

Climate Change Adaptation Good Practices

by Japanese Private Sector
in Developing Countries

March 2023



This booklet was compiled as part of the Ministry of Economy, Trade and Industry of Japan's "Fiscal Year 2022 Study on Countermeasures for Issues related to Climate Change (Visualization of Contributions of Japanese Companies in Adaptation Fields in Developing Countries)" by Ernst & Young ShinNihon LLC, the project consultant.



Introduction

This booklet is presented as part of the “Fiscal Year 2022 Study on Countermeasures for Issues related to Climate Change (Visualization of Contributions of Japanese Companies in Adaptation Fields in Developing Countries)” by Ministry of Economy, Trade and Industry of Japan.

The global community has been facing more extreme and frequent weather events and natural disasters than in the past, as seen in the torrential rains, record heat and frequent wildfires, and these disasters impacting people's lives and livelihoods, economies, societies, infrastructures and other broad areas in a variety of ways. To address climate change, “measures for adaptation to climate change” are considered important as an approach to reducing the impacts of climate change which are already emerging and to preparing for potential risks, in addition to taking “mitigation measures” as an approach to curbing greenhouse gas emissions.

We believe that, for any country, engagement of the private sector in the climate change adaptation activities is necessary for its sustainable growth, and therefore we have been promoting participation of the private sector to such adaptation activities overseas. This booklet specifically showcases the good practices of Japanese companies' adaptation business in developing countries across a range of fields, including the fruits of support by the Ministry of Economy, Industry and Trade to date.

We hope that this booklet will help grasp image of adaptation businesses and ultimately contribute to the development of new businesses by the companies seeking such opportunity in developing countries.

Lastly, we would like to extend our cordial appreciation to all the companies for their cooperation on development of this booklet.

March 2023

Global Environment Partnership Office,
Industrial Science and Technology Policy and Environment Bureau,
Ministry of Economy, Trade and Industry of Japan

Explanatory Notes

In this booklet, each good practice is organized into seven promising areas in which the Japanese private companies can make an international contribution in the field of adaptation. Some good practices fall into more than one field. This booklet also describes the Sustainable Development Goals (SDGs) by the United Nations that are closely related to each good practice, as well as how each good practice addresses the challenges of climate change, out of ten issues identified based on the IPCC Sixth Assessment Report.

7 Promising Areas of Adaptation

- Resilient Infrastructure against Natural Disasters
- Sustainable Energy Supply
- Food Security & Strengthening Food Productive Base
- Health & Sanitation
- Climate Monitoring & Early Warning
- Secure Resources & Sustainable Water Supply
- Climate Change Finance

Related SDGs



10 Climate Change Challenges

- ① Sea level rise
- ② Droughts
- ③ Floods, heavy rain & typhoons
- ④ Extreme temperature changes
- ⑤ Water insecurity
- ⑥ Food insecurity
- ⑦ Air, water & land-based pollution
- ⑧ Spread of infectious diseases
- ⑨ Ecosystem loss
- ⑩ Economic loss & livelihood failure

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Sustainable Development Goals (SDGs)

1 NO POVERTY	7 AFFORDABLE AND CLEAN ENERGY	13 CLIMATE ACTION
2 ZERO HUNGER	8 DECENT WORK AND ECONOMIC GROWTH	14 LIFE BELOW WATER
3 GOOD HEALTH AND WELL-BEING	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	15 LIFE ON LAND
4 QUALITY EDUCATION	10 REDUCED INEQUALITIES	16 PEACE, JUSTICE AND STRONG INSTITUTIONS
5 GENDER EQUALITY	11 SUSTAINABLE CITIES AND COMMUNITIES	17 PARTNERSHIPS FOR THE GOALS
6 CLEAN WATER AND SANITATION	12 RESPONSIBLE CONSUMPTION AND PRODUCTION	

1. Development of anti-disaster information system for utilizing forestry preservation project

Kanematsu Corporation <http://www.kanematsu.co.jp/>

Hitachi Ltd. <http://www.hitachi.co.jp/>

Challenges Addressed | ③ Floods, heavy rain & typhoons, ⑨ Ecosystem loss

Adaptation Challenge Frequent forest fire and decrease in forest area due to climate change such as El Nino have led to deterioration of the function of eco system and rise in disaster risks in Indonesia.

Contribution The eco system recovery through forest conservation projects by Kanematsu reinforces physical response capacity to weather events and mitigate disaster risks. In addition, disaster information system built by Hitachi utilizing a flood simulator called DioVISTA/Flood contributes to minimizing the impact of disasters on human, etc.

Project Detail

■ Background

Country | Indonesia

Kanematsu launched a project in Boalemo Prefecture, Gorontalo Province 2011 to raise profits of local farmers suffering from loss of forests caused by forest fire and thereafter shifting from corn to high-quality cacao farming. In 2015, the project was adopted as the “REDD+ Project using Joint Crediting Mechanism (JCM)” and then the pilot project was materialized, under which initiatives are taken to reduce the greenhouse gas emissions to the targeted 86,000 CO2 ton annually for the entire project. A new value chain was established where cacao beans are produced for export to Japan through agroforestry, contributing to greater adaptability of local producers by raising their income. In 2018, the project was adopted as the “Feasibility Research Project towards Overseas Development of High Quality Infrastructure” by the Ministry of Economy, Trade and Industry of Japan and initiatives were launched for introduction of a flood simulator. Combining the disaster prevention information system and REDD+ Project, the project is expected to grow as a mitigation/adaptation cross-cutting project.

■ Business Model of the Project

The project is executed in collaboration with a major local conglomerate, the Gobel Group which is a partner in the REDD+ Project. The Group helps in the sales coordination/management of disaster prevention information system to the prefectural governors and local heads of Gorontalo Province. In addition, the project is pursued through network of various partners, including, Pasco Co., Ltd, map data provider and Tokyo Food Co., Ltd. for sale of cacao in Japan.

