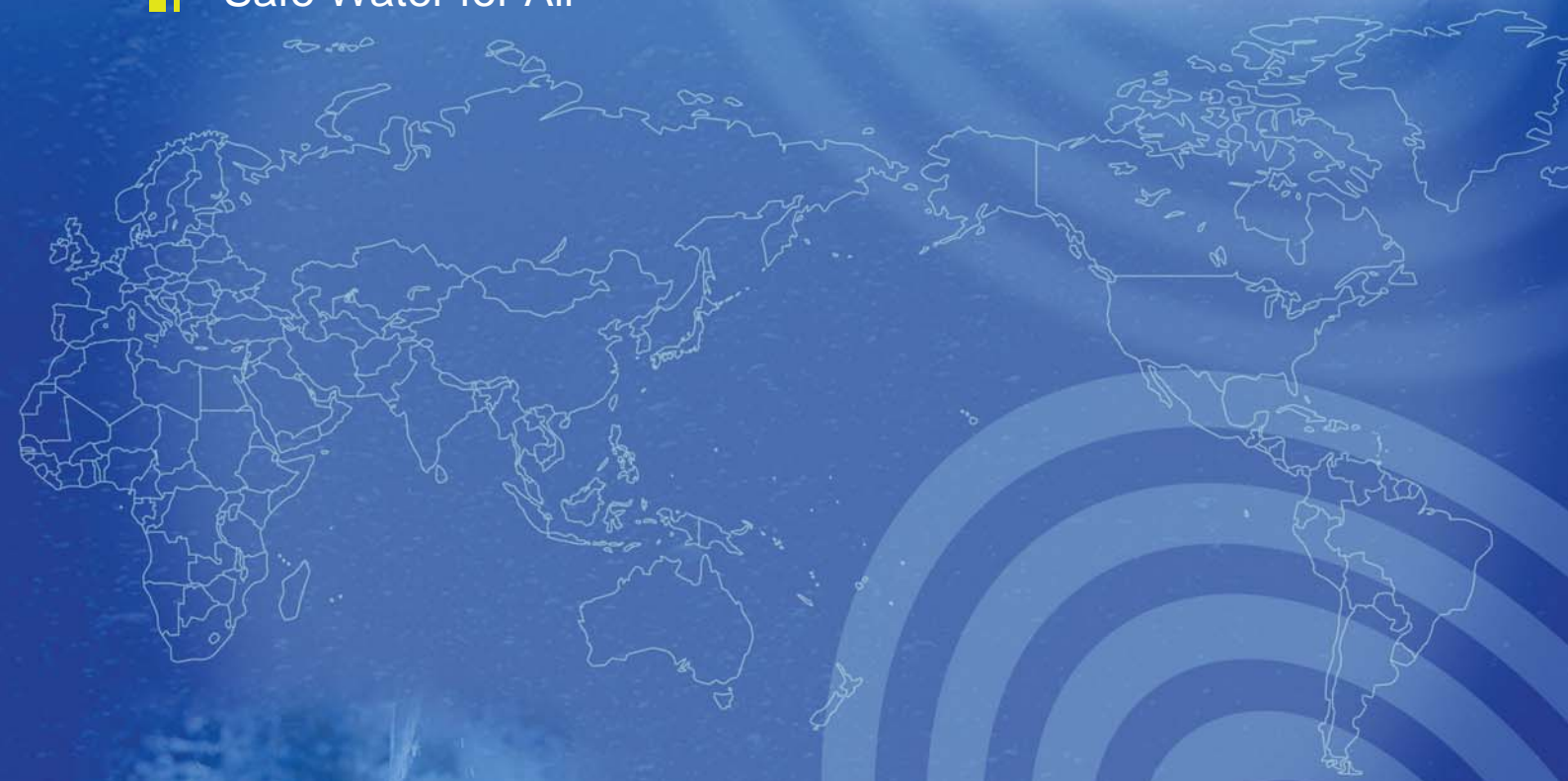


Water Human Future

Safe Water for All

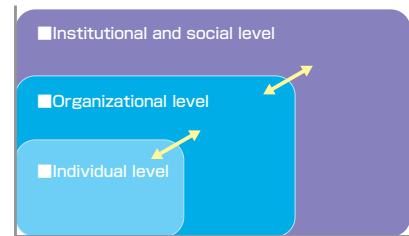


Capacity Development in the Water Sector for the Enhancement of Human Security

Lack of access to safe water is an impediment to the progress of public health, education and poverty reduction for many people around the world. Contaminated water and lack of hygiene practices, such as washing hands and using toilets, expose people in developing countries to the risk of waterborne diseases. In addition, natural disasters, such as floods and droughts, have become increasingly serious threats in recent years.

Solving such water-related issues is essential for allowing people to escape the poverty trap and for enhancing human security. In order to develop a system to effectively manage water resources and to ensure access to stable, equitable and safe water for people, using the capacity development (CD) approach is an important strategy. With the CD approach, JICA has been cooperating with partner countries and their communities to strengthen the capacity of individuals, organizations, institutions and societies.

JICA places importance on the sharing of experience and information gained in the field. We take into account the needs on the ground of each individual country while cooperating with institutions that include government agencies and other public entities. This knowledge sharing comes not only from Japan, but also from neighboring countries.



Three layers of capacity development

Source: JICA (2004)
<http://www.jica.go.jp/english/publications/reports/study/capacity/200403/pdf/200403.pdf>

Given that many developing countries are situated in areas vulnerable to climate change, JICA supports the following water-related measures:

- (1) Introduce integrated water resources management in the region, reduce climate risks and promote sustainable water resources management.
- (2) In areas with a higher risk of floods and other disasters, consider prevention measures according to local conditions.
- (3) In areas where the risk of drought is expected to increase, accelerate implementation of water supply measures.
- (4) Design projects/programs in view of climate risks.

JICA's approach

As water resource problems are becoming more critical, JICA has established a development strategy with four objectives in taking the initiative to solve global water problems. These objectives are: (1) to provide a safe and stable water supply and improved sanitation; (2) to enhance flood control to protect lives and property; (3) to conserve the water environment; and (4) to promote integrated water resources management.

