribution of water resources

- Water stress (the ratio of water withdrawal to available water) is high in the Middle East and South and Central Asia, where precipitation is originally low, as well as in the urban areas of Asia, where populations are concentrated.
- In addition, tensions over international river basins are increasing.



Source: AQUEDUCT GLOBAL MAPS 3.0

Impacts of climate change on the hydrological cycle

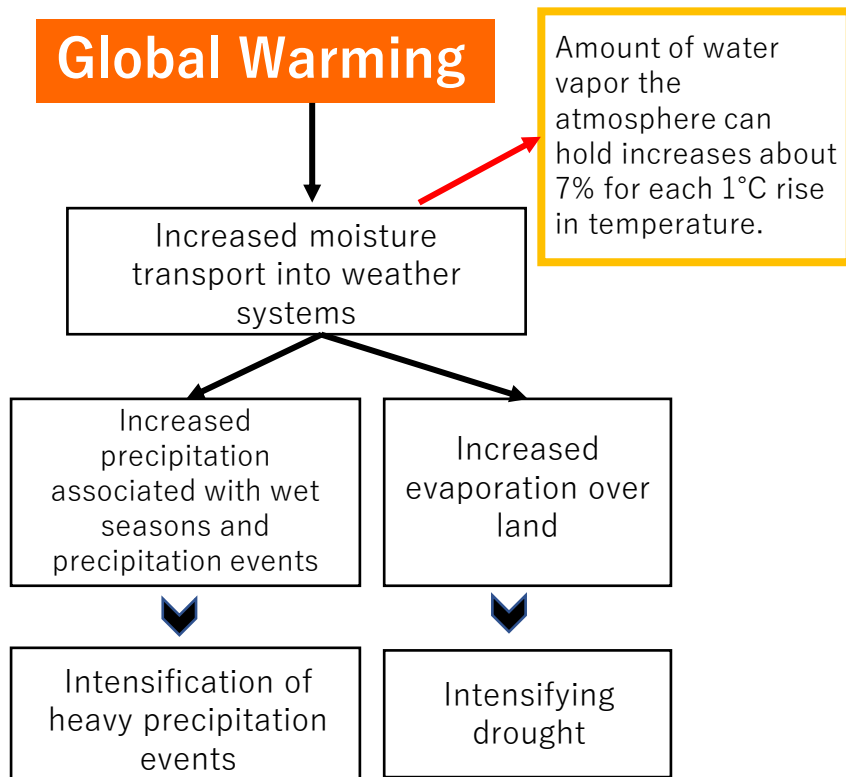
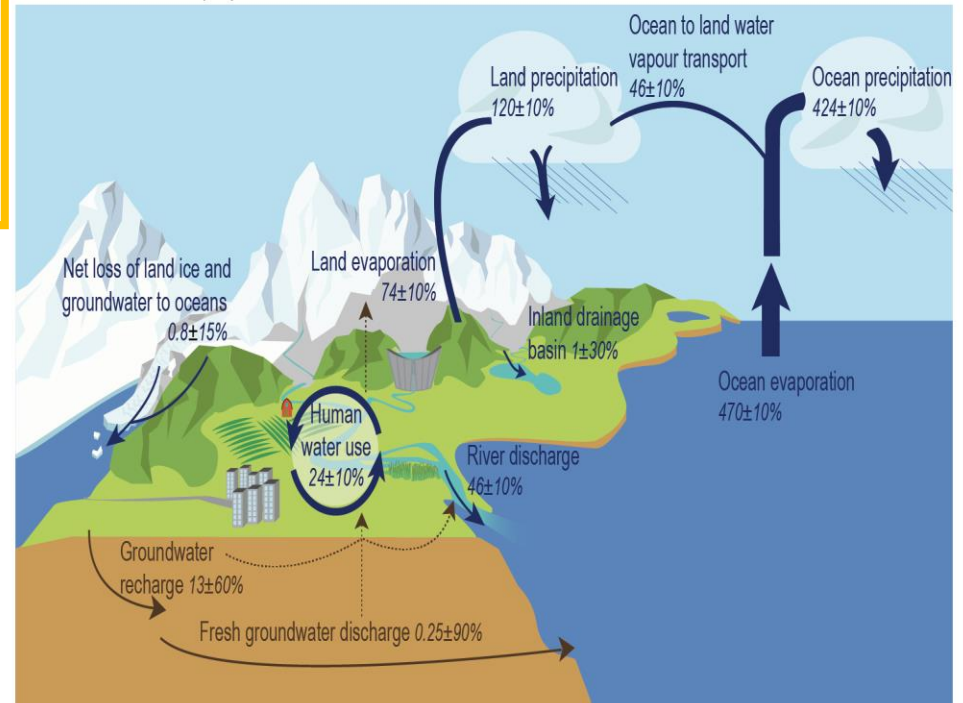


Figure: Schematic diagram of the impact process of global warming on flood and drought intensification

Figure : Schematic diagram of the hydrological cycle



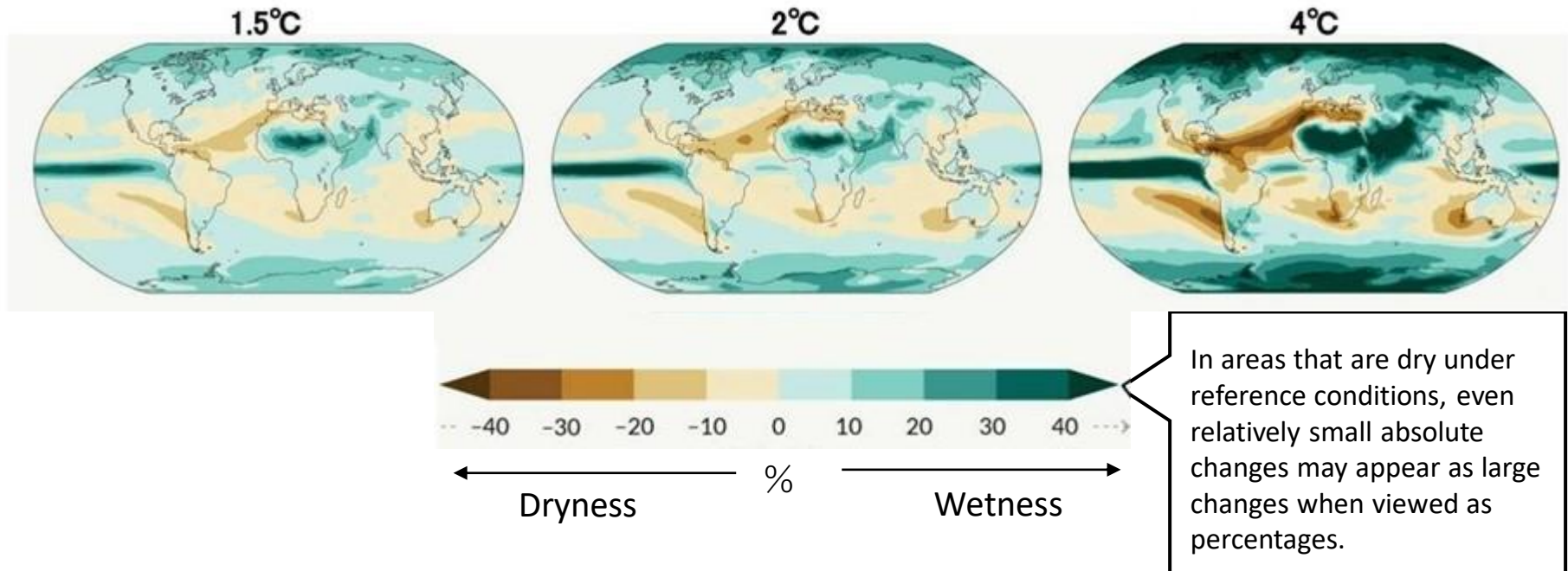
Source: Ministry of the Environment IPCC Sixth Assessment Report Summary, p. 49

Source : IPCC Sixth Assessment Report Executive Summary
<https://www.ipcc.ch/report/ar6/wg1/chapter/chapter-8/>

Continued global warming is projected to lead to increased precipitation and evaporation in the global water cycle, intensifying phenomena such as floods and droughts.