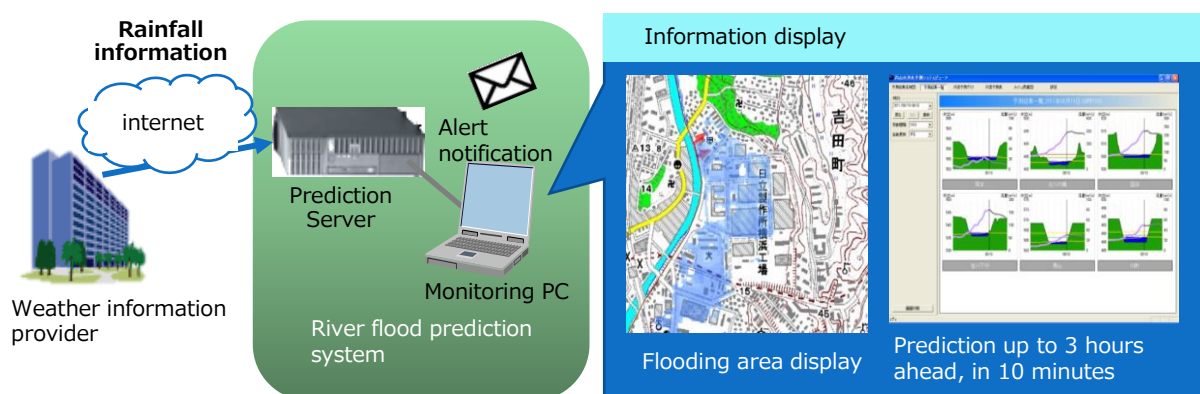


▲Implementing Agroforestry



Product & Technology

DioVISTA/Flood: A software developed by Hitachi Power Solutions Co., Ltd. for simulation of floods which is used extensively for prediction of inundation areas by local governments, preparation of flood hazard maps by the central government and prefectures, and quantification of flood risks by insurance companies. The software is equipped with user-friendly functions such as 3-dimension GIS and high-speed simulating calculation functions using the patented technology of Dynamic DDM to enable non-experts to conduct a high level of simulation.



▲DioVista/Flood System Overview

Key to Success & Challenges for Further Development

- The project is supported by a strong partnership with the local partner Gobel Group having an extensive network with public and private sector stakeholders.
- Raising awareness for disaster prevention is imperative for further growth.

Profile of Project Company

Kanematsu Corporation was founded in 1889 as a general trading firm under the motto of "Contribution to society through creation of business". The Company strives to become a company that grows together with customers and incessantly aims for the creation of business. Setting "Environment, Society and Governance" as the key management principle, the Company considers climate change business as its management foundation and promotes REDD+ activities as part of the climate change business such as forest conservation, sustaining lives of local residents, and biodiversity conservation. In addition, the Company incorporates climate change adaptation as part of the environment policy.

Hitachi Ltd. was founded in 1910 and is one of the largest industrial electronics companies both in Japan and in the world. The Company promotes its founding strength of operation/control technology and social innovation projects incorporating IT and cutting-edge digital technology to solve social challenges and create new value. As an innovation partner in the IoT era, the Company strives for social innovation projects in areas of electricity/energy, industry/distribution/water, urban and finance/society/healthcare.

2. Examining the Earth as “Earth Doctor”

Kawasaki Geological Engineering Co., Ltd. <http://www.kge.co.jp/>

Challenges Addressed | ③ Floods, heavy rain & typhoons, ⑩ Economic loss & livelihood failure

Adaptation Challenge Disasters triggered by floods and landslides on account of climate change and frail soil foundation attributable to the tropical monsoon climate bring considerable damage.

Contribution Kawasaki Geological Engineering has contributed to the establishment of a disaster-resilient public infrastructure through its unique technology and know-how that have effectively been translated into landslide disaster prevention and mitigation.

Project Detail

■ Background

Country | Vietnam

The Project was selected for the “Climate Change Adaptation Effect Visualization Project” by the Ministry of Economy, Trade and Industry of Japan from 2013 to 2015. Despite its initial plan to cover the entire Great Mekong Subregion which is highly vulnerable to climate change, the Project was first launched in Vietnam where the framework of project execution was established earlier than any other country.

■ Business Model of the Project

A local representative office was set up in 2014 for the launch of consulting services and raising awareness of the government and corporations. The Project successfully secured a deal from EVN (Electricity of Vietnam). Kawasaki Geological Engineering also conducted a survey, design and construction relevant to landslides and constructed evacuation warning systems, proposed landslide prevention methods and implemented countermeasures in the landslide-hit area of Dalat, a sightseeing spot in Vietnam. In the future, the Company intends to expand the business in Vietnam through technical/business tie-ups or capital alliances.



▲ Completion of landslide countermeasure works by well and drilling in Dalat city



Product & Technology

The Company renewed its existing technologies both in terms of hardware and software for the prevention and mitigation of incline disasters and enabled the technologies to be operated successively and sustainably in Vietnam.

Monitoring System, Early Warning System : Exploration and measurement technologies, prediction technology of incline disasters, various analysis technology, assessment technology of potential outbreak of incline disasters using AHP (Analytic Hierarchy Process), design technology of landslide evacuation warning system leveraged on various measurement devices.



▲Emergency Survey and Installation of Monitoring Post for Prevention of Landslides

Packaging of Disaster Prevention and Mitigation Technologies: Packaged with the technologies above with helicopter laser measurement offered by partner company, Nakanihon Air Co., Ltd., geomorphic analysis technology such as satellite image processing, and the GIS (Geographic Information System) technology for general management. Local deployment and technical guidance of Japanese landslide countermeasure technology through planning and construction.



▲Illustration of Landslide Hazard Map

Key to Success & Challenges for Further Development

- Support from local construction consulting company through the relationship built on the feasibility study has led to the successful delivery of the project from EVN and the City of Dalat.
- In Vietnam, demands for prevention and mitigation works have been increasing steadily.
- Going forward, while continuing its efforts of raising awareness and developing engineers on a long-term basis for disaster prevention and mitigation, the Company plans to focus on the service orders and outsourcing demands from other companies for employee training and technical assistance to cope with challenges including risk management due to different business practices. It also plans to strengthen cooperation with Japanese companies that have entered the local market to create a sustainable business environment.

Profile of Project Company

Kawasaki Geological Engineering Co., Ltd. was established in 1943 as Japan's pioneer in geological survey. The Company upholds hands-on approach and offers a comprehensive package of survey, analysis, reporting and consulting leveraged on the geophysical exploration and field measurement technologies. Based on the corporate philosophy of “Examining the Earth (Earth Doctor)”, the Company's business scope stretches from land surface, underground, rivers to oceans across the Earth and provides diagnosis and consulting on each symptom for the establishment of a safe and affluent society. The Company also acts as a geological consultant overseas in the fields of ocean and energy (including renewable energy), soil and geophysical exploration, disaster prevention and environmental survey. It also conducts soil exploration and natural environmental assessment besides incline disaster prevention mainly in Vietnam.

