3. Standard indicator reference and typical lessons learned (Water resources)

Mid-term sub-targets corresponding to models in this reference

Model name	Corresponding mid-term sub-targets
Model (1) Basin management	1-1-1 Strengthening integrated management of water resources 1-2-1 Grasp of water resources and establishment of a comprehensive water resources management plan
Model (2) Policy for the sewage sector, strengthening the capacity to establish a sewage management plan	2-3-1 Preservation of quality of water sources (note: see the development strategic objective “4. Water environment conservation”) 2-3-2 Strengthening the pollution prevention system 4-2-1 Establishment of centralized sewage treatment facilities
Model (3) Water quality management	4-1-1 Strengthening the implementation capacity of relevant administrative organizations 4-1-2 Human resource development for water environment management 4-1-4 Formulation of environmental standards 4-1-5 Appropriate execution of regulations 4-3-2 Prevention of degradation in water quality
Model (4) Operation and maintenance of sewerage	4-1-2 Human resource development for water environment management
Model (5) Groundwater development	2-2-1 Groundwater development 1-2-1 Study and management of groundwater potential
Model (6) Strengthening the capacity of the water utilities	2-4-5 Effective water supply <urban water>
Model (7) Reduction of Non-Revenue Water	2-4-5 Effective water supply <urban water>
Model (8) Rural water supply	2-2-1 Groundwater development 2-4-6 Effective water supply <rural water>
Model (9) Access to sanitation facilities and improvement of hygiene practice	2-4-6 Effective water supply <rural water>

JICA standard indicator reference and typical lessons learned in technical cooperation projects (water resources)

Model (1) “Basin management”

Development strategic objective	Mid-term objective	Indicators at a program goal level	Mid-term sub-target	Overall goals/Project purposes and indicator examples	Methods/ Policies for setting indicators	Typical lessons learned	Example of project purpose (image of projects)	Reference projects
Development strategic objective	**Development thematic issue level to which the cooperation program corresponds**	**Connection with the target years or indicators in sector/regional development plans by the recipient country's government**	**Level of thematic issue to solve in individual projects**	**To . . . (outcome) By/through . . . (output) Thereby contributing to (impact) Indicator examples**	**Ways of thinking, points to remember, and important points in setting indicators**	**Write in lessons and risks to be necessarily used or reflected in implementing projects corresponding to the “mid-term sub-targets” from the perspectives of: 1) planning stages, and 2) management.**	**Example of project purpose (image of projects)**	**Project information with good practices to refer to**
1. Promotion of integrated water resources management	1-2 Promotion of basin management	(1) Number of established basin management plans (2) Number of basin management organizations (3) Annual forest area reduction	1-2-1 Grasp of water resources and establishment of a comprehensive water resources management plan	(Proposed model description) To strengthen the water resources management capacity of the human resources of the basin management organizations, (outcome) By establishing an implementation system, guidelines, and manuals necessary for integrated water resources management, (output) Thereby contributing to integrated water resources management in the target basin. (impact)		It is necessary to strengthen the establishment of hardware, such as observation equipment, and the capacity of software, such as human resource development, because the basin management organizations are expected to carry out the following functions appropriately: (1) Observation of weather and hydrological conditions in the basin (2) Allocation of water resources (3) Operation and maintenance of dams, weirs, intake/discharge gates, pumps, etc. (4) River management (including environmental conservation) (5) Water quality management (6) Flood control (including public participation) With regard to (2), though the adjustment of allocation among water users is a main issue, it is necessary to pay attention to the following: ●Securing and allocation of the amount of available water; Generally, the adjustment of allocation becomes more difficult with smaller amounts of available water. First of all, the amount of available water should be assessed. After that, if needed, the development of water resources and the efficient use of water should be considered from the viewpoint of appropriate allocation of water.	To establish a system whereby the Dissemination Unit of Water Resources Management and Technology (DUWRMT) can strengthen the River Basin Organization (RBO)’s practical capacity to manage water resources, By developing DUWRMT’s capabilities necessary for providing training to RBOs, establishing guidelines and manuals in the priority sectors related to water resources management necessary for RBOs and constructing a system whereby DUWRMT can provide counseling to RBOs concerning water resources management, Thereby contributing to the strengthening of RBOs’ capacity to carry out practical water resources management.	2. Capacity Development Project for River Basin Organizations in Practical Water Resources Management and Technology in Indonesia (Term of Cooperation: July 2008 – July 2011)
				(Standard indicator examples) 1. Indicator examples of overall goal (Basic) (1) Results of the basin management organizations’ adjustment of water resources allocation according to seasonal and other changes in the river flow rate and the level of groundwater (unit of river flow rate: ton; unit of level of underground water: meter)		●Consideration for local customs etc.; In allocation of a limited amount of water, it is important to respect various local conditions (social climate, culture, traditions, etc.) and give consideration to habitual water use and traditional groups of water users. ●Establishment of participation mechanism; It is important to form partnerships among the government, the private	To carry out participatory basin management by cooperation between the provisionary local government and the District Soil Conservation Office (DSCO) in the project target district, By improving the participatory basin management capacity of the Department of Soil Conservation and Watershed Management (DSCWM) and DSCO and reviewing the system for carrying	1. Participatory Watershed Management and Local Governance Project in Nepal (Term of Cooperation: May 2009 – April 2014)

				(based on the management and operation of dams, weirs, intake/discharge gates, pumps, etc.) (2) Status of the basin management organizations' conservation of water environments (water quality) (unit for total nitrogen (TN), total phosphorus (TP), total organic carbon (TOC), etc.: mg/L) (3) Number of established basin management plans (4) Number of basin management organizations		sector, and communities so that opinions from not only large water users but also NGOs and communities can be reflected in the adjustment of water allocation. (From "Thematic Guidelines – Water Resources")	out participatory basin management according to the local administration line (in cooperation with the Village Development Committee (VDC), the District Development Committee (DDC), and the Coordination Committee (CC)), Thereby contributing to the application of participatory basin management by cooperation between the provisional local government and DSCO in districts other than the project target district under the initiative of the Ministry of Forests and Soil Conservation (MoFSC) and the Ministry of Local Development (MoLD).	
				2. Indicator examples of project purpose (Basic) (1) Degree of understanding of guidelines and manuals for water resources management by C/P (2) Results of C/P's technical guidance to local people (number of times, number of persons) (3) Authorization of guidelines and manuals concerning water resources management (institutionalization)		・Because the establishment of an institutional framework is important, it is desirable to begin the project after the establishment of a basic laws, regulations and organizations. If not, problems would arise, including non-existence of C/P, the failure to increase the stakeholders' awareness, and the failure to gain cooperation from relevant organizations. ・Because it is necessary to encourage various kinds of organizations to participate in the project, it is desirable to carry out stakeholder analysis. Above all, it is important to involve not only water resources management organizations but also water resources user organizations (such as the Ministry of Agriculture).	To improve the basin management skills and the project management capacity of the relevant staff members of the Sur Futuro Foundation and the Secretariat Environment and Natural Resources, By arranging information on the natural environment and the social and economic conditions in the target village, appropriately introducing agro-forestry and simple irrigation agriculture, grasping the needs of the target residents, making it possible to carry out activities and evaluation according to the annual tree farming plan for each village and strengthening the system for preventing and extinguishing forest fires in the target area, Thereby contributing to the appropriate management of the forest resources in the project target area through the practical use of the skills about which local people received guidance from the relevant staff members of the Sur Futuro Foundation and the Secretariat Environment and Natural Resources.	3. Sustainable Watershed Management Project in the Upper Area of the Sabana Yegua Dam in the Dominican Republic (Term of Cooperation: April 28, 2006 – March 31, 2009)

JICA standard indicator reference and typical lessons learned in technical cooperation projects (water resources)
Model (2)“Policy for the sewage sector, strengthening the capacity to establish a sewage management plan”