Impacts of climate change on the hydrological cycle

Figure: Change in average annual precipitation based on 1850-1900



Source: Ministry of the Environment IPCC Sixth Assessment Report Summary, p. 49

The global hydrological cycle continues to intensify as global temperatures rise.
The changes of dryness and wetness are projected to increase and fluctuate more widely.

Water resources management issues becoming more serious in developing countries

- **Water circulates around the globe, but droughts and floods occur due to spatial and temporal maldistribution.**
- **Water supply and demand crunch in developing countries**
 - Increase in water consumption intensity due to population growth, urbanization, and improved standard of living
 - Expand irrigated farmland (80% of the world's water use is for agriculture. Food loss reduction and water-saving irrigation are important solutions.)
- **Impacts of climate change**
 - Greater variability and change in average annual precipitation, including dryness and wetness
 - Increased drought and extreme rainfall
 - Changes and extremes in rainfall, reduced snowpack, melting glaciers, rising sea levels, salinization of coastal freshwater resources
- **Conflicts and problems related to water resources**
 - **Conflicts of interest** over upstream and downstream transboundary rivers, lakes, and aquifer
 - Drought and flooding, lowering of the groundwater table, land subsidence, water pollution, impact on ecosystems, etc.
 - **Trade-offs** across multiple stakeholders and sectors involved
- **Factors hindering development**
 - **Insufficient basic data** on water quantity, quality, etc., **and scientific knowledge** on various water-related issues
 - **Lack of a responsible entity or lack of capacity** to manage water resources while coordinating many stakeholders and sectors
 - **Absence of consultative mechanisms** to promote the consensus building of solutions

As result of inability to take effective measures,
water resources management issues could become more serious.

SDG Goal 6 Target 6.5 Integrated Water Resources Management

Target 6.5

By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

indicator

6.5.1 Degree of integrated water resources management (IWRM) implementation (scoring from 0 to 100)

Category	Evaluation items (33 items in total)
(1) Enabling environment (7 items)	<ul style="list-style-type: none">• Policies, laws, and plans in place and utilized at the national level• Policy and regulation formulation and utilization by non-state entities such as the regional/basin level, etc.
(2) Institutions and participation (11 items)	<ul style="list-style-type: none">• Status of coordination between government agencies representing different sectors• Status of participation by organizations, academic institutions, civic groups, individuals, private sector, etc., etc.
(3) Management instruments (9 items)	<ul style="list-style-type: none">• Status of monitoring of water resources at the national level• Implementation of water demand management, water use monitoring, water allocation, and other management practices at the national level• Status of data and information sharing within the country, etc.
(4) Financing (6 items)	<ul style="list-style-type: none">• Allocation and execution of national budget for infrastructure and IWRM elements• Revenue (fees, taxes, surcharges, etc.) for IWRM elements, etc.

SDG Goal 6 Target 6.5 Integrated Water Resources Management

Indicator 6.5.1 [Monitoring results as of 2023](#)

Indicator 6.5.1

IWRM Implementation Categories

(Figures in parentheses are the 6.5.1 score range.)

- Very high (91 to 100)
- High (71 to 90)
- Medium-high (51 to 70)
- Medium-low (31 to 50)
- Low (11 to 30)
- Very low (0 to 10)
- No data
- Not applicable

- The progress has been slow 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 137 countries that all reported monitoring data in 2017-2020-2023, **111 countries increased their scores**, but **only 15 countries increased their scores by 10 points or more and 32 countries increased their categories, with 120 countries making limited progress**. On the other hand, of the 183 countries that reported monitoring data in 2023, **71 (39%) had a score of 50 or less (category Medium-low or below), compared to 87 (47%) in 2020**.
- 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.

History of JICA's cooperation approach to the water resources sector

1

Cooperations for the formulation of the comprehensive water resources management plans in the basin level

- **Formulate long-term basic plans** and conduct feasibility studies (F/S) for the purposes of various water resource use, water utilization, flood control, and water environment comprehensively (development studies).
- The results of these studies have been utilized to implement a number of **facility construction projects** (dam construction, river improvement, irrigation facility etc.) with Japanese ODA loans.

Cooperation for Brantas River, Indonesia

Phase 1

Brantas River Comprehensive Development Plan Study

1961

Emphasis on tangible infrastructure measures

Construction of multi-purpose dams and river improvement for flood control and irrigation

Phase 2

Report on Brantas River Basin Development

1972

Tangible + Intangible

River Law, Institutions, Early warning

Phase 3

Widas River Basin Development Plan Study

1984

Focus on intangible measures

Cost sharing, Participatory approach, Establishment of a public corporation

Phase 4

The study on comprehensive management plan for the water resources of the Brantas River basin

1997

History of JICA's cooperation approach to the water resources sector

2

Cooperations for the development of water resources master plan in the national level

- The national master plans are necessary because of competition for water use, insufficient water supply capacity, duplication of activities and functions of various related agencies, and insufficient capacity for water management, including monitoring and allocation of water resources.
- From the perspective of aiming to integrate policies and plans for water resources development and management, these national master plans embodied the concept of IWRM and were the pioneers.
- On the other hand, due to the greater emphasis on “water resources development” centered on facility development, some issues in “water resources management,” including organization, institutions, and human resources, were also observed, as shown below:
 - They remained conceptual recommendations, which were not considered the feasibility.
 - The government was the primary target, and the involvement of other stakeholders was not considered at that time.
 - For above reasons, some recommendations have not always been fully implemented after all.

Countries that supported the development of the National Water Resources Management Master Plan

Asia

Philippines



Vietnam



Malaysia



Africa

Kenya



Côte d'Ivoire



Zambia

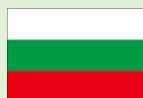


Nigeria



Eastern
Europe

Bulgaria



Macedonia



History of JICA's cooperation approach to the water resources sector

3

Cooperation to strengthen the capacity to **solve water-related issues in the regions** based on the concept of **IWRM**.

Examples of recent cooperation for IWRM practices to solve local water problems

Bolivia



Project for Capacity Development on Integrated Water Management in Cochabamba

- The project covers the Rocha River basin in the central region of the Cochabamba metropolitan area, the third most populous city in the country.
- Focusing on issues such as water shortages, low groundwater levels, and water pollution.
- Strengthening collaboration among stakeholders, improving the legal system, and establishing a monitoring system.

