

Ex-post Evaluation Report 2011-2-5

# **Water Supply & Sewerage Sector Evaluation**

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(Government Agency for the EDCF)

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(Evaluated by Korea Water Resources Corporation)

# Chapter 1. Evaluation & Partnership strategy Establishment System

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## 1. Introduction

### 1.1. Evaluation Purpose

It aims to contribute to reviewing the effectiveness of projects and establishing EDCF's ODA policy in the water supply and sewerage sector for the future ODA through bottom-up evaluation in which five evaluation criteria of OECD DAC and cross-cutting issues.

### 1.2. Evaluation Scope

The completed 6 projects in five countries are evaluated.

(Unit: Million Dollars)

Country	Date of Approval	Project Name	Amount
Sri Lanka	2000.10.25	Greater Galle Water Supply Project	26.67
	2004.08.31	Greater Galle Water Supply Project (Phase II)	14.8
	2006.11.03	Greater Galle Water Supply Project (Phase II) (Supplementary)	6.44
Vietnam	1995.05.26	Thien-Tan Water Supply Project	32.85
	2000.07.04	Thien-Tan Water Supply Project (Supplementary)	6.85
Nicaragua	2004.10.12	Juigalpa Potable Water System Expansion Project	17.2
	2007.12.31	Juigalpa Potable Water System Expansion Project (Phase II)	15.94
Jordan	1991.03.09	Wadi Es Sir Waste Water Collection And Treatment Project	10
	1996.12.27	Madaba Wastewater Treatment System Expansion Project	9
Indonesia	1999.12.08	Hospital Waste Water Treatment Plant Project	40

With regard to the water supply and sewerage sector, partnership strategy and system of a donor country, output, outcome and impact of sector assistance are evaluated.

Approach	Outcome	Impact
<ul style="list-style-type: none"> <li>◦ Strategic objectives of sector assistance</li> <li>◦ Assistance system of EDCF in general</li> <li>◦ Partnership with a partner country</li> <li>◦ Relevance to a national development plan of a partner country</li> <li>◦ Comparison of EDCF assistance strategy with other donors'</li> <li>◦ Evaluation of partner country</li> </ul>	<ul style="list-style-type: none"> <li>◦ Achievement in the water supply and sewerage sector</li> </ul>	<ul style="list-style-type: none"> <li>◦ Contribution to the water supply and sewerage sector of a partner country</li> <li>◦ Contribution to achievement of MDGs of the UN (Target Year : 2015)</li> </ul>

### 1.3. Evaluation Methodology

5 Evaluation criteria of OECD DAC and cross-cutting issues including environment are reflected based on integrated evaluation guidelines, integrated evaluation manual of Korean government and Ex-post evaluation guidelines of EDCF. And the matters related to ODA policy and issues are additionally applied to detailed evaluation indices before determination of details through meetings of experts in the policy and technology of water supply and sewerage sector.

Evaluation Criteria	Weighted Value	Details
Relevance	20%	<ul style="list-style-type: none"> <li>◦ Correspondence with development policy and priority in the water supply and sewerage sector of a partner country</li> <li>◦ Correspondence with MDGs</li> <li>◦ Correspondence with EDCF country partnership strategy and the water supply and sewerage sector partnership strategy</li> <li>◦ Harmonization with partnership strategy in the water supply and sewerage sector of other donors</li> </ul>
Efficiency	20%	<ul style="list-style-type: none"> <li>◦ Process Efficiency</li> <li>◦ Cost Efficiency</li> <li>◦ Time Efficiency</li> </ul>

Effectiveness	20%	<ul style="list-style-type: none"> <li>◦ Achievement of project objectives</li> <li>◦ Application of appropriate technology in consideration of local conditions of partner country</li> </ul>
Impact	20%	<ul style="list-style-type: none"> <li>◦ Effects on socio-economy</li> <li>◦ Effects on gender equality and environment</li> <li>◦ Effects on institution</li> </ul>
Sustainability	20%	<ul style="list-style-type: none"> <li>◦ Financial sustainability</li> <li>◦ Technical sustainability</li> <li>◦ Risk management plan with regard to environment, society and technology</li> </ul>

## **2. Partnership strategy establishment system**

Based on 5 evaluation criteria of OECD DAC, problems and matters to be improved are figured out with regard to the projects in the water supply and sewerage sector through designation of relevant evaluation indices and implementation of evaluation, and partnership strategy in the water supply and sewerage sector of EDCF would be established on reference to the assistance strategies of other donors.

