

"Feasibility Survey and Pilot Project for  
Disseminating SME's Technologies to  
Developing Countries" under the Governmental  
Commission on the Projects for  
ODA Overseas Economic Cooperation  
in FY2012

Summary Report

Kingdom of Bhutan

Pilot Project on Small Scale Wastewater Treatment  
for the Improvement of the Quality of Water and Life.

March, 2013

Mokan Joka System Co.ltd.

# GIST

## 1. Introduction

### Background and Necessity of the Project

In a country where about 700 000 people living in the area of the place Kyushu, Bhutan is a country that promotes a way of life that coexists with nature, in the basic philosophy of Gross National Happiness. The peri-urban population growth due to economic growth, pollution of rivers has been exacerbated by the discharge of such wastewater. With the assistance of Denmark, the capital city of Thimphu, sewage treatment plants that target human waste has been established, for only three-stage lagoon, discharge outlet, pollution has become serious. In addition, you may not have the toilet in the house, there is the inconvenience of daily life.

But not in the situation that we can build a large-scale sewage treatment plants, financial strength of the country, there is a need for wastewater treatment facilities that target a small area, available immediately. Even in rural areas of Bhutan country, some regions are beginning to become a similar situation. There is no secondary pollution, construction costs are cheap, there is a need for sewage treatment technology cheaper maintenance costs.

Do-joyoka system is wastewater treatment technology that was developed in Japan, it be prevented second pollution by soil. Do-joyoka system has become the processing scheme are installed in auxiliary operations and the Ministry of Agriculture, Forestry and Fisheries Ministry of Land, Infrastructure and Transport. It is based on the results of Japanese business, to set the design criteria that are suitable for Bhutan, embody together to improve the lives by improving the water quality of rivers and flush toilet.

### The contents of the business policy and business

- 1) Research survey of water use and wastewater standards about life in Bhutan
- 2) (For the City and County Paro Thimphu) Survey of the development of domestic wastewater and water supply development status of
- 3) (For the City and County Paro Thimphu) Survey on the contamination of rivers
- 4) (Conducted at 50 Quai targeting city and prefecture Paro Thimphu) survey of soil degradation ability
- 5) (Carried out at 10 for hair Prefecture City and Paro Thimphu) infiltration capacity of the soil survey (Distribution of soil investigation and possible trench installation, soil investigation, groundwater level observation, surveys, etc. water-reducing rate)
- 6) In private homes, set up the soil deodorizer to prevent the odor for septic tank.
- 7) In private homes, set up the Niimi-trench to purify wastewater.
- 8) For small scale wastewater treatment model facility built at high school.
- 9) In order to understand the technology of soil treatment method in order that you visit the facility will be a good way of most, who are responsible for relations of Bhutan, conducted facility tours of soil treatment method of the town Aizubange Fukushima to.
- 10) Two technical personnel land treatment maintenance methods, etc., of Bhutan for training in Japan.
- 11) To illustrate the method of soil remediation technology held a seminar on land treatment in Bhutan.
- 12) Conducted a study on the quality of treated water continuously check the water quality improvement through the establishment of treatment facilities in conjunction with the survey of the river.
- 13) Targets the entire Bhutan to set efficient treatments to formulate a basic plan (sewer) wastewater treatment.

14) Put together a proposal to the (sewer) in small-scale wastewater treatment country Bhutan.

2. Description of the current situation and development needs of the concerned development issues in the surveyed country.

Current state of the development challenges of the process small scale wastewater treatment in Bhutan, Decided to improve the public health of the community around and city against the background of rapid population growth, But the concept of public health given the environment of Bhutan current it is also necessary that you must start by understanding of the public with, we will promote it as part of the education.

Current state of the wastewater treatment in urban area. In out of sewer area , Human waste is discharged waterway and river after primary treatment septic tank. Drainage be confluence at waterway .wastewater stinks even in winter.

House's toilet often have been in building in urban area. Type of india toilet. Use water if they clean themselves and flushing. (Do not use paper) Hotel's toilet is Western Toilet. you used paper and discard to the trash without flow in pod.

Domestic wastewater in rural areas are more poor, has become the urgent need to improve.

1. Toilet must be installed in the building for as an improvement of the living environment . now the toilet is installed separately from the living room .