Sudan



The Project for Enhancement of Integrated Water Resources Management

- Cooperations for the federal government's implementation of IWRM practices for the entire country (e.g., legal and organizational structures, water balance assessments, problem analysis, planning, etc.), and IWRM practices in the pilot regions.

Indonesia



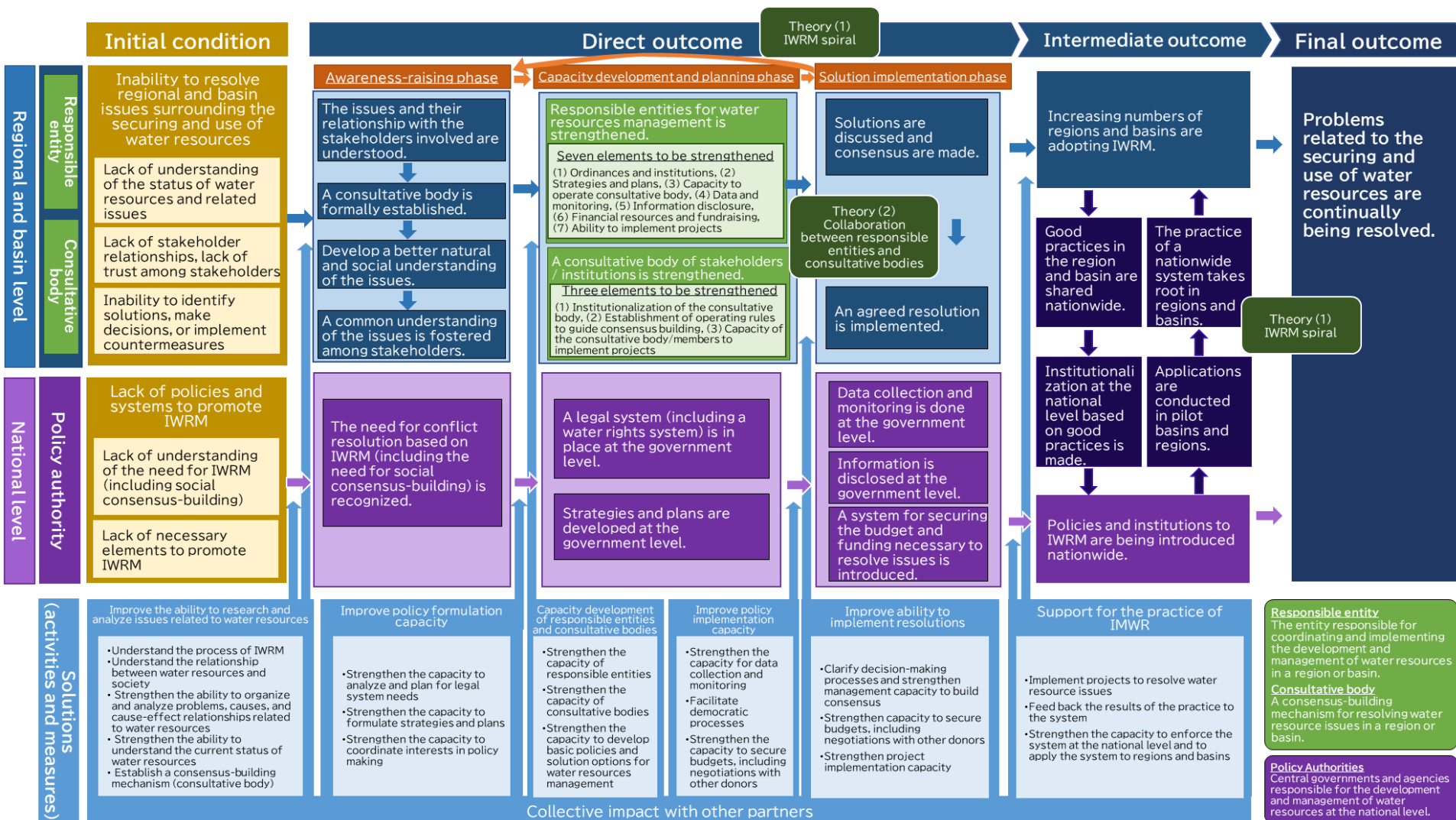
Project for Promoting Countermeasures against Land Subsidence in Jakarta

- The project targeted the subsidence control in the capital city of Jakarta.
- Cooperations for the establishment of the subsidence Planning and Implementation Committee, promotion of understanding among stakeholders, development of a monitoring system and the action plan, etc.

