

**Needs Survey under the Governmental
Commission on the Projects for
ODA Overseas Economic Cooperation
in FY2015**

Summary Report

Democratic Socialist Republic of Sri Lanka

**Needs Survey for
Energy/Environment, Agriculture, and
Water Purification and Water Treatment Sector**

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Kaihatsu Management Consulting, Inc.

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Needs Survey for Energy/Environment, Agriculture, and Water Purification and Water Treatment Sector Democratic Socialist Republic of Sri Lanka

Research Company and Counterpart Organization

- Research Company: Kaihatsu Management Consulting, Inc.
- Site: Democratic Socialist republic of Sri Lanka (Colombo, Kandy, Nuwara Eliya, Galle and others)
- Counter Part Organizations: SEA, MOA, DOA, TRI, NWSDB, etc.

Concerned Development Issues

- **Energy:** Stable power supply by appropriate development of power sources, promotion of renewable and energy efficiency
- **Agriculture:** Improvement of efficiency in cultivation and product management and value addition of tea, development of less developed area through increase productivity of agriculture sector
- **Water Purification and Water Treatment:** Increase of coverage of water supply and piped-sewerage to meet the water demand, and protect environment, especially at catchment area.

Products, Technologies, etc. of SMEs, etc

- **Energy:** Micro hydro-generators, products for energy efficiency improvement (Energy saving products, peripheral devices for EMS), quick EV chargers
- **Agriculture:** ICT related agriculture products (sensor device, satellite data, devices for tea manufacturing, labor management system, logistic management system, etc.)
- **Water Purification and Water Treatment:** Devices for water supply and sewerage treatment facilities (Jokaso, POD, PTF)

Proposed ODA Projects and Expected Impact

- **Energy:** 1. Introduction of micro hydro-generators or energy saving products in a ODA grant or loan projects. 2. Knowledge Co-Creation Program in Japan for dissemination of Japanese technologies and products for energy saving.
- **Agriculture:** 1. Productivity improvement by using sensor devices and cloud system. 2. Developing of agricultural information system by using satellite data. 3. Enhancing competitiveness of plantation industry. 4. Enhancing effective logistic and distribution system for agricultural products with ICT.
- **Water Purification and Water Treatment:** 1. Reduction of NRW by introduction of Japanese-made float valves 2. Realizing fair distribution of water and reduction of NRW by pressure sustaining valves. 3. Protection of water resources and improvement of sanitary and living condition by packaged-type Jokaso. 4. Economical, efficient and sustainable development of sewage treatment facilities by POD and PTF.

Future Business Development of SMEs, etc.

- **Energy:** There is a potential for the products to be introduced in public and private facilities, such as factories and commercial buildings once a success stories in public sector project is acknowledged among the people.
- **Agriculture:** There will be more demand from agri-business companies for the proposed products, after creation of favorable business environment through ODA projects both private partnership and technical cooperation.
- **Water Purification and Water Treatment:** Devices for water supply can be widely used in water supply facilities of NWSDB and local government; and sewerage treatment facilities can be introduced to hotels, housing schemes, factories and others.



Abstract

Chapter 1: General Information of Sri Lanka

The Democratic Socialist Republic of Sri Lanka (hereinafter referred to as “Sri Lanka”) is an island nation in the Indian Ocean. The population of the country is 20 million, and the land extent is equal to around 80 per cent of that of Hokkaido. It is a multi-ethnic and multi-religious country. Around seventy per cent of the population are Buddhist; there are also substantial communities of Christians, Hindus and Muslims.

The objectives of Japan’s Official Development Assistance to Sri Lanka, stated in the *Country Assistance Policy for Sri Lanka* of the Ministry of Foreign Affairs of Japan in 2012, are to promote economic growth in the country with consideration of least developed areas. The main areas for assistance were: (i) Promotion of economic development, (ii) Assistance for development of least developed areas, and (iii) Reduction of vulnerability.

The ethnic conflict, which prevailed for nearly thirty years, ended in 2009. Thereafter, public security in the country quickly improved, and it has been attaining steady economic growth. GDP per capita exceeded US\$3,000. Unemployment and inflation rates also improved gradually. Fuel occupied first place with regard to import expenditure of the country, due to the fact that Sri Lanka imports all the fuel needed for primary energy, such as coal and oil. Garments/textiles and tea were first and second respectively for export earnings of the country.

Sri Lanka has promoted foreign direct investment since it opened up its market in 1977, which established export processing zones and industrial estates in various parts of the country, and applied concessional tax rates for import and corporate taxes for prominent investments. As a result of these efforts to promote investment, as well as the recovery in public security, Sri Lanka was ranked as number one among South Asian countries in the “Doing Business Ranking” conducted by the World Bank in 2015.