## Chapter 2. Implication of Water Sector Assistance by Other Donors

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### **1. Concrete objectives in the water supply and sewerage sector and establishment of partnership strategy**

Concrete objectives are set to make it possible to quantify short-term goals under long-term goals, so detailed action plans can be made to achieve goals in the water supply and sewerage sector on an annual basis. The World Bank suggests achievement of MDGs as goals in the water supply and sewerage sector. As MDGs are quantitative goals aimed to reduce the population alienated from water and sanitation services by 50% by 2015, they are concrete objectives. JICA suggested Tokyo Agenda for Action aimed to supply safe water and sanitation services to 80% of residents by 2025 and announced water-related development goals for specific implementation at home and abroad.

At a time of selecting water supply and sewerage projects, partnership strategy by country and sector has been established in consideration of regional characteristics and development plans on the part of a partner country. If a partner country requests ODA or if it is the right time to identify projects, donors define projects from the partnership strategy perspectives to improve relevance in assistance.

### **2. Strategy of cooperative partnership with other donors and partner countries for the purpose of improving the aid effectiveness**

As water supply and sewerage industries request a strong publicness and professionalism, other donors make the most of experiences in development and aid on the part of the international community. For the purpose of establishing professional capability, they internally identify the effective ways of using resources while externally figure out a partner country's based on partnership with donors, local governments, universities, NGOs and private companies. And water supply and sewerage projects with strong aid effectiveness have been selectively supported.

### **3. Pursuit of RBM that links aid resources to results**

Among the water supply and sewerage projects requested by a partner country, the projects which are expected to be highly effective would be implemented on the preferential basis to improve aid effectiveness and maximize development effectiveness on the part of a partner country.

RRMA (Results and Resources Meeting Approach) of the World Bank is a policy aiming to select more appropriate projects and provide more ODA to country producing greater effects.

RRMA is expected to enhance a partner country's ownership and local supplier's responsibility to improve sustainability of water supply and sewerage projects where O&M is more important than establishment of facilities.

### **4. Expansion of non-physical assistance in the water-related sector**

In the past, other donors mostly focused on helping less developed countries establish infrastructure. However, sustainability has been recently improved in the water supply and sewerage sector through expanded assistance for operational competence enhancement such as governance, system and human resources for the purpose of enabling a partner country to figure out how to support themselves.

As non-physical support such as institutional improvement cannot be realized with an individual donor country or institution alone, donors' collaboration has been pursued.

### **5. Fund-raising in the form of PPP**

In recent years, cooperation in international development has been diversified in terms of methods of assistance in addition to quantitative expansion and greater efforts to achieve qualitative improvement of ODA. And the roles of the private sector have been facilitated in cooperative development projects that tended to be led by the government. The Ministry of

Foreign Affairs in Germany recognized that ODA conducted only by the government is not sufficient to resolve problems that most developing countries are facing in development. Therefore the private sector will play a greater role in ODA with close cooperation with the government in the form of PPP (Public Private Partnership).

As ODA projects in the water sector request a huge amount of funds and professionalism going beyond the competence of an individual donor, other donors have raised funds with the government and companies specialized in water resources in the form of PPP. Until the 1970s, more than 70% of funds that had flown to developing countries from developed countries originated from the government's ODA fund, and the remaining 30% of funds were from private investments. In recent years, more than 80% of funds have stemmed from the private sector, and only the remaining 20% have originated from public funds, which show a much greater role of the corporate sector.

PPP enabling various donors to take part in jointly establishing assistance system for partner countries' sustainable development has an advantage of improving efficiency in water supply and sewerage projects and expanding the scale of assistance through close combination of capital, technology, professionalism and creativity of companies specialized in water resources to the EDCF projects.

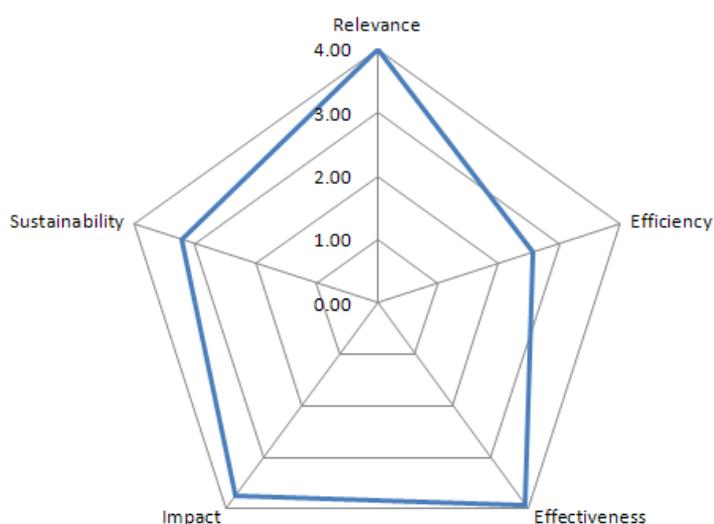
## Chapter 3. Evaluation by Criteria on Water Supply and Sewerage Sector Projects

### 1. Comprehensive grade as a result of evaluation

Projects in the water supply and sewerage sector are evaluated as 'successful' based on 5 OECD DAC evaluation criteria. They earned high points in terms of relevance, effectiveness and impact, but they gained relatively low points in terms of efficiency and sustainability.