Development strategic objective	Mid-term objective	Indicators at a program goal level	Mid-term sub-target	Overall goals/Project purposes and indicator examples	Methods/ Policies for setting indicators	Typical lessons learned	Example of project purpose (image of projects)	Reference projects
Development strategic objective	**Development thematic issue level to which the cooperation program corresponds**	**Connection with the target years or indicators in sector/regional development plans by the recipient country's government**	**Level of thematic issue to solve in individual projects**	**To . . . (outcome) By/through . . . (output) Thereby contributing to (impact) Indicator examples**	**Ways of thinking, points to remember, and important points in setting indicators**	**Write in lessons and risks to be necessarily used or reflected in implementing projects corresponding to the “mid-term sub-targets” from the perspectives of: 1) planning stages, and 2) management.**	**Example of project purpose (image of projects)**	**Project information with good practices to refer to**
2. Water supply with consideration for efficiency, safety and stability 4. Water environment conservation	2-3 Securing of water quality for water supply (water sources and drinking water) 4-2 Promotion of proper treatment of sewage through establishment of sewage treatment facilities	(1) Establishment of a sewage management plan that includes sewerage and sanitation facilities	4-2-1 Establishment of centralized sewage treatment facilities	(Proposed model description) To strengthen relevant government offices’ capacities for sector policy and improve/construct sewerage facilities, (outcome) By proposing various plans for improvement/construction of sewerage, (output) Thereby contributing to the strengthening of the administrative system for sustainable maintenance of sewage system. (impact) (Standard indicator examples) 1. Indicator examples of overall goals (Basic) (1) Establishment of a sewerage law 2. Indicator example of project purpose (Basic)		• To strengthen the water environment management capacity, it is essential to improve the relevant administrative organizations’ capacities to establish laws and systems, construct an organizational system, and develop human resources. While ensuring the appropriate execution of various administrative regulations in this way, effective implementation of them requires the industries and the local residents’ understanding and participation. Therefore, from the viewpoint of comprehensive water resources management, it is desirable to share information fully with stakeholders, such as business operators and residents, through the provision of support to administrative organizations in the establishment and execution of laws and regulations and the planning of environmental public relation activities to give consideration to the avoidance of conflicts of interest among various water users, including relevant industrial parties and the local uniqueness and variation of water use that they have traditionally developed. (From “Thematic Guidelines – Water Resources”) When carrying out a project for strengthening the water environment management capacity, it is necessary to assess the partner’s system fully at the stage of planning, in order to reflect it to an appropriate input plan. Special attention should be paid to the following: (1) With regard to support for the establishment of a sewage law, to prevent the result of Japanese experts’	To improve/construct sewerage facilities appropriately, By setting targets for the management of urban sewage and establishing a sewage measures plan or a sewerage construction plan, Thereby contributing to strengthening the administrative system for sustainable sewerage management.	1. Project for Capacity Development of Wastewater Sector through reviewing the Wastewater Management Master Plan in DKI Jakarta, Indonesia (Term of Cooperation: July 2010 – June 2012)

				(1) Preparation of a draft of sewerage law (2) Preparation of a sewerage construction plan (3) Development of a sewerage maintenance system (4) Preparation of a sanitation facilities management plan (5) Preparation of a sewerage financial plan (6) Establishment of a department in charge of sewerage		input from being of no practical use , the partner government's commitment at a higher level is essential for effectively carrying out the project. (2) When consideration is given to the provision of support for the establishment of a legal system, the capacity required of the partner differs between the establishment of a legal system and its enforcement. In the case of the latter especially, it is necessary to make a plan, predicting a maintenance system after the establishment of a legal system and noting that the budgeting for the enforcement, including personnel expenses, should be well based on the actual situation of the partner country, before making the plan. (3) It is necessary to understand the capacity of the C/P to which technology is planned to be transferred and adopt a form of input appropriate for the capacity.		

JICA standard indicator reference and typical lessons learned in technical cooperation projects (water resources)
Model (3) “Water quality management”

Development strategic objective	Mid-term objective	Indicators at a program goal level	Mid-term sub-target	Overall goals/Project purposes and indicator examples	Methods/ Policies for setting indicators	Typical lessons learned	Example of project purpose (image of projects)	Reference projects
Development strategic objective	**Development thematic issue level to which the cooperation program corresponds**	**Connection with the target years or indicators in sector/regional development plans by the recipient country's government**	**Level of thematic issue to solve in individual projects**	**To . . . (outcome) By/through . . . (output) Thereby contributing to (impact) Indicator examples**	**Ways of thinking, points to remember, and important points in setting indicators**	**Write in lessons and risks to be necessarily used or reflected in implementing projects corresponding to the “mid-term sub-targets” from the perspectives of: 1) planning stages, and 2) management.**	**Example of project purpose (image of projects)**	**Project information with good practices to refer to**
4. Water environment conservation	4-1 Improvement of the capacity to manage water environments 4-3 Promotion of water environment conservation in public water areas	(1) Proper establishment of a water quality monitoring plan in the target area (2) Preparation of an annual report after monitoring	4-1-1 Strengthening the implementation capacity of relevant administrative organizations 4-1-2 Human resource development for water environment management 4-1-4 Formulation of environmental standards 4-1-5 Appropriate execution of regulations 4-3-2 Prevention of degradation in water quality	(Proposed model description) To enable the Environment Agency’s Water Quality Analysis Laboratory to provide accurate monitoring information on discharged water (industrial wastewater and household effluent) and natural water (rivers, lakes, sea area) in ○● province, (outcome) By enabling the analysts of the Environment Agency’s Water Quality Analysis Laboratory to carry out the sampling and analysis of dirty water independently and constructing a highly reliable database on water resources and industrial wastewater, (output) Thereby contributing to the strengthening of the capacity to manage the compliance with the water discharge standards law in ▲△ country. (impact)			To enable the Environment Agency’s Water Quality Analysis Laboratory to provide accurate monitoring information on waste water (industrial and domestic effluents) and natural water (rivers, lakes, marine area) in Panama Province, By enabling the technicians of the Laboratory to carry out sampling of polluted water independently, enabling the scientists of the Laboratory to carry out water quality analysis independently, developing a highly reliable database on water resources and industrial wastewater and establishing a training system for technical transfer of water quality analysis to other agencies and for water environment education, Thereby contributing to the strengthening of the capacity to manage the compliance with the effluent standards law in Panama.	5. Water Quality Monitoring Techniques Project in Panama (Term of Cooperation: October 2003 – October 2006)
						・Many technical cooperation projects adopt an approach whereby the central government forms a framework for policies and management rules and trials of the framework are carried out at a pilot site. In this project, the project period was divided into phases, and the following scenario was specified: guidelines were completely prepared in Phase 1; the guidelines are used at the pilot site in Phase 2. The intensive establishment of management rules in Phase 1 made it possible to start the pilot activities in Phase 2 without delay. It can be said that clear division into phases is an effective means for securing sufficient	To strengthen the water quality management capacity of the Environmental Management Board (EMB), the Department of Environment and Natural Resources headquarters and regional offices to carry out priority activities for enforcing the Clean Water Act (CWA) and the enforcement regulation, By establishing a comprehensive water quality management policy and guidelines for carrying out the policy pursuant to the CWA, making them widely known among the staff of the EMB, strengthening the water quality management capacity of the EMB headquarters for the guidance of the regional offices, designating water quality	2. Capacity Development Project on Water Quality Management in the Philippines (Term of Cooperation: January 2006 – December 2010)

						time for pilot activities. (From the Reference Project 2 written on the right)	management areas, strengthening the capacity of the EMB regional offices for the foundation and management of the Water Quality Management Committee and strengthening the EMB regional offices' comprehensive capacity to manage water quality, Thereby contributing to the implementation of measures necessary for achieving the water quality targets specified by regional action plans.		
				(Standard indicator examples) 1. Indicator examples of overall goals (1) Increase in the number of factories over which the Environment Agency exercises administrative supervision according to water standard values (2) Increase in the number of factories that achieve water standard values (3) Standard values and regulations that the Environment Agency corrects based on the Laboratory's monitoring information (4) Establishment of a legal system that contributes to conservation of water quality (5) Status of construction of a water quality monitoring system (the status is measured by rating, etc.)			To increase the Department of Public Health Engineering (DPHE)'s capacity to inspect and monitor water quality, By increasing the water quality inspection capacity of the staff of DPHE's central and regional laboratories, improving the central and regional laboratories' management methods, and revising the water quality monitoring procedure, Thereby contributing to appropriate monitoring of water quality and the launching of relevant water quality surveillance systems.	1. Strengthening Capacity for Water Quality Analysis and Monitoring System in Bangladesh (Term of Cooperation: 2008 – 2011)
				2. Indicator examples of project purpose (1) Increase in the number of rivers (lakes and marine areas) to be monitored regularly (2) Increase in the number of inspection items to be analyzed (3) Frequency of publication and updating of water quality data on the website of the Environment Agency and the White Paper on the Environment (4) Increase in the number of examination items for the legal system and management rules that contribute to water quality conservation (5) Status of establishment of a system for carrying out various		When strengthening monitoring, it is important to clarify the legal position of the monitoring agency in the partner government, because the budget for the analysis and how to reflect the results of the monitoring in the measures are important.	To strengthen the Ministry of Housing, Territorial Planning and Environment's National Directorate for the Environment (DINAMA)'s and relevant agencies' capacity to manage pollution sources and water quality in the Santa Lucia River, By strengthening DINAMA's systems for managing pollution sources and water quality , establishing a system for coordinating agencies related to the management of pollution sources and water quality, strengthening DINAMA's and relevant agencies' capacity to monitor the water quality of rivers and discharged water, strengthening the DINAMA's and relevant agencies' capacity to collect information and analyze and evaluate data concerning DINAMA's and relevant agencies' management of pollution sources, strengthening DINAMA's capacity to inspect and evaluate management of pollution sources and give guidance about it and constructing and using a	3. Project on Water Pollution Control and Management of Water Quality in the Santa Lucia River Basin in Uruguay (Term of Cooperation: April 2008 – March 2011)

				measures that contribute to water quality conservation (the status is measured by rating, etc.)			comprehensive system for managing information on pollution sources and water quality, Thereby contributing to implementing measures for the improvement of water quality in the Santa Lucia River and DINAMA's leadership in promoting the establishment of a system for managing pollution sources and water quality in rivers in other basins. To enable the Environmental Quality Laboratory of the National Authority for the Environment (ANAM) to provide information sufficiently reliable to contribute to the environmental management administration of ANAM, By increasing the Laboratory's sampling and analysis skills and capacity, improving its QA/QC methods, and strengthening its capacity to provide scientific knowledge based on environmental monitoring, Thereby contributing to the strengthening of the capacity to manage the achievement of the water quality standards (surface water and wastewater) in Panama.	4. Water Quality Monitoring Techniques Project Phase 2 in Panama (Term of cooperation: November 2008 – November 2011)