3. Water projects for realization of cooperative and rich society

Kubota Corporation <http://www.kubota.co.jp/>

Challenges Addressed | ③ Floods, heavy rain & typhoons, ⑦ Air, water & land-based pollution

Adaptation Challenge Frequent floods and droughts as well as water contamination due to climate change seriously affect society and economy of many developing countries that are highly vulnerable to climate change.

Contribution Kubota contributes to resilient infrastructure and supply of secure and safe water through its technologies, such as pipes used for water supply and sewage water facilities, drainage and irrigation pumps, water treatment membranes and wastewater treatment plant, which serve as adaptation measures against floods and water pollution.

Project Detail, Product & Technology

■ Background

Country | UAE (Abu Dhabi), Bangladesh, Thailand, Vietnam, Myanmar, etc.

Kubota is tackling to solve the problems of developing countries through the products and technologies developed in Japan, such as pipes, pumps, and water treatment.

■ Business Model of the Project

Kubota conducts design, construction and supply products for water related project in developing countries etc. The following are some of the project cases.

Abu Dhabi: Ductile Iron Pipe that supply secure and safe water under harsh environment

In Arab countries where 70% of the land is desert, household, industrial and agricultural water depends on desalinized seawater. The highly-durable ductile iron pipes supply safely this precious desalinized water throughout the region.

Bangladesh: Dual purpose pump station for Flood and Droughts

In Bangladesh, rivers cover 10% of the land surface and the land is only 9m above sea level or below. In such environment, flooding during the rainy season and droughts during the dry season are a major problem.

Thus, a project was launched to surround a specific area by levees, Kubota pumps were installed in the pump station that drains and draws water. Since the project was launched, agricultural harvest in this area has doubled. Kubota pump is thus contributing to the infrastructure for both flood prevention and agricultural development.

Thailand: Drainage pumps that contribute to the reconstruction from the flood.

The 2011 Thailand floods that occurred mainly in the Chao Phraya River basin, Japanese government dispatched the Kubota's mobile pump trucks, and engineers of Kubota were dispatched as an international emergency disaster relief team.

The pumps can empty a 25m-pool filled with water in just 10 minutes, weighing 95% less than conventional pumps. The feature of its high mobility enabled quick recovery from flood in various parts of Thailand.



Project Detail, Product & Technology (Continued)

Vietnam: Johkasou (Wastewater treatment tank) that improve hygienic environment in developing countries.

Poor hygiene is posing serious threat to developing countries where rapid urbanization outpaces the development of sewage facilities.

Kubota contributes to the improvement of hygiene and reinforcement of urban infrastructure in developing countries utilizing Johkasou that enable the treatment of sewage on site.

Myanmar: Water Purification and Treatment Plant that environmental friendliness through comprehensive water solution.

Kubota has built water infrastructure including water purification plant, wastewater treatment plant and water supply system in the first SEZ in Myanmar, to which Kubota has exported agricultural machinery and irrigation pumps for over 60 years.

These technologies have significantly contributed to the Thilawa SEZ in terms of harmony with surrounding environment and sustainable economic growth of Myanmar.



▲ Ductile iron pipe



▲ Dual purpose pump station



▲ Drainage works by the Japan Disaster Relief Team



▲ Johkasou in hospital



▲ Water purification plant built in Zone A, industrial park in the Thilawa SEZ

Key to Success & Challenges for Further Development

- Kubota strives to explore market opportunity in areas of "food, water, environment" as the common global agenda through its long-established brand strength and close-knit network with local community.
- In Myanmar, Kubota has supported industrialization for years and been engaged in activities to build capacity in the area of water environment while supporting and training engineers.

Profile of Project Company

Established in 1890, Kubota Corporation is Japan's largest manufacturer of agricultural machinery. The product line-up also includes small construction machinery, small industrial engines, pipes, pumps and environment-related plants. Under the corporate philosophy of "Contribution to society through business", Kubota has been delivering what society truly needs in the form of products, technologies, and services including increased food production and saving labor through agricultural machinery. Kubota also upholds "For Earth, For Life" and setting SDG's, the world's common themes, as its compass. Kubota Group will keep striving to realize the abundant living environment and development of society through tackling the global challenges in the area of "Food", "Water" and "Environment". In the area of water environment, Kubota aims at solving challenges through the provision of total solution services including individual equipment to after-sale systems diagnosis services leveraged on IoT.

4. Protecting society and infrastructure from slope disasters

Kokusai Kogyo Co., Ltd. <https://www.kkc.co.jp/>

Challenges Addressed | ③ Floods, heavy rain & typhoons

Adaptation Challenge Frequent slope disasters due to torrential rain triggered by climate change pose serious threats to socio-economic activities in many developing countries where technical know-how for measures against slope disasters is not readily available.

Contribution Kokusai Kogyo, with its expertise in disaster risk reduction utilizing geospatial information and technical slope disaster management, is contributing to the establishment of resilient infrastructure and of systems for monitoring and early warning in developing countries. These measures are the concrete countermeasures for heavy rainfall disasters caused by climate change.

Project Detail, Product & Technology

Background

With the increasing frequency of natural disasters in recent years many developing countries are facing these disasters. Kokusai Kogyo is providing support for the development of sustainable national infrastructure in these developing countries, utilizing its disaster risk reduction measures built on the geospatial information technology developed in Japan, which is frequently struck by natural disasters.

Business Model

As an example, to counter slope disasters, Kokusai Kogyo has introduced both physical infrastructure initiatives such as river works (sabo dams), and 'soft' initiatives such as real-time measurement system and hazard mapping as well as the organization of the administrative structure required for early warning/evacuation systems and the drafting of manuals. Projects in developing countries mainly consist of ODA projects by the Japan International Cooperation Agency (JICA) and other profit-aimed SDGs activities.

Country | Ethiopia, Brazil, Bhutan



▲ Expert advisors conducting a survey of Landslide points along the Abay River Gorge



▲ Local training for developing hazard maps.