[Total Evaluation Chart]

Evaluation Criteria	Weight	Classification	The value
Relevance	20%	Highly Relevant	4.00
Efficiency	20%	Partly Efficient	2.56
Effectiveness	20%	Highly Effective	3.92
Impact	20%	Highly Influential	3.75
Sustainability	20%	Sustainable	3.22
Comprehensive Evaluation Score		Successful	3.49



## **2. Relevance**

Considering the alignment among the development policy of the partner countries, MDGs and EDCF partnership strategy, these projects in water supply and sewerage sector are evaluated as 'highly relevant.' Water supply and sewerage projects aimed to supply treatment facilities and safe drinking water to the general public as a basic social infrastructure which have been the top priority national development task for developing countries. They also correspond with EDCF partnership strategy as EDCF designates water supply and sewerage projects as a main partnership strategy sector on the EDCF policies.

### **2.1. Alignment among development policy and priority in the water supply and sewerage sector of a partner country**

Providing safe drinking water and sanitation services to the general public has been designated as a high priority national development project by the government of partner countries. The target countries of water supply sector evaluation are assessed to be high demand areas for safe drinking water. They suffer from a lack of water due to the insufficient water treatment facilities and drastic seasonal changes of water resources despite plenty of water. The target countries of sewerage sector evaluation desperately need sewerage system and wastewater treatment facilities due to the increased wastewater as a result of economic development, but water contamination has been worsened by insufficient treatment facilities. Thus investment in sewerage sector was evaluated as relevant.

The Sri Lankan government suggested supply of safe drinking water and expansion of sewerage and sanitation services as important national policies in the Regaining Sri Lanka Program announced in December 2002. In particular, these water services for poor people were designated as one of the first priority projects along with education, public health and public order.

Although Vietnam has achieved a rapid economic growth on the back of an open economy since 1986, there are many problems such as deteriorated infrastructure and a low water supply and treatment rate as ever. Therefore, the Vietnamese government designated expansion of water supply facilities as the first priority project in terms of national socio-economic and land development plan. Vietnamese socio-economic development strategy

emphasizes expansion of modernized infrastructure in terms of medicine, education, housing and environment, and it particularly values expansion of water supply system, one of the most vulnerable areas.

In Nicaragua, 72% of water sources are underground water, so they are highly likely to be contaminated. In this regard, the Nicaraguan government focused on fundamentally resolving a lack of water sources by developing lakes that account for 82% of the nation's total land area. The national basic plan also regards improvement and expansion of existing water supply and sewerage systems as main tasks for the purpose of improving a water supply rate.

Jordan is a country with severe water shortages, and per-capital available water resource has been continuously reduced as a result of rising population, so water resources management has been recognized as the first priority national development task. Accordingly, the water resources sector has been considered as the top priority development sector all the time, and Water Sector Planning & Associated Investment Program 2002~2011, an ongoing 10-year water resources development plan, includes a \$25 billion investment plan reflecting the rising need for investment of water resource development.

In Indonesia, 'Repelita VI, 1994-1998', the 6th five-year national development plan designated improvement of life quality through the provision of basic public services including water supply, sewerage system and expansion of medicine and health care facilities, development of human resources and elimination of a regional income gap. Therefore water supply and sewerage project is the one of the top priority target tasks of Indonesian government.

## **2.2. Correspondence with MDGs**

MDGs are the supreme plan made by the international community with an aim to eliminate poverty in the 2000s, and it pushes for detail goals such as ① Eradicating extreme poverty and hunger, ② Achieving universal primary education, ③ Promoting gender equality and empowering women, ④ Reducing child mortality rates, ⑤ Improving maternal health, ⑥ Combating HIV/AIDS, malaria and other diseases, ⑦ Ensuring environmental sustainability and ⑧ Developing a global partnership for development.

The major indicator of ‘Ensuring environmental sustainability’ among the eight goals is to halve the proportion of the population without sustainable access to safe drinking water and basic sanitation by 2015, and the goal of assessable population proportion is 74.5%.

EDCF water supply and sewerage sector projects have contributed to realizing ‘Ensuring environmental sustainability’ in the way that the portion of population that can access safe drinking water and basic sanitary was increased. They also correspond with MDGs by playing a part in helping attain goals such as ‘Achieving universal primary education’ and ‘Promoting gender equality and empowering women’.

### **2.3. Correspondence with EDCF strategy**

Water supply and sewerage development projects are high priority projects according to EDCF Operational Guidelines and correspond with EDCF partnership strategy.