Presented here are case studies of JICA's contributions to the CD of institutional systems, organizations and individuals in relation to the four objectives of the development strategy mentioned above.



Safe and stable water supply and improvement of sanitation



Improvement of flood management to protect lives and property



Water environment preservation



Integrated water resources management

Safe and Stable Water Supply and Improvement of Sanitation

Supplying water and sanitation through community participation (Rural water supply and sanitation)



People in many villages in developing countries have been trying hard to meet their daily water needs, but without proper water supply facilities.

They are often faced with a choice of whether to carry clean water from a source far from their communities or to fetch water available near at hand, which might possibly be contaminated. Residents have little knowledge about hygiene and sanitation and are frequently affected by waterborne diseases.

In addition, children lose opportunities to go to school because of water-fetching responsibilities. Water scarcity in the dry season brings a great financial burden to poor households because they have to purchase expensive drinking water. Access to safe water is one of the most critical issues to ensure escaping from the poverty trap.

JICA provides assistance in improving water supplies and sanitation in rural areas through community participation, making communities the main players in development.

JICA places great importance on conducting social surveys to grasp the real needs of communities, establishing water-user groups, building the capacity of communities to maintain water facilities and providing education on hygiene.

JICA also develops the capacity of central and local governments involved in rural water supply in preparing for serious breakdowns that communities cannot cope with, and thereby ensures the sustainability of projects.



Safe and Stable Water Supply and Improvement of Sanitation

Supplying water and sanitation through community participation (Rural water supply and sanitation)

Assistance for Senegal

As a long-term development partner of Senegal, Japan has provided financial and technical assistance in rural water supply for decades, with the construction and servicing of more than 120 motor pump water supply systems. This is equivalent to over 10% of facilities in the whole nation, enabling 350,000 people in rural areas to access potable water and 600,000 domestic animals to be fed, in terms of constant secured water. While hardware is built progressively, soft components such as the degradation of facilities and unreliable operation and management systems became challenges.



Regarding water availability, the local people, and especially women, had been facing risks all the time. For example, when the pumps or the generators broke down, the community had to present a petition to the government to fix the facilities, with no information on when they would be fixed because of the limits of the government's budget. Sometimes it took more than one year before facilities became functional.

To overcome these circumstances, JICA started a technical cooperation project aiming to establish a system for the sustainable use of potable water, managed by the local people themselves. The project was called the Project on Safe Water and Support on Community Activities (PEPTAC) (Phase 1: February 2003 to January 2006; Phase 2: December 2006 to March 2010).

The project was designed to establish associations for users of rural deep wells (ASUFORs), which are user associations for the self-sustainable operation and maintenance of water supply facilities. ASUFOR associations collect water tariffs, and whenever facilities break down (repairs within about 1 million yen), they use their funds to fix them so that the community does not need to rely on government support. At the same time, the associations were expected to play a role in revitalizing their communities.

To introduce and establish ASUFORs in communities, the project team took various aspects into consideration for active participation by the community. Among these aspects, four points should be highlighted as follows.

The first aspect was consideration of the selection of ASUFOR members: in other words, deliberation on individual capacity, rather than the constraints of old systems. Neither family status nor age was included in the selection criteria. Job descriptions for each post were clearly stated and selected based on a member's capacity.

The second aspect was to allocate posts to each of the tribes in the community. If the members were selected by votes, the major tribes would dominate the association and the minority groups would be neglected, which would

lead them to have less interest in the ASUFOR and fewer payments for the water tariff. Thus, in the project, a rule was set that at least one post should be allocated to each tribe, including pastoral people who do not even reside permanently in one community.

The third aspect was gender. Fetching water is a role assigned to women, and the workload directly affects them. Consequently, women benefit more than men from maintenance of the facilities. Women ultimately made up more than half of the ASUFOR members.

The fourth aspect was to introduce transparency in financial management. In the past, water tariffs were collected but did not last long because of obscure usage. To amend this system, water tariffs were managed by several members and there was an obligation to report financial status on a regular basis.

With all the above points integrated into project activities, ASUFORs were successfully established and managed in a self-sustainable manner. As a result, during the 2nd Phase period, the government of Senegal institutionalized ASUFORs as a requirement whenever water supply facilities are constructed. In addition, the project team implemented training programs inviting not only the project target areas, but also officers from other regions. This attempt resulted in the concept becoming pervasive in a wider area and the independent establishment of a number of ASUFORs.



In addition, hygiene and sanitation related activities were conducted as one component of the project in the 2nd Phase. The reason behind this was that even if people buy safe water, as long as the water is not properly managed in line with a "safe water chain" (proper and clean lifting up from deep wells, a clean sanitary situation around the wells, clean buckets for bringing water back home, clean pots for conservation of water, etc.), people will end up suffering from waterborne diseases. This may lead to a loss of credibility for "safe water," and people would not pay for the water any more. To avoid this situation, members in charge of hygiene and sanitation activities were selected among ASUFORs members, and they used IEC tools made by the PEPTAC project. Furthermore, construction of toilets for the improvement of a "total hygiene and sanitation environment" was tried out in collaboration with UNICEF and local governments.

Two new projects were formulated from the community development through water management activities based on ASUFORs. One, in the water supply sector, was the Project for Sustainable Rural Development (March 2008 to January 2011), in which ASUFORs invested their surplus funds in community agricultural activities that showed the potential for improving incomes and quality of life. The other project, in the sanitation sector, is the Project for Sanitation and Hygiene Improvement in Rural Areas of Tambacounda, Kedougou and Matam Regions (March 2012 to February 2016), in which support for improving sanitary behavior, the spread of sanitation facilities and building sanitary systems is extended in three target regions.

Thus, with comprehensive cooperation that includes both the construction of facilities and capacity building for government officials and local people, JICA implements multilateral support that contributes to access to safe water as well as the management of water supply facilities, improvement of sanitation and hygiene, community development and improvement of life through ASUFORs.

■ Assistance for Malawi

Malawi has around 1,000 mm of precipitation per year, which is relatively high compared to other countries in Africa. However, this precipitation has not been fully utilized, especially in rural areas, where the rate of access to safe drinking water remains at 50%. In those areas, villagers have been forced to spend time and effort to ensure they have enough of the water needed for daily life. This causes a reduction in the time for work and education. In fact, that low rate of access to safe drinking water is a drag on the economy in Malawi.