Ethiopia: Project case on the management of river gorge slopes (physical and 'soft' measures)

Route 3 is a major highway in Ethiopia running through one of the country's largest granaries which also serves as a crude oil pipeline from South Sudan. The highway turns into an obstacle to economic activities during the rainy season that triggers frequent landslides along the route passing through the Abay River Gorge. Kokusai Kogyo participated in the JICA ODA project for developing countermeasures against landslides. Measures implemented include the streamlining of relevant administrative structures, preparation of handbooks, emergency countermeasures against landslides (surveys, decisions about countermeasure work and construction) and mid-to-long term countermeasures (surveys/analysis, design, construction/maintenance and management).



Project Detail, Product & Technology (Continued)

Brazil: Support for overarching reinforcement of landslide disaster management ('soft' measures)

Damage from landside disasters is on the rise in Brazil due to the expansion of habitats into disaster-risk areas under rapid urbanization and the impact of climate change. Kokusai Kogyo participated in a technical cooperation project of JICA and implemented measures such as the assessment of landslide disaster risks in the pilot area and urban expansion planning based on the assessment, preparation of disaster prevention manuals, and the reinforcement of comprehensive disaster response built on structural measures against mudslides and rockslides. The project was awarded the United Nations Sasakawa Award for Disaster Reduction in 2017. Kokusai Kogyo currently seeks to introduce the project outside the pilot areas through manual-based training.

Bhutan: The Project for Capacity Development on Countermeasures of Slope Disaster on Roads (physical and 'soft' measures))

Bhutan is mostly made up of steep mountainous areas and most roads face steep slopes. Frequent slope disasters caused by the increasing occurrence of extreme weather events hinder economic activities. Kokusai Kogyo participated in a technical cooperation project of JICA and implemented 'soft' measures such as the inspection/diagnosis of slope disasters, establishment of a slope disaster risk reduction database and ex-ante traffic control, as well as physical measures such as countermeasures for road slope failures and debris flow disasters, resulting in the overall improvement of road slope disaster prevention technology in Bhutan.



▲ Installation of monitoring sensors for ex-ante traffic control as components of a smartphone-based road information system

Key to Success & Challenges for Further Development

- Contributing factors to growth in business include growing the demand for disaster risk reduction measures in the target countries, recognition of high quality disaster risk reduction technologies from Japan, the effects of slope disaster countermeasures that are easy-to-visualize, and the implementation of ODA projects.
- Inefficient communication due to the lack of coordination among relevant government agencies in the target countries was improved by supporting relationship building through the clarification of tasks, regular meetings, technology transfer among groups and organized training in Japan.
- In June 2018, a joint venture was established with a Taiwanese local partner. Through the localization of business, Kokusai Kogyo strives for profit-aimed SDGs activities with the key focus on local communities, mainly in Southeast Asia.

Profile of Project Company

Kokusai Kogyo Co., Ltd. is the core subsidiary of the Japan Asia Group. Since its establishment in 1947, Kokusai Kogyo has utilized its geospatial information technology in the fields of construction consultancy, geological/marine survey, disaster risk reduction/mitigation, and environmental energy. Under the Group Mission of "Save the Earth, Make Communities Green" and regarding climate change as a solution for social challenges, Kokusai Kogyo is engaged in various adaptation and mitigation activities, including disaster risk reduction and social infrastructure. Kokusai Kogyo is a member of the United Nations Global Compact (UNGC) since 2013 and a private sector group of the United Nations Office for Disaster Risk Reduction (UNDRR) since its inception in 2011.

5. Strengthening the resilience of mountain roads through capacity building on slope disaster prevention

Japan Conservation Engineers & Co., Ltd. <https://www.jce.co.jp/en/>

Challenges Addressed | ③ Floods, heavy rain & typhoons

Adaptation Challenge As heavy rainfall is becoming more frequent due to climate change, it is important to implement slope disaster prevention measures in parallel with road maintenance, especially on mountain roads. However, developing countries often lack knowledge on design and implementation of slope disaster prevention measures.

Contribution Japan Conservation Engineers (JCE) contributes to the development of climate-resilient mountain roads, by supporting the capacity building of local road maintenance-related companies (including consultants and EPC contractors) and conducting the design and implementation of slope disaster prevention measures together.

Project Details

■ Background

Country | India, Vietnam, Sri Lanka, Nepal, Afghanistan, etc.

Developing countries have developed expertise in road maintenance and the formulation of disaster prevention guidelines through ODA schemes, but often lack knowledge on the planning and implementation of disaster prevention measures, and roads are often cut off when disasters occur. This situation can be also seen in Assam, India, where there is a need to implement disaster prevention measures in parallel with road maintenance, especially for mountain roads where the slope disaster risks are increasing due to the increasingly frequent heavy rains. In addition, even if disaster prevention measures are planned in public works, there is a lack of knowledge in design and construction, and capacity building for local road maintenance-related companies is needed. In order to promote effective implementation of disaster prevention measures, JCE is working on establishing a capacity building support business for local companies.

■ Business Model of the Project

In Assam, JCE provides support for slope disaster prevention measures on mountain roads that are designated for maintenance. To enable sustainable maintenance, JCE supports capacity building of local consultants and EPC contractors who bid for the road maintenance, while working together on planning slope disaster prevention measures. In 2022, under the feasibility study scheme of the Ministry of Economy, Trade and Industry, Japan, JCE is considering financing methods for the road projects. In the future, JCE aims to support in creating a mechanism that facilitates collaboration between companies that conduct road maintenance and disaster prevention projects.



▲ View of the mountain road where the slope collapsed due to heavy rain



Product & Technology

Support for design and implementation of slope disaster prevention measures: JCE supports the knowledge transfer of information gathering, identification of issues, and consideration and implementation of slope disaster prevention measures, in order to enable local stakeholders to plan and implement measures on their own. JCE is characterized by providing both top-down support, such as the preparation of guidelines and technical seminars on slope disaster prevention measures for local governments, and bottom-up support, such as capacity building for local consultants and EPC contractors on slope disaster prevention measures and grassroots-level activities in response to the needs of local communities. The bottom-up support on the capacity building for local companies includes not only advanced on-desk simulations but also detailed field surveys such as borehole investigations, as well as knowledge transfer on the consideration and basic design of appropriate measures (one or a combination of multiple measures) based on the field surveys, and guidance to construction companies on quality-assured construction works.



◀ JCE's approach in developing countries

Key to Success & Challenges for Further Development

- Through on-site detailed field surveys and understanding of the current conditions of mountain roads, JCE is able to consider appropriate measures for the respective sites.
- On the other hand, considering the existing policies and difficulty in securing financing methods, local governments find it difficult in implementing slope disaster prevention measures in parallel with road maintenance. JCE plans to first support local governments in designing slope disaster prevention measures by utilizing available capacity building schemes.