### **2.4. Harmonization of partnership strategy in the water supply and sewerage sector of international organizations**

As EDCF and other donors recognize that water supply and sewerage sector projects aim to satisfy basic human needs, they allocate a certain rate of investments to water supply and sewerage projects.

The World Bank designated improvement of water resources management capacity as one of the focus areas and provided \$4.4 billion accounting for 9.3% of \$46.9 billion, the total amount of 2009 with an aim to attain MDGs,

As the Asian Development Bank pushes for an integrated approach in water resources policy and considers that balanced economic growth and poverty reduction as important social issues to be carefully managed, the bank pursues to establish policy through stakeholders' participation.

With an aim to supply safe water and sanitation services to 80% of population in developing countries by 2025, JICA suggested Tokyo Agenda for Action and presented a basic policy related to water resources in the 3rd World Water Forum in 2003 while pursuing collaborative

partnership with the international community that has abundant experiences and knowledge about water resources.

### **3. Efficiency**

As a result of measuring achievements with regard to project implementation system, costs and period, it has turned out to be 'partly efficient'. The tariffedback system should include detailed and tangible performance evaluation indicators from the project appraisal stage to figure out reasons for delayed process by monitoring, but the tariffedback systems of the target projects of evaluation were not in place. In addition, projects were delayed due to natural disasters and administrative procedural problems. Although project costs did not exceed loan limits, due to the delay caused by internal and external reasons in the course of conducting projects costs raised.

#### **3.1. Efficiency in Implementation System**

Although most projects in the water supply and sewerage sector did not have significant problems in terms of plans and processes, implementation problems occurred in some projects. Tariffedback system where detailed and tangible performance evaluation indicators are set from the project appraisal stage to figure out possibility of attaining project goals and reasons for delayed process have not been in place.

#### **3.2. Cost Efficiency**

In most ODA projects in the water supply and sewerage sector, expenses of public works, equipments and design after change in the scale of project have corresponded with planned project costs, but some other projects have been delayed because of internal and external reasons, so the project costs have risen. In this case, the government of partner country had to provide more funds or the scope of the project needed to be changed. It is recommended that project costs should be calculated against indexation considering circumstances and economic conditions of partner countries and that a method of calculating project costs by sector needs to be systematized.

### **3.3. Time Efficiency**

As actual project period tends to be delayed generally than planned in the wake of natural disasters and administrative procedural problems, efficiency has turned out to be lowered in terms of project implementation period. In addition, after the Korean government decided to provide support, delay occurred in the process of preparation in the wake of administrative problems and approval problems from the parliament on the part of a partner country.

## **4. Effectiveness**

As a result of evaluation on appropriate technology introduction and possibility of project goals achievement considering the local conditions in a partner country, it turned out to be 'highly effective'. As water supply and sewerage projects supported by EDCF have been successfully completed, project goals of supplying safe drinking water and improving living conditions have been attained. In addition, the most appropriate technology was introduced to the field in consideration of location and climate of a partner country, so most project facilities have been recognized as successful ODA project models for partner countries.

### **4.1. Degree of achievement of Project Goals**

As water supply and sewerage projects supported by EDCF have been successfully completed to supply safe drinking water and improve living conditions on the back of wastewater treatment, they are believed to contribute to raising the standard for the water supply and sewerage system of partner countries, so the project goals are considered to be attained.

Greater Galle Water Supply Project in Sri Lanka aimed to resolve a lack of water by expanding water and sewerage facilities and contribute to facilitating socio-economic development in consideration of rising population and soaring demand for water supply in project areas in 2005. Expected demand for water supply in 2005 when the phase I of the project had been established was about 60,000 m<sup>3</sup> per day, and it contributed to expanding water supply and sewerage services within project areas by supplying safe water to meet local demand for water based on existing facilities (32,000 m<sup>3</sup>/day) and expected water supply of the project (32,000 m<sup>3</sup>/day).

As a result of that Thien-Tan Water Supply Project in Vietnam supplies 87,400 m<sup>3</sup> of industrial water and household water to Bien Hoa and its surrounding areas everyday with 90% of operation rate of water treatment facilities, the project has expanded the total water supply of Dong Nai province to 197,800 m<sup>3</sup> per day.

As Juigalpa Potable Water System Expansion Project in Nicaragua led to expanded water service facilities to the about 75,000 local residents and 1,200 households in Juigalpa City, it is considered to contribute to resolving drinking water shortages and sanitation problem.

The Wadi Es Sir Waste Water Collection And Treatment Project in Jordan aimed to achieve three goals including installation of water collection pipes to transport wastewater to Cesspool, a water collection site, establishment of waste water treatment facilities to treat collected wastewater and introduction of sewerage pipes linking water collection sites to wastewater treatment facilities for the purpose of treating wastewater discharged from Lower Wadi Essier. Although there were some differences compared to plans, the extent changes did not affect the scale of the project to attain project goals by considering the local circumstances.