There are several reasons for the low rate of access to safe drinking water, such as inappropriate operation and maintenance (O&M), aging, destroyed or stolen equipment and an insufficient supply network of spare parts for hand pumps.

To improve such poor water supply conditions in rural areas, JICA has been providing support by using a combination of technical and financial approaches, such as repairing and installing 1,691 hand pumps from 1987 to 2014 and strengthening central and local government officer human resources since 2011.

Technical cooperation has been implemented with roots in the community under the collaboration of JICA experts and Japan Overseas Cooperation Volunteers.

Generally, in rural areas of Malawi, it is difficult to have villagers correctly understand hand pump O&M due to the low literacy rate. As a result of discussions with local residents, it was found that the solution for such difficulties is to convey messages with songs, because Malawian people enjoy singing songs and dancing in their daily life. Two songs titled “Water Is Life” and “We Should Not Underestimate,” which were written by villagers and composed by the famous Malawian singer-songwriter Skeffa Chimoto, are contributing to strengthening their ownership of hand pumps.

Training activities are also one of the effective methods for disseminating O&M know-how for water facilities. The first step of training activities is the training of extension

workers, and the next step is the training of village water committee members by skilled extension workers. After the training activities, water committee members started to improve the hygiene environment around water facilities through exchanges of opinions with villagers. Their efforts are to construct infiltration and fences around water facilities, upgrade account-recording systems and collect water tariffs.

The results of monitoring conducted after these activities show that the rate of water tariff collection has been improved to 76% from 40%, and there was an increase in the number of villages with fences around water facilities, which were constructed using collected water tariffs.

Another activity contributing to the dissemination of O&M methods is community radio, which airs interviews with villagers or government officials in charge of water facilities on specific issues such as “Why does a hand pump malfunction?” and “Why do we have to pay a water tariff regularly?” Sharing experiences through community radio contributes to efficiently spreading O&M philosophies.



Safe and Stable Water Supply and Improvement of Sanitation

Sharing experience from the field for reliable services (Urban water supply)

Strong organizations with proper facilities are essential to ensure a safe and stable water supply for an urban population.

JICA has been providing support in planning improvements to water supply facilities and in developing the human resources of organizations in order to increase the coverage of water supply systems and improve services. JICA has dispatched experts to developing countries from local governments that operate and manage waterworks in Japan, and they have supported local engineers to develop their potential to solve problems under their own initiatives. Capacity development, through on-the-job training, has led to service improvements such as a stable water supply, improved water quality and the reduction of non-revenue water.

JICA has also provided learning opportunities in Japan for officials and engineers from developing countries with regard to relevant Japanese technologies and expertise to solve water supply problems. In addition, JICA has facilitated the establishment of partnerships between water operators in developing countries and the private sector in Japan.

Some water operators that developed their capacity through cooperation with JICA are now active in supporting other water operators in their own country and neighboring countries.

■ Assistance for Thailand

The Bangkok metropolitan region is the hub of politics and the economy in Thailand, and it occupies an important position in Asia. Japan has implemented cooperation eight times since the 1970s as the ODA Loan Bangkok Water Supply Improvement Project for the Metropolitan Waterworks Authority (MWA), which is responsible for water services in the Bangkok metropolitan region, in order to cope with the increasing demand for water due to population and economic growth. Japan has also developed water supply facilities as ODA Loan Projects in nine provincial cities such as Nakhon Ratchasima and Ubon Ratchathani. These projects contributed to increasing the amount of water supplied, reducing the amount of water leakage and improving water quality as well as the rate of access to safe drinking water. In addition, a serious land subsidence problem in the Bangkok metropolitan region was solved



because the Bangkok Water Supply Improvement Project prompted a change in the water source from groundwater to surface water, along with restrictions on drawing groundwater.

In the 1980s, the government of Thailand (GOT) rapidly expanded water supply facilities nationwide. There was an urgent need to develop human resources to operate and maintain these systems. GOT established National Waterworks Technology Training Institutes (NWTTI) in Bangkok, Chiang Mai and Khon Kaen with the support of Japan's grant aid.

From 1985 to 1999, through capacity building by NWTTI, including a regional center in Songkhla that was established with GOT's own budget for the Phase II project from 1994, JICA supported the development of human resources at the MWA and the Provincial Water Authority (PWA), which is responsible for water services in the provincial cities. JICA dispatched experts from water operators of the municipalities of Sapporo, Yokohama, Tokyo, Osaka and Nagoya to NWTTI. In addition, NWTTI officials visited several water operators in Japan to participate in training programs to become core engineers, who would train other operators and disseminate their knowledge and experience throughout Thailand.

Japanese and Thai engineers have worked together on the ground to find appropriate remedies to improve the maintenance of facilities, to reduce non-revenue water and to enhance customer service. Through such exercises, knowledge and experience were shared among MWA,



PWA and Japanese water operators. This on-the-job approach was applied nationwide as a model to solve the problems of water supply systems in Thailand.

At present, MWA has undertaken training for neighboring and African countries in NWTTI. It is regarded as the key organization for disseminating waterworks technology.

Thus, JICA has extensively extended financial and technical assistance such as developing water supply facilities, constructing the training center and strengthening capacity development. Partnerships with the private sector have been developed on the basis of confidential relationships established through ODA. For example, a Japanese enterprise with close ties to local government in Japan established a joint venture together with a local enterprise, and it was entrusted with leak detection.



Assistance for Cambodia

For the urban water supply sector in Cambodia, Japan, as a lead development partner, has been supporting the Phnom Penh Water Supply Authority (PPWSA), whose success has been acclaimed worldwide. Taking advantage of this successful experience, JICA is working for the improvement of the water supply in other major cities.

●Support for the Phnom Penh Water Supply Authority

In Cambodia's capital Phnom Penh, the PPWSA has been working to expand its facilities and strengthen its technical and management capacity with the help of development partners, including Japan, for the restoration of facilities that were dilapidated after the end of the civil war.