Profile of Project Company

Established in May 1966, JCE is a construction consulting firm with over 400 specialists that provides consulting services on the countermeasures for landslides, slope failures, debris flows, and other sediment-related disasters. JCE has been conducting various disaster prevention projects throughout Japan under the support of the Ministry of Land, Infrastructure, Transport, and Tourism and the Forestry Agency of the Ministry of Agriculture, Forestry, and Fisheries. In recent years, JCE also began providing training on disaster prevention and evacuation. In 2016, JCE launched its international department to deploy its services overseas, mainly participating as experts in ODA projects as well as NGO financial cooperation by the Ministry of Foreign Affairs.

6. Protecting local community from threat of high tide and sea level rise

TAISEI CORPORATION <http://www.aisei.co.jp/>

Challenges Addressed | ① Sea level rise

Adaptation Challenge Island nations are vulnerable to high tides due to insufficient height above sea level and are at the brink of submersion due to rising sea level associated with global warming.

Contribution TAISEI CORPORATION builds robust yet eco-friendly seawall in such vulnerable areas. In addition to enhancing disaster preparedness, the Company plays a key role in socioeconomic infrastructure and secure lives and assets of island people. Building robust seawall serves as an adaptation measure in the field of infrastructure.

Project Detail

■ Background

Country | Maldives

Male Island in the Maldives has been repeatedly hit by high tides due to flat landscape which is only 1.5 meters above sea level. Unusually high tides in 1987 and 1988 wrecked existing seawall structures and residences, paralyzed government operations and the total damage was worth 6 million US dollars. The Island is also at the brink of submersion due to the sea level rise associated with global warming. The Maldives is heavily dependent on the import of construction materials and much of the concrete aggregate was delivered from neighboring Malaysia and Singapore. Water for construction and domestic use by workers came from desalinated sea water. To conserve natural environment from adverse effects of construction, the Company set out self-disciplinary principles and refrained from coral stone mining. All such efforts bore fruit at the time of major earthquake off Sumatra in December 2004 when the Island had no human casualty and very little collateral damage which significantly contributed to saving human life and maintaining key government functions.

■ Business Model of the Project

The Japanese government offered grant aid to support the construction of seawall. TAISEI CORPORATION took on the construction of breakwater along the south coast of Male Island in 1987 which stretched 6 kilometers around the Island as robust seawall.



▲ Bird's-eye view of Male Island



Product & Technology

- Sloped revetment using ripraps and tetra pods
- Vertical seawall using concrete blocks and caissons (large concrete or steel boxes used in construction of seawall and other underwater structures or underground structures) and others

The traditional seawall built by the government of Maldives is made of piled coral mass coated with mortar and is vulnerable to wave pressure. Thus the Company applied the above-mentioned technology to build a staunch and durable seawall for long use which helps to mitigate maintenance burden while enhancing disaster preparedness.



▲Visual Illustration of Seawall

Key to Success & Challenges for Further Development

- High-quality infrastructure was developed through the construction of eco-friendly seawall reflecting local demand. Next focus is to improve cost-competitiveness and technological differentiation for further development.

Profile of Project Company

TAISEI CORPORATION was founded in 1873 and established itself as one of five super general contractors, with unique strength in large-scale construction and civil engineering works including skyscrapers, airports, dams, bridges and tunnels. Its core competence lies in technology and close-knit group structure built on its early presence overseas. The Company won the submarine tunnel project under the artificial "Palm Island" off Dubai with much credit to its groundbreaking proposal outshining European and American competitors. The Company was also highly accredited for its consideration on environmental aspects by local community (catching fish feared to be affected by construction works beforehand and releasing them upon completion, or restoration of seaweed bed). Under the group philosophy of "Creating a Vibrant Environment for All Members of Society", TAISEI CORPORATION, through its construction activities, strives for the development of high-quality social infrastructure and improvement of the living environment in harmony with nature. The company recognizes "the realization of a sustainable and environment friendly society" as a material ESG initiative.

7. Methodology for prevention of soil surface erosion with soil algae (BSC methodology)

Nippon Koei Co., Ltd. <https://www.n-koei.co.jp/english/>

Challenges Addressed | ③ Floods, heavy rain & typhoons

Adaptation Challenge Biological Soil Crust (BSC) method prevents soil erosion due to increased rainfall intensity caused by climate change and accelerate the succession of surrounding vegetation by spraying materialized soil algae, which are widely distributed around the world, from frigid to torrid zones. BSC method contributes to resolve the issues by quickly initiating natural vegetation succession in accordance with the site conditions.

Contribution Nippon Koei (NK) developed a technology to prevent soil erosion by using soil algae in collaboration with Public Works Research Institute (PWRI), in the course of a research on countermeasure to the red soil problem that was polluting the rivers and coasts of the southwestern islands.

Project Detail

■ Background

Country | Nepal, Malaysia

During research on countermeasures to red soil runoff in Okinawa, NK discovered that the amount of sediment runoff was lower in areas where soil algae had developed. Subsequently, the amount of sediment runoff was reduced to 1/10 to 1/20 in fields where BSC was formed. NK, jointly with PWRI obtained the patent right in Japan of BSC method in 2009. The patent right was granted in Malaysia and Indonesia, and is currently under patent examination in India and other seven-~~(7)~~ countries and at the European Patent Office (EPO).

In collaboration with Nikken Sohonsa Corporation (Hashima City, Gifu Prefecture), which has algae cultivation technology, BSC material production was commercialized as civil engineering material, and it was registered in the Ministry of Land, Infrastructure, Transport and Tourism's New Technology Information System (NETIS) in 2018 and selected as a technology to promote utilization in 2022. In addition, as a JICA project to promote dissemination of private-sector's technology for social and economic development in developing countries, NK conducted demonstration of BSC method, slope restoration technology that uses soil algae to prevent slope erosion in Nepal to promote understanding of its usefulness (February 2019 - March 2021). Based on this experience, demonstration and monitoring of BSC method and market survey for business development are currently underway in Malaysia (May 2022 - August 2023).



Just After Spray
After 3 Months



▲BSC material▶

■ Business Model of the Project

Planning and implementation service including production and sales of algae material (BSC-1), site evaluation etc.



