英文要約

"Project Formulation Survey" under the Governmental Commission on the Projects for ODA Overseas Economic Cooperation in FY2013

Summary Report

LAO PEOPLE'S DEMOCRATIC REPUBLIC

Study on the Project Formulation

For a Small Town Water Supply System

March, 2014

TOHKEMY CORPORATION

PACIFIC CONSULTANTS CO., LTD.

JOINT VENTURE

The content of this report is a summary of the project formulation survey, which was commissioned by the Ministry of Foreign Affairs of Japan in the FY 2013 and is carried out by the consortium TOHKEMY CORPORATION,PACIFIC CONSULTANTS CO., LTD. Joint Venture. It does not represent the official view of the Ministry of Foreign Affairs.

Introduction

Proposed company hopes to catch a great business opportunity in the Lao People's Democratic Republic (hereinafter referred to as Laos) where the government of Laos has been promoting urban water services in consideration for commercial base.

In this project formulation study, we examined the following problems.

a) Is a small distributed water purification facilities / water distribution system proposed by the proposed company (hereinafter referred to as the proposed water purification system / water distribution system) applicable to the projects that are listed in water development investment plan for small provincial water supply system subject city (hereinafter referred to as small - town) of “the revised water development investment plan up to 2020 in 2013” related to urban water supply development promoted by the government of Laos, on a technical aspect, cost side and legislative side?

b) How much is the scale of the project needs?

c) Can the proposed company respond voluntarily to their needs?

d) Which Japanese ODA scheme can the proposed company with a little overseas experience utilize, in order to achieve business development in Laos?

The proposed company was able to recognize the presence of 580,000 served population and 9.1 billion yen in the development investment scale until 2020 as needs. The proposed company could recognize the necessity of the following requirements of the proposed water purification system / water distribution system because of the variability of water quality turbidity due to seasonal, diversity of water sources in the field and the vulnerability of the management skills of provincial water companies.

a) The proposed water purification system / water distribution system has to be developed on the base of “a simple and compact design concept” corresponding to from low turbidity to high turbidity timely.

b) It has to be operated and maintained by “an easy system” and can supply “safety drinking water” that meets the WHO standards.

In addition, the proposed company was able to recognize various challenges in its business development in Laos through this project formulation study. It was able to recognize that the name recognition of the proposed company and its products is low and that the financial base of government agencies related to Small Town water supply is vulnerable and the development plan has not progressed smoothly. In order to solve the problems, the proposed company examined the use of a Japanese ODA scheme of " private proposal-based dissemination and demonstration project" for the first time. Then, in order to expand its business opportunities, it examined the use of "a general project grant".

For “the private proposal-based dissemination and demonstration project for Pakxsan water expansion project of the NPSE Bolikhamxay Province (tentative name)” as the candidate for the former ODA scheme, the MOU on the offer of the project site and the business cooperation between Laos government agencies related to the project (MPWT, DHUP, and the NPSE Bolikhamxay Province) and the proposed company could be concluded in this formulation study.

CHAPTER 1 Confirmation of needs and the state of the development issues in the target country

1.1 Current state of development issues in the water supply sector of Laos

1) Development plan of water sector

Up to 2010 in 2006, "Sixth National Socio-Economic Development Plan" (hereinafter referred to as NSEDP) got good results that exceed the target value in the economic growth aspect, but in the water sector, sufficient results could not be obtained. Then continued improvements have been taken up in the Seventh NSEDP. Its content is "NPSEs attempt to continuous improvements in water supply development so as to 65% of urban residents access rates in urban areas in 2015 ".

2) Challenge of water underdeveloped district

In water underdeveloped district, the problems of a stable water intake and safe water quality ensuring such as withered well of the dry season and muddy water contamination of the rainy season , and

changes in water quality due to depth of water intake and location of well (salinity or iron concentration is high) has become actualized.

1.2 Confirmation of needs in the Small Town Water Supply Development Plan

It is confirmed that the estimated volume of Small Town Water Supply Development Project which is the needs of the water purification system and the water distribution system proposed by the proposed company towards to 2020 in 2012 is 580,000 people in the served population and 9.1 billion yen in the development investment scale. This estimated figure is based on the "revised water development investment plan" that is opened by MPWT and DHUP in April 2013.