First of all, JICA developed a midterm plan for water supply development in Phnom Penh in 1993. Based on this plan, in coordination with other development partners, JICA extended: (1) grant aid projects for facility improvement; then (2) a technical cooperation project for the proper maintenance of those facilities and effective business management; and (3) an ODA Loan Project for further facility expansion. These three schemes of cooperation were combined to provide effective support according to the development stage. As a result, the success of PPWSA is called the "miracle of Phnom Penh," which has come to be highly evaluated worldwide (See accompanying table.).

| 1993 | INDICATORS | 2012 |
|--------------|--|--------------|
| 20 | Staff / 1,000 connections | 2.58 |
| 65,000 | Production capacity, m ³ /day | 300,000 |
| - | Water quality | WHO |
| 20% | Water supply coverage | 90% |
| 10 hours/day | Supply hours | 24 hours/day |
| 0.2 bar | Supply pressure | 1~2.5 bar |
| 26,881 | Number of connections | 234,225 |
| 72% | Non-Revenue Water | 6.63% |
| 48% | Collection efficiency | 99.9% |

Source: Presentation by PPWSA, 2014

●Strengthening the Capacity of Provincial Waterworks

Based on the experience of support for PPWSA, JICA, with Ministry of Industry and Handicraft, which has jurisdiction over the water supply, has expanded support for provincial waterworks under the PPWSA's cooperation, which has become the core of Cambodia's water supply sector.

JICA has implemented technical assistance to develop the capacity of eight provincial waterworks whose facilities were improved and expanded by JICA's grant aid projects, or loan projects by the Asian Development Bank (ADB). For the technical aspects of the proper operation and

maintenance of water supply facilities, technical cooperation has been conducted in the fields of water quality analysis, water treatment, operation and maintenance of electrical and mechanical facilities, and distribution facilities. Capacity development for the stable business management of provincial waterworks is also covered by JICA's technical cooperation, such as improvement of management information, development, implementation and monitoring of business management plans, and human resources management.

For these major provincial cities, JICA utilized its various aid modalities to effectively improve their facilities, which led to increasing water supply coverage and significant improvements in water supply services. Through supporting the improvement and expansion of facilities in parallel with capacity development for technical and management aspects, JICA is contributing to improving an environment in which utilities can consider investing in their facilities based on sustainable and sound management of their business.

● Strengthening Monitoring the Capacity of the Responsible Ministry

JICA has been supporting strengthening the capacity not only of water supply utilities, but also of the Ministry of Industry and Handicraft, for monitoring the performance of water supply utilities, examining the business management plans of utilities and arranging financial support for utilities.

● Cooperation with Local Governments in Japan

The projects in Cambodia have been implemented under close cooperation with local governments in Japan, such as the Cities of Kitakyushu, Yokohama, Nagoya, etc. In particular, many experts have been dispatched from the Kitakyushu City Water and Sewer Bureau for technical cooperation, mainly via OJT, which has significantly helped in improving workplace operations. Furthermore, the experts from local government have made significant contributions to improving water utilities through conveying the mission and responsibility of water utilities, as they were in the same position as the staff involved in the waterworks.



■ Assistance for Chittagong, Bangladesh

Chittagong is the second-largest city in Bangladesh and its largest commercial city, as well as a center of industry with the country's largest seaport. However, its infrastructure has not sufficiently developed, and water supply coverage still remains 47%. In addition, the non-revenue water (NRW) ratio is as high as 30 to 40% due to leaks from aging water supply pipes built in the 1960s, and low collection of water tariffs caused by illegal connections, meter faults, misreading of meters, etc., which affects the financial sustainability of water supply services.

With this background, JICA has been providing financial assistance for efforts to expand water supply facilities and rehabilitate aging pipes by means of the Karnaphuli Water Supply Project (from June 2006) and the Karnaphuli Water Supply Project Phase 2 (from March 2013), which aim to supply safe water for more than 1 million people and reduce NRW.

In addition to improving facilities, it is essential to strengthen water supply operations and management to ensure the sustainability of the water supply service. Therefore, JICA has been providing technical assistance to the Chittagong Water Supply and Sewerage Authority (CWASA) to improve NRW management, business management, financial management, operations and maintenance for water supply facilities by means of the Project for Advancing NRW Reduction Initiative (PANI) of Chittagong WASA (2009–2014) and the Project for Institutional Improvement and Advancing NRW Reduction Initiative of Chittagong WASA (PANI-2) (2014–2019). In this manner, with the combination of soft and hard infrastructure, comprehensive assistance is being provided for water supply services in Chittagong.



Water Environment Preservation

Many developing countries are facing serious water pollution because of the increase in household and industrial wastewater associated with rapid economic growth as well as the concentration of population and industries in urban areas. These problems may lead to adverse effects on the health of local people who use river water and groundwater, and the destruction of ecosystems.

Improvement of water quality and promotion of appropriate water use through the water cycle in the entire watershed are thus required. Therefore, it is essential to monitor the condition of water pollution, make regulatory policies for emission sources and develop appropriate facilities including sewage treatment plants.

JICA proactively supports these approaches for the improvement of water environment in developing countries.

Assistance for the Socialist Republic of Vietnam

Vietnam has recently achieved high economic growth, and environmental issues, especially water pollution, have become a serious problem. Under this situation, the Vietnamese government has been promoting environmental policy, the establishment of the Ministry of Natural Resources and Environment (MONRE) (2002), the formulation of the National Strategy for Environmental Protection (2003), revision of Law on Environmental Protection (2006 and 2014) and so on. Despite these efforts, the water environment has not been much improved. This is because the construction of infrastructure, development of policies and administration, and knowledge and techniques for the enforcement of policy on water environment management are insufficient. Taking advantage of the experience of overcoming environmental pollution in Japan, JICA has been providing proactive assistance to water environment protection in Vietnam.



- Assistance for policy formulation by MONRE and policy implementation by provinces

Although the Vietnamese government has been developing the legal systems for environmental protection, they still have challenges. For example, some regulations that are enacted by different ministries overlap each other due to the insufficient coordination among ministries, the contents of the legal system are too demanding to be enforced by the provinces and guidance to the provinces is insufficient. In some cases, the provinces fail to comply with the laws due to insufficient budgets, human resources, equipment and lack of environmental awareness.