Product & Technology

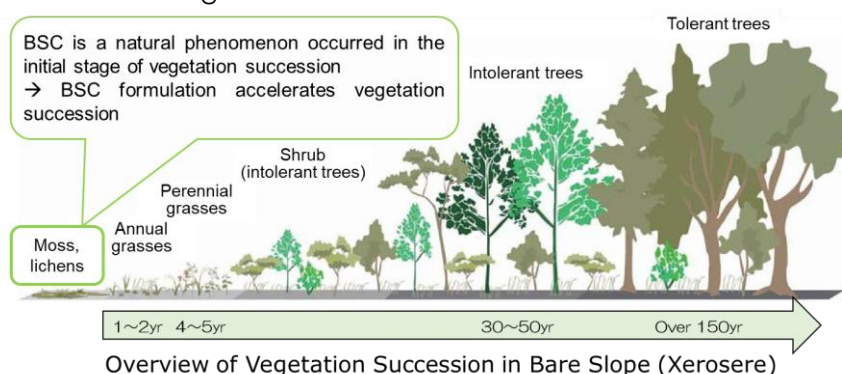
1) In the initial stage of vegetation succession, BSC (soil surface covered with algae, moss, etc.) is formed naturally, and as the environment improves, grass and other vegetation grows, followed by trees. By taking advantage of this phenomenon, this technology enables the formation of BSC in a short period (2 weeks to 1 month) by spreading soil algae and allowing them to dominate on the surface of the soil.

2) Soil algae applied in BSC method is cosmopolitan species, habituating globally from the north to south pole. Besides, since it is hermaphrodite and increases by clonal proliferation, there is no risk of hybridization and genetic disturbance. Thus, it can be applied in those areas which do not accept intrusion of invasive species such as nature parks, although the conventional methodology for slope protection and vegetation recovery such as seed spray method is not allowed to be applied in such area due to potential contamination of seeds of invasive species.

3) This methodology does not need to cast cement on slopes nor to put up a wire lath net, but need only to spray liquid of soil algae on the slope surface using conventional spraying equipment, which is easier than the conventional methodologies.

4) BSC method can be applied in combination with existing methods such as seed spraying, vegetation sheet/mat covering works, if the site is not in protected areas.

5) Helicopters/radio-controlled helicopters can be used for spraying in mountainous areas.



Key to Success & Challenges for Further Development

After joint development with the PWRI, Nikken Sohonsa and NK collaborated and established mass production prospect. BSC method has been applied to natural parks and the areas where conventional methods cannot be applied, and has been steadily yielding results. In addition, outside of protected areas, BSC method has been increasing its sales by combining with existing methods and aerial spraying in mountainous areas. The challenges for future overseas expansion include building up track records of test construction in each country, public relations, collaboration with existing greening product suppliers, and cost reduction through local production of materials.

Profile of Project Company

Nippon Koei Group is a construction consultant company with No.1 sales in Japan that supports the safety and security of people's life and living around the world. Since the establishment in 1946, it has been engaged in solving social issues as a leading company in Japan through the business of developing social infrastructures and have developed sustainable businesses that are fundamental to national and human development in more than 160 countries and regions. Various projects related with adaptation and mitigation of climate change have been implemented both in Japan and overseas.

8. Disaster risk reduction by river water level alarm system

Unimation System Inc.

<https://www.unimation.co.jp/index.html>

Challenges Addressed | ③ Floods, heavy rain & typhoons

Adaptation Challenge In the Philippines, measures to prevent or reduce disaster is an urgent issue because Philippines is affected by climate events such as typhoons. Especially, frequent occurrence of river water flooding due to undeveloped sewage system and lack of technology and institutional capacity for disaster management cause serious disaster risk.

Contribution River Water Level Alarm System of Unimation System Inc. can send alert of occurrence of river water flooding to local people, collect information of river water level, and control/forecast occurrence of flooding for wide area in high disaster risk area. The Alarm System of Unimation System Inc. contributes to prevention of disaster and reduction of disaster risk for local residents even though it is worried that typhoon becomes larger with higher frequency due to climate change.

Project Detail

Background

Country | Philippines

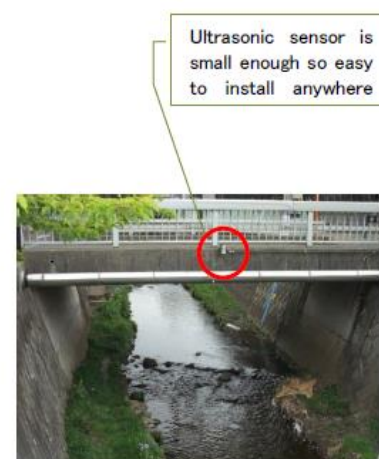
Unimation System Inc. (herein after Unimation) is a specialized company dealing in equipment for disaster prevention such as River Water Level Alarm System, Flood Warning Unit for Road, and Flood Warning System and has been selling the equipment in Japan. After the major flood disaster in Thailand in 2011, Unimation found that its technology and products are in need in countries outside Japan, and hence started thinking about developing its business abroad. Afterward, they has joined Grassroots Technical Cooperation Project (City of Iloilo, Philippines) using JICA Business Model Formulation Survey and JICA Verification Survey ("Establishment of Disaster Prevention System using River Water Level Alarm System in Philippines" in Cebu City and Talisay City etc. in Metro Cebu) and examined their business development in developing countries where seriously causing disaster such as flooding.

Business Model of the Project

Unimation implemented the Project in cooperation with concerned government staff and other stakeholders through JICA scheme. Unimation aims at expanding services in Southeast Asia from Metro Cebu in Philippines with consideration for advantages for sales promotion such as large population, strong initiative for inviting foreign investment, and rather short distance from Japan.



▲ River Water Level Alarm System



▲ Image of Setting of Alarm System

Related SDGs



Product & Technology

River Water Level Alarm System: The equipment continuously monitors water level of river and when a preset trigger level (6 levels of water level can be set) is reached, warning signals are instantaneously released by rotating warning lights, sirens and speakers, as well as by emails sent to pre-registered email addresses. Lead time of alarm can drastically shorten because the equipment sounds the alarm by itself. Moreover, the system lower cost than other alarm system because server is not necessary for the system.

Flood Warning Unit for Road: The equipment uses a the sensor which can be installed in narrow place such as side of road and can call attention in the place where water is retained easily such as under path, elevator pit, and drainage ditch. Even if communication system stops due to disaster, the system can detect current water level and increasing water level of current location and display, warning signals, and alarm can be activated and pedestrians and cars can be alerted.