CHAPTER 2 Outlook of future utilization possibility and business development of the proposed company

2.1 The strengths of the proposed company and products and technologies anticipated to be used

In the "Small Town Water Supply Development Plan" promoted by the Lao government, because of the diversity of water sources and the variability of turbidity in water quality, a general-purpose systems and general-purpose product cannot be expected stable water supply. In addition, due to rapid urbanization, water supply must be carried out immediately to the accelerated growth of clean water demand. In order to solve these problems, on the assumption that fully satisfied the quality standards of the WHO, consistent overall adjustment capability of the hardware side and software in the value chain from design, device production, to system operation is needed. The overall adjustment capability is a critical requirement for the implementation of "Small Town Water Supply Plan".

Against this requirement, the proposed company not only has compact turbidity removal device corresponding to the high turbidity raw water as its own product "fiber filtration device", but also has a track record for designing and selling water treatment equipment as a subcontractor of the leading water treatment manufacturer in Japan. And the proposed company may be carried out in-house design also hard water treatment systems as well as (soft) design , such as piping design and production design of the can body . The general overall coordinates composed of "Product force", "Design force" and "Price competitiveness" to construct water treatment system around the filtration device is the strength of the proposed company.

2.2 Assumed business scheme

As a business development in Laos, the proposed company will consider two systems of "water treatment-company " and " filtering material production".

1) Water treatment-company

The business concept of water treatment-company is "it sells water treatment equipment/system in reasonable price Lao government can buy water treatment equipment/system similar to high-quality level of Japan".

The proposed company consider that it is necessary to prepare the product in the amount of level budgeted by Lao government in order to provide the intention to buy in their own funds to the Lao government. However, it is impossible to design and produce a product locally with one bound.

To the level of the budget, it is necessary to make collaboration in Japan and Laos. We referred to the image of the person that will run the products and technology level in the following figure.

Table1 Image of the person that will run the products and technology level

Level	Objectives	Period	Product	Technology
Introductory period	delivery record making local production survey	~3 years	Japan (Laos FS)	Japan
Growth phase	Local manufacturing start (subcontractors, self-investment) Local pricing, Laos self procurement start	3~5 years	Laos	Japan (Laos Education)
Maturity phase	Local complete procurement from beginning to end	5~years	Laos	Laos

2) Filtration material manufacturing plant

Water treatment filtration material is the heart of the water purification process. Though a membrane filtration is prevalent as a new technology of Japan, it is a good consideration that sand filtration is prior technology in consideration of the after-sales service and price point. Because the weight of

filtration material (sand, gravel, filtering material excepting iron and manganese) is heavy, then the transport cost is high, it is desirable to carry out from the acquisition of raw materials to manufacture in Laos.
Because filtration material is the flagship product of the proposed company and the proposed company is familiar with know-how from manufacturing method to product management, the proposed company will examine investing in the local company by itself.
It is assumed that the time when the self- investment in Laos is expected. is 3-5 years after .

2.3 Assumed project implementation system and schedule for concrete business development
The proposed company will show below the commercialization schedule and investment plans of the proposed company with the aim of autonomy / independence deployment of small town water supply business. In addition, the proposed company has shown ODA schemes of Japan proposed to be used by the proposed company and small town water supply development investment plan of Laos.