The JICA project titled Project for Strengthening Capacity

of Water Environmental Management in Vietnam has conducted an evaluation of current policy on the water environment, and the formulation of new policies based on the evaluation with the assistance of Japan's Ministry of the Environment. Capacity for formulation of achievable policies toward enforcement of environmental protection policies was strengthened through this project. In this project, JICA also supported provinces to strengthen their capacity to enforce policies. Technical guidance was conducted for practical activities in the field for water environmental protection, including water quality monitoring techniques (i.e., planning of monitoring, chemical analysis, monitoring data analysis) and the development of pollution source inventory maps.

- Assistance for the construction of sewage treatment plants and technical cooperation from the experience of Japanese municipalities

JICA has been assisting the construction of sewerage facilities by means of ODA Loan Projects in Hanoi and Ho Chi Minh City since the 1990s, and has expanded the area of the construction to South Binh Duong Province and Thua Thien-Hue Province. In addition, JICA is extending a technical cooperation project aiming at capacity development of the organizations concerned with sewerage facilities operation in Ho Chi Minh City. This project is implemented through collaboration with a Japanese municipality (Osaka City). In this project, a number of engineers from the Public Works Bureau of Osaka City were dispatched in Vietnam to pass on experimental know-how and techniques regarding the adequate operation and maintenance of sewerage facilities and sewerage system management.

JICA has also supported sewerage treatment in Vietnam in collaboration with other municipalities, including Chiba Prefecture, the Tokyo Metropolitan Government, Yokohama City and Kawasaki City.



- Comprehensive assistance

As described above, JICA has been providing support through a combined approach that incorporates both hard (construction of sewerage and drainage) and soft (policies, institutions, technologies, knowledge and awareness raising) measures in order to make assistance more efficient and sustainable. Such assistance with the collaboration of the Japanese Ministry of the Environment and local municipalities makes it possible to comprehensively assist the improvement of the water environment being promoted by the Vietnamese government. Recently, there are expectations for the use of the advanced environmental technologies of Japanese private companies for environmental measures as one of the solutions, so JICA will promote their introduction in Vietnam. JICA will continue to provide support toward achieving healthy water environment management in Vietnam.

Improvement of Flood Management to Protect Lives and Property

Recently, water-related disasters such as floods, landslides and storm surges caused by the increasing intensity and frequency of extreme weather events has been magnifying hazards throughout the world. In addition, social vulnerabilities such as the concentration of population in urban areas and residences on steeply sloping areas increase water-related disaster risks.

In order to protect human lives and mitigate social and economic damage from water-related disasters, it is important to make preparations from ordinary times (preventive measures) so that disaster damage can be minimized even if a disaster occurs.

JICA has examined the combination of preventive and mitigation measures from the viewpoints of both structural measures (e.g., river improvement works, construction of retarding basins, etc.) and non-structural measures (e.g., warning systems, evacuation activities, etc.) for various potential disaster risk elements, and targets reducing water-related disaster damage by supporting flood management planning through project implementation in a consistent way.

Flood Prevention Measures in Metro Manila, Philippines

The Philippines is one of the countries that are most severely damaged by natural disasters. Metro Manila is the center of the politics, economy and culture of the Philippines, with a population of 12 million (in 2010). It accounts for approximately one-third of the country's GDP, but it has suffered great economic and social damage from frequent floods every year.

The Philippine government has been making continuous efforts to mitigate this problem for more than 50 years, such as the formulation of flood control and drainage improvement plans and the implementation of projects based on those plans. The Pasig-Marikina River is a river in Metro Manila that flows through a highly urbanized and heavily populated area, which is the center of administration and the economy. It has been prioritized for implementing river channel improvement works, because floods in the river basin have inflicted a tremendous amount of

economic and social damage to the country.

● Support for Flood Management and Climate Change Adaptation

Japan has provided support on a number of occasions for flood control projects in Metro Manila since a Japanese ODA Loan Project for flood control in 1973. In particular, the Manggahan Floodway, which was constructed under Japanese ODA financial assistance, has enhanced the safety level for flooding in the downtown area of Metro Manila. In addition to the floodway construction, JICA conducted technical cooperation for updating the Master Plan for flood control and drainage improvement in Metro Manila and for making a feasibility study in 1990, which proposed the Pasig-Marikina River Channel Improvement Project (PMRCIP) as one of the priority projects.

PMRCIP started under a Japanese ODA Loan Project in 1999, and river improvement works such as the construction and rehabilitation of embankments and revetments have been steadily carried out from the lower reaches of the river. In addition to these structural measures, JICA has provided support for non-structural measures such as establishing flood forecasting and warning systems, and developing the capacity of governmental organizations for disaster management in the Philippines through grant aid and technical cooperation schemes.

Moreover, taking into account the lessons learned from the flood disasters due to Typhoons Ondoy and Pepeng, which caused 956 deaths and affected approximately 9 million people in Metro Manila and surrounding areas, JICA provides technical evaluations of the effects of climate change on the safety level for flooding in the Pasig-Marikina river basin and provides the Philippine government with several scenarios for implementing flood control measures in order to respond flexibly to future uncertainty.

JICA will contribute to economic development in the Philippines via mitigating flood damage in Metro Manila by supporting flood management planning through integrated project implementation, which has been carried out steadily by the Philippine government.



Flood control of the Medjerda river basin, Tunisia

The Medjerda River, which flows through the northern part of Tunisia to the Mediterranean Sea, has a catchment area of 23,700km². It has a population of 2,100,000 within its basin. Although water resources development/management plans have been prepared and implemented, the focus was on the development and use of water resources rather than flood control.



Under these circumstances, a large-scale flood occurred in the Medjerda River Basin in 2003. The lower plain area was flooded for a month, and crops, houses, and properties were damaged. The resultant obstruction of traffic also caused severe socio-economic damage.