JICA standard indicator reference and typical lessons learned in technical cooperation projects (water resources)
Model (4) “Operation and maintenance of sewerage”

Development strategic objective	Mid-term objective	Indicators at a program goal level	Mid-term sub-target	Overall goals/Project purposes and indicator examples	Methods/ Policies for setting indicators	Typical lessons learned	Example of project purpose (image of projects)	Reference projects
Development strategic objective	**Development thematic issue level to which the cooperation program corresponds**	**Connection with the target years or indicators in sector/regional development plans by the recipient country's government**	**Level of thematic issue to solve in individual projects**	**To . . . (outcome) By/through . . . (output) Thereby contributing to (impact) Indicator examples**	**Ways of thinking, points to remember, and important points in setting indicators**	**Write in lessons and risks to be necessarily used or reflected in implementing projects corresponding to the “mid-term sub-targets” from the perspectives of: 1) planning stages, and 2) management.**	**Example of project purpose (image of projects)**	**Project information with good practices to refer to**
4. Conservation of water environment	4-1 Improvement of the capacity to manage water environments	(1) Population ratio that has access sanitation facilities	4-1-2 Human resource development for water environment management	(Proposed model description) Financial aspect: To operate and maintain sewerage facilities appropriately, (outcome) By establishing a sewerage management plan that reflects the financial condition, (output) Thereby contributing to sustainable management of sewerage works. (impact) Technological aspect: To operate and manage sewerage facilities appropriately, (outcome) By improving the capacity to maintain and manage sewerage, including a staff development plan, (output) Thereby contributing to the improvement of the quality of sewerage service. (impact)		• With regard to the construction of sewerage in a metropolitan city, the application of an advanced system that developed countries use to treat a large volume of sewage in a small area is often inappropriate in light of difficult maintenance and high cost. Therefore, it is important to consider fully whether it is possible to apply a technology that requires a small initial investment, is easily operated, and requires low maintenance cost. To treat sewage, it is essential not only to adopt the activated sludge process common in developed counties but also to compare several methods according to urban development and conditions for land use, such as lagoon process and oxidation ditch. With regard to the sewer pipe network also, methods for reducing construction cost have been contrived, such as partial conduit opening, small-bore sewerage, and shallow sewerage. In the future, depending on the degree of urban development, the open ditch method (rainwater and sewage are discharged simultaneously) will be replaced with the close ditch method, and small sewerage system. Moreover, it is necessary to shift gradually to highly efficient and high-cost technology, such as the construction of centralized sewage treatment facilities that treat sewage from broad area in an integrated manner (sewer treatment plant, sewage pipe network, sludge treatment facility). Given the size of the initial investment in large-scale facilities, it is desirable to first divide	To establish a system for managing the Jericho City’s sewerage works, By constructing organizational foundations for the department in charge of sewerage works of the city and acquiring the city government’s capacity to operate and maintain the sewage treatment plant, maintain sewer pipes properly, promote the connection to each household, and manage the finances for the sewerage works, Thereby contributing to appropriate management of the city’s sewerage facilities under sound financial condition. To establish an efficient and effective method for operating and maintaining sewage treatment plants, By recovering the function of the model sewage treatment plant, preparing a reference material effective for the improvement of the operation and maintenance of the plant, operating and maintaining the plant by staff members who satisfy the capacity standards, disseminating the reference material and establishing an information system for collecting information on the operation and maintenance of the plant,	5. Technical Assistance and Capacity Building Project for the Jericho Sanitation Project in Palestine (Term of Cooperation: May 2012 – March 2016) 2. Project for Improvement of Sewage Treatment Plants Management in Thailand (Term of Cooperation: May 2004 – November 2007)

							the treatment area and carry out small-scale emergency measures and then consider integrating centralized treatment gradually. This makes it possible to diversify investments.	Thereby contributing to efficient and effective operation and maintenance of the sewage treatment plants in Thailand.	
				(Standard indicator examples) 1. Indicator examples of overall goal (Basic) (1) ○● city's annual revenue from the sewerage works exceeds XX. (2) The quality (BOD, TSS, T-N) of ○● city's monthly average of water discharged from the sewage treatment plants is lower than the standard value throughout the year.		However, it is necessary to examine cost-effectiveness in comparison to the hypothetical case where centralized facilities had been constructed from the outset, bearing always in mind the final overall treatment plan. In addition, because large-scale facilities are necessary for centralized treatment, it is necessary to confirm carefully the project management agency's maintenance capacity. If there is concern in the capacity, it is necessary to consider the construction/maintenance of medium-scale facilities and manage it first before installing a large-scale facility and it also should be assumed that several years of support would be needed for the improvement of the management and maintenance capacity. (From "Thematic Guidelines – Water Resources")	To establish the function and activities of the Training Center for Sewerage Works, By establishing a system for managing the Center, training engineers, technicians, scientists, and supervisors, preparing an information management system and preparing research activities, Thereby contributing to the establishment of the proper sewage treatment technology and appropriate planning, design, construction, and management of the sewage treatment service in Thailand.	3. Training Center for Sewage Works in Thailand (Term of Cooperation: August 1995 – July 2000)
				2. Indicator examples of project purpose (Basic) (1) The sewerage works are managed according to the sewerage management plan and the manual (*).	(*) When the sewage management plan and the manual are established, concrete indicators should be set for checking the achievement of the project purpose.				

						It is necessary to check carefully whether a budget and human resources necessary for the operation and maintenance of the sewerage treatment plants have been guaranteed.	To enable the Ministry of Housing and Construction's Training and Qualification Bureau and Sewerage Bureau and the Damascus Sanitary Drainage Company to jointly establish a training system in the operation, maintenance, and design review of sewerage facilities, By improving the Company's capacity to provide training in planned maintenance of sewer pipes, improving the Sewerage Directorate's capacity to provide training for the examination of design of sewerage facilities, and improving the Training and Qualification Directorate's capacity to plan and manage training in cooperation with the Sewerage Directorate, Thereby contributing to the development of human resources engaged in the operation, maintenance, and design reviews of the sewerage facilities in Syria.	4. Human Resources Development Project in Sewerage Sector in the Syrian Arab Republic (Term of Cooperation: April 2000 – March 2012)

JICA standard indicator reference and typical lessons learned in technical cooperation projects (water resources)
Model (5) “Groundwater development”