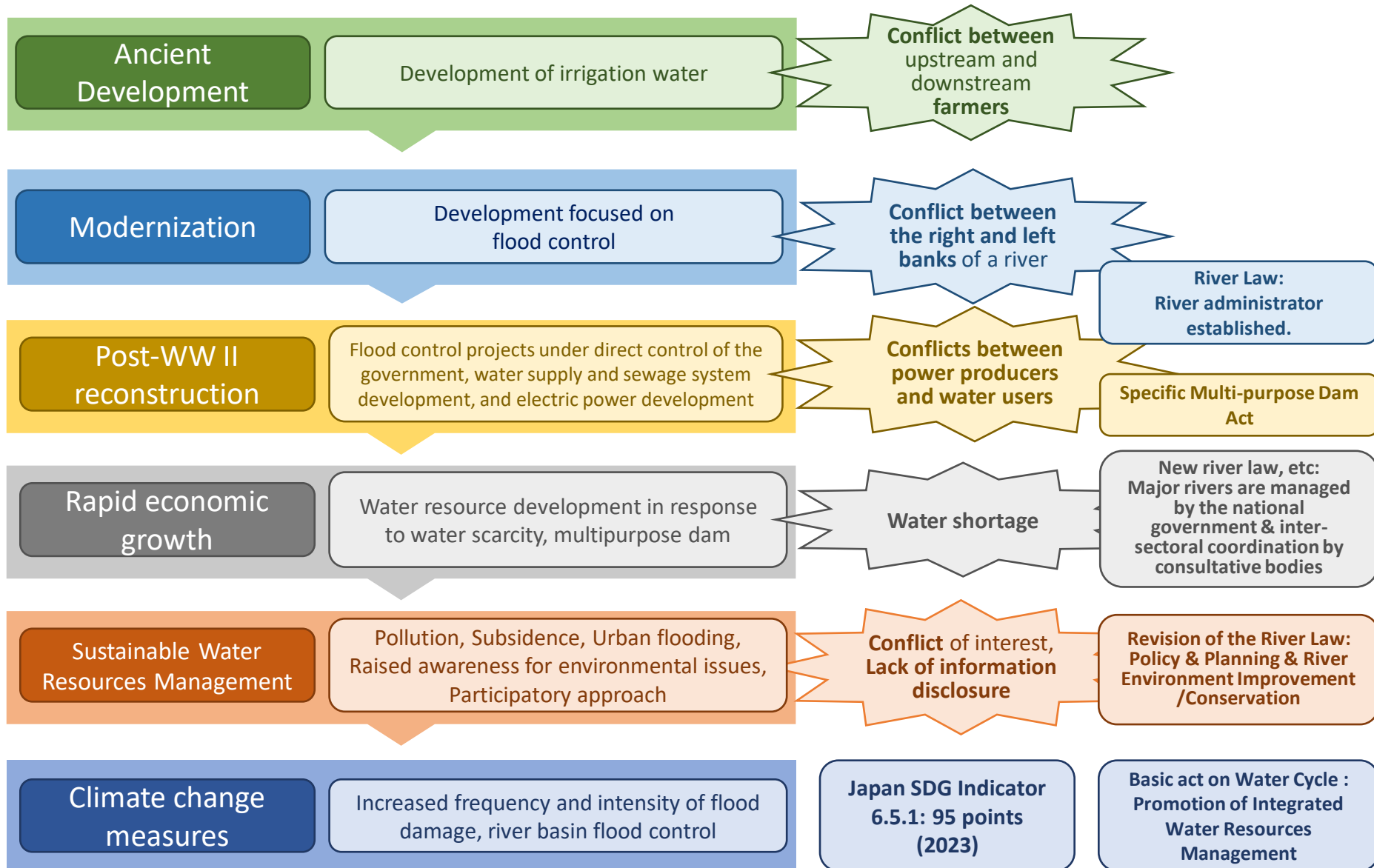


4. Development Scenarios

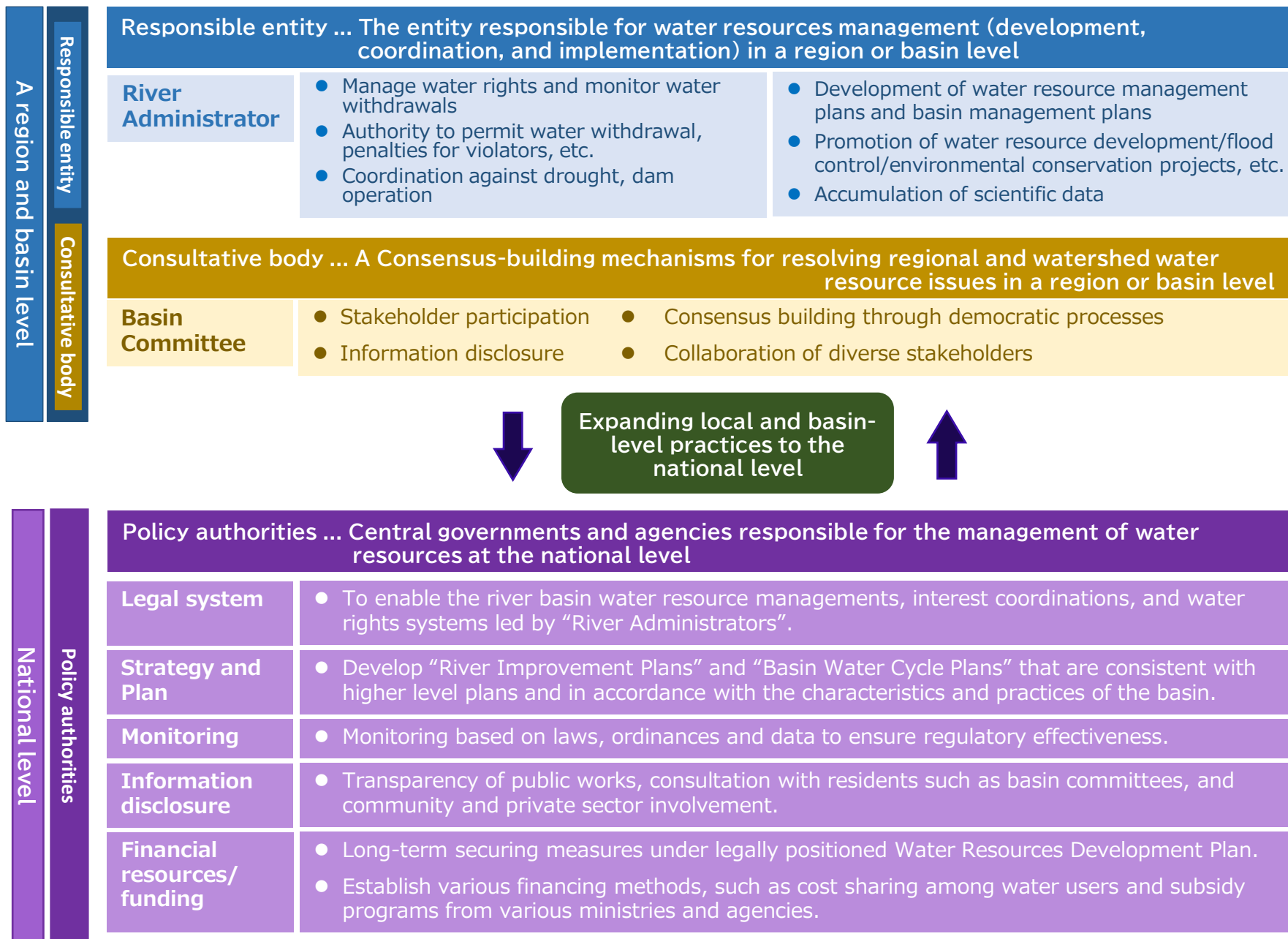
Conceptual diagram of development scenarios



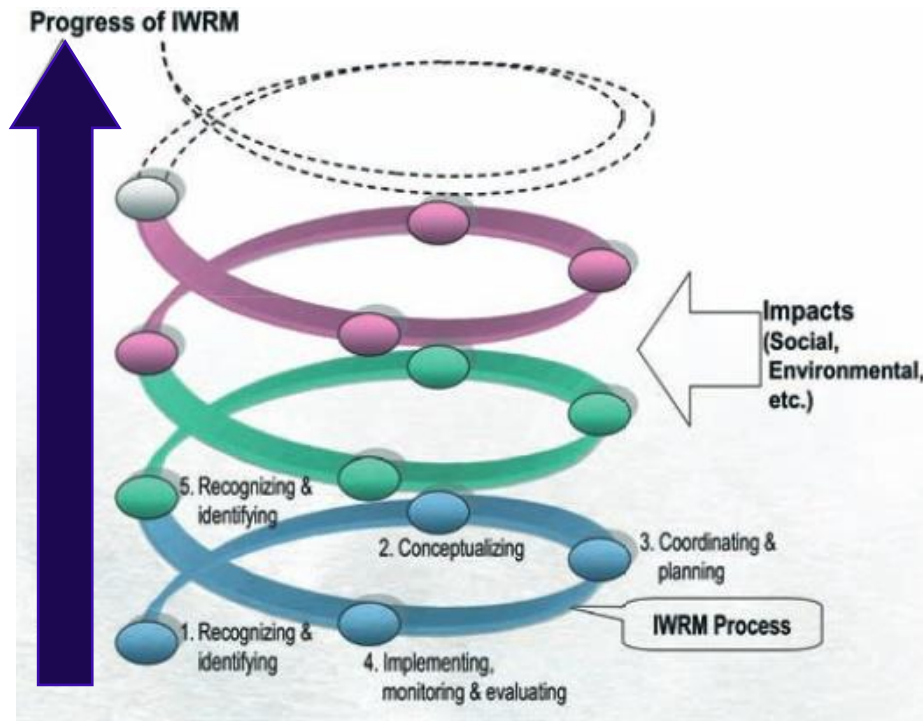
Japan's experience in water resources management