To address drought and flood problems, JICA started a study named The Study on Integrated Basin Management Focused on Flood Control in the Medjerda River in the Republic of Tunisia in 2006 and completed it in 2009. The following are some of the features of the study:

- Consideration of various aspects of water
The study takes into account various aspects, such as water/land resources, quantity/quality of water, and surface water/groundwater.
- Establishment of a collaboration mechanism between various water related organizations
Flood control in rivers, water use (water supply and sewerage systems, agricultural water and industrial water use) and environmental conservation (water for maintaining ecosystems) have been managed by different organizations such as the Ministry of Agriculture and Water, Ministry of Environment and Sustainable Development and Ministry of Equipment, Housing and Territory Development. A forum was created to discuss and implement comprehensive measures.
- Participation of all stakeholders
JICA intends to promote the participation of all stakeholders including the central and local governments, the private sector, NGOs, and local residents. The aim is to maximize the benefits of water fairly by managing water comprehensively without compromising the sustainability of ecosystems.



The study suggested splitting the Medjerda river basin into five zones and implementing river improvement projects one by one, which have been approved by the Government of Tunisia. The cost-benefit analysis conducted in the study concluded that, among the five zones of the basin, the lowermost zone would be the most urgent area in which to implement a river improvement project. Following this study result and with the approval of the Government of Tunisia, JICA conducted a feasibility study on a river improvement (flood control) project in the lowermost zone of the Medjerda River, and in 2014 Tunisia and Japan signed an ODA Loan Agreement for the project. The project includes embankment and excavation of the river channel, development of a retarding basin and non-structural measures. In parallel with the project implementation, JICA dispatched an expert in disaster management and shared Japanese experience in disaster damage reduction.

Integrated Water Resources Management (IWRM)

Basin-wide water resources management

Integrated Water Resources Management (IWRM) is the key approach to the solution of water-related issues such as water shortages, flood disasters and water pollution. In IWRM, different stakeholders like local governments, engineers and the local community work together for better water management. The concept of the Water-Energy-Food Nexus is also important to enhance water security.

To realize IWRM, we need to formulate a basin-wide medium- or long-term water resource development plan as well as provide capacity building for the administrative organizations that implement the planned projects. The targets of capacity building for administrative organizations range from individual-level to department-level; sometimes the formulation of social institutions is required. Knowledge sharing among different countries that are tackling the same problems is also essential.

JICA has consistently implemented technical cooperation projects, in parallel with assistance for the development of social infrastructures, in various countries to enhance the capacity for water resources management and realize IWRM.

Capacity Development Project for River Basin Organizations in Integrated Water Resources Management in Indonesia

JICA has assisted Indonesia in formulating river basin master plans for 22 major rivers, thus supporting the realization of basin-wide IWRM. These master plans also led to the realization of 14 ODA Loan Projects for water resource management facilities. In addition, the master plan led to the establishment of a water management corporation in the Brantas river basin to operate and manage river facilities in the river basin.

Nonetheless, exploding population sizes and urbanization are causing water shortages, increases in flood damage to densely inhabited areas and degradation of the water environment, thus making the successful implementation of IWRM more complex. Since these problems are bottlenecks to sustainable economic development and food security, the implementation of appropriate IWRM is an urgent issue for Indonesia.

The Government of Indonesia (GOI) revised the Water Act in 2004, and established River Basin Organizations (RBOs) in major river basins so as to promote IWRM. GOI also established a knowledge center to accumulate and disseminate the knowledge and practical experience of RBOs in order to strengthen the management capacity of RBOs.

Following these efforts by GOI, JICA launched a technical cooperation project for the capacity development of RBOs in 2008 and dispatched Japanese experts with practical know-how and experience in administration from organizations such as the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and the Japan Water Agency. Although this project was closed in 2011, its follow-up project (Phase II project) is to be launched.

●Preparation of guidelines and manuals

The basis of water resources management lies in regular hydrological observation (e.g., precipitation, river water levels, etc.) and on-site inspection and maintenance of river structures (e.g., dams, dikes, etc.). However, as the RBOs in Indonesia were still brand-new at the time JICA's project began, they had neither standard guidelines to define regular mandates nor supporting manuals to illustrate the guidelines. Therefore, within JICA's project, 41 issues of standard guidelines, 11 issues of supporting manuals and 90 issues of training materials were prepared under the supervision of Japanese experts.



●Establishment of dissemination mechanisms for water resources management knowledge

The project supported the establishment of a Dissemination Unit for Water Resources Management Technology (DUWRMT) in the Ministry of Public Works, which conducts training courses for the staffs of RBOs nationwide using the guidelines and manuals prepared through the project.



In the Phase II project, three pillars of activities are to be implemented, namely: (1) strengthening of the knowledge dissemination mechanism established in Phase I; (2) cultivating trainers for knowledge dissemination; and (3) improving accessibility to the guidelines and manuals.

■ Development of IWRM master plan in the Brantas river basin, Indonesia

The Brantas River, with a length of 320 km and basin area of 12,000 km², is the second-longest river in Java Island, Indonesia. The vast grain belts and Surabaya, the second-largest city in Indonesia, have enjoyed the supply of water resources from the Brantas River. On the other hand, the Brantas has also caused flood disasters and threatened people's livelihoods.

JICA's cooperation on the Brantas has a long history: the first basin master plan with assistance by JICA was completed in 1973; a second revised master plan in 1984 and a third in 1998 were both supported by JICA. Based on these master plans, a number of ODA Loan Projects were implemented, such as water resources development, river improvement, sediment control and irrigation facility development. The amount of estimated flood damage reduction achieved by these projects, for example, reaches as much as 135 million USD. Moreover, agricultural productivity has been drastically improved and the rice production amount in the Brantas basin has increased by 80%. In the power supply sector, an additional 200 MW of electricity supply was realized by the projects, contributing to industrial development and job creation in the basin. Also noteworthy are the human resources developed through these projects: the governmental officials and engineers in the private sector involved in the projects gained expertise through working with Japanese experts and have significantly contributed to the development of Indonesia even after the completion of the projects.