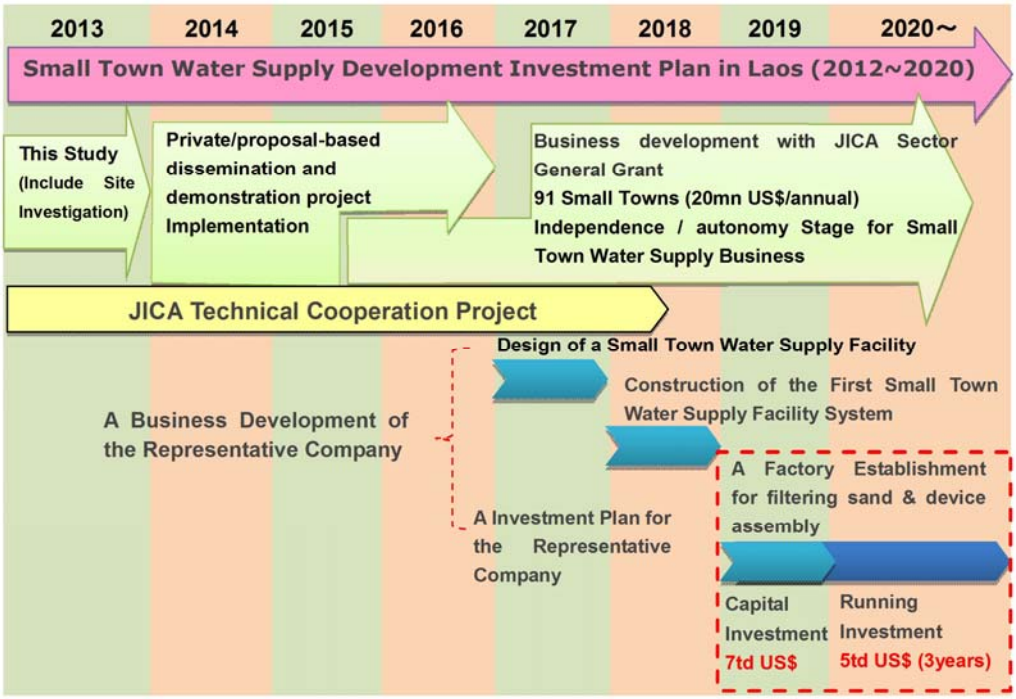

Fig1 "Small Town Water Supply Development Investment Plan" by The Lao Government, the Schedule for Japanese ODA Schemes used by the Proposed Company and the Schedule for Concrete Business Development

CHAPTER 3 Introduction of products and technologies and local conform verification activities (demonstration pilot study) included variety of tests or trials.

In order to confirm the performance of small-scale water purification device in Lao, we performed demonstration for the water source of ground water and river surface water. Demonstration results such as the following were obtained by the field test.

A. It was confirmed that the proposed small-scale water purification equipment against water raw water of one of the groundwater and surface water, treated water that meets the criteria Laos water can be obtained.
B. For the raw water and surface water, because the turbidity varies greatly depending on the season, it is necessary to have sufficiently high turbidity measures in rainy season (~ 3000 degrees). For dry season low turbidity implementation period of the demonstration test was (100 degrees), verification by the simulated high turbidity raw water by sediments had been made. As an introduction, verification by a continuous water flow test of the rainy season is important.
C. In Pakxan water treatment plant which uses raw ground water, it was possible to adequately remove manganese. However, since regional differences are large in surface water, groundwater

quality requires engineering (design) in water intake per site.

Table2 Results of the Test on site

Site	Water resources	System	Results
Chinaimo training center	River Mekong	Pre-filter(fiber media) Sand filter SMF Membrane Activated carbon	● Turbidity 100NTU→0NTU ● Japanese Drinking water level *The system for High turbidity water resources in Rainy season is the next subject.
Paksan municipal water treatment sentor	Ground water	● Sand filter (Manganese removal) ● Resin filter (Hardness removal)	● Manganese 0.5mg/L→0.02mg/L ● Hardness 350mg/L as $CaCO_3$ → 30mg/L

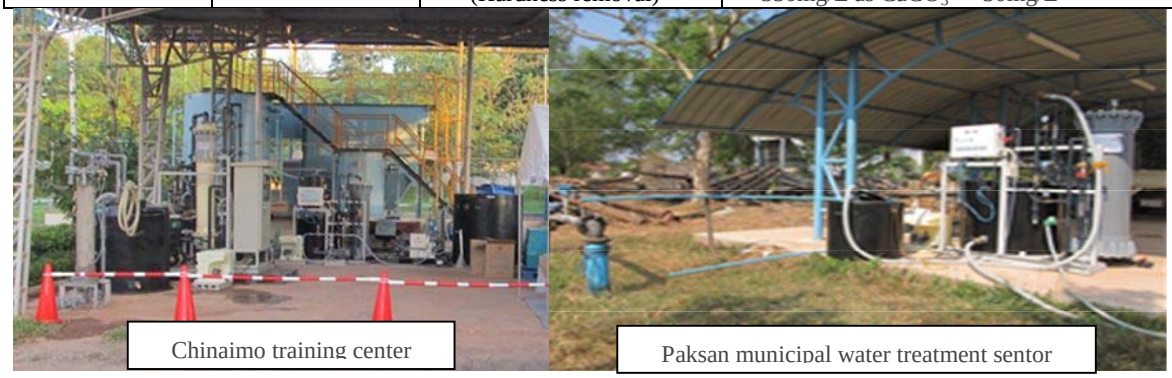

Photo1 Field test location

CHAPTER 4 Development impact in Lao PDR through ODA projects and effects related with the business development of the proposed company.