▲Flood Warning Unit for Road

By installation of the abovementioned equipment, alarm of flooding and evacuation signal are given and human damage can be minimized. Moreover, required maintenance for the equipment is only cleaning its cover. The cost for establishment of disaster prevention system tends to be lower than other large scale systems.



▲Installation of Alarm Unit (City of Iloilo)



▲Installed Alarm Unit (City of Iloilo)

Key to Success & Challenges for Further Development

- To promote development of the business in Philippines, Unimation installs River Water Level Alarm System and also cooperate with another company (company skilled at radio wireless) and is able to propose more effective solution for needs in the site. It's effective to cooperate with another company for developing business in developing countries because integrated solution including various equipment and technology is often required.
- In developing countries, needs of disaster prevention is bigger, however, installation of equipment is often difficult because of cost. Initial and maintenance cost of Unimation's equipment is lower than other company's. However, to develop sales channel in Southeast Asia, it's necessary to produce equipment in Philippines and develop low cost model.

Profile of Project Company

Since the foundation of the company in 1979, Unimation specializing in disaster prevention products, has manufactured, sold, and developed its flood early warning system, and also developed a website related to flood early warning system along with management services. Unimation sells and produces River Water Level Alarm System, Flood Warning Unit for Road, Flood Warning Sensor, ultrasonic sensor etc. and contributes for prevention and reduction of disaster in local areas in Japan.

9. Disaster prevention system through real-time image data distributed by river monitoring cameras

eTrust Co., Ltd. <https://www.etrust.ne.jp>

Challenges Addressed | ③ Floods, heavy rain & typhoons

Adaptation Challenge Typhoons, hurricanes, and torrential rains, which are becoming more severe due to climate change, can cause river overflows and floods, putting human lives and infrastructure at risk.

Contribution eTrust's disaster prevention system using river monitoring cameras can help reduce the risk of disaster by providing real-time information on river conditions to local residents and others, thereby identifying the risk of overflows and floods in advance.

Project Details

■ Background

Country | Malaysia, Philippines, Bangladesh, Brazil, etc.

The disaster prevention system using river monitoring cameras introduced in Nagaoka City, Niigata Prefecture, Japan, has been well received. The company is considering disseminating the system to developing countries from a low price range. Starting with the Philippines, the company has introduced disaster prevention systems to Malaysia, Myanmar, Bangladesh, and Brazil.

■ Business Model of the Project

Malaysia: Disaster prevention system using low cost and high-performance water level gauges

eTrust Co., Ltd participated in "3L Water Level Gauge Test Construction Project" led by Ministry of Land, Infrastructure, Transport and Tourism for the purpose of introducing Japanese water level gauges. eTrust's water level gauges and cameras have been installed in a river in Kuala Lumpur to demonstrate their usefulness.

Philippines: Local economy-based disaster prevention system for farming villages around the lake

In order to monitor changes in tributaries flowing into Laguna Lake, the largest lake in the country, six cameras and water level gauges were installed through JICA's Grassroots Technical Cooperation Project. A workshop was held to provide lectures on system operation and management methods.

Bangladesh: Disaster prevention system using solar power and wireless communication

Through a feasibility study under the then Ministry of Foreign Affairs of Japan's ODA Overseas Economic Cooperation Project, cameras and water level gauges were installed along the Meghna River. The system demonstrated that it is possible to collect and transmit river information even in an environment where infrastructure such as power and communication lines are not yet in place.

Brazil: Disaster prevention system using network infrastructure

As part of a research project commissioned by the Ministry of Internal Affairs and Communications Japan, three cameras and a water level gauge were installed in the lower reaches of the Iguaçu River. The acquired data was transmitted to the local disaster prevention bureau and fire department. When the water level reaches a dangerous level, an alert e-mail is sent, supporting the prompt issuance of evacuation warnings.

Related SDGs



Product & Technology

Cloud-based disaster prevention monitoring system STAND GUARD: By using solar panels as the power source for the river monitoring cameras, the system can be installed in off-grid areas. The system is completely wireless, and its high-performance cameras allow for clear vision of river conditions even at night. By automatically capturing images of the river at regular intervals and transferring the data to the cloud through cellular phone lines, it is possible to provide real-time and past photos of the river on a dedicated management screen or website. In addition to the basic equipment, by installing a water level gauge and an anemometer, meteorological data can also be measured. A new feature is the automatic generation of time-lapse video using images for a day, which can be used to analyze disaster situations. Furthermore, the system is also used to monitor coastal areas, mountainous areas, construction sites, mega solar power plants, and illegal dumping.

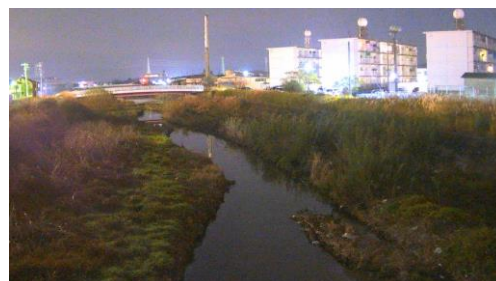


▲ Equipment configuration



▲ Website and smartphone screens

Clear images can be seen even at night ►



Key to Success & Challenges for Further Development

- This is a disaster prevention system developed in-house in response to the needs of Japanese municipalities, and is less expensive than products from major manufacturers, making it easy to introduce to developing countries.
- Technical know-how is required for the installation of river monitoring camera systems, and it is important to establish a local maintenance and management system.

Profile of Project Company

Established in 1935 as a motor repair business in Nagaoka City, Niigata Prefecture. Since establishment, the company has made it a management policy to continue to be "a presence needed by society" and has developed its business activities centering on the telecommunication industry. Since the 2004 Chuetsu Earthquake and flood damage, together with Nagaoka City, the company began developing a disaster prevention monitoring system for the city called Nagaoka Disaster Prevention Information System, and has continued to develop disaster prevention systems ever since.

10. Functional paving materials made from waste roof tiles and bricks to reduce urban flooding and heat island effect

ECOSYSTEM Inc. https://eco-system.ne.jp/index_eng.html

Challenges Addressed | ③ Floods, heavy rain & typhoons, ④ Extreme temperature changes

Adaptation Challenge Torrential rains, typhoons and hurricanes have been occurring more frequently due to climate change. In urban areas, ground surfaces are paved with asphalt and concrete, making it difficult for water to seep into the ground and be absorbed. Therefore, urban flooding occurs when rainfall and water levels exceed sewage treatment capacity. Moreover, rising temperatures will exacerbate the heat island effect, causing health problems and ecological changes.