As a total of 35 structures and major machine equipment were constructed throughout the Madaba Wastewater Treatment System Expansion Project of Jordan, the entire goals were achieved as planned at a time of appraisal. The wastewater treatment facilities construction expanded daily capacity, and a method of treatment was improved from stabilization pond to extended aeration. Daily average wastewater inflow into wastewater treatment facilities is 4,422 m<sup>3</sup>, which is more than twice than before. As the Jordan government has consistently conducted household sewerage system connection projects, inflow of wastewater into wastewater treatment facilities is expected to increase continually.

Hospital Waste Water Treatment Plant Project in Indonesia has been normally completed with construction of hospital wastewater treatment facilities, supply of equipment and education and training program for the operators of wastewater treatment facilities.

## **4.2. Application of appropriate technology considering the local situation**

Water supply and sewerage projects supported by EDCF are recognized for being optimized application of technology that considers economy, geology, location, climate, technological

competence and cost reduction in the future operation and management on the part of partner countries.

Greater Galle Water Supply Project in Galle Metropolitan City in Sri Lanka installed seawater embankment facilities to prevent seawater back flow caused by lowered water level in consideration of climate and topography of partner countries. As the water intake facilities are designed to realize their capacity of 100,000 m<sup>3</sup> per day, it is expected to meet the expanded capacity of water treatment system as a result of increased water supply in the future. In addition, a cascade aerator has been installed at the location of a receiving well, where source water arrives within a treatment plant to raise concentration of source water dissolved oxygen and improve condensation efficiency of compound. Installation of the aerator facility is expected to contribute to saving O&M costs by reducing drinking water production costs.

Throughout the Juigalpa Potable Water System Expansion Project of Nicaragua, an additional treatment plant was installed to realize 180ℓ/s capacity in close proximity to the existing treatment plant. The water energy mixture method was applied which is the same purification process adopted by the existing treatment plant. As the facility was located at an altitude of 155m, the method of water energy mixture enabling water to be supplied to most water supply areas without pressurization system is expected to be advantageous in terms of maintenance, management and cost saving because it does not require separate electric power costs.

Daily average inflow of waste water into wastewater treatment facilities installed by Madaba Wastewater Treatment System Expansion Project in Jordan is 4,958 m<sup>3</sup>, which fall short of facility capacity. However, the Jordan government has consistently conducted household sewerage system connection projects, so the amount of inflow is expected to keep increasing. In this regard, it is considered to have been designed in consideration of demand in the future.

The Wadi Es Sir Waste Water Collection And Treatment Project in Jordan went through changes in construction method for detail design considering local situation, and according to opinions presented by the project executing agency and technical experts with an evaluation team, they were appropriate measures in consideration of conditions of the local situation to improve quality of treatment water, safety of structures and operational convenience.

Hospital Waste Water Treatment Plant Project in Indonesia was divided into engineering part and construction part considering the treatment characteristics of hospital wastewater at a time of placing an order. Considering future operators' difficulties of facility operation, process technology was selected at the feasibility study stage so that operators in the field can conveniently learn technology. Water quality standard of treatment aimed at satisfying pH 6~9, BOD 30mg/L, COD 80mg/L and TSS 30mg/L, the legal standard of discharge of hospital wastewater in Indonesia.

## **5. Impact**

As a result of evaluation based on impacts on society, economy and institutions, EDCF projects are evaluated as 'highly influential' to the partner countries. Water supply and sewerage projects have had a positive effect on poverty reduction and economic growth in partner countries, and they are considered to have contributed to improving the level of water supply and sewerage system of partner countries.

### **5.1. Impact on Society and Economy**

As the Sri Lankan government supplies safe and clean water to Galle Metropolitan City, 200,000 local residents have been able to improve quality of life in terms of healthcare, sanitation, living conditions, risks reduction from water borne diseases, improvement of productivity on the back of better health, rising incomes by lengthened time of production activities, water supply services to surrounding facilities including hospitals and ports through the installation water service facilities, so it is evaluated to have met corporate demand in Galle Metropolitan City.

As water service capacity has been expanded in Bien Hoa in Dong Nai, the largest industrial area in Vietnam, stabilized supply of industrial water has been attained, and it has helped realize intended goals of achieving industrial development and improving living conditions for local residents.

The Wadi Es Sir Waste Water Collection And Treatment Project in Jordan created many jobs as local companies in Jordan were selected to take responsibility for implementing all of three project parts, and incomes of local labors is assumed to account for 15.7% of actual project

costs. As small-scale construction contracts with private companies to connect water intake facilities each and every household was established to operate and manage the facilities after the project completion, so the project still has effect on employment.