Japan's IWRM based on experience



Theory 1: Integrated Water Resources Management Spiral

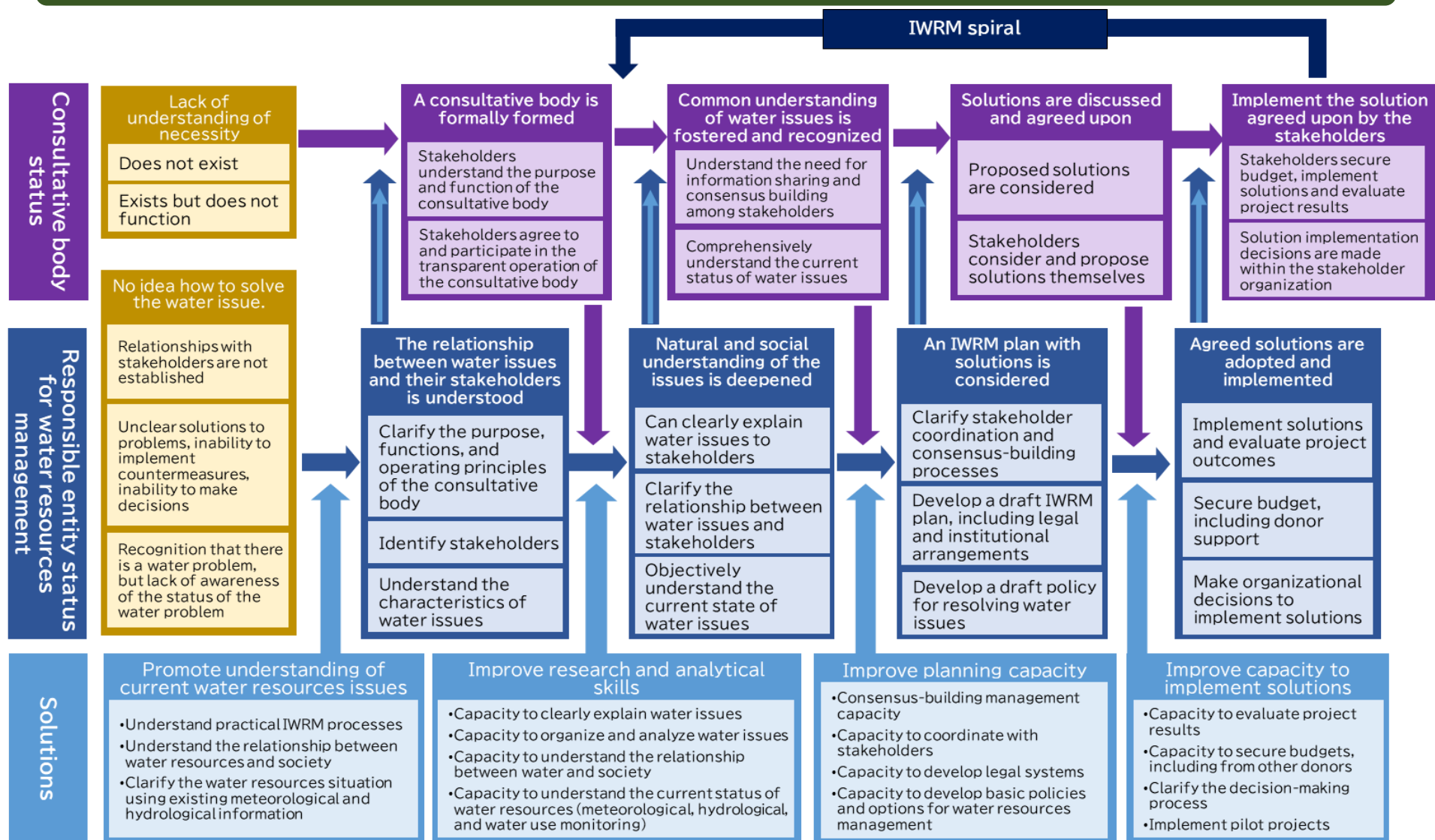


- (a) Recognizing the need for IWRM and identifying the problem.
- (b) Conceptualizing ways to solve problems.
- (c) Coordinating with stakeholders and planning in concrete terms.
- (d) Implementing, monitoring, and evaluating the plan through consensus among the stakeholders involved.

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

By repeating a problem-solving process that is easy to deal with, gradually evolve to deal with more complex and challenging problems.

Theory 2: Collaboration between responsible entities and consultative bodies



Strengthening responsible entities and consultative bodies is important for IWRM at the regional and basin levels. By implementing the solutions agreed upon by the consultative body and feeding back the results to the consultative body, each party concerned, including the responsible entity, will continuously implement and improve the solutions, and the parties concerned will realize improvements in water issues.



5. Implementation Direction

Main target countries (regions) for cooperation

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.

Current status of 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
Morocco	Pilot basins with dams experiencing sedimentation progression	Integrated watershed sediment management

Current status of cooperation at the national level

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

Utilization of various JICA schemes

Collaboration with other JICA Global Agenda

<Type of assistance>

(Intangible support)

- Technical Cooperation
- Technical Cooperation for Development Planning
- Science and Technology Research Partnership for Sustainable Development(SATREPS)
- Knowledge Co-Creation Program(KCCP), etc.

Key Solutions to Challenges

Related JICA Global Agenda

Water resources development,
Water supply, Leakage reduction

Groundwater pumping regulations,
securing alternative water sources

Water Resources
Management and Water
Supply

Hydroelectric power development

Energy and Mining

Dam sediment control and
redevelopment

Improvement of flood control and
river facilities

Disaster Risk Reduction

Water-saving irrigation and
improved farming

Agricultural and Rural
Development

Ecosystem conservation

Water pollution control
regulations

Natural Environment
Conservation

Watershed and catchment
preservation

Sewage treatment facility
development

Environmental Management

(Tangible support for infrastructure)

- ODA loans (soft loans)
- Grants
- Private-Sector Investment Finance
- Public-Private Partnership, etc.

Involve a wide range of partner agencies, development partners, private companies, NGOs, universities, civic organizations, etc. in the consultative bodies
⇒ Mobilizing funds to increase impact

Sustainability Initiatives

Climate change adaptation and mitigation

- Adaptation measures: Planning for IWRM, water cycle analysis, source selection, watershed conservation, ecosystem conservation, land use policies, groundwater conservation and recharge, and other measures to strengthen community resilience.
- Mitigation measures: Utilization of hydropower as a renewable energy source, preservation of watersheds that contribute to the absorption of GHGs, and promotion of less energy-intensive water resources.

Governance

- Information disclosure and consensus building among stakeholders are important for IWRM.
- Special attention will be given to meaningful participation and transparency in the management of the consultative body, and to the identification and disclosure of scientific and quantitative data.

Nature, TNFD, NbS, Green Infrastructure, etc.

- The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Global Assessment (2019) describes the importance of IWRM, taking into account water environment and watershed conservation in the management of freshwater areas.
- "Nature-based Solutions (NbS)" and "Green Infrastructure" should be considered. There have been moves such as the CDP Water Security and the Taskforce on Nature-related Financial Disclosures (TNFD), which require private companies to disclose information on the impact of their corporate activities on water resources and nature, including water.