Contribution ECOSYSTEM contributes to reducing urban flooding and the heat island effect by paving the ground with waste roof tiles and bricks that have permeability and water retention properties.

Project Details

Background

Country | Vietnam

Ceramic products such as roof tiles and fired bricks, which are used as raw materials for pavement, are found in many parts of the world, especially in Europe, Southeast Asia, and South America. In order to capture this market, ECOSYSTEM is considering expanding overseas. In Vietnam, it is conducting a feasibility study and demonstration project with support from the Ministry of the Environment, Japan.

Business Model of the Project

In Vietnam, construction waste materials and substandard products from tile and brick factories are disposed of as industrial waste in landfills or illegally dumped. However, local partners will contract with ECOSYSTEM to purchase plants manufacturing paving materials, procure waste tiles and bricks, reuse them, and sell them to private companies and public organizations. Since plants manufacturing paving materials can be assembled locally, ECOSYSTEM plans to contract with a local company for local plant assembly and maintenance in the future.



▲Discarded construction waste materials
(roof tiles and bricks)



▲Test construction



Product & Technology

Waste roof tiles and bricks are crushed by crushers to produce gravel and sand products, which are then used as gardening materials, tile chips, and paving materials. Since tiles and bricks are porous, water-permeable and water-retentive pavement materials using these materials can reduce urban flooding and the heat island effect. In addition, a ready-mixed concrete plant is usually required for pavement construction, but since it is expensive, ECOSYSTEM developed a low-cost, mobile, vehicle-mounted manufacturing plant called Mobacon. Because paving material needs to be applied before it hardens, paving material produced at fixed ready-mixed concrete plants can only be used within a radius of 1.5 hours. However, Mobacon makes it possible to manufacture paving material at the same location where it is used, thus eliminating limitations on the work area.



▲ Waste roof tiles and bricks



▲ Vehicle-mounted manufacturing plant (Mobacon)



▲ Road paved with waste roof tiles and bricks

Key to Success & Challenges for Further Development

- Although it is common to recycle construction waste into subbase materials, using waste tiles and bricks for paving materials adds value by producing porous material with water-permeable and water-retentive properties, in addition to enhancing the landscape.
- Tiles and bricks are heavy materials and are manufactured by local manufacturers for local consumption. However, considering that manufacturing techniques vary among manufacturers, it is important to distinguish the level of local products to be recycled.

Profile of Project Company

Established in 1994, ECOSYSTEM started its recycling business in 1997 when the company reused contaminated sea sand as paving material in the Nakhodka oil spill. ECOSYSTEM, with a corporate philosophy under which it aims to create ecosystems, has a wealth of knowledge and experience in the recycling of roof tiles and bricks, including tile chips. In Japan, the company is engaged in the disposal of waste roof tiles (intermediate industrial waste disposal business), roof tile paving, franchising of Mobacon, and internet sales of roof tile chips and others.

In 2018, ECOSYSTEM won the Grand Prize at the SDGs Business Contest, Global Innovator Award at the SDGs Business Awards, and Grand Prize at the Ishikawa Eco Design Awards.

11. Waterproofing and Extending the Service Life of Buildings with Concrete Repair Materials

ZEN Co., Ltd <https://zen-kaisyu.jp/>

Japan Prolong Limited Company <http://everprolong.jprolong.net/>

Challenges Addressed | ③ Floods, heavy rain & typhoons

Adaptation Challenge With the increase of wind damage, floods, and storm surges caused by climate change, concrete gradually erodes from the surface and deteriorates due to neutralization and salt damage caused by contact with CO₂ in the air and water. Deteriorated concrete develops voids and cracks, which not only cause water leakage but also lead to the weakening and shortening of the service life of buildings.

Contribution The Ever Prolong method, developed by ZEN and Japan Prolong, densifies the concrete surface by penetrating it with Ever Prolong material. By densifying, the concrete structure becomes waterproof, and its surface protection function is strengthened, thus extending the service life of buildings.

Project Details

Background

Country | Philippines

In the Philippines, the construction industry has become a major industry due to construction rush associated with urbanization and population growth. In urban areas, many buildings are made of reinforced concrete, many of which are more than 20 years old and have become decrepit. In addition, high precipitation throughout the year results in water leakage damage due to cracks in concrete, in houses, schools, hospitals, commercial facilities and so on. ZEN and Japan Prolong have been developing a business in the Philippines to solve this problem using the Ever Prolong method. In 2019, the project was selected for the small and medium-sized enterprise (SME) partnership promotion survey under JICA's private-sector collaboration scheme, and a market survey was conducted locally. In the future, the project will be commercialized through on-site demonstration activities.

Business Model of the Project

Concrete repair materials (Ever Prolong) are planned to be exported and sold to local construction companies. In addition, training and guidance (supervising) on construction techniques are planned to be provided to these companies.



◀ Applying Ever Prolong



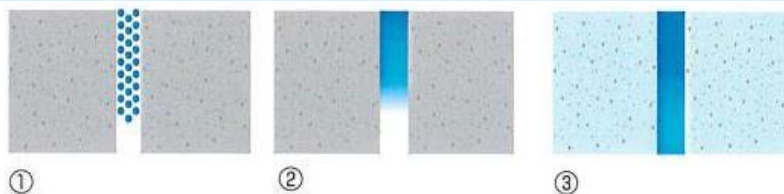
▲ Cracks on a building roof (Philippines)



Product & Technology

Ever Prolong: An odorless and harmless concrete modifier (repair material) consisting of a silicate-alkali mixture. When diluted with water and applied or sprayed on the concrete surface, it penetrates and fills the pores of the surface layer of a few centimeters to form a dense protective layer. It closes small cracks in the concrete and allows moisture inside to escape to prevent freezing, while exhibiting waterproof performance against rain. The densification of the concrete surface also prevents adhesion of dust, mold, moss, and algae. It can be used for a wide range of purposes such as waterproofing of rooftops, exterior walls, exterior stages and elevator pits, simple balcony waterproofing, moisture control of basements, and can be applied to all types of concrete.

- ① Ever Prolong is applied to the concrete