As capacity of a waste water treatment plant has been improved through Madaba Wastewater Treatment System Expansion Project, Jordan, more residents have been able to benefit from water services, and it has contributed to increasing income as increased number of farmers use treated water for irrigation.

## **5.2. Impact on Gender Equality and Environment**

Although water supply and sewerage projects do not specify gender equality and environmental issues in a project plan, given that they aim to supply safe drinking water by improving contaminated wells or treatment plants, it is considered that cross-cutting issues are reflected in terms of environment. The goals of wastewater treatment projects are considered to reflect such cross-cutting issues enhanced quality of life on the part of partner countries through consistent environmental improvement and preservation based on prevention of illegal discharge of wastewater.

It is considered to have an effect on cross-cutting issues in that resolution to contaminated wells or treatment plants has led to water supply in more sanitary environment than before and that wastewater treatment has induced many people to pay attention to the importance of environmental preservation and wastewater treatment.

The water supply and sewerage system expansion projects are considered to have contributed to improving women's social status and gender equality on the strength of women's increased participation in the society by facilitating supply of drinking water. That's because women who are responsible for supplying water at home have been able to get more chances to get a job. These projects have turned out to have a great effect on improving sanitation environment and preventing water contamination as environment-friendly projects.

## **5.3. Impact on Institutions**

Water supply and sewerage projects are considered to have contributed to institutional advancement in partner countries as some partner countries that recognized problems in

implementation process or in post-project operational maintenance have pursued to enhance related institutions. For example, Jordan Water Service Agency that realized the importance of topographic and geological surveys through EDCF-supported wastewater treatment projects made it mandatory to conduct topographic and geological surveys in all projects and established a supervisory organization for review and implementation.

## **6. Sustainability**

As a result of evaluation on financial and technological sustainability, the projects have turned out to be 'sustainable'. As project executing agencies in most partner countries supplement the loss with governmental subsidies, it seems to be necessary to secure financial soundness through fares reflecting the realities and improved water flow rate. As project executing agencies that have specialized technologies required in facility operation, normal operation and water quality management have been conducted normally, but absence of risk management measures in terms of environment, society and technology has resulted in reduced capability to handle the crisis. Partner countries push for institutional improvement in order to resolve problems in project implementation or in operational maintenance after the completion of the project for the purpose of enhanced sustainability.

### **6.1. Financial Sustainability**

As water supply and sewerage projects in partner countries correspond with national development plans, proactive investment plans have been pursued, but realistic tariff system has not yet been in place. In this regard, under the current tariff system reliant on governmental subsidies for loss supplementation, it is hard to cover re-investment costs for consistent O&M of facilities. Therefore it is necessary to achieve realistic tariff system.

Nicaragua, Jordan and Indonesia are likely to provide governmental subsidies and achieve financial sustainability of institutions. As of 2007, operational efficiency of ENACAL responsible for managing water supply and sewerage system in Nicaragua recorded 87%, and it is expected to post almost 90% from 2008 through 2011, and the government is providing subsidies. Efforts need to be made to achieve realistic tariff system so that financial soundness can be secured in case that governmental subsidy is suspended.

As Sri Lanka and Vietnam experience deteriorated financial soundness, project executing agencies conduct loss-protection with national subsidy, so efforts need to be made to secure financial soundness through realistic tariff system and improved water flow rate.

## **6.2. Technological Sustainability**

As project executing agencies have an abundance of operational experiences in water service facilities and Korean suppliers provide them with technical education and separate operation manual, there would be no problem in operation and management in the future. The project executing agencies have in-house specialists so that inspections and checks are regularly conducted by equipment installed in treatment facilities. And water supply system, water intake facilities and pumps are normally operated and the water quality is well managed.

## **6.3. Risk management measures in terms of Environment, Society and Technology**

Main activities aimed to manage risks are focused on enhancing stability of power supply through nighttime duty and installation of an in-house power generator, but efforts need to be made to achieve stabilized O&M of water supply and sewerage system through risk management based on countermeasures against such tap water pipe-related accidents as water leakage and deteriorated water quality as well as actual training.

Considering characteristics of water supply and sewerage facilities, construction of the facility is important, but problems frequently occur in terms of O&M. Some partner countries faced problems in O&M after the completion of the project. In this regard, post-management system needs to be introduced to allocate part of the budget to post management and consistently transfer technology and know-how in operational management.

Jordan needs to enhance lowered response capacity of wastewater treatment facilities caused by failure in automation of operational method in the field depending on personnel. As partner countries suffer a lack of risk management system and competence in terms of environment, society and technology, technological cooperation in management policy and operational techniques need to be additionally considered.

