“Needs Survey” under the Governmental Commission on the Projects for ODA Overseas Economic Cooperation in FY 2012

Summary Report

Republic of Indonesia Kingdom of Cambodia
Republic of India Republic of Kenya

Deployment of Small-Scale Water Treatment Units
for an Expansion of Water Supply
in Urban Fringe and Scattered Settlement Areas

March 2013

The Joint Venture between
Pacific Consultants Co., Ltd. and METAWATER Co., Ltd.

Introduction

Background

"Progress on Drinking Water and Sanitation 2012" published jointly by UNICEF and WHO in March 2012 reported that one of the indicator for the Millennium Development Goals (MDGs) to "Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation" has been met. However, approximately 780 million people, equivalent to 11% of the world population are yet to be able to access safe drinking water.

Development of water supply in suburban and rural areas in particular, is still a major challenge to be dealt with. Although there has been a progress in development of water resources and water supply infrastructures through Official Development Assistance (ODA) and private investments in the urban areas of developing countries, such development in suburban areas and rural areas are yet to see much progress due to the lack of feasibility owing to difficulties in collecting enough usage fee to meet the high cost of initial investment because of low population density in these areas. The development and distribution of safe water supply in suburban and rural areas is an important factor not just for ensuring human security, but also from the point of sustainable development.

Against the above mentioned background, this survey aims to provide the means of water supply system in suburban and rural areas through application of small scale water treatment devise combining existing products and technologies held by Japanese Small and Medium Enterprises (SMEs).

Purpose

The purpose of this survey is to identify the needs of developing countries, with a view to set up ODA projects for deployment of water supply system in suburban and rural areas of the 4 targeted countries through application of water treatment products and technologies owned by Japanese SMEs.

Survey Team

NAME	ROLE	COMPANY
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Satoshi KACHI	Water Treatment	METAWATER Co., Ltd.
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1. Description of the current situation and development needs of the concerned development issues in the surveyed countries

1.1 Indonesia

Management in many water supply utilities in Indonesia (PDAM) are considered unsound, and development of water supply facilities to meet the increasing demand due to continuing influx of population from suburban and rural areas are slow.

The country aims to achieve access rate to safe drinking water of 75.3% in urban areas and 65.8% in rural areas by 2015. However, the statistics in 2011 shows that the rate is at 52.2% for urban areas and 57.9% for rural areas, both falling short of the target. Development projects for simple water supply facilities called the PAMSIMAS projects are being implemented in rural areas however, no ready-made water treatment system has been installed in any of the past cases, and sustainability of maintenance is also being regarded as problematic.

In Padang city, a selected site for the pilot study, approximately 65% of population covered by PDAM Kota Padang is receiving treated water, and the rest of the residents, approximately 35%, are getting untreated water from shallow wells of their own or community, direct use of rain or surface water, or simple water supply facilities by the PAMSIMAS projects. Together with a slow rehabilitation works of water piping repair and non-revenue water rate improvement after the West Sumatra Earthquake Disaster, PDAM Kota Padang is facing a problem of inadequate water supply in several areas due to recent flooding damages to the water supply systems. Water supply in these areas has been resorted to water trucks since the occurrence of flooding in July 2012.

1.2 Cambodia

Water in the rivers in Cambodia is increasingly polluted from lack of adequate sewerage facilities and pesticide contamination. Contamination by arsenic is particularly a serious problem for the ground water in the Mekong Basin.

The rate of development for water supply system is low, due to the high cost of developing an urban-style water supply system in rural areas where settlements with population of several thousand people are scattered over a large area

The MDG target value for Cambodia is comparatively low and realistic however, the current access rate for rural area is at 41%, falling short of the target value at 45%.

1.3 India

Development of water supply system to meet the sudden surge in population is slow, causing issues such as high rate of non-revenue water and intermittent water supply, particularly in urban fringe areas.

Development of urban water supply system takes several years; after the submission of development application till the completion of construction work. In the meantime, countermeasure of water supply is required to those without access to the main water system. Meanwhile, additional water supply is also required for emerging housing developments which are built by private developers prior to the development of the main water supply system.

1.4 Kenya

Major rivers in the Arid and Semi-Arid Lands, which covers more than 80% of Kenya, dry up in the dry season. Residents of such areas access water through digging the riverbeds however, sanitation is of concern.

Water treatment system is installed in parts of the survey area however, most areas are unequipped with such system.