4.1 Consistency of development issues and proposed products and technologies

The summarized consistency development issues and proposed products and technologies are shown in Table 3.

Table 3 Consistency with development issues and proposed products and technologies

Development subject	Present condition	Consistency with development issues and proposed products and technologies
Ensuring the safe water quality	Direct use of groundwater that is drawn from shallow wells	Water purification process which is a combination of filtration and disinfection to allow a supply of safe water
	Some water sources contain high iron, manganese.	Iron, manganese removal device will keep the value.
Stable Water supply	In the water treatment plant that use surface water lowering of water purification capacity due to high turbidity is obvious.	In the demonstration in this survey the backwash time was constant regardless of the raw water turbidity, it is obvious that the effect on the filtration flow by turbidity change is small.
	In areas where the water source of groundwater, due to withering well in dry season, a certain amount of water intake cannot be secured.	By switching to a surface water source, it is possible to realize stable water supply. However, compared with a facility that used raw ground water, water purification facilities are costly. Cost reduction is essential.

4.2 Effect related with the business development of the company through implementation of ODA projects

In the "private proposal-based dissemination and demonstration project", we would like to collect information and data of technology and management in order to examine/evaluate procurement possibility of materials and equipment in the field related to water purification equipment / water distribution system of the present study proposed small-scale distributed to the raw water of high turbidity river surface water, the management capacity of the province water supply company as the

counterpart and the various risks and countermeasures in the operation and maintenance stage for the small town of Pakxan. In addition, through the "private proposal-based dissemination and demonstration project", we will hope that DHUP as promotion organization of small town water supply program and a province water supply company as a business practitioner understand/recognize the introduction effect and role of water purification equipment proposed by the company in the small town water supply program and want to get the business track record and the improvement of risk management capacity in ourselves in order to acquire small town water supply business that require facility development further.

CHAPTER 5 Concrete proposals of ODA scheme

In the realization of " Small Town Water Supply Development Plan" promoted by Laos government (MPWT and DHUP etc.), the proposed company will expect to utilize one of the Japanese ODA scheme of the " private proposal-based dissemination and demonstration project " in order to make the Lao Government recognized that the water purification equipment/water distribution system proposed by the proposed company is very useful, at first step of business development of the proposed company. Then, the proposed company will expect to get a business opportunity to sell the Lao government related to "Small Town water Supply development Plan" the water purification equipment/water distribution system proposed by the proposed company. The following figure shows the Japanese ODA scheme of the "private proposal-based dissemination and demonstration project" proposed to be used by the proposed company.