Development strategic objective	Mid-term objective	Indicators at a program goal level	Mid-term sub-target	Overall goals/Project purposes and indicator examples	Methods/ Policies for setting indicators	Typical lessons learned	Example of project purpose (image of projects)	Reference projects
Development strategic objective	**Development thematic issue level to which the cooperation program corresponds**	**Connection with the target years or indicators in sector/regional development plans by the recipient country's government**	**Level of thematic issue to solve in individual projects**	**To . . . (outcome) By/through . . . (output) Thereby contributing to (impact) Indicator examples**	**Ways of thinking, points to remember, and important points in setting indicators**	**Write in lessons and risks to be necessarily used or reflected in implementing projects corresponding to the “mid-term sub-targets” from the perspectives of: 1) planning stages, and 2) management.**	**Example of project purpose (image of projects)**	**Project information with good practices to refer to**
2. Water supply with consideration for efficiency, safety, and stability	2-2 Increase in supply by development of water resources	(1) Ratio of population who can access safe water (2) Water consumption per capita per day (3) Quality of raw water (4) Number of labor hours per day for water fetching	1-2-1 Study and management of groundwater potential 2-2-1 Groundwater development	(Proposed model description) To increase human resources for groundwater development, (outcome) By providing technical training in groundwater development, (output) Thereby contributing to improvement in access to water supply facilities whose sources are groundwater. (impact) (Standard indicator examples) 1. Indicator examples of overall goal (Basic) (1) The national water supply coverage reaches the government’s target (XX% in the country; YY% in rural areas) in the year of ○● (2) The annual number of wells successfully dug (or the number of groundwater supply facilities) increases from XX in the year ○ to YY by the year ●.		・Because comparatively safe drinking water can be provided stably from groundwater (including springs) and the cost of making drinking water from groundwater, including maintenance cost, is low, groundwater can be used as the main water source chiefly for small-scale water supply service in rural areas. However, attention should be paid to the following: when the pumping of groundwater is prone to be excessive due to industrial use, such as irrigation, this may cause saline water intrusion, drawdown of groundwater level and land subsidence or may disturb local hydrological balance, including surface water. Moreover, a water quality problem due to arsenic and fluorine is increasing. Therefore, to use groundwater, it is necessary to assess the potential, carry out environmental assessment, and inspect water quality at the time of development and regularly monitor water level and quality for proper management. (From “Thematic Guidelines – Water Resources”)		
				2. Indicator examples of project purpose (Basic) (1) The number of participants who completed the training course reaches the target number (XX in the first year; YY in the second year; ZZ in the third year). (2) More than ▲△% of the participants who completed the training and their superiors satisfy the result of the training.		・As the project purpose has been written as “increase of human resources for appropriate management of groundwater and water supply,” importance was placed on the provision of various training courses and the implementation of research activities. However, it is necessary to consider the development of human resources and the capacity building of the organization itself in the same way. (From “Lessons Learned” in the Terminal Evaluation)	In this center-type project, technical training is held concerning groundwater development and water supply, while research activities are conducted and the research results are used for development and improvement.	1. Ethiopian Water Technology Center Project Phase 2 (Term of Cooperation: January 2005 – January 2008)

								(Although the following is not a lesson concerning groundwater development, it has been written herein for reference.) Because, after the beginning of the project, a change was made in the method to allocate the budget for the training participation expenses to be paid by the counterpart, the budget was allocated not to the training providing agency but to the provincial government. However, the provincial government did not allocate the budget to the training participation expenses, and the training providing agency cannot force the provincial government to allocate the budget. Therefore, the number of participants is limited. It is important to strengthen the efforts to gain budgets by urging the federal government and giving information to the provincial government (especially, emphasizing improvements in new training programs and the impact of such programs), diversify budget sources for the Water Resources Training Center and encourage the private sector, NGOs and other development partners to participate in training at their own expenses. (From "Recommendations and Lessons Learned" in the Mid-term Review Report)	The capacity of the persons engaged in local water supply and sanitation is strengthened through the clarification of their necessity for training and the provision of support for the establishment of the training system, the enhancement of the lecturers' capacity, the improvement of the training courses based on the Plan-Do-Check-Action (PDCA) cycle, and the improvement of organizations' operation and management capacity. This project supports Cuba, the National Institute of Hydraulic Resources (INRH), and Grupo Empresarial de Investigaciones, Proyectos e Ingeniería (GEIPI) and the Managerial Group for the Hydraulic Resources Exploitation (GEARH), both of which are under the umbrella of INRH, in their improving groundwater development and management capacity. The groundwater development and management capacity is improved through the training of internal lecturers by OJT (on-the-job training) for the eastern region, where is subject to damage from drought and flooding due to climate change, and the development within INRH by the use of the existing internal training system. Proper development and management of groundwater in this region will contribute to the securing of stable drinking water supply.	2. Project for Enhancing the Function of the National Water Resources Institute in Nigeria (Term of Cooperation: March 2010 – December 2014) 3. Capacity Development on Groundwater Development and Management for Climate Change Adaptation in Cuba (Term of Cooperation: September 2008 – February 2012)

1. Promotion of integrated water resources management (Note 1) (Note 1) The other development objectives are “Water supply with consideration for efficiency, safety, and stability,” “Improvement of flood control for the protection of life and property,” and “water environment conservation”. As “Integrated water resources management” is the overarching objective of three other objectives, all JICA projects are expected to contribute to the achievement of this objective.	1-1 Strengthening the organization and system for promotion of integrated water resources management	(1) Available volume of groundwater per unit time (day, month, year)	1-2-1 Study and management of groundwater potential	(Proposed model description) To strengthen the groundwater managing agency’s capacity to manage water resources, (outcome) By preparing an implementation system, guidelines, and manuals necessary for management of groundwater resources, (output) Thereby contributing to proper management of the target aquifers and proper management of groundwater resources used for daily life and various industries. (impact) (Standard indicator examples) 1. Indicator examples of overall goal (Basic) (1) Results of the groundwater managing agency’s development and pumping restriction of groundwater according to seasonal changes in groundwater level, the amount of precipitation, etc. (2) Status of the groundwater managing agency’s control of groundwater level (unit: m) and water quality (satisfaction of WHO’s drinking water quality guidelines) 2. Indicator examples of project purpose (Basic) (1) Degree of understanding of the guidelines and manuals related to the implementation agency’s groundwater development and management capacity (2) Results of the groundwater managing agency’s measurement of groundwater level (unit: m) and water quality (3) Results of the groundwater managing agency’s regulation and guidance to groundwater users (number of times, number of persons)		(1) Related to the contents of the plan A method similar to development study was adopted for the project. The hydrogeological map of the model site was refined in cooperation with the counterpart. At the same time, simulation of groundwater development was carried out in the same model district. This promoted deep understanding of the following, including practical points of attention: the method to carry out the groundwater study; acquisition of skills in three sectors; the method to use the results of the groundwater study; and the method to manage groundwater. (2) Related to the implementation process All the core engineers had expert knowledge and work experience in the sector and have technical aptitude and PC skills. Moreover, they had the basic capacity to understand planes and spaces, such as transformation between coordinate systems and three-dimensional maps. In addition to this capacity, they were eager to acquire new knowledge and information and acquired skills at the target level while carrying out busy daily work. The basic capacity and eagerness are important for improving the capacity of water resources management engineers by the use of computer software.		

JICA standard indicator reference and typical lessons learned in technical cooperation projects (water resources)

Model (6) “Strengthening the capacity of the water utilities”

Development strategic objective	Mid-term objective	Indicators at a program goal level	Mid-term sub-target	Overall goals/Project purposes and indicator examples	Methods/ Policies for setting indicators	Typical lessons learned	Example of project purpose (image of projects)	Reference projects
Development strategic objective	**Development thematic issue level to which the cooperation program corresponds**	**Connection with the target years or indicators in sector/regional development plans by the recipient country's government**	**Level of thematic issue to solve in individual projects**	**To . . . (outcome) By/through . . . (output) Thereby contributing to (impact) Indicator examples**	**Ways of thinking, points to remember, and important points in setting indicators**	**Write in lessons and risks to be necessarily used or reflected in implementing projects corresponding to the “mid-term sub-targets” from the perspectives of: 1) planning stages, and 2) management.**	**Example of project purpose (image of projects)**	**Project information with good practices to refer to**
2. Water supply with consideration for efficiency, safety, and stability	2-4 Equitable water supply	(1) Ratio of population who can access safe water (2) Water supply service coverage (3) Volume of water consumption per person per day (4) Average per-capita consumption rate (from the viewpoint of water supplier) (5) Non-Revenue Water ratio (6) Ratio of water supply that meets water quality standards (7) Tariff collection ratio (8) Revenue from tariff collection (9) Average number of hours service is provided (the water utility can extend water supply hours, which were limited) (10) Operating ratio (ratio (%) of billing amount to operation and maintenance cost) (financial indicator) (11) Number of employees per 1,000 connections (number of persons) (the number for an efficient water utility is said to be about five)	2-4-5 Effective water supply <urban water>	(Proposed model description) To improve the water utility staff’s capacity to operate and maintain water supply service in urban areas, (outcome) By strengthening the financial management capacity, the Non-Revenue Water reduction capacity, and the capacity to manage water quality in water purification facilities, (output) Thereby contributing to improve the water utilities’ water supply service in urban areas. (impact) (Standard indicator examples) 1. Indicator examples of overall goal (Basic) (1) Served population increases. (2) Purified water quality always satisfies the water quality standards as a result of daily water quality test. (3) Customer satisfaction increases concerning water supply service by the water utilities in the city of ○●. (4) The number of days when purified water that satisfies the water quality standards (turbidity: ** NTU or less; residual chlorine: ** mg/L) is supplied increases from ○ to ○ per month at each sampling	The indicator (3) is difficult to measure at an actual case. A decrease in the number of complaints can be expected in the case of a project that aims to strengthen the water utilities’ overall capacity. However, note that the number of complaints may not decrease in the case of a project that aims to strengthen only a part of the technical sector dealt with by the water utilities. * The indicator (4) should be higher than the quantitative target specified in the project	• Even if the goal is to strengthen the water utilities, because the organizational position of the water utilities (such as whether or not it employs self-supporting accounting), the central government’s policy for human resource development, the water tariff system, and other external environmental factors can have impact, it is necessary to plan a project after grasping the whole sector. • If a training center is founded independently from the water utilities, it will be difficult to finance the operation and maintenance cost (the cost of maintaining the facilities and the personnel cost) after the end of the project, and a problem about sustainability will remain. It is desirable to construct a mechanism for capacity development inside the water utilities. • It is important to motivate the counterpart and give incentives to it. This requires devices, such as introducing a system whereby achievements can be evaluated fairly and reflected in promotion and wages and heightening competitive consciousness. • Because there is a close relation between the operation and maintenance of the water supply facilities and the management of the water utilities, it is effective to design the project by taking both into consideration. “Analysis from a Capacity Development Perspective: Human Resource Development in the Water Supply Sector” (National Institute for Land and Infrastructure	To improve the water utilities staff’s capacity to operate and maintain the water supply service in the Maminasata Metropolitan Area, By improving the mechanism for regional cooperation and coordination among water utilities, strengthening the financial management capacity, the capacity to reduce Non-Revenue Water, and the capacity to construct a Geographic Information System (GIS) database and enhance the management of the water quality in small-scale water purification facilities, Thereby contributing to the improvement of the water utilities’ water supply service in the Maminasata Metropolitan Area. To establish a system for performing safe and efficient water supply service at the pilot water treatment plant and the pilot area for Non-Revenue Water reduction, By establishing a system whereby the east and west districts general service headquarters’ maintenance division and the water production division in each district give guidance on the maintenance of the water treatment plants under their supervision, improving the maintenance capacity of the staff of the pilot water treatment plant, establishing a system for carrying out water quality test and management at the pilot water treatment plant, enabling other water treatment plants’ staff to participate in OJT to carry out water quality test and management and developing the	1. Project for Water Supply Service Improvement in the Mamminasata Metropolitan Area in Indonesia (Term of Cooperation: September 2009 – March 2012) 4. Project for Capacity Building of Water Maintenance in Jamaica (Term of Cooperation: March 2007 – September 2010)