2. Analysis on the products and technologies developed by the Japanese SMEs

2.1 Needs for application of products and technologies developed by the Japanese SMEs

(1) Indonesia, Padang City
Water treatment units independent from the urban water supply system is required for use in emergency, as the water supply system itself is half way to recovery from earthquake disaster and vulnerable to flooding. Furthermore, a mobile system such as a vehicle-mounted type would be required as the site of evacuation shelter and water intake point would vary at a time of disaster.

(2) Cambodia, Kandal Province / Siem Reap Province
The study area is scattered with settlements with population of several thousands, and lacks access to water resources with good water quality such as a dam. Therefore a system that can adapt to highly turbid raw water from the Mekong river where turbidity vary from 20 ~ 500 NTU, or a system that utilizes small water resources such as shallow wells in each settlements is required.

(3) India, Badlapur City
A temporary water supply measure to respond to the rapid increase in population in the urban area is required by both private housing developers and public water supply utility until the completion of the public water mains. A system that is reusable in areas without access to the new public water main after it's completion is desirable. For this reason, a water treatment package that is compact, mobile, and easy to implement is required.

(4) Kenya, Kitui District
An integrated water supply system that also provides a solution for ensuring water source in areas where rivers dry up in the dry season and increase in turbidity in the rainy season is required. An economic treatment system is desirable as raw water from shallow wells and infiltration gallery set up in riverbeds have low turbidity however, it is also necessary to consider potential waterborne diseases.

2.2 Situations surrounding products and technologies developed by Japanese SMEs

(1) Industry Summary
Main water treatment technologies used by the Japanese SMEs are; "Coagulation-Sedimentation Method"; "Sand Filtration Method"; and "Membrane Filtration Method". These technologies are typically chosen for it's aptitude to the water source and cost effectiveness. Use of the membrane filtrate method is increasingly popular in Japan to eliminate cryptosporidium Japanese water treatment industry is also well experienced in responding to the needs of compactifications, with numerous cases of installation in small scale water supply system and factories, or for application in emergencies.

(2) Scale of the Water Treatment Products Manufacturing Industry
The scale of the industry measured by shipment value is as follows. Numbers of SMEs with a record for shipment of water treatment related products were 147 in 2010 according to industrial statistics. Total value of shipments was 98.7 billion JPY.

The scale of the industry measured by sales volume is as follows. The overall sales volume of SMEs in the industry was 298.6 billion JPY. Out of which 75.5 JPY is estimated to be the sales volume of metal sanitary ware including water treatment and water conditioner.

2.3 Advantages of products and technologies developed by Japanese SMEs

Advantages of products chosen for this survey are "High Quality", "High Durability", and "Energy Saving." The initial cost of the products may be high considering the standard of the developing countries however, the life-cycle cost of these products are reasonable considering the maintenance cost is comparatively low.

Unit Classification	Role of SMEs	Technological Characteristics
Compact Coagulation Sedimentation & Sand Filtration Unit	Development, Design, Fabrication technology	A compact devise for highly turbid raw water involving typical rapid sand filtration method Comparatively high cost of chemicals and labor cost however, easy to implement. 【Applicable raw water】 Highly turbid (NTU < 100) 【Process volume】 72～240m^3/day
High Efficient Backwash Filtration Unit	Development, Design, Fabrication technology	A simple device applicable for clear raw water Easy O&M, comparatively lowly priced 【Applicable raw water】 Turbidity < 10NTU 【Process volume】 144～1000m^3/day
Compact Ceramic Membrane Filtration Unit	Fabrication technology	Treating raw water with extreme turbidity, including iron and manganese. Also adaptable to raw water which the turbidity changes rapidly. Easy and low cost O&M however, the cost of device is comparatively high. 【Applicable raw water】 Ultra-high turbidity ≤1000 NTU 【Process volume】 72～672m^3/day
Mobile Ceramic Membrane Filtration Unit	Fabrication technology	Treating raw water with extreme turbidity, including iron and manganese. Also adaptable to raw water which the turbidity changes rapidly. High mobility however, O&M cost and the cost of device itself is comparatively high. 【Applicable raw water】 Ultra-high turbidity ≤1000 NTU 【Process volume】 24～200m^3/day

2.4 Similar products by oversea competitors

Some introduction of ceramic membrane products and mobile units are on the internet, however, detailed information of implementation records of those products in urban fringe or scattered settlement areas in target countries are not reported. Also, no evidence of implementation of such products was confirmed by hearing surveys in each country.

Summary of competitive products by oversea firms available in target countries researched through information available online are as shown in the table below.