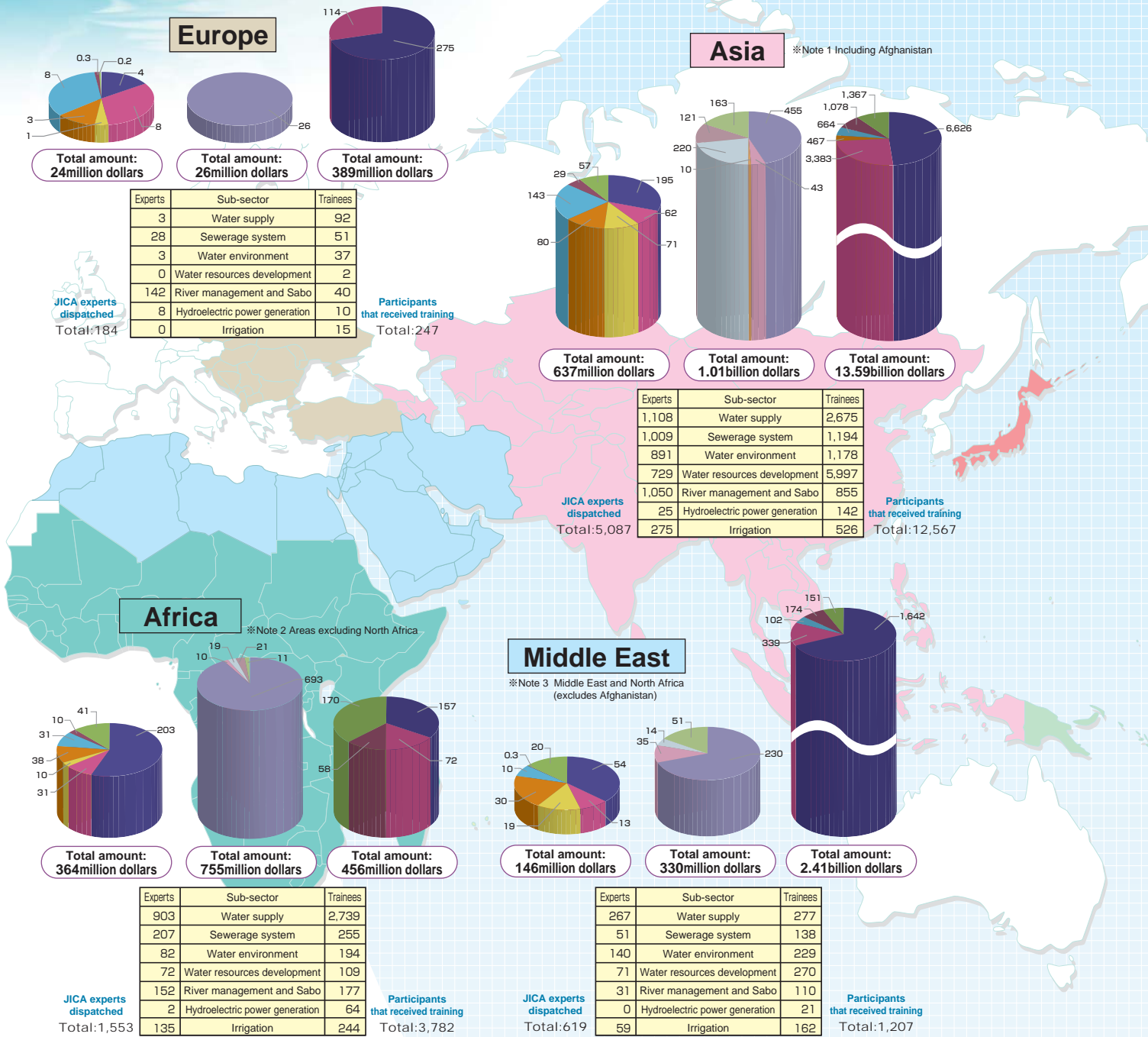
A new study to update the basin master plan of the Brantas River and Musi River has been underway since 2013. Many research results indicate that Indonesia is subject to a significant influence by global climate change, so the new study incorporates an assessment of climate change impact on the regional water cycle of Indonesia and reflection of this analysis in the updated water resources management plan. The scope of the study includes the preparation of guidelines that instruct processes to develop similar master plans in other river basins.

The assessment of the impact of climate change on the water cycle, namely precipitation and river flow discharge, is being conducted in collaboration with the University of Tokyo, making use of the multi-model ensemble technique of 24 general circulation models (GCMs), which is also adopted in the assessment reports of Intergovernmental Panel on Climate Change (IPCC). In addition to the analysis of the water cycle, an assessment of the impact of climate change on food production is also being conducted in the survey using a crop model named the Simulation Model for Rice-Weather relations (SIMRIW), which was developed by Kyoto University. Since few countries, including developed countries, have conducted such sophisticated climate change impact analysis and practical reflection of the results in their water resources management plans, the results of this study will be valuable for many countries that face serious impacts due to climate change.



JICA's Assistance for Water Issues Worldwide (FY 2004–2013)

Shown here are the cumulative totals of (1) expenditures on water-related projects (JICA's investments for technical assistance, Japan's grant aid projects facilitated and managed by JICA and ODA Loans), (2) the number of JICA experts dispatched and (3) participants from other countries that received training.