				point of ○●city water authorities. (5) The Non-Revenue Water ratio reduces.	purpose. If a project purpose is “to improve the capacity,” it is safe to evaluate the project by the use of an indicator for measuring the strengthening of the capacity like the indicator (4). If, like the indicator (1) or (3), an indicator for a result of the application of the capacity at an actual case is set, the risk of failing to achieve a result will increase. Therefore, it is necessary to pay attention when selecting indicators.	Management) is a well-organized document that includes many lessons. (Japanese only)	capacity to prepare and carry out a plan concerning the Non-Revenue Water reduction for the east and west districts general service headquarters, Thereby contributing to the improvement of the system for the safe and efficient water supply service in the water supply areas specified by the National Water Commission (NWC).	
						・Cooperation with the private sector In developing countries also, there are an increasing number of cases where the whole management of water supply service or the operation and maintenance of some facilities are entrusted to private companies to realize efficient management. In addition, because limited public funds cannot satisfy the needs of expanding water supply service, financing by private funds through public-private partnership (PPP) has been expanded. In this way, the entry of the private sector has become a global trend. In this situation, it is essential to consider how the private sector should be involved in ODA, based on the situation of PPP in the country in question. To advance the entry of the private sector, it is necessary to establish a system for promoting it. Because water supply is directly connected with human health and is a public service that should be provided to all people, it is necessary to consider the government’s proper supervision and regulation, including the provision of service to the urban poor without fail. (From “Thematic Guidelines – Water Resources”)	To improve the service and management in the selected water districts and show measures for improving the service and management in the target water districts (40 water districts excluding the selected ones), By preparing a profile for each target water district, selecting water districts where management should be improved concretely, preparing a plan to improve the water supply management and service in the selected water districts, improving the water supply facilities in the selected water districts, strengthening the management capacity for the overall water supply management in the target water districts, and enforcing the support system for the target water districts of the Local Water Utilities Administration (LWUA), Thereby contributing to the improvement of the service and management in the target water districts.	3. Small Water Districts Improvement Project in the Philippines (Term of Cooperation: August 2005 – July 2010)
						・To operate and maintain water supply facilities properly, it is essential to place and train engineers engaged in the operation and maintenance. However, because the operation and maintenance of the facilities requires recurrent costs,	To strengthen the water supply management capacity of the Juba Branch of the South Sudan Urban Water Corporation (SSUWC) through the improvement of the capacity to operate and maintain the facilities, By improving the SSUWC Juba	3. Project for Management Capacity Enhancement of Southern Sudan Urban Water Corporation (Term of Cooperation: August 2010 – July 2013)

				2. Indicator examples of project purpose (Basic) (1) Main performance indicators concerning operation and management (such as cost recovery rate, number of connections and number of days when the water quality standards are satisfied) are improved. (2) The number of days when water is distributed according to the water supply plan increases from X days to Y days per month. (3) The number of days when purified water satisfies the water quality standards (turbidity: ** NTU or less; residual chlorine: ** mg/L) is supplied increases from X days to Y days per month at each sampling point set by ○● city water utilities. (4) The staff's capacity is enhanced (measured by the examination pass rate). (5) The management plan and the maintenance plan are officially approved and applied. (6) SOP (standard operating procedures) is officially approved and applied. (7) Internal training is provided more than ○ times a year (indicator for checking whether the internal human resource development mechanism begins to function).	With regard to "according to the water supply plan" in the indicator (2), actual evaluation should be made as to whether water is distributed so that various service standards (standards for water volume, water pressure, water quality, water service hours, etc.) can be satisfied.	such as electricity expenses, chemical expenses, repair expenses, and spare parts expenses, it is necessary to manage the water supply service appropriately so that the recurrent costs can be financed. In other words, the operation and maintenance cost should be covered by properly collecting water tariff through the check of the volume of water consumption by installing customer meters, the improvement of the water tariff system and the tariff collection system and the implementation of measures against water leakage and theft. The provision of sustainable water supply service becomes possible by improving the management of the water supply service and financing investments in the construction and repair of the facilities. (From "Thematic Guidelines – Water Resources") • Investments in facilities are essential for water supply. Even if efforts are made to improve the management capacity, the impact of the efforts will become limited unless budgets are secured to use the management capacity and construct and expand the facilities. It is necessary to investigate the target water utilities' financing means and financing capacity and, if needed, provide support for improving the financing capacity (establishment of a financial plan and an investment plan, setting of performance indicators (PIs), a review of the tariff policy, etc.).	Branch's capacity to operate and maintain the facilities for taking, conducting, and purifying water, increasing the Juba Branch's capacity to operate and maintain the facilities for supplying and distributing water, increasing its capacity to inspect water quality, developing its understanding of the financial condition and strengthening the SSUWC headquarters' capacity to support the Juba Branch, Thereby contributing to an improvement in the quality of the water supply service provided by the Juba Branch and the strengthening of the SSUWC headquarters' provision of support to the branches other than the Juba Branch. To construct a system for strengthening the project management capacity according to the middle- and long-term visions of the water utilities in Laos, By enabling the pilot water utilities to continuously use the data necessary for the formulation of long-term, medium-term, and short-term project plans, by having the pilot water utilities manage the project according to the plans by the use of the Plan-Do-Check-Action (PDCA) cycle, strengthening the monitoring of the project plans, including the performance indicator (PI), by preparing technical guidelines for water supply plan (technical guidelines) based on the above results, and constructing a system for encouraging the water utilities and private companies all over the country to establish project plans and monitoring systems, Thereby contributing to the strengthening of the management system for sustainable and stable development in the water supply sector in Laos.	2. Capacity Development Project for Improvement of Management Ability of Water Supply Authorities in Laos (Term of Cooperation: August 2012 – July 2017)

JICA standard indicator reference and typical lessons learned in technical cooperation projects (water resources)

Model (7) “Reduction of Non-Revenue Water”