Gender and human rights

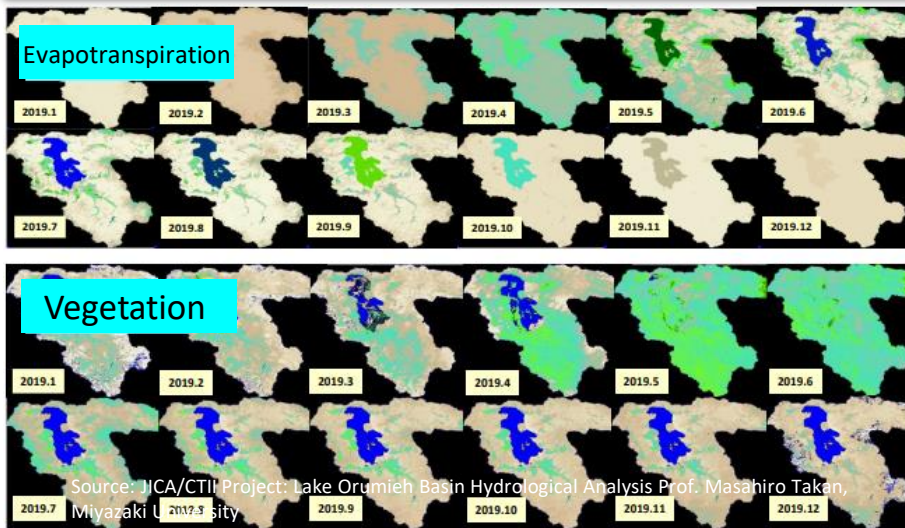


2010 UN General Assembly:
"Safe and clean drinking
water and sanitation
Access is a human right."

- Ensure meaningful participation of women, indigenous peoples, and others in discussions and decision-making in the consultative bodies.
- In the social consensus building that WRM aims to achieve, it is necessary to ensure that no particular group is excluded in the membership of the consultative body and in the decision-making process.

Digital Transformation (DX)

Estimation of actual evapotranspiration using satellite data (Lake Urmia Basin, Iran)

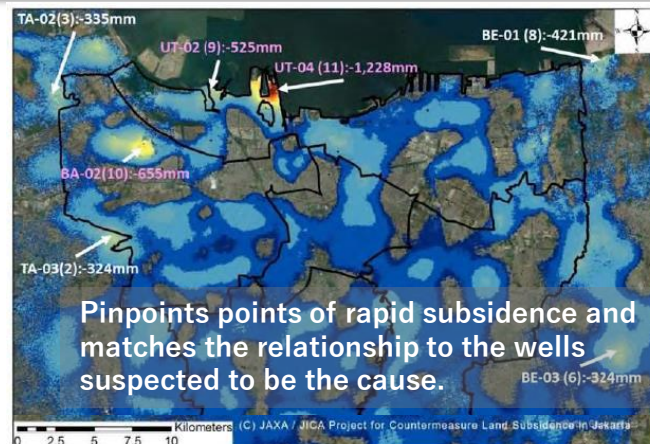


“Decidim” a digital platform for citizen participation (Bolivia)

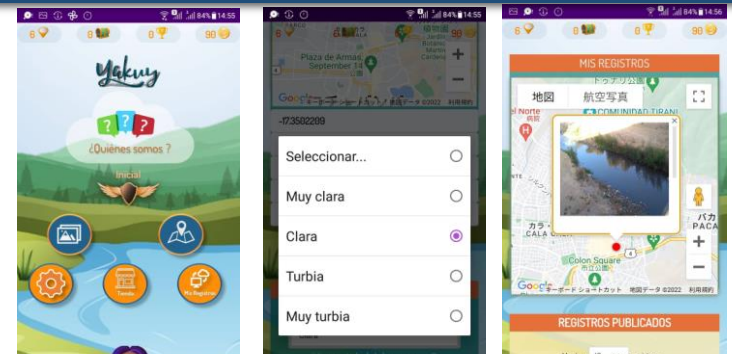


Trial of a basin-level digital platform to solicit action proposals from citizens on water resource issues and to encourage voting on them (transparency).

Investigating the cause of the land subsidence by using satellite data (Jakarta, Indonesia)



Water quality application based on citizen science (Bolivia)



Visualization of river pollution and accumulation of information, including photographs, using the five senses evaluation method by citizens

Proactively utilize innovative tools, including DX, to compile and horizontally deploy knowledge.

Disseminating knowledge to maximize impact

INTERNATIONAL JOURNAL OF WATER RESOURCES DEVELOPMENT
https://doi.org/10.1080/07900627.2021.1921709

Routledge
Taylor & Francis Group

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Practicality of integrated water resources management (IWRM) in different contexts

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ABSTRACT
The significance of integrated water resources management (IWRM) is broadly recognized, but practical implementation methods are little known. This paper proposes a Practical IWRM approach that has the potential to accelerate consensus-building and problem-solving relating to water resources based on the formation of an aligned perception of natural and human-made water resource systems among stakeholders, and the establishment of a properly functioning multi-stakeholder partnership (MSP). This approach was applied in four countries – Sudan, Bolivia, Indonesia and Iran – where it has worked well in different contexts, and can be an effective methodology usable elsewhere in the field.

ARTICLE HISTORY
Received 6 October 2020
Accepted 20 April 2021

KEYWORDS
Integrated water resources management (IWRM); multi-stakeholder partnership (MSP); Sustainable Development Goals (SDGs); social consensus-building; community; conflict

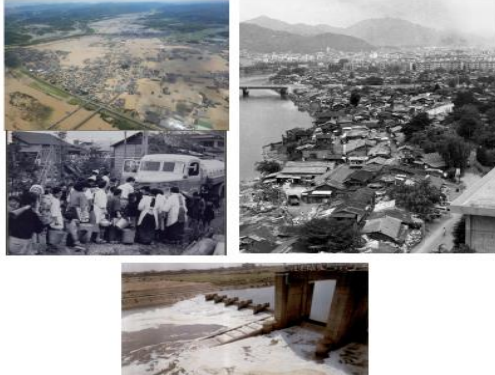
Introduction

Historically, humanity has employed various methods of local water governance through mediation and arbitration in conflicts over water shortages and disasters. In the modern era, via advancements in civil engineering technology, large reservoirs and water supply facilities are constructed to meet demands without consideration of the natural or social environment; consequently, sustainability of water resources management is gradually receiving less attention among users who are able to access such resources with relative ease (Kaishin

Paper on practical integrated water resources management, which was published in the International Journal of Water Resources Development ([see here](#)).

JICA Japan International Cooperation Agency

Japan's Experience on Water Resources Management



March, 2022

Japan International Cooperation Agency
Nippon Koei Co., Ltd.

GE
JR
22-070

Teaching materials (Japanese and English text and English PowerPoint) summarizing **Japan's experiences and lessons learned** in water resources management.

English version <[Link](#)>

Other development policies

- **Collaborating with Development Partners**

- **International Network**: Global Water Partnership (GWP) and so on.
- **Private sector** : CSR, TNFD, “Water Positive” and so on.
- **Academic**: The research results, SATREPS and networks among researchers.