Sri Lanka has significantly better figures on maternal mortality rate, infant mortality rate, life expectancy and other primary health care indexes compared to other South Asian countries. With regards to education, the country has especially higher indexes among neighboring countries on school enrolment and female adult literacy rate. The poverty index in the country in 2012/13 was 6.7 per cent, which was improving year by year. However, it is still a problem that the poverty indexes of rural and estate areas are much higher than that of urban areas.

Chapter 2: Environment, Energy and Waste Management Sector

Annual electricity consumption of Sri Lanka in recent years was around 13,000 GWh. It increased annually by 4.5 per cent over the past 10 years. To cater to this demand, the Japanese government has implemented ODA projects for construction of hydropower plants and transmission lines, with the aim of promoting economic development in the country. The total installed capacity of power plants in the country was 3,932 MW by the end of 2014. The capacity of coal power plants has been increasing in

recent years, and the trend is expected to continue in future.

The government of Sri Lanka has identified the increased importation of fossil fuel as a serious issue for the country, and is promoting electricity generation using renewable energy sources that are indigenous to the country. As a result of the promotion of these projects, electricity generation using renewable energy resources, excluding large hydro, has increased and reached 10 per cent of total electricity generation in 2013. At present, the majority of the projects under the Feed-in tariff (FIT) system in the country are mini-hydro projects. SEA, however, recognized importance of research, technological development and investment in future for those areas that have not developed much but are rich in resources, such as micro-hydro power, for the purpose of further expanding generation by renewable energy.

The government regards utilization of available electricity at night, and peak-clipping and peak-shifting, as being important for greater energy efficiency. Peak-clipping is to reduce electricity consumption at the peak time, and peak-shifting is to consume electricity that used to be consumed at peak time at non-peak time. There is a considerable amount of electricity available at night, as a result of development of coal-power plants. The Ceylon Electricity Board (CEB) needs to utilize this electricity at night. In Sri Lanka, electricity consumption at the peak time - from 6.30 p.m. to 10.30 p.m. - is very high. The government emphasizes the importance of introducing strategies, products and technologies that can prevent the increase of electricity consumption at peak time. Part of this strategy is to promote energy efficient products to households by introducing an energy efficiency labelling system. The government has also promoted electric vehicles (EV) and usage of electricity at night for charging EV, and environment protection, by reducing import tax on EV and introducing a time tariff for general households.

Development of micro-hydro generation projects became popular in Japan after the Great East Japan Earthquake in 2011. A number of projects on micro-hydro generation were developed using government subsidies, and the supply of generators has still not caught up with demand in 2015. However, the number of micro-hydro generators that can be installed in the country will be limited as locations with appropriate water sources are limited. The industrial association on micro-hydro of Japan is looking for an opportunity to introduce the technology to Asian countries as soon as domestic demand has been fulfilled.

The micro-hydro generators of Japanese SMEs are able to generate power even at low-head locations. They have strength in terms of experience of installing the generators in various locations, including water supply and drainage facilities. However, as a result of comparison with existing micro-hydro generators in the country, it was found that the Japanese products need to make the initial investment cost less than J¥ 250,000 per kW of installed capacity, to meet the needs of the country in terms of price.

Heat insulation paint, which is proposed in this survey as one of the products for energy efficiency, would contribute to peak-cut in the country. There is a prospect for this product to become popular in Sri Lanka if the initial cost for the product would be recovered in 2-3 years. It is important to make LED bulbs and lights popular as they would contribute to peak-cut in the country if they are widely used by public facilities, office buildings and general households. Japanese products needed to be

promoted by giving emphasis on durability, while keeping price competitiveness with other products, because cheaper products from India and China are already in the market. It is also important to improve level of awareness among the stakeholders of Sri Lanka about the potential of the Japanese products to contribute implementation of the energy efficiency strategies of the country, such as energy labelling programme and code of practice for energy efficient buildings.

Peripheral devices for Energy Management Systems (EMS) proposed in this survey are products for storing electricity generated by solar systems in daytime, or available electricity at night, and to utilize it at peak times; this would contribute to peak-shifting in the country. As this product is new to Sri Lanka, it is necessary to make its success stories known to people, and to train human resources for maintenance. The market for quick chargers for EV is expanding at the moment due to the increased number of EV in the country. Manufacturers of this product need to be competitive in price, and enter into the market promptly by giving publicity of its specialized features, such as mobility.