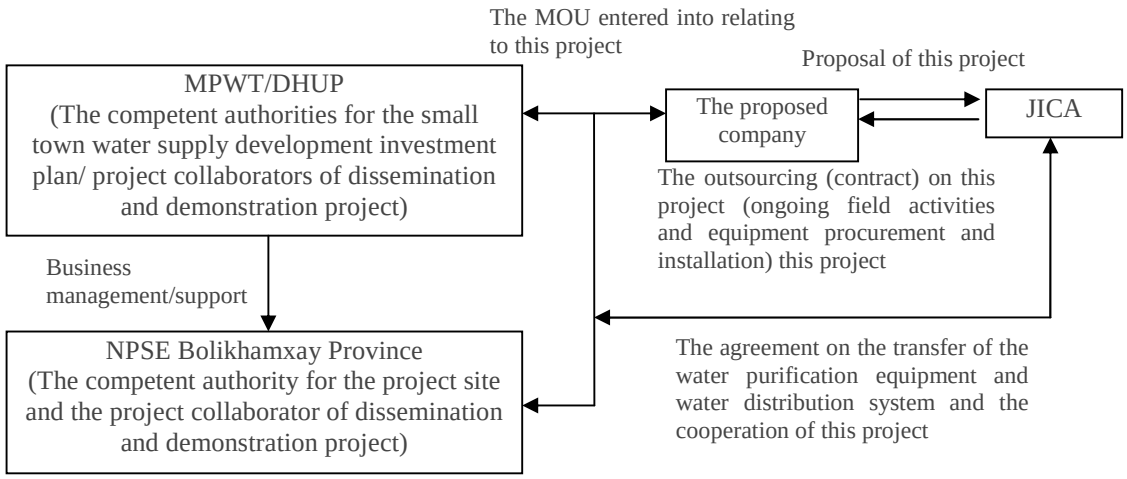

Fig2 The scheme of "the private proposal-based dissemination and demonstration project in Pakxan water expansion project of Bolikhamxay Province Water Supply Authority (tentative name)"

In "the private proposal-based dissemination and demonstration project in Pakxan water expansion project of Bolikhamxay Province Water Supply Authority (tentative name)", Water supply population is assumed to be 19,309 people and the required capacity of water purification equipment has become a 1,000 m^3 / day. In consideration of those specifications and the variability of turbidity et al. the approximate estimated cost size of the water purification equipment has become from 80 million yen to 120 million yen.

As shown in Figure 1, a business schedule is assumed to be 2014-2016 periods for the private proposal-based dissemination and demonstration project.

When the proposed water purification device and water distribution system would have reached the stage where it would be recognized and employed in the small town water supply projects in Laos through "the private proposal-based dissemination and demonstration project", the proposed company expects the use of "general project grant" in order for Japanese small and medium-sized enterprises to increase the accuracy of acquisition of the business opportunities.

In this project formulation study, it is assumed that the development of two projects/year and 200 million yen per year over a three-year period.

STUDY ON PROJECT FORMULATIOM
STUDY ON THE PROJECT FORMULATION　FOR A SMALL TOWN WATER SUPPLY SYSTEM IN LAO PEOPLE'S DEMOCRATIC REPUBLIC

COMPANY・SITE OUTLINE

- PROPONENT COMPANY　: TOHKEMY CORPORATION
- SEAT OF REPRESENTATIVE COMPANY : OOSAKA　CITY., JAPAN
- SITE ・C/P ORGANIZATION　: MPWT & DHUP in LAO PDR

DEVELOPMENT ISSUES of LAO PDR

➢**Regional disparities of water services**

Compared to small towns in provinces, water supply development of metropolitan areas is priority. Corresponding to the regional disparities of access to water services has been required. The population of small towns has become 42% of the urban population (2005 census).

➢**Stable supply of safe water**

Excess demand for water is generated by concentration of population in urban areas. Where water supply system is not in place or in trouble in the water source shortage for wells, users of this system are exposed to health hazards such as conjunctivitis and diarrhea because they drink river water with high turbidity . Where water supply system is required to be improved.

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➢**Provision of water services in accordance with regional characteristics**

In a small town such as urbanization is rapid, public funds are insufficient, and large-scale infrastructure development is not in time, water supply is possible with small-scale water purification equipment that can be developed immediately and without the need for cost and large estate.

➢**Supply of safe water by advanced filtration technology**

A proposed filtration technology (including filtration material for water treatment, which account for 50% market share in Japan) can treat raw river water with high turbidity and provide safe water equivalent to the drinking water to be made in water purification plant.

Expected Effects and ODA Projects proposed in the Proposal

【ODA scheme envisioned 】"The private proposal-based dissemination and demonstration project": With installation and business operations of small-scale distributed water purification system / water distribution system proposed by the proposed company in cooperation with Province Water Supply Company of jurisdiction through this ODA scheme, the proposed company will make the Lao government and the users of water supply recognized that the proposed equipment / system is effect for the projects listed in the Small Town Water Supply Development Plan of 2020 of the Government of Laos.

【Expected Effects】Achievement of the national objectives related to urban water supply and promotion of Small Town Water Supply Development Plan of the Government of Laos. Create and expand business opportunities for Japanese small and medium-sized enterprises.

Business Development of Proponent SME

In ODA projects, the proponent SME will support the small town water supply program promotion as a water purification facility system supplier/ O&M supporter in cooperation with a local company.

In the autonomous/ self-development phase of the small towns water supply program, a local corporation which the representative company takes a stake expands the small town water supply business.