- **Utilizing various modalities for project formulation and human resources development**

- **Technical cooperation**: Dissemination of the Cluster Strategy and project formulation through Knowledge Co-Creation Program(KCCP) in Japan.
- **Financial Cooperation**: Mobilizing other JICA Global Agenda, Loan and Grant Aid to resolve issues through project implementation.
- **Human resources development to implement JICA's cooperation**: Training regarding the Cluster Strategy, especially on knowhow of consensus building, etc. for JICA experts.
- **JICA Development Studies Program(JICA-DSP)**: Inviting future leaders from partner countries to Japan, and offering them the opportunity to learn about Japan's modernization and development experiences on IWRM.

- **Utilizing teaching material "Japan's experience in Water Resources"**

- **Contribution to initiatives by Japanese government**



6. Goal, Targets, and Monitoring

Goal and Targets

<Final goal>

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

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

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

<Indirect Target (2)> (National level)

- **Establishment of a nationwide system to promote IWRM.**

<Direct target (1) > (Regional and basin level)

- Strengthening the responsible entities
- Strengthening the consultative bodies
- Implement solutions based on social consensus-building

<Direct target (2) > (National level)

- Strengthening the policy authorities

Goal and Targets (Indicators)

<p>Monitoring Indicators of Intermediate Outcomes</p>	<p>(Regional and basin level) 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>(National level) 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>Monitoring Indicators of Direct Outcomes</p>	<p>(Regional and basin level) <u><Strengthening the responsible entities>.</u> With JICA's cooperation and collaboration with partners, responsible entities will be strengthened in more than 10 regions and basins by 2030.</p> <p><u><Strengthening the consultative bodies></u> 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> <p><u><Implement solutions based on social consensus building></u> 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>	<p>(National level) <u><Strengthening the policy authorities></u> With JICA's cooperation and collaboration with partners, more than 200 administrative officers will be trained by 2030.</p>



7. Examples of JICA projects

Examples of JICA project on IWRM

Cooperation to strengthen capacity to **solve specific issues surrounding water resources in the region** based on the concept of **IWRM**

Bolivia



Project for Capacity Development on Integrated Water Management in Cochabamba

- The project covers the Rocha River basin in the central region of the Cochabamba metropolitan area, the third most populous city in the country.
- Problems such as water shortages, low groundwater levels, and water pollution.
- Strengthening collaboration among stakeholders, improving the legal system, and establishing a monitoring system.

Sudan



The Project for Enhancement of Integrated Water Resources Management

- Support for the federal government's implementation of IWRM for the entire country (e.g., legal and organizational structures, water balance assessments, problem analysis, planning, etc.).
- IWRM practices in a pilot region.

Indonesia



Project for Promoting Countermeasures against Land Subsidence in Jakarta

- The project targets subsidence control in the capital city of Jakarta.
- Establish a Project Implementation Committee, awareness-raising of stakeholders, develop a monitoring system, develop an action plan, etc.

Impact of Subsidence in Jakarta (1)

In the coastal area north of the city, when storm surge occurs, seawater intrudes beyond the seawall.



A mosque abandoned due to subsidence and a seawall constructed later (far right)



Impact of Subsidence in Jakarta (2)

Damage to structures caused by “upward displacement”

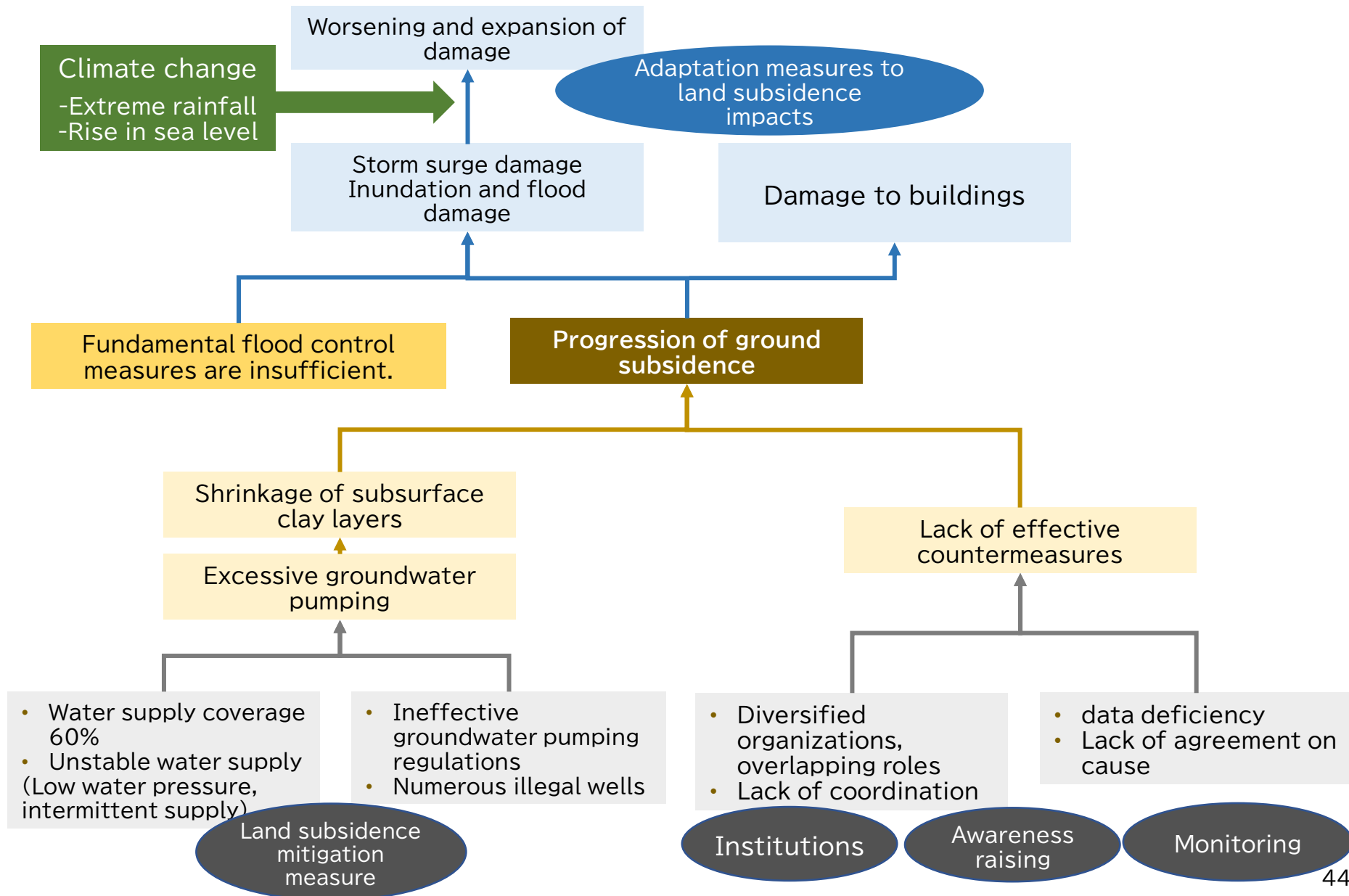
(The structure, which was supported by piles driven deep underground to the support layer, did not settle; only the ground settled, resulting in a step.)



Flooding and traffic congestion in central Jakarta



The problem: Subsidence increases urban vulnerability



Before the start of cooperation

There is no consensus among the stakeholders on the cause of the subsidence, and no serious measures can be taken.