Development strategic objective	Mid-term objective	Indicators at a program goal level	Mid-term sub-target	Overall goals/Project purposes and indicator examples	Methods/ Policies for setting indicators	Typical lessons learned	Example of project purpose (image of projects)	Reference projects
Development strategic objective	**Development thematic issue level to which the cooperation program corresponds**	**Connection with the target years or indicators in sector/regional development plans by the recipient country's government**	**Level of thematic issue to solve in individual projects**	**To . . . (outcome) By/through . . . (output) Thereby contributing to (impact) Indicator examples**	**Ways of thinking, points to remember, and important points in setting indicators**	**Write in lessons and risks to be necessarily used or reflected in implementing projects corresponding to the “mid-term sub-targets” from the perspectives of: 1) planning stages, and 2) management.**	**Example of project purpose (image of projects)**	**Project information with good practices to refer to**
2. Water supply with consideration for efficiency, safety, and stability	2-4 Equitable water supply	(1) Water supply service coverage (2) Population served (3) Volume of water consumption per person per day (original unit for water supply) (4) Non-Revenue Water ratio (5) Ratio of water supply that meets water quality standards (6) Financial management indicators (operating ratio, billing collection ratio)	2-4-5 Effective water supply <urban water>	(Proposed model description) To reduce the Non-Revenue Water ratio in ○● city, (outcome) By systematizing the planning process for the reduction of Non-Revenue Water and establishing a method for reducing Non-Revenue Water, (output) Thereby contributing to improve the water supply service of XX water utilities and an increase in the water utilities’ revenue from water supply service. (impact)		The following are basic requirements for Non-Revenue Water measures: 1. Grasp the actual condition (the whole system and in each region) of Non-Revenue Water accurately. 2. Set a realistic reduction target based on the accurately grasped condition (the whole system and in each region). 3. Clearly identify the organization that has the overall responsibility for reducing Non-Revenue Water in each region and carries out measures 4. Be able to monitor the achievement of Non-Revenue Water reduction 5. There is an organization that grasps results accurately and objectively and evaluates them fairly and impartially. 6. There is an incentive system for persons who achieve excellent results.	To decrease the Non-Revenue Water ratio in Honiara City, By systematizing the planning process for Non-Revenue Water reduction, establishing a method for reducing Non-Revenue Water through a pilot project and improving the management method for water meter inspection and billing, Thereby contributing to the improvement of the water supply service of the Solomon Islands Water Authority (SIWA) and an increase in SIWA’s revenue from water supply.	3. Project for Improvement of Non-Revenue Water Reduction Capacity for Solomon Islands Water Authority (Term of Cooperation: October 2012 – September 2015)
						・It is necessary to formulate a “medium- and long-term plan for Non-Revenue Water reduction” (including a plan for organizational and institutional reform) to satisfy the above-described basic requirements and carry out activities for receiving the C/P head’s official approval. ・It is necessary to carry out a technical cooperation project for Non-Revenue Water reduction step by step, adopting a long-term viewpoint and checking the C/P top’s eagerness. ・The causes of Non-Revenue Water include not only physical loss due to water leakage and other defects in the facilities but also commercial loss caused by the management of water supply service, such as the failure to install customer meters, broken meters, illegal connections, and defects in customer ledgers and the billing system. Because the causes of Non-Revenue Water vary, it is necessary to formulate a plan after grasping main causes in the target city	To strengthen the National Water Supply and Drainage Board (NWSDB)’s capacity to carry out Non-Revenue Water measures in Colombo City, By improving the Western-Central Regional Support Center’s senior staff’s planning and implementation of management capacity and improving the Western-Central Regional Support Center’s engineers’ and workers’ capacity to perform duties for carrying out Non-Revenue Water reduction activities (technical capability, construction monitoring capacity), Thereby contributing to a reduction in the Non-Revenue Water ratio in Colombo City.	2. Capacity Development Project for Non-Revenue Water（NRW）Reduction in Colombo City in Sri Lanka (Term of Cooperation: August 2009 – July 2012)
				(Standard indicator examples) 1. Indicator examples of overall goal (Basic)		To improve the Goa Province Public Works Department (PWD)’s capacity to carry out reduction of Non-Revenue Water, By formulating long-term and		1. Capacity Development Project for Non-Revenue Water Reduction in Goa in India (Term of Cooperation: October

				(1) The number of water supply hours increases. (2) The Non-Revenue Water ratio in ○● city decreases to ○●% by the year ▲△. (3) The ordinary balance ratio exceeds 100% by the year ▲△. 2. Indicator examples of project purpose (Basic) (1) The Non-Revenue Water ratio in each pilot area decreases to ○○%. (2) The Non-Revenue Water ratio in ○● city decreases to □□%		as much as possible. Because water leakage occurs due to various reasons, such as decrepit pipes, high water pressure, poor installation of pipes, fragile pipe materials like asbestos cement, etc., it is important to grasp the actual condition. There are also some cases where measures include not only measures for discovering and repairing water leakage but also measures for making water pressure proper through the improvement of water distribution management and improving pipeline construction technology. ・After the beginning of the project, it is important to conduct baseline survey at an earlier stage, analyze the cause of Non-Revenue Water, and consider taking effective Non-Revenue Water measures in the target cities. The baseline survey requires the hydraulic separation and water volume measurement, which may take a lot of time. ・The efficient Non-Revenue Water measures differ according to the level of the Non-Revenue Water ratio in the target cities. In a city where the Non-Revenue Water ratio is high (more than the 30% to 40% mark), it is generally possible to decrease the ratio greatly by reducing commercial loss. If the Non-Revenue Water ratio decreases, it will be more difficult to take measures. There is a method whereby the network of distribution pipes is divided into small district metered areas (DMAs), the Non-Revenue Water ratio is measured in each area, and measures are taken in the areas in order of ratio. Although this method is often used by other donors, this requires a lot of investment. Therefore, the method should be applied to cities where the Non-Revenue Water ratio is relatively low (about the 20% mark). In cities where the ratio is larger, it is advisable to grasp and analyze the volume of water distributed in larger blocks (which is sometimes called “sectorization”). ・The first step of Non-Revenue Water measures is to measure the volume of water as input to the water supply system by flow meters and measure the volume of water consumption by customer meters to analyze the volume of distributed water quantitatively. Including the activities	annual plans for Non-Revenue Water reduction in the whole province of Goa, formulating and implementing the plan to carry out the pilot project for Non-Revenue Water reduction, and sharing Non-Revenue Water reduction technology within the provincial PWD, Thereby contributing to a reduction in the Non-Revenue Water ratio in the province of Goa.	2010 – September 2013)

							for this, consideration should be given to supplying necessary flow meters and customer meters or procuring them by other funds. • Projects for Non-Revenue Water measures often adopt an approach of transferring technology in the pilot area while measuring the effect. When supervising this approach, it is necessary to pay attention to the following: (1) Incorporate measures for disseminating and extending this approach from the pilot area to other area. For example, prepare an action plan for the dissemination and extension and approve it officially (Capacity Development Project for Non-Revenue Water Reduction in Goa, India); construct a system for formulating annual plans and middle-term plans systematically; and go on to financial cooperation (such as ODA Loan) whose components include the renewal of decrepit pipes and the continuation of Non-Revenue Water measures (Sao Paulo, Brazil). (2) Because Non-Revenue Water reduction measures include nighttime work (leak detection and measuring the volume of leaked water by minimum night flow method) and require steady efforts, it is necessary to use devices for enhancing the staff's motivation and giving incentives to them, such as drawing out positive commitment from the water utilities' top executives, raising the importance of the measures in the organization, making it possible to measure the result of the reduction of the Non-Revenue Water ratio in each area to enhance competitive consciousness, bestowing commendations, improving wages or paying rewards according to the result of the reduction of the Non-Revenue Water ratio, and giving night work allowances and other incentives. (3) Full attention should be paid to the sharing of expenses and the management of schedules for procuring necessary materials for pilot activities (such as valves and flow meters) and constructing chambers. • Because some water utilities outsource the installation of pipelines, the repair of leakage, the inspection of meters, and the collection of bills, it is necessary to pay attention to the target	To enhance the Non-Revenue Water reduction capacity of the Lima Water and Sewerage Service Company (SEDAPAL), By improving the Non-Revenue Water (NRW) management team's capacity to formulate plans, carry out and monitor measures, and evaluate projects continuously, the NRW action team's capacity to carry out Non-Revenue Water reduction activities, and the NRW action team's capacity to manage the quality of the installation of water supply equipment, Thereby contributing to a decrease in the volume of SEDAPAL's Non-Revenue Water.	4. Project for Capacity Strengthening for Non-Revenue Water of SEDAPAL in Peru (Term of Cooperation: March 2012 – February 2015)

						and method of capacity development through the project. There are cases that include the strengthening of the water utilities' systems for monitoring private companies and the water utilities' guidance to private companies concerning technical improvement. • Because activities in the pilot area have to be carried out also at night, it is necessary to select safe area. In many cases, the criteria for selecting pilot area include the following: there is information on the condition of the pipeline network; there are prospects for the measurement of the Non-Revenue Water ratio with hydraulic separation; and the district persons in charge are highly motivated.		