2. In a small village often sewage is flowing through the road shoulder, not sanitary , pollution is in progress.

3. Septic tank has ventilation pipe. Bad smell from the tank are out from the pipe and challenges remain, such as odor control.

Current state of the school toilets etc.

school toilet common built dedicated building beside school. school toilets are distinguished for boys and girls and teachers. Toilet washed with water by sump. If the paper is not used, it has cleaned with water, the waste flow in pod. High school toilet is very dirty. It is necessary to do education of toilet and tell sewer necessity.

Septic tank has been installed on the side of the toilet. sewage is stored by septic tank. Soak pit (mass penetration) is installed downstream thereof. sewage has been penetrated ground by soak pit. The infiltration by gravity water often become dysfunctional due to clogging. Drainage discharged to the waterway ,overflowing. It has become the main cause of pollution of area.

3. Possible applicability of the SME's products and technologies, and prospects for future business development

Do-joyoka system is waste water treatment technology. It is unique to Japan, which was developed by agronomists Niimi tadashi. Do-joyoka systems techniques is utilizing the power of natural soil. Three techniques have been mainly used.

- Niimi-trench(Sedimentation tank covered soil + Niimi-trench)
- Niimi-system(sedimentation tank and aeration tank each covered soil)
- Soil deodorization

This technology is not only used for individual residence. It can combined for a local environmental problem in need. Development of small scale sewerage. Can be developed in a way to divided the city center utilizing the characteristics of the area .

## Positioning of overseas expansion in business development

Hiroko Kimura is Daughter of Tadashi Niimi who developed Do-Jyoka system. Moka-Joka System Co.ltd. is Construction consultant specializing in Do-jyoka System (Do-jyoka System developers)

March,1980 company was founded March,1983. Niimi-system have been authorized from Minister of Construction. (From 51 people to 500 people)

March,1988. Niimi-system have been authorized from Minister of Construction. (From 501 people to 2,000 people)

April,1990. The start of service in Shimkappu Hokkaido. The supported business by the Ministry of Land, Infrastructure and Transport.

April 2000. The organization of the local municipality were established "National municipality Do-jyoka system association".

"Do-jyoka network" private organization have been established by individual active membership.

July,2010. Model facility in China operation by Ministry of the Environment is received a high evaluation and have been delivered to Taizhou city.

July,2012. As business of JICA Do-jyoka system Model facility is constructing in mexico.

Environmental improvement of Bhutan is from now. Do-jyoka system is expected to be a suitable technique.

## 4. Verification of adaptability of the SME's products and technologies to the surveyed country

### Capillary infiltration trench method (Niimi-trench)

Niimi-trench is a method that sewage leads to partial soil of high biological activity by unsaturated flow . treatment by the oxidative decomposition of organic matter.

This method is easy to maintenance and It is a nature-friendly method because treated water not flow out. On the other hand, need for broad soil space. Require a soil investigation at the site because it is a device that relies on the power of the natural purification capacity. Investigation result such installation is possible, so it is important to diagnose the site. I have set up the model facilities in high school and personal residential.

### Type of treatment plant covered by soil (Niimi-system)

It becomes necessary for the usual sewage disposal plant to build facilities to delete a bubble or th deodorization device as a second pollution measure.

Do-jyoka system is the sewage treatment technology that can easily prevent second pollution by the coating soil of these..



Nantan city treatment plant



South kyusyu city treatment plant

## Soil deodorization

It is intended by contacting the soil particles leads to the soil gas odor. Absorbed in the soil water of the surface of the particles and soil odor components, into odorless decomposition odor components by microorganisms in the soil. Soil suitable for deodorization, the specific surface area of soil particles is large, it is suitable as a living area soil microorganisms, animals and plants and the soil conditions. It is important to ensure the appropriate deodorizing floor area according to the amount of processing wind, no load high for the soil.

Soil deodorization, you can lower maintenance costs because there is no consumption and exchange, such as activated carbon and deodorizing chemicals needed to process different from other deodorization method. Resolved by the soil deodorizing, for the odor of septic tank.

## Various surveys in Bhutan

Do-joyo-ka system ,Since the method be applied to wastewater treatment systems the functions of soil ecosystems, if the installation, It is important to keep track of the soil with the local natural environment.

### 15) survey of soil degradation ability

#### Survey description

Embedded in two places of 20cm and 10cm depth, two chikuwa and dig out after one month, the study was to investigate the degradation capacity in the region.