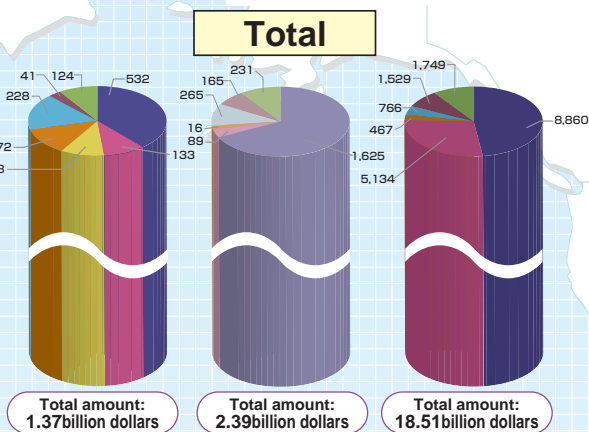
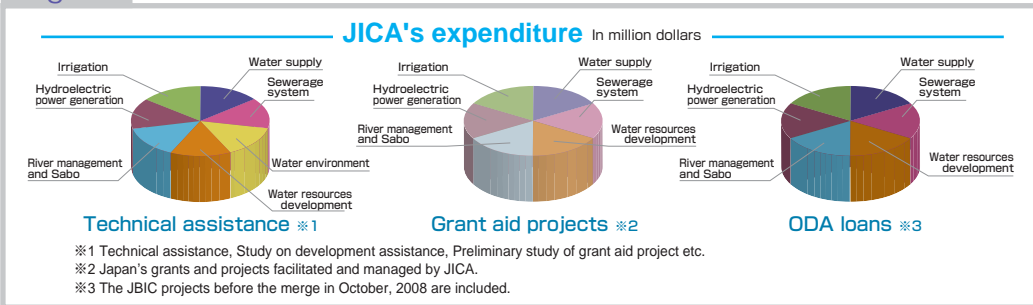
(1) Expenditures on technical assistance
 JICA has invested 1.37 billion USD worldwide for technical assistance in the water sector. A total of 637 million USD was invested in Asia, accounting for 47% of the total investment, followed by 364 million USD (27%) in Africa, 156 million USD (11%) in Latin America and the Caribbean and 146 million USD (11%) in the Middle East.
 In terms of sub-sector expenditures, 532 million USD (39%) were invested in the water supply sub-sector, 228 million USD (17%) in the river management and Sabo sub-sector, 172 million USD (13%) in the water resources development sub-sector and 138 million USD (10%) in the water environment sub-sector.

(2) Expenditures on grant aid projects
 JICA has facilitated and managed Japan's grant aid projects, the total

amount of which was 2.39 billion USD. The largest investment was in Asia, totaling 1.01 billion USD (42%), followed by 755 million USD (32%) in Africa and 330 million USD (14%) in the Middle East.
 In terms of sub-sector expenditures, a significant amount of the investment, 1.63 billion USD (68%), went to the water supply sub-sector, followed by 265 million USD (10%) for the river management and Sabo sub-sector.

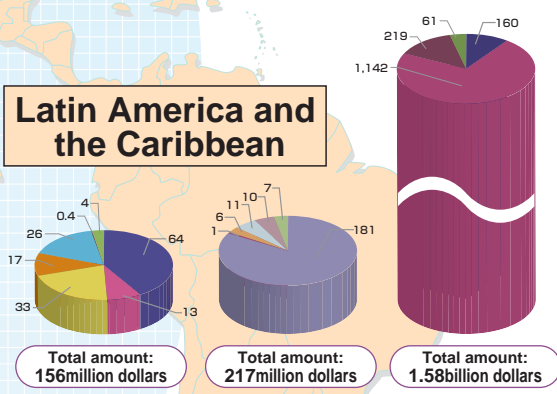
(3) Expenditures on ODA Loans
 JICA has invested 18.51 billion USD worldwide for ODA Loans in the water sector. The largest investment was in Asia, totaling 13.59 billion USD (73%), followed by 2.41 billion USD (13%) in the Middle East and 1.58 billion USD (9%) in Latin America and the Caribbean.
 In terms of sub-sector expenditures, a significant amount of the investment, 8.86 billion USD (48%), went to the water supply sub-sector, followed by 5.13 billion USD (28%) for the sewerage system sub-sector.

Legend



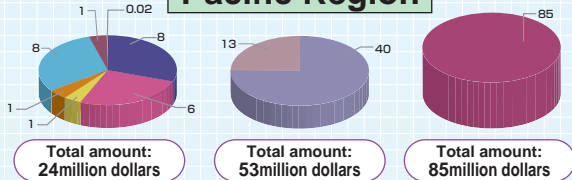
| Experts dispatched | Sub-sector | Trainees |
|---------------------|--------------------------------|----------------------|
| 2,718 | Water supply | 6,230 |
| 1,330 | Sewerage system | 1,975 |
| 1,387 | Water environment | 2,266 |
| 999 | Water resources development | 6,474 |
| 1,579 | River management and Sabo | 1,365 |
| 41 | Hydroelectric power generation | 279 |
| 500 | Irrigation | 1,024 |
| Total: 8,554 | | Total: 19,613 |

Latin America and the Caribbean



| Experts dispatched | Sub-sector | Trainees |
|---------------------|--------------------------------|---------------------|
| 385 | Water supply | 405 |
| 35 | Sewerage system | 304 |
| 271 | Water environment | 561 |
| 123 | Water resources development | 58 |
| 170 | River management and Sabo | 145 |
| 6 | Hydroelectric power generation | 18 |
| 31 | Irrigation | 72 |
| Total: 1,021 | | Total: 1,563 |

Pacific Region



| Experts dispatched | Sub-sector | Trainees |
|--------------------|--------------------------------|-------------------|
| 52 | Water supply | 42 |
| 0 | Sewerage system | 33 |
| 0 | Water environment | 67 |
| 4 | Water resources development | 38 |
| 34 | River management and Sabo | 38 |
| 0 | Hydroelectric power generation | 24 |
| 0 | Irrigation | 5 |
| Total: 90 | | Total: 247 |

※The area classifications mentioned above are based on the classifications of the newly merged JICA.

Experts Dispatched

JICA has dispatched 8,554 experts to other countries, of which 5,087 were assigned to Asia (59%), 1,553 to Africa (18%), 1,021 to Latin America and the Caribbean (12%) and 619 to the Middle East (7%).

Of this total, 2,718 experts (31%) were assigned to the water supply sub-sector, 1,579 (18%) to the river management and Sabo sub-sector, 1,387 (16%) to the water environment sub-sector and 1,330 (15%) to the sewerage system sub-sector.

Participants Trained

JICA has provided training for 19,613 participants from other countries, including 12,567 (64%) from Asia, 3,782 (19%) from Africa and 1,563 (8%) from Latin America and the Caribbean.

Of this total, 6,474 participants (33%) received training in the water resources development sub-sector, 6,230 (32%) in the water supply sub-sector and 2,266 (12%) in the water environment sub-sector.

Note: As amounts and percentages are rounded off, they may not match the totals.

Expenditures in USD are calculated by converting the yen amount at an exchange rate of 1 USD = 97.6 yen, as designated by DAC for 2013.