JICA standard indicator reference and typical lessons learned in technical cooperation projects (water resources)
Model (8) “Rural water supply”

Development strategic objective	Mid-term objective	Indicators at a program goal level	Mid-term sub-target	Overall goals/Project purposes and indicator examples	Methods/ Policies for setting indicators	Typical lessons learned	Example of project purpose (image of projects)	Reference projects
Development strategic objective	**Development thematic issue level to which the cooperation program corresponds**	**Connection with the target years or indicators in sector/regional development plans by the recipient country's government**	**Level of thematic issue to solve in individual projects**	**To . . . (outcome) By/through . . . (output) Thereby contributing to (impact) Indicator examples**	**Ways of thinking, points to remember, and important points in setting indicators**	**Write in lessons and risks to be necessarily used or reflected in implementing projects corresponding to the “mid-term sub-targets” from the perspectives of: 1) planning stages, and 2) management.**	**Example of project purpose (image of projects)**	**Project information with good practices to refer to**
2. Water supply with consideration for efficiency, safety, and stability	2-4 Equitable water supply	(1) Ratio of population who can access safe water (2) Coverage rate of water supply facilities (3) Volume of available safe water per person per day (4) Reduction in water fetching labor (especially on women and children) (5) Reduction in water-borne diseases (such as diarrhea and Guinea worm)	2-4-6 Effective water supply <rural water>	(Proposed model description) To strengthen the system for operating and maintaining the rural water supply project in the target county, (outcome) By improving the development plan planning and coordinating function of the provincial officials engaged in the operation and maintenance of the rural water supply project and the provincial officials who give guidance about the rural water supply in the county, (output) Thereby contributing to the improvement of the rural water supply service in the target county. (impact)		• The knowledge of Bridge Asia Japan, which has experience in carrying out activities in this project site, was effectively used for selecting digging sites and forming good relationships with rural residents. The use of knowledge of NGOs that carry out local relevant activities can be useful for carrying out projects related to the nature of the locality or the local culture. (From the Reference Project 1 written on the right)	To increase the capacity to construct, repair, and maintain water supply facilities in the central dry zone, By enabling the staff of the Department of Development Affairs (DDA) of the Ministry for Progress of Border Areas and National Races and Development Affairs to develop their skills in the construction of rural water supply facilities, improve skills in the repair of wells, and improve skills in the maintenance of water supply facilities, Thereby contributing to the stable supply of safe water in the central dry land.	1. Project on Rural Water Supply Technology in the Central Dry Zone in Myanmar (Term of Cooperation: November 2006 – October 2009)
						(1) Institutionalization (enactment of internal rules on the training system and the establishment of the operation and maintenance department) is effective for maintaining the results of cooperation in the situation where it is difficult to establish C/P firmly due to personnel changes. (2) Although the regional office made efforts to introduce new knowledge, methods, and technology into water associations, it was difficult to gain water associations’ understanding due to the different language, culture, etc. The simplification of the monitoring and evaluation systems was effective for coping with this. Moreover, the visualization of training materials (into illustrations, videos, etc.) makes it possible to gain higher effect. (3) Because trouble in water supply equipment that uses a motor pump is often caused by electricity, what is important for similar projects is strengthening the electricity sector. (4) The participation of local governments (which are nearer to	To increase the implementing agency’s local office’s capacity to support water associations, By constructing a training provision system and developing training programs concerning the operation and maintenance of groundwater supply facilities, Thereby contributing to strengthening the water associations’ operation and maintenance capacity.	2. Strengthening Water Associations and Community Development in Guatemala (Term of Cooperation: April 2010 – June 2013)
				(Standard indicator examples) 1. Indicator examples of overall goal (Basic) (1) Increase in the population			Methods for clarifying the roles of three stakeholders – the Ministry of Water’s regional officials, communes, and the organization	3. Project for the Improvement of Rural Water Supply Management and

				that can continue to use improved water sources (2) Increase in the number of water supply facilities in villages (3) Improvement in the ratio of operating water supply facilities		residents) is important for carrying out water supply service more effectively. (From “Lessons Learned” in the Terminal Evaluation)	that maintains water supply facilities – and developing the capacity in order to establish the system for maintaining water supply facilities will be established. In addition, the hygiene and sanitation enlightenment and education by the provincial branches of the Ministry of Education and the Ministry of Health and local administrative organizations in the target districts will be strengthened. These will contribute to the establishment and operation of the systems for maintaining water supply facilities and promoting hygiene and sanitation enlightenment in the counties.	Hygiene Practice in Astimo-Andrefana Region in Madagascar (Term of Cooperation: September 2008 – March 2013)
				2. Indicator examples of project purpose (Basic) (1) Human resources that received training under the project (administrative officials, representatives of the Water Committee, engineers, et al.) (Unit: number of persons; to be measured by rating etc.) (2) Number of rural water supply plans submitted to (or approved by) provincial assemblies with the support of the Ministry of Water, basic water offices, and provincial administrative offices (3) Number of rural water supply facilities operated and maintained according to the guidelines and manuals prepared in the project.		(1) Flexible revision of PDM in response to changes in the condition of institutions and policies made it possible to maintain the effectiveness of the project. Experts should pay attention to the consistency between the framework of policies and the contents of the project and make efforts to collect information on bills, rules, and strategies together with C/P. (2) When PDM was revised, a wide range of investigations, such as interviews, site visits, consultations with other donors, and feasibility study entrusted to the private sector, were effective for collecting good practices and lessons suitable for the actual situation and having them reflected in the project. (From “Lessons Learned” in the Terminal Evaluation)		
						(1) Although efforts were made to improve the staff’s occupational consciousness and basic business skills (presentation to residents, personal computers, etc.), it was impossible to follow up on details because guidance was basically given on the spot. Efficiency would have been better if the staff had begun to work on the spot after receiving basic training by the use of local resources. (2) In relation to (1), because outside instructors were invited to hold training in other donors’ projects, efficiency would have been better if it had been possible to make arrangements beforehand. (From “Lessons Learned” in the completion report)	The implementation of the following will increase the water supply and sanitation capacity of farm villages and small cities in the target province and improve the situation of water supply and public health there: (1) Strengthening the provincial government’s capacity concerning the establishment (construction and large-scale repair) of water supply facilities (2) Strengthening ward offices’ and water and sanitation committees’ capacity concerning the operation and maintenance of water supply facilities and enlightenment about sanitation (3) Construction of a system for	4. Project for Institutional Reinforcement of Water Supply and Sanitation in North Area of Peru (Term of Cooperation: April 2009 – March 2013)

								disseminating the contents of the manuals concerning the operation and maintenance of water supply facilities and enlightenment about sanitation among ward offices and water and sanitation committees.	
							(1) It is advisable to understand fully that water supply facilities necessarily reach the end of their usefulness some day and that trouble that cannot be solved by residents is repeated every several years, and make clear residents' limitations and the administration's role. (2) When constructing water supply facilities, it is desirable to design or take over the facilities, taking into consideration maintenance in the future (drawing, information on the facilities, etc.). (From "Lessons Learned /Recommendations through PEPTAC 2" in the completion report)	A system for maintaining water supply facilities will be constructed with the cooperation of administrative organizations, residents, and local private companies, and systems for continuously using safe water will be spread through the improvement of water use and residents' sanitation habits and the diversification of community activities.	5. Project on Safe Water and Support on Community Activities Phase 2 in Senegal (Term of Cooperation: November 2006 – March 2010)
							(1) To effectively operate a maintenance mechanism that involves many stakeholders at various levels, it is necessary to give planned and strategic consideration as to what activities to carry out at what place in the target districts. (2) When this project was carried out, the stakeholders in the communes covered by the first model building under the maintenance project shared experience and know-how as the leaders for the third model building. When the maintenance model is extended all over the country in the future, effective extension can be expected if the stakeholders in the target counties and districts go to other districts to share experience and know-how. (From "Lessons Learned" in the Terminal Evaluation)	The implementing agency's administrative capacity concerning the operation and maintenance components will be strengthened and a maintenance model will be carried out with the support of the implementation support team in the target county and by the provision of support to the target district. This aims to improve the operating rate of the local water supply facilities.	6. Project for Support in National Roll-out of Sustainable Operation and Maintenance Programme (SOMAP3) in Zambia (Term of Cooperation: September 2011 – February 2016)
							• In this project, the residents who think "well water can be used by neighboring people free of charge" are requested to think "well water should be managed by the whole village with charge." A project that requires such a change in people's behavior can become sustainable if the people can understand the significance of the new mechanism and rules, and the mechanism and rules are established firmly as daily customs. However, this takes a lot of time. If the result	In the target area, the following will be carried out: the preparation of a operation and maintenance training manual according to the national plan and the policy for reforming the system for managing drinking water supply and use facilities; the provision of guidance to the extension officials of the counties that use the manual; the foundation of water users' associations; extension workers' strengthening of the capacity of the water supply	7. Project for Enhancement of Water Supply Infrastructure Management and Hygiene and Sanitation in the Regions of Central Plateau in Burkina Faso (Term of Cooperation: June 2009 – May 2013)