Micro-hydro generators, peripheral devices of EMS, heat insulation paint and LED products would be utilized in ODA projects. Micro-hydro generators can be installed in facilities of the National Water Supply Development Board (NWSDB), which have an adequate volume of water and head, where a proper implementation system for generation maintenance is also available. Peripheral devices of EMS can be installed at public facilities and others, which were identified by SEA. Heat insulation paint and LED products can be introduced to education and research institutions, and hospitals in line with the Energy Audit Scheme. These products are suitable for being introduced as a component of ODA projects, rather than being introduced as a single project, because the size of the projects is not substantial. Once the advantages of the products and technologies are verified in the ODA projects, there is a good potential for these products to be introduced in other public and private facilities. Quick EV chargers, which have been proposed in this survey, have more chance in private business or marketing than in ODA projects.

Chapter 3: Agriculture Sector

The contribution of the agriculture sector to GDP in Sri Lanka has been decreasing year by year. However, the growth of the agriculture sector is still important for the country to fill the poverty gap between rural and urban areas; this is one of the important issues of the country because more than 80 per cent of the population under the poverty line lives in rural areas. Sri Lanka has various issues in the agriculture sector. For example, the traditional export agriculture items, especially tea, are losing their competitiveness in the global market, productivity of agricultural crops is low, and the logistics and distribution system is inefficient. These are the most important issues.

In Japan, ICT-related products have been developed for the purpose of optimizing the agricultural production and distribution process, to compensate for the shrinking and aging agricultural population of the country. Among these agriculture-related ICT products of Japan, there are products with advanced technologies that can address the above-mentioned issues and needs of Sri Lanka, such as strengthening competitiveness and improving productivity and efficiency - for example, products for analyzing and controlling environmental conditions by using remote sensor devices and satellite data, software applications for assisting Good Agriculture Practice (GAP) certification and ensuring traceability by using cloud systems with smartphones or tablet PCs, machinery with sensor

technologies for tea manufacture, and logistics and sales control system for agricultural products.

Tea is the second largest export item of Sri Lanka. The tea industry is one of the most important traditional export-oriented industries, which supports the national economy and employment. However, in recent years the major tea plantation companies have been struggling for survival. Due to high production costs caused by a rise in labor costs and fuel prices, Sri Lankan tea is losing its competitiveness in the global market. There is high demand for products and technologies that can improve efficiency of production in extensive tea estates and optimize tea manufacturing in factories, and compensate for the shortage of labor.

While Sri Lanka has achieved self-sufficiency in rice, the major crop of the country, productivity improvement in other crops has not showed substantial improvement and is in need of a breakthrough. The main reasons for low productivity are: limited mechanization due to small plots of agricultural land, and lack of access for farmers to information related to climate, new crops and new agricultural technologies, as a result of the governmental extension system not functioning adequately. Quality improvement of export crops is also needed to increase export earnings. For this purpose, ICT products, which improve access by farmers to information on upgrading quality of crops, and contribute to productivity improvement, are required. For the logistics and distribution of agricultural products, it is a serious issue that supply chains of fruit and vegetables in the country are long and inefficient because a lot of intermediaries are involved. This leads to a higher rate of post-harvest loss and large price fluctuations, minimizing farmers' return on investment. Therefore, ICT products are required for improving the efficiency and transparency of logistics and distribution systems, and facilitating improvement of access to necessary information, including prices, for the stakeholders of the market.

Proposed ODA projects utilizing ICT products of Japanese SME, which have potential to meet the above-mentioned needs in the agriculture sector in Sri Lanka, are listed below. These proposals are aiming at supporting existing programs of the Sri Lankan government, by adopting schemes of Japanese ODA for promoting private sector partnership. It is a recommendable strategy for Japanese SMEs firstly to verify their applicability in ODA projects, and then market them to individual farmers.

- The project for productivity improvement by using remote sensing devices and cloud system: In cooperation with the Agricultural Research Institutes under the Department of Agriculture, this aims to promote optimization of cultivation practice and dissemination of information to farmers by introducing pest and disease risk control systems using remote sensing technologies.
- The project for constructing agricultural information infrastructure by using satellite data processing system: In cooperation with Natural Resource Management Center under the Department of Agriculture, this aims to construct agricultural information infrastructure to provide necessary data for risk mitigation and harvest prediction by analyzing data on land utilization and erosion captured by satellite images.
- The project for enhancing competitiveness of the plantation industry: It aims to improve efficiency in production and manufacturing process of tea by introducing an energy-efficient machinery and labor management system, which enables digital measurement of tea leaves harvested by each laborer and automatic calculation of remuneration according to the weight of

the leaves.

- The project for improving efficiency in agriculture logistics and distribution system with ICT: In cooperation with farmer organizations or companies running supermarket chain stores, introducing a cloud-based system to control logistics and marketing-related information, such as available volume of harvest, timing of harvest, crop price and stock management, which can be shared with all related stakeholders. This will decrease post-harvest loss, realize crop cultivation planning based on market price and stabilizing production, which leads to reduced unnecessary handling costs for intermediaries and increased farmers' income.