- ✓ Lowering of the groundwater table due to groundwater pumping
- ✓ Increase in load due to building construction, etc.
- ✓ Natural compaction of strata
- ✓ Effects of crustal movement

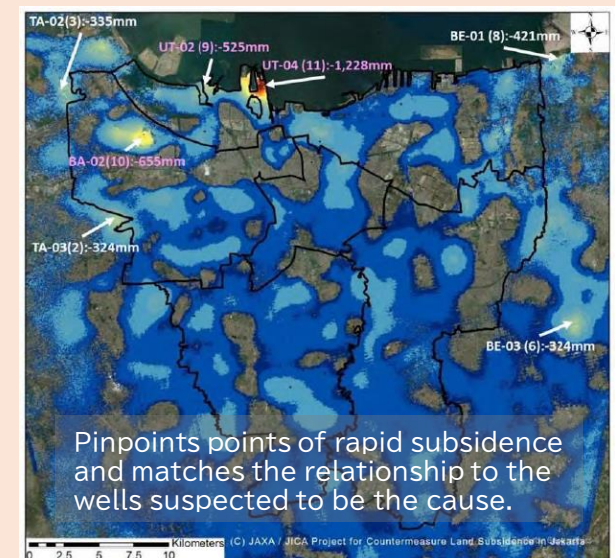
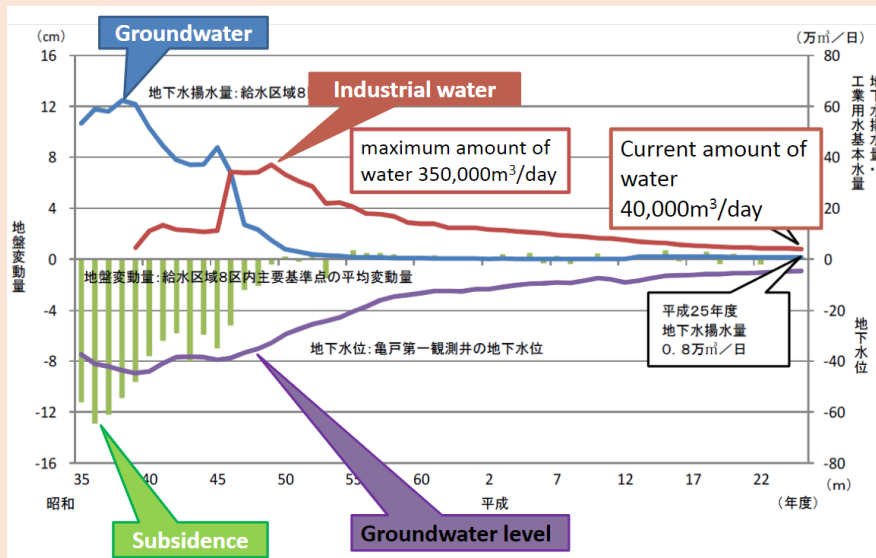
Initiatives in the Project

1

The scientific data showed that in Japan and Bangkok, the conversion of water sources and reduction of groundwater pumping stopped the progression of land subsidence.

2

Wide-area, high-precision land subsidence analysis using sensors on JAXA's ALOS-2 (Daichi-2) satellite showed that in Jakarta, wells pumping large amounts of water are located in areas where land subsidence is severe.



Promoting comprehensive measures through IWRM

Subsidence mitigation measures

- ◆ Construction of subsidence observation wells, Establishment of data collection and analysis system
- ◆ Strengthen regulations on groundwater pumping (enactment of ordinances)
- ◆ Promote securing alternative water sources to reduce groundwater pumping (piped water supply expansion, rainwater harvesting, decentralized facilities)



Impact adaptation measures

- ◆ Future projections of land subsidence
- ◆ Inundation analysis, risk maps
- ◆ Proposing flood control measures



Establishment of an execution system

- ◆ Raise awareness and publicize to residents, government officials, groundwater users, etc.
- ◆ Establishment of a committee for subsidence control by related organizations
- ◆ Creation of short, medium and long term action plans
- ◆ Strengthen responsible agencies (Ministry of Public Works and National Housing, Provincial Government) and develop consultative bodies



Approach based on cluster strategy

Cluster Strategy

Strengthening responsible entities for water resources management

Formulating a democratic consultative body by stakeholders

Scientific findings and data for consensus building

Working with partners

Practice in Jakarta's Subsidence Control

- Introduce effective **groundwater pumping regulations**
- Clarify the **division of responsibilities and collaboration** among the many organizations involved
- **Comprehensive capacity development** on monitoring, mitigation measures (e.g., pumping regulations), and adaptation measures (e.g., measures against flooding and storm surge)

- Implementation structure that unites the central government (Ministry of Public Works and National Housing, Ministry of Mining, Industry and Energy) and local government (Jakarta Special Province)
- Awareness surveys of **residents and groundwater users** and risk education
- Establish permanent **Project Implementation Committee** to implement countermeasures by many related organizations

- Construction of subsidence **observation wells**
- Observation of land subsidence using **satellite data**
- Integrated database to **share data and build trust**

- Collaborate with **academics and administration in Japan** to mobilize domestic knowledge and experience
- Cooperate with **other development partners** such as the Netherlands
- Share knowledge and experience with **other cities with the same challenges**

Implement solutions by related JICA Global Agenda based on IWRM

Key issues related to the securing and use of water resources

Initiatives under this Cluster Strategy

Key Solutions to Issues and related JICA Global Agenda

Land subsidence due to excessive groundwater pumping



Inundation damage due to storm surge



Prolonged inundation due to flooding and inland water overflow, traffic congestion



Building upward displacement



【Intrinsic factors】

- Lack of consensus on the causes of subsidence
- Lack of scientific data
- Many organizations involved, overlapping roles
- Lack of coordination and consensus-building mechanisms
- Ineffective groundwater pumping regulations, many illegal wells
- Lack of alternative water sources to groundwater (Piped water supply coverage is 60%.)

Awareness-raising phase

Seminar for the Minister of Public Works and the Governor of Jakarta

Learning about precedents through training in Japan and knowledge sharing from Thailand

Investigating the cause of the land subsidence by using satellite data and matching it with well data

Establish a consultative body of relevant agencies at the central ministry and state levels.

Capacity development and planning phase

Construction of subsidence monitoring wells and development of a monitoring system

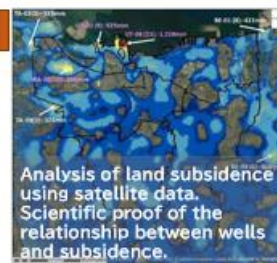
Enforcement of groundwater pumping regulations through the issuance of regulations

Preparation of short-, medium- and long-term action plans and their incorporation into regional development plans

Solution Implementation phase

Construction of public awareness signs and rainwater harvesting facilities as a pilot project

Study and plan for implementation of flood control projects



The Project for Integrated Urban Flood Management in JABODETABEK (underground drainage canals, floodplain groups, drainage pump stations, river improvement, regulating reservoirs, operation centers, etc.)

ODA Loan Preparatory survey underway

Development of alternative water resources to groundwater (surface water, rainwater)

Increase water supply coverage and reduce water leakage

Disaster Risk Reduction through Pre-disaster Investment and Build Back Better

Sustainable Water Resources Management and Water Supply

Sustainable Water Resources Management and Water Supply