						requires a change in people's habits and behavior, it takes a longer time for the result to emerge than if the result does not require a change in their behavior. (From "Lessons Learned" in the Terminal Evaluation) With regard to (2) right especially: (1) When rules, guidelines, or a manual established at the national level are used, they should be reviewed at the regional level and the project level. Moreover, it is necessary to be always conscious of problems in actual application. (2) Before capacity building training is held for local government officials, plan ex-post monitoring evaluation as to whether any effect emerges concerning the strengthening of the operation and maintenance capacity in the local area. The issue check sheet compiled as Attached Material 6 of the Project Study Report can be used as a practical reference. ・There are many areas where water drawing should be carried out by women or girls. In addition, the management of water at home is often carried out by women. Therefore, it is especially important to give consideration to gender.	officials in the target commune; and the strengthening of the capacity to carry out enlightenment activities concerning the improvement of sanitation practice and to construct and maintain public health facilities. (Example of project study) Project study for the following purposes: (1) Efficient project implementation with sector aid coordination and under the decentralization regime; (2) the operation and maintenance of water supply facilities, such as residents' operation and maintenance system and the system for supplying spare parts and billing; and (3) compilation of good practices that contribute to project implementation in the future. Field research was conducted concerning the provision of grand aid or technical cooperation to Ethiopia, Zambia, Sierra Leone, Senegal, Gambia, Tanzania, Rwanda, and Mozambique. In addition, documents were reviewed concerning technical cooperation projects in Burkina Faso and Madagascar.	1. Project Study on "Lessons and Challenges in Operation and Maintenance of Rural Water Supply Facilities in Sub-Saharan Africa" (Term of Cooperation: August 2009 – March 2010)

JICA standard indicator reference and typical lessons learned in technical cooperation projects (water resources)
Model (9) “Access to sanitation facilities and improvement of hygiene practice”

Development strategic objective	Mid-term objective	Indicators at a program goal level	Mid-term sub-target	Overall goals/Project purposes and indicator examples	Methods/ Policies for setting indicators	Typical lessons learned	Example of project purpose (image of projects)	Reference projects
Development strategic objective	**Development thematic issue level to which the cooperation program corresponds**	**Connection with the target years or indicators in sector/regional development plans by the recipient country's government**	**Level of thematic issue to solve in individual projects**	**To . . . (outcome) By/through . . . (output) Thereby contributing to (impact) Indicator examples**	**Ways of thinking, points to remember, and important points in setting indicators**	**Write in lessons and risks to be necessarily used or reflected in implementing projects corresponding to the “mid-term sub-targets” from the perspectives of: 1) planning stages, and 2) management.**	**Example of project purpose (image of projects)**	**Project information with good practices to refer to**
2. Water supply with consideration for efficiency, safety, and stability	2-4 Equitable water supply	(1) Rate of access to improved sanitation facilities (2) Rate of improvement of residents’ sanitation and hygiene practice (elimination of open defecation, encouragement of hand washing)	2-4-6 Effective water supply <rural water>	(Proposed model description) To improve residents’ sanitation and hygiene practice and lifestyle, (outcome) By strengthening the government’s sanitary and hygiene education and the dissemination system for the residents in the target area, (output) Thereby contributing to the reduction of water-borne diseases in the target area. (impact) (Standard indicator examples) 1. Indicator examples of overall goal (Basic) • Morbidity of diarrhea in the target community		• Because residents’ demand for sanitation facilities is not necessarily higher than their demand for water supply facilities, which directly connect to life maintenance, and because sanitation facilities may conflict with culture, customs, or taboos, it is desirable to discuss well with residents to promote a change in their understanding of public health and to determine facility design and the place of installation. Because water supply facilities are usually close to the village that is using them, when selecting where to install penetration-type sanitation facility, it is necessary to consider installing it at some distance from water supply facilities and other measures for preventing groundwater pollution. (From “Thematic Guidelines – Water Resources”) • If the target village has no custom of using sanitation facility appropriately, it is necessary to reform the villagers’ understanding radically. Therefore, to motivate the users, consideration should be given to install sanitation facilities together with the construction of the water supply facilities. In addition, the availability of water will become essential for hygiene improvement itself, such as the promotion of hand washing and the washing of bodies, clothing, and tableware. (From “Thematic Guidelines – Water Resources”) • When efforts are made to improve sanitation, attention should be paid to adopting approaches at various levels ranging from the government to residents and enabling the cycle of planning, implementing, evaluating, and monitoring based on the role at each level according to a series of administrative procedures. Moreover,		

						because sanitation is cross-sectoral, involving sectors such as basic education, primary healthcare, rural development, etc., many countries have not clearly designated a competent government office. Therefore, it is necessary to coordinate among the relevant government offices and clarify the sharing of roles among them. (From "Thematic Guidelines – Water Resources")		
						(Although the following cannot be regarded as a lesson limited to sanitation, it has been included here for reference.) The preparation of a monitoring model will lead to the participation of the community through the use of illustrations and pictures. If the monitoring model is revised repeatedly, it will reflect the views of the users. (From "Lessons Learned" in the Terminal Evaluation)	In cooperation with the government (central, provincial, or district), efforts will be made to strengthen systems for supporting the maintenance of water supply facilities and the promotion of hygiene and sanitation habits and improve the sustainable use of the existing water supply facilities and the hygiene and sanitation practices in the target districts. This will contribute to a reduction in residents' water-borne diseases in the target area and an increase in the number of operating water supply facilities.	1. Sustainable Water Supply, Sanitation and Hygiene Promotion in Zambezia Province in Mozambique (Term of Cooperation: February 2007 – July 2011)
							In each target county, a system will be constructed for improving rural sanitation. In each pilot village, total sanitation will be achieved, sanitation facilities (toilets) will be spread, systems for monitoring and evaluating these activities will be constructed, and strategies for disseminating results (spread plan, implementation system, etc.) will be established. The dissemination of the results will contribute to the improvement of the residents' hygiene practices and access to basic sanitation facilities in the target counties.	2. Project for Sanitation and Hygiene Improvement in rural areas of Tambacounda, Kedougou and Matam Regions in Senegal (Term of Cooperation: March 2012 – February 2016)
				2. Indicator examples of project purpose (Basic) (1) Water associations' activity implementation rate (2) Ratio of available water supply facilities (3) Toilet penetration rate		・In this project, the residents who think "well water can be used by neighboring people free of charge" are required to have the new understanding and behavior of "well water should be managed by the whole village with charge." It can be thought that a project that requires such a change in people's behavior can be sustained when people understand the significance of new systems and rules and the systems and rules are established firmly as daily habits. However, this takes a lot of	In the target area, the following will be carried out: the preparation of a operation and maintenance training manual according to the national plan and the policy for reforming the system for managing drinking water supply and use facilities; the provision of guidance to the extension officials of the counties that use the manual; the foundation of water users' associations; extension workers' strengthening of the capacity of the water supply officials in the target commune; and	3. Project for Enhancement of Water Supply Infrastructure Management and Hygiene and Sanitation in the Regions of Central Plateau in Burkina Faso (Term of Cooperation: June 2009 – May 2013)

						time. It is necessary to think that the achievement of results that require a change in people's habits and behavior takes a longer time than the achievement of results that do not require it. (From "Lessons Learned" in the Terminal Evaluation) • Although such methods as Community-Led Total Sanitation (CLTS) have been applied, follow-up (visiting several times) until the establishment of behavioral change is insufficient. In addition, there is no written agreement among government agencies concerning sanitation. (Ethiopia, Malawi, Uganda) • By CLTS under the leadership of UNICEF, the shift from open defecation to the use of traditional toilets is in progress. On the other hand, because CLTS has been promoted excessively, some problems have been pointed out, such as a delay in the development of hygiene and sanitation consciousness other than the use of toilets and the failure to bring about the use of improved toilets. (Zambia) • The following problems have been pointed out: there are cultural problems, such as the prohibition of children-in-law's use of the toilet the parents-in-law are using; the soil is unsuitable for penetration-type toilets; and many residents do not use soap for hand washing. (Kenya) • There are following problems: toilets are traditionally a taboo; it is difficult to secure water; there is a gap between knowledge and behavior about hand washing. (Madagascar) (Extracted and summarized from the report "Challenges and Lessons Learned") • With regard to the use of sanitation facilities, because problems often arise concerning privacy and safety, it is especially important to pay attention to gender. (In recent years, many people have understood that it is necessary to pay attention to menstrual hygiene.)	the strengthening of the capacity to carry out enlightenment activities concerning the improvement of hygiene and sanitation practice and construct and maintain public health facilities. (An example of basic information collection surveys) This is a basic survey conducted in the rural sanitation sector where the progress of MDG has been considerably delayed, in order to collect information on the status of efforts, issues, and good practices in Sub-Sahara Africa. There are seven target countries: Ethiopia, Uganda, Kenya, Zambia, Tanzania, Madagascar, and Malawi.	Information Collection and Verification Survey for the Hygiene Sector in the African Region (implementation period: October 2012 – May 2013)