In order to study during winter was, most were not degraded. The survey was conducted in Japan too, it had been completely decomposed at 10 places.

#### infiltration capacity of the soil survey

#### Survey description

Even if they are carried out in accordance with the standards of the trench design, selection of the installation location does not work and if it is inappropriate.

Proper place for the determination of trench installation, this survey was carried out to measure water-reducing rate, the study, there were several places unsuitable installation.

#### Survey of the river

#### Survey description

Survey on the contamination of rivers

An investigation into the status of an existing sewage treatment plant

#### Survey description

Understand the specifications and design of the treatment plant in Thimphu scale to reflect the future plans.

Proposed renovation plan by do-joyo-ka system.

#### Survey of living conditions

#### Survey description

Status of the investigation by the local living environment in urban wastewater and sewage.

## 5. Expected development impact and effect on business development of the proposing SMEs in the surveyed country(ies) through proposed ODA projects

Do-joyo-ka system is energy-saving wastewater treatment technology developed in Japan. Therefore, It is said to be the suitable technology for sewer of underdeveloped and developing countries. Degradation capacity of the soil, has been evaluated in many places. Item demanded from small scale wastewater treatment plant.[ It is a technology that suppresses the occurrence of second pollution. Treatment technology that machine is few and simple. Construction costs and a maintenance cost are low. The water quality to discharge is good.]

Do-joyo-ka system is the waste water handling with which it can be satisfied of all the items

requested from a small scale treatment plant. Therefore, this technology can be said highly effective way if pollution of rivers by drainage has advanced area.

Development impact of business development.

Pollution load to the environment in the region that will be provided to expand the technology "Do-jyoka system" can be reduced, improving the water quality of rivers and ditches can be expected.

Do-jyoka system is prevented second pollution, living conditions will improve environmental protection of rivers and Bhutan.

By experiencing how to use the toilet stool and to deepen the understanding of the public health, that improves the life.

## 6. Proposals for formulating ODA projects

### (1) Dissemination and demonstration project proposal-private

Under consideration in the "dissemination and demonstration project proposal-private", and what there is a demand in the developed urgently in Bhutan.

1. Authorized by the Ministry of Education, the School of Bhutan, set up the "Niimi-trench".

2. Authorized by the Tourism Council of Bhutan, the flush toilet tourist destination, set up the "Niimi-trench".

3. Authorized by the Ministry of Health, hospitals and health facilities, set up the "Niimi-trench".

4. Authorized by each prefecture, public facilities, set up the "Niimi-trench".

### (2) The use of technical cooperation projects JICA, site design and guidance

small scale sewer planning is carried out of the village set in and around the city.

1. Authorized by the Ministry of Health, Implement the development of an environment in rural areas by small scale sewer.

1. Authorized by the Ministry of Works and Human Settlement, Implement the development of an environment in urban areas by small scale sewer.

# Feasibility Survey and Pilot Project Kingdom of Bhutan, Pilot Project on Small Scale Wastewater Treatment for the Improvement of the Quality of Water and Life

## SMEs and Counterpart Organization

- Name of SME : Moka-Joka System Co.Ltd.
- Location of SME : Wacore-Kanamecho bldg. 11-2 Nakamarucho,Itabashi-ku,Tokyo
- Survey Site · Counterpart Organization : Throughout the country of Bhutan, Ministry of Education

## Concerned Development Issues

- Wastewater caused serious environmental pollution due to rapid population growth in urban areas.
- Necessary to improve the living conditions in the suburbs there are outdoor toilet.
- Education for toilet has not been conducted in school. Environmental education need to do in school.

## Products and Technologies of SMEs

Solve the environmental problems of  
Bhutan using Do-joyoka system.

- Niiimi-trench
- Niiimi-system
- Soil deodorization

## Proposed ODA Projects and Expected Impact

- Installation of purification facilities and remodeling of school toilets in Bhutan by dissemination and demonstration projects JICA private proposal (business development type spread) .
- In order to preserve of public water quality by treatment facilities and renovation of school toilets in Bhutan ,Do environmental education.
- Will strive to improve the environment in Bhutan, parents of the students and student by change the perception of environmental issues.

## Future Business Development of SMEs

- By the increasing awareness of environmental protection,The sewer plan be required early.
- Do-joyoka system will be adopted,lead to the expansion of the business as a construction consultant.