Company Name (Country)	Summary of Competitive Products	Availability of Products in Target Countries
Degremont (France)	Degremont Compact Unit: a simple sand filtration device for urban water supply system. Process volume is 115~16,560 m^3/day	Local corporation is established in Indonesia and India.
Aqua Sun International (USA)	Aqua Tender series: trailer type water treatment device using activated carbon and UV. Use in emergency. Process volume is approx. 19~180 m^3/day. Stationary Solar Powered Water Treatment System series: a portable water treatment device using coal filtration and UV. The device has built-in solar panel power generation system. Production volume is 0.4~32 m^3/day.	Aqua Tender series were used in the Sumatra Earthquake in 2004. Stationary Solar Powered Water Treatment System series have been installed in Kenya.
Pure Aqua Inc. (USA)	RO-500 series: a portable water treatment devise using RO membrane. Process volume is 760~3,400 m^3/day.	Has been installed in Indonesia in the past.
Beijing IWHR Corporation (China)	Seawater Ro Plant & Project: sea water desalination device using RO membrane. Process volume is 10~35,000 m^3/day.	A small scale plant (12~18 m^3/day) constructed in Indonesia in 2012.
Metito Saudi Limited (Saudi Arabia)	Reverse Osmosis desalination plant: a desalination device using RO membrane. Process volume is 12,500 m^3/day.	Local corporation is established in Indonesia.

3. Possible applicability of the SME's products and technologies to the future ODA projects

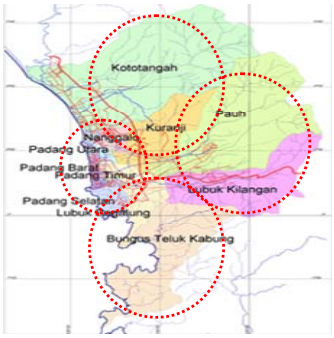
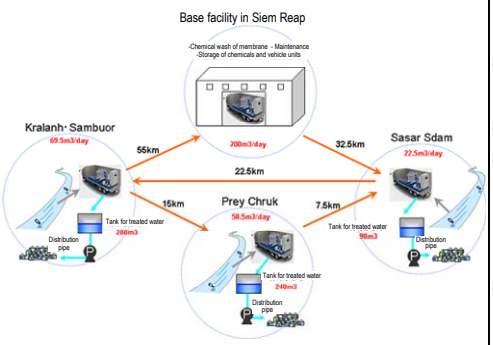
3.1 Products and Technologies developed by SMEs to cope with the issues in target countries

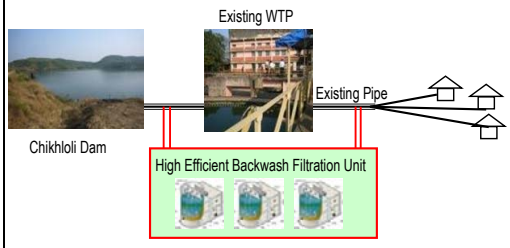
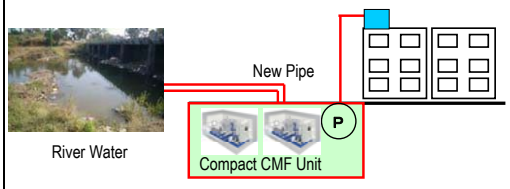
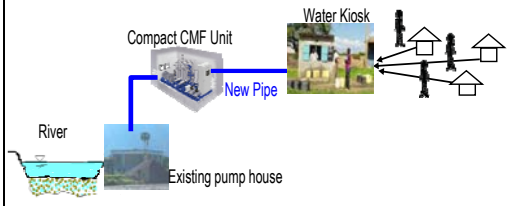
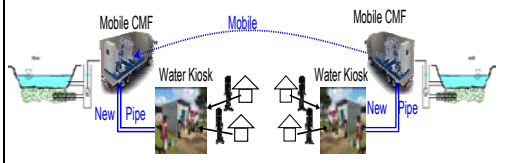
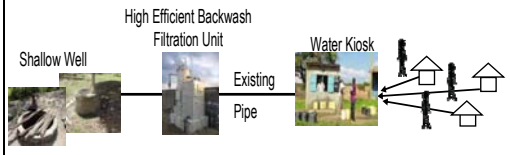
Units applicable to cope with issues in target countries are selected as follows.