## **7. Evaluation on water supply and sewerage projects in partner countries**

### **7.1. Relevance of EDCF assistance aimed to counter a lack of water or sanitation facilities in partner countries**

Partner countries pursue water supply and sewerage projects as part of efforts for poverty reduction through economic development, and the water supply and sewerage projects are placed before anything else in national development plans. Public demand for sanitation facilities including safe water and sewerage system have been drastically increased followed by their economic growth, so EDCF assistance is considered to be very relevant.

The ODA projects have contributed to enhancing cooperative relationships between partner countries and donor countries, and the partner countries desire continuous support due to their high demand in the water supply and sewerage sector.

### **7.2. Application of optimized technology to water supply and sewerage system in consideration of local conditions**

Treatment plants in Vietnam and Sri Lanka have been cited as model cases where the most appropriate installation has been realized in consideration of climate and technology conditions of partner countries on the back of conquest of various obstacles in the course of conducting projects.

### **7.3. A lack of field-oriented management system seen in other donors**

As absence of EDCF Office in the field has resulted in problematic communications with the governments of partner countries and project executing agencies, field management system needs to be in place through establishment of field offices in project areas in the future.

## **8. Lessons and Recommendations**

### **8.1. Enhancement of field-oriented management through participation in establishment of policy on the part of stakeholders and companies specialized in water supply and sewerage system**

Stakeholders' participation in local communities or NGOs has been generally insignificant in overall water supply and sewerage projects supported by EDCF. It seems necessary to establish water supply and sewerage development policy through collection of opinions from various stakeholders.

Participation of direct beneficiaries such as local communities or NGOs in the process of planning and implementing projects needs to be enhanced. Only when stakeholders take part in executing the policy, appropriate measures can be taken to respond to unexpected problems or complex issues.

## **8.2. Enhancement of experts' participation related to the project assessment and feasibility study**

Comprehensive and detailed feasibility study and appraisal need to be conducted in consideration of political, cultural, economic, social and technological issues related to projects. In particular, if projects are conducted in various areas, inspections on each area need to be complemented. Local consultants can be hired if necessary.

Project plans need to be made based on more specialized survey through more enhanced participation of experts conducting feasibility study and appraisal in the future.

### **1. Targeting a niche market of the water supply and sewerage sector based on Korean assistance models**

#### **1.1. Contents development related to development cooperation in the water supply and sewerage sector**

Based on Korean experiences in development, operation and management of water supply and sewerage system, the contents related to development cooperation of water supply and sewerage system need to be developed, and it is needed to be focused on specialized areas.

A person in charge from ADB suggested that EDCF needs to pursue projects based on Korean experiences in development and consultations with experts from water resources companies instead of pushing for the same strategy as other donor countries or institutions. It means that concentration is recommended on the areas with the unique core competence of EDCF based on 'selection and concentration' instead of comprehensive support with small funds.

For example, EDCF and companies specialized in water resources can jointly push for a project to improve water flow rate in developing countries. Considering characteristics of water service projects, ODA needs to be provided to the O&M to enhance sustainability. As the rate of non-performing water supply in developing countries is as high as 40~50% on average, it becomes a stumbling block to profitability. AFD also pointed out non-profitable projects, non-performing water supply, as the biggest problem in ODA projects.

#### **1.2. Concentrated investment in the water supply and sewerage sector, the sector with comparative advantage**

As seen in various Korean ODA experiences in the past, such Korean water supply and sewerage development sectors of 'Improvement of Water and Sewerage Management' and 'Safe Drinking Water Supply' have been recognized as comparative advantage sectors compared to other donor countries or international organizations.

EDCF has designated green growth-related sectors such as photovoltaic power, wind power, bio, water services and sewerage system as high priority areas in an effort to facilitate the

green industry, nurture domestic companies and help them extend their business abroad. However, it is considered that to preferentially support the water supply and sewerage projects based on Korean comparative advantage and development experiences improves aid effects instead of supporting the entire areas of the green growth industry.

## **2. Enhanced partnership with water service and sewerage system experts groups**

### **2.1. Enhanced partnership between partner countries, donor countries and international organizations**

Other donors make efforts to figure out how to use internal resources efficiently and establish cooperative system along with specialized agencies for the purpose of building specialized competence based on an abundance of project experiences and financial capacity in the global society.

As water supply and sewerage system projects request a lot of funds, it is necessary to enhance partnership with other donor countries and international organizations for the purpose of effective use of limited financial resources. In terms of cost efficiency and aid effectiveness, it is more desirable for EDCF to provide aids in collaboration with other donors in order to achieve goals than pursuit of independent routes. In addition, partnership with other donors will help share information on how to overcome difficulties in conducting projects and enhance cooperation.

Considering regional characteristics, cooperation with donor countries and international organizations with specialized knowledge about water supply and sewerage system of the region needs to be pursued, and efforts need to be made to play a major role through proactive participation in regional forums. USAID established partnership MOD strategically with other donor countries and international organizations in an effort to improve impact on partner countries and efficiency in aid. JICA is playing an important part or proactively participating in cooperation with other donor countries.