Chapter 4: Water Purification and Water Treatment Sector

The coverage of piped water supply in the country was 45 per cent in 2015. One of the development targets of the country is to improve this to 60 per cent by 2020. It is also important for the country to improve financial management of NWSDB, which is playing a crucial role in developing the water supply and sewerage facilities of the country, by improving the non-revenue water rate, reducing the electricity cost for pump operation, and others. It was found in this survey that there were several areas in which water was not used efficiently due to leakage caused by poor quality float valves, including those for water supply and domestic usage, although the capacity of water supply is limited as a result of increased population and the establishment of more factories and commercial buildings. There is some need to improve this situation from the aspect of management. The float valves of the Japanese SMEs, which were proposed in this survey, are highly durable and do not clog; therefore, these will contribute to prevention of water leakages, which are happening currently as a result of deterioration and clogging of float valves, and would further contribute to reduction of non-revenue water.

It was also found that there were areas where water was not supplied adequately to consumers because expansion of the water supply facilities had not been carried out, or necessary measures that were supposed to be implemented until such expansion had not been implemented, although there were changes in water demand in these areas. There is a need to improve this situation and provide water evenly to provide better services to consumers. A pressure-sustaining valve automatically adjusts the amount of water supplied to various locations and households according to the pressure in the relevant transmission and distribution network, and realizes even distribution of water even in hilly areas and those with bulk consumers. This product can be used as a permanent facility, not only as temporary until expansion of facilities, for realizing fair or even distribution of water, and also enables reduced electricity cost of pumps and non-revenue water.

The coverage of piped sewerage of the country is only 2 per cent. Septic tanks are generally used for sewerage treatment in the country. Most people do not carry out proper maintenance of septic tanks, by regularly conducting inspections and extracting sludge from the tanks. Some malfunction. These septic tanks have lower treatment efficiency than Jokaso, which is proposed in this survey, and they are one of the causes of water pollution in rivers and underground. The country aims to improve this situation by increase the coverage of piped sewerage to 7 per cent by 2020.

There are places in the country, in addition to the major cities, which have an urgent need to introduce improved waste water treatment facilities. These are, for example, hostels at universities and bus stations in major towns. The urgency is greater if waste water is discharged near the water intake of water supply. The packaged-type Jokaso proposed in this survey is a standardized, factory-made product, which does not need designing, and will be able to solve these problems at such urgent locations, especially in countries which do not have much experience in sewerage treatment technology.

Treatment facilities with less cost for operation and maintenance and those of space-saving are also needed for sustainable and efficient development of sewerage treatment systems. Treatment facilities with Pre-fabricated Oxygen Ditch (POD) system and Pre-treated Trickling Filter (PTF) system, which are proposed in this survey, will serve the purpose. Japanese mobile dewatering trucks, which are a product for circuit-type sludge treatment that visit several places one after the other, require minimum initial investment, and will be able to meet the demand of improving sludge treatment in the country.

In Japan, piped-water supply coverage for the population is almost 100 per cent, and that of piped sewerage is around 90 per cent. The budget for water supply and sewerage projects has been decreasing recently, as the need for constructing new facilities reduces and the population is shrinking. However, it is necessary in Japan to re-structure old facilities from the aspect of environmental and water quality protection and earthquake countermeasures. Therefore, Japanese companies in the water supply and sewerage sector, including SMEs, have to keep their momentum for development in future. It is now necessary for them to go into markets of developing countries and utilize their accumulated know-how for the betterment of the countries, and to keep expanding their business, human resource development and technological improvement.

There are several requirements for Japanese SMEs to make their products widely used in Sri Lanka. The float valves need to have competitive prices in comparison to the products of a British company that are widely used in the country; and the brand of the product should be recognized in the market. There are very few examples of use of pressure sustaining valves in the country; therefore, the product should be introduced first as a pilot project for verifying its effect. The SMEs producing the packaged-type Jokaso need to find a reliable local partner for sales and circuit-type maintenance, as Jokaso made of fiber-reinforced plastic (FRP) has not been introduced in the country yet. POD is a new product in the country; therefore, it is effective to introduce and operate it as a pilot project to verify its effect and make it appreciated locally. The PTF system can be proposed in the Sewerage Sector Master Plan, which is going to be formulated by NWSDB with the assistance of JICA, so that it would be utilized and acknowledged in the country as a specialized technology of Japan in future.

These products would be introduced mainly in new or existing water supply and sewerage facilities to be developed under Japanese ODA loan projects that are implemented for the purpose of economic development, according to the ODA policy of Japan. Once their advantages and effects are acknowledged in the ODA projects, there should be a high demand for these products in other sectors. The float valves can be introduced for general households. The packaged-type Jokaso will have a good demand in other public facilities that need urgent improvement, as well as in projects in the private

sector, such as hotels and factories.

(End)