Country	Needs	Applicable Units
Indonesia	Supply to areas with water shortage due to flooding Highly turbid river water Mobility of devices for emergency response	- Mobile Ceramic Membrane Filtration Unit
Cambodia	Extremely turbid river water Mobility to supply various settlements	- Mobile Ceramic Membrane Filtration Unit
India	Stationary water treatment device for multi-year application Highly turbid river water	- High Efficient Backwash Filtration Unit - Compact Ceramic Membrane Filtration Unit
Kenya	Relatively large process volume Highly turbid river water Elimination of contaminants from upper river basin and sands in time of flooding	- High Efficient Backwash Filtration Unit - Compact Ceramic Membrane Filtration Unit - Mobile Ceramic Membrane Filtration Unit

3.2 Proposal for future ODA projects using SME's products and technologies, and it's degree of contribution towards solving the development issues in surveyed countries

Outlines of proposed projects in each target site and examinations for project sustainability are shown as below.

Country	ODA Project Image	Outline
Indonesia		- Installation of 4 Mobile Ceramic Membrane Filtration Units to several districts for emergency response. - Project scale approximately 200 million JPY. - Unit cost of O&M is estimated as 2,115IDR/m^3, which exceeds water tariff of normal household as 1,200IDR/m^3, while falling behind the production cost of PDAM Kota Padang as 3,930IDR/m^3. - Deliberation with local stakeholders is required for securing project sustainability, since operation body and tariff collection system seem different between emergency and normal times
Cambodia		- Installation of 9 Mobile Ceramic Membrane Filtration Units (3 for Kandal Province; 6 for Siem Reap Province) - Auxiliary facilities include water pipe, water pump, and fee meter. - Project scale approximately 730 million JPY. - Unit cost of O&M is estimated as approximately 30JPY/m^3 in Kandal Province and approximately 53JPY/m^3 in Siem Reap Province, which are within the permitted range in both provinces. - Project sustainability securing is expected by establishment of operation body mainly composed of DIME in the future, with having assistance with water supply authorities in each provincial capitals.

Country	ODA Project Image	Outline
India	Increasing capacity of existing water treatment facilities 	- Installation of 3 Efficient Backwash Filtration Units linked to existing water treatment facilities. - Water source to use dams used by existing treatment facilities. - Project scale approximately 150 million JPY. - Unit cost of O&M is estimated as 1.58INR/m^3, which falls far behind water production cost by MJP as 6INR/m^3. - Method of clear off the product cost would be the key issue, as purchasing of such units would be by open tender generally in India.
	Water supply to private housing developments 	- Installation of 2 Compact Ceramic Membrane Filtration Units. - Water source to use near-by rivers which increase in turbidity during floods. - Auxiliary facilities to include water pipe and pump. - Project scale approximately 200 million JPY. - Unit cost of O&M is estimated as 19.2INR/m^3, which far exceeds water production cost by MJP as 6.0INR/m^3. - However, private business market targeting private housing developers would be expected, as some of them purchase treated water from MJP by 42INR/m^3.
Kenya	Areas with existing water distribution pipe, using river water 	- Installation of 1 Compact Ceramic Membrane Filtration Unit. - Water intake through infiltration gallery, distribution pipe and pump. - Supply to water kiosk. - Project scale approximately 250 million JPY. - Unit cost of O&M is estimated as 1.1KES/20L, which falls behind the target cost as 3.0KES/20L. - Technical assistance of soft component such as tariff collection to WSP or community organization would be the key issue for project sustainability securing.
	Area with no distribution pipe, using river water 	- Installation of 4 Mobile Ceramic Membrane Filtration Units. - Water intake through infiltration gallery. - Supply to newly constructed water kiosk. - Project scale approximately 670 million JPY. - Unit cost of O&M is estimated as 1.8KES/20L, which falls behind the target cost as 3.0KES/20L. - Technical assistance of soft component such as tariff collection to WSP or community organization would be the key issue for project sustainability securing.
	Areas with existing water distribution pipe, using water from a shallow well 	- Installation of 9 Efficient Backwash Filtration Units. - Supply to water kiosk. - Project scale approximately 320 million JPY. - Unit cost of O&M is estimated as 1.3KES/20L, which falls behind the target cost as 3.0KES/20L. - Technical assistance of soft component such as tariff collection to WSP or community organization would be the key issue for project sustainability securing.

3.3 Effective cooperation with existing ODA projects (proposed)

(1) Grant Aid Projects

ODA by non-project grant aid can be used for installation of water treatment device to cope with water quality issues such as turbidity and chemical contamination unique to the target region. In cases such as above mentioned Kenya, where the construction of water intake facility in the riverbed is required, non-project grant aid could be split into civil engineering and construction, and procurement of devices from SMEs.