Prior to implementation of water supply and sewerage system projects, policies including a master plan on water supply and sewerage systems need to be established based on

participation of various stakeholders including EDCF overseas office under the leadership of partner countries with ownership.

As water supply and sewerage projects can maximize aid effects through pursuit of field-oriented development and partnership strategy, transfer of authority to overseas offices in major partner countries needs to be expanded to enhance partnership with partner countries and identify high-quality water supply and sewerage projects. Other donor countries or institutions figure out the needs from perspectives of developing countries and respond effectively to complicated or tricky issues while rapidly and accurately dealing with diversified tasks based on vast amount of field experience and knowledge.

In order to realize field-oriented policies, local offices need to be expanded and added and that will enhance the policy dialogues with partner countries and reflect experience of overseas offices in partner countries in the process of establishing partnership strategy. According to experiences of ODA projects in the past, the key for success is selection of the right projects with great aid effects based on experience.

## **2.2. Introduction of PPP to improve project efficiency**

Based on inducement of participation of private companies specialized in water supply and sewerage system, efficiency in the private sector and funds originated from public institutions need to be combined. And cost efficiency and effectiveness of human and financial resources in water supply and sewerage projects need to be expanded through specialization of water supply and sewerage sector and role-sharing of EDCF.

If PPP is introduced, EDCF can ① share costs and risks with companies specialized in water supply and sewerage system and ② use expertise owned by companies specialized in water supply and sewerage system. In addition, the companies can maximize such advantages by facilitating advancement into overseas projects through reduced entry costs.

## **3. Establishment of sustainable water supply service system**

Sustainability is very important to evaluate success or failure in ODA projects, and for this such factors as ① Establishment of an integrated plan, ② Participation of local community,

③ Selection of applicable technologies, ④ Financial investment by local community, ⑤ O&M, ⑥ Continuous educational support are necessarily requested.

#### **4. Establishment of regular monitoring system in the water supply and sewerage sector**

Responsibility and transparency of ODA strategies need to be improved through enhanced management system and evaluation for the purpose of increasing the effectiveness of ODA projects. Result-oriented evaluation system pursued by other donors needs to be established, and more than anything else, M&E system need to be integrated to systemize project O&M system.

Performance indicator of water supply and sewerage system needs to be set in the project appraisal stage to establish M&E system for regular check-ups. Systematic monitoring needs to be conducted to realize organic project management ranging from project appraisal to mid-review, completion evaluation and ex-post evaluation. And prompt action for the problems occurring in the course of execution is needed to improve technological sustainability of water supply and sewerage facilities in the future.

If monitoring process do not exist, it is impossible to figure out problems occurring in the course of conducting a project adversely affecting the effectiveness and sustainability of a project after completion and reducing efficiency due to post management costs.

Water supply and sewerage system performance indicator needs to be designated in cooperation with a partner country, and a response manual established for an absence of performance indicator is expected to improve efficiency of ODA.

It is evaluated as desirable that EDCF established and managed performance indicator in cooperation with the government of a partner country at a time of evaluating a project after improvement of regulations from 2007.

It seems necessary to establish regular monitoring system to flexibly respond to expected or unexpected external factors by designating performance indicator that can quantitatively

measure expected development effects that specifies goals by project process and the scope and period of a project.

## **5. Introduction of evaluation on water supply and sewerage technology to assess relevance of selected technologies**

Water supply system consists of water source, water intake, water conveyance facility, water treatment facility, water supply system, water distribution system and water tariff system, and technologies applied to each factor are determined according to regional characteristics. In order to judge relevance of applied technology, proactive support from locals is requested in addition to results of field survey on regional conditions of a partner country.

Of water sources, if quality and quantity of underground water are satisfactory, simplified treatment aimed at sterilization can be applied to supply water through development of a tube well, and turbidity and germs in water sources can be treated by using surface water in rivers or lakes to supply water. Methods applicable to treatment of surface water can be divided into slow and fast filtration based on chemical mixture.

However, there is no case where such high class treatment as ozone, granular activated carbon, UV and AOP that is being introduced to developed countries has been applied to EDCF projects. As the water sources of partner countries are characterized by an absence of turbidity, germs or other special contaminants that are hard to eliminate through standard treatment process in terms of water quality, there has been no need of application, and membrane filtration facilities are not appropriate in terms of sustainability for technical level and costs required in operation, maintenance and management.

Accordingly, judgment on relevance of application technology by factor needs to be made after accurate assessment on regional circumstances. In other words, water sources need to be determined according to circumstances of a partner country, and an appropriate method of treatment needs to be decided after understanding about water quality and characteristics of water flow in water source.