(2) Technical Cooperation such as Volunteer Program and Development Study

Development study aiming to identify potential projects in regions lacking water supply system after the implementation of the pilot project is considered effective. Rural entities in particular lack adequate information on appropriate technologies, therefore a problem-solving type promotion of products by SMEs are also considered effective. However, SMEs lack in financial resources to carry out such promotional activities independently. Therefore, implementation of promotional activities through a volunteer program with a private cooperation and development study identifying needs ran in parallel is thought to be effective.

(3) Human Resource Development and Technology Transfer

Provision of experts from the SME to oversee the operation and maintenance of the installed water treatment is desirable, until the operation and management by local business entity takes off. Within the period of the Technical Cooperation, SMEs could also establish a network of contacts, identify new business opportunities, and expand business opportunities to similar areas in the target country, as well as sending engineers.

(4) Funding Procurement

There is a large need for SMEs to hedge the risks associated with expansion of business opportunities. There are numerous SMEs involved in manufacturing of parts for devices such as those proposed in this survey. A funding scheme targeting water treatment and supply sector as a whole is desirable to allow overall profit, even though scale of profit may be small for installation of each device.

4. Possibility of business development by utilizing the SME's products and technologies in the surveyed countries

4.1 ODA projects and medium-long term business development scenario

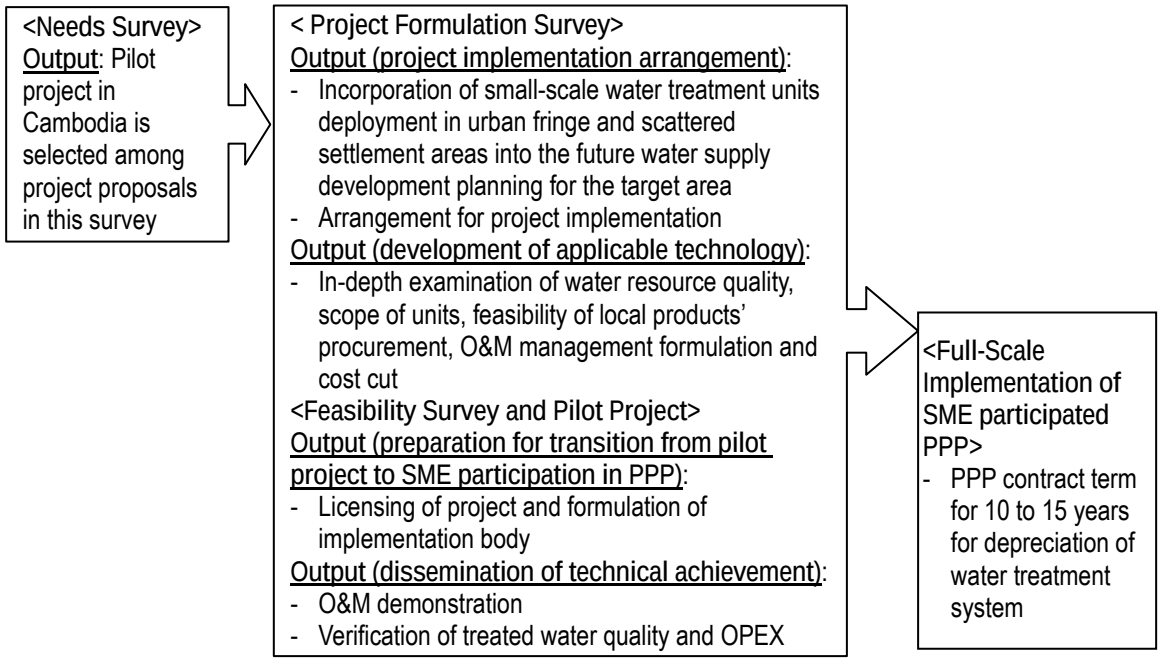
Barriers for oversea expansion of SMEs were identified through questionnaires and interview survey with Japanese SMEs in water treatment product manufacturing industry. Barriers identified are listed in the table below.

Categorization	Barriers
Management capacity	- Lack of management resources such as human resource, funds, and information - Lack of ability to respond to risks associated with oversea expansion of business
Lack of information	- Lack of awareness with regards to international aid - Lack of understanding for needs of oversea markets
Lack of support	- Lack of organizations and system to provide risk money to support willingness to expand abroad - Lack of support scheme to sustain business

For the pilot regions in this survey, most of the O&M cost are likely to be lesser than the local selling price. Therefore, it is realistic to aim to recover investment in a medium to long term span, including the maintenance of the system. Financial support mechanism for such business by SME will require following aspects:

- Low interest loan for small amount applicable to small businesses
- Long term loan that allows investment recovery for maintenance project with low profit rate
- A total support system that includes a lending mechanism for initial investment and a support system for human resource development including technology transfer that will benefit not just the project but the country as a whole.

For SMEs on the other hand, detailed investigation of the degree of cost cut agreeable in order to meet the needs of developing countries that have a tendency to prefer immediate effect at a lower cost over quality, and promotion of their products from the point of life-cycle cost are required. As one of the assistance scheme for such SMEs' activities, the below shows a full-swing O&M project deployment scheme by SMEs through a continuous step-up implementation process from this "Needs Survey", "Project Formulation Survey" and "Feasibility Survey and Pilot Project" under "the Governmental Commission on the Projects for ODA Overseas Economic Cooperation".



4.2 SME's contribution to the regional economy

(1) Potential demand

A. Estimation of potential demand in Indonesia

Assuming that the potential national demand is equivalent to the amount installed in the 4 cities targeted for installation of small devices in emergency response as stated in the Blue Book, expected order value can be estimated as 1.4 billion JPY.

B. Estimation of potential demand in Cambodia

Assuming that the potential national demand is equivalent to the population short of achieving the target population for access to safe drinking water in rural region by 2025,

expected order value is estimated at 4.1 billion JPY.

C. Estimation of potential demand in the state of Maharashtra, India

As the system vary for each of Indian states, potential demand for the state of Maharashtra was estimated. Assuming that the potential demand is equivalent to 10% of the new housing development led by growth in population, expected order value is estimated at 1.5 billion JPY.

D. Estimation of potential demand in Kitui district, Kenya

Potential demand was estimated for the Kitui district in Kenya, as a model project including water resource development with consideration for existing water supply facilities was proposed. Assuming that the potential demand is equivalent to the population short of achieving the MDG in the target region, expected order value is calculated at 2.4 billion JPY.

(2) Benefit to Japanese Local Economy

The degree of impact to Japanese local economy was estimated by using the latest inter-regional and inter-industry relations table for the case that the pilot project in Cambodia, as the most probable and expected project in this survey, would be realized and the estimated potential demand in Cambodia be fulfilled by the similar projects, which counts for 4.1 billion JPY. Assuming regionally-spread SMEs over the country receive the order averagely, the estimation results shows 1.8 times expansion of growth of production, job creation of 306 employees, and income creation of 2.9 billion JPY.

Needs Survey
Indonesia, Cambodia, India, Kenya
Dissemination of Small-Scale Water Treatment Units for an Expansion of Water Supply in Urban Fringe and Scattered Settlement Area

Enterprise and Counterpart Organization

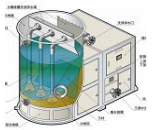
- Name of Enterprise: Joint Venture between Pacific Consultants Co.,Ltd. and METAWATER Co.,Ltd.
- Location of Enterprise : Tama City, Tokyo / Minato City, Tokyo
- Survey Site ・ Counterpart Organization : Indonesia・PDAM Kota Padang / Cambodia・Kandal PDIME, Siem Reap PDME
  India・PDAM Kota Padang / Kenya・Tanathi WSB

Concerned Development Issues

- Indonesia: Inadequate water supply system due to financial difficulties, Urgent needs for flood disaster response
- Cambodia: Water contamination problem for both surface water and groundwater, Low water supply coverage in scattered settlement area
- India: Imbalance between supply and demand, Intermittent supply, High NRW, Inadequate supply to housing development area
- Kenya: Insecurity of water resource, High water-born disease rate, Inadequate supply to broad range of rural area

Products and Technologies of SMEs

- Easy installation by compact equipment size
- Manageability by automatic operation
- Capability of high turbidity and Mn/Fe contained water treatments
- Mobility by vehicle installation (for utilization of unused water resource)

Proposed ODA Projects and Expected Impact

- Indonesia and Cambodia: Introduction of mobile equipment for disaster response and utilization of unused water resource
- India: Introduction of packaged equipment for quick-impact on water supply area expansion
- Kenya: Integrated plan with water security measure and utilization of existing water supply system for improved service population and sanitary condition

Future Business Development of SMEs

- Verification of advantages of easiness and cost effectiveness in O&M and stable quality through pilot project on site
- Small scale business promotion that recovers investment cost by lower production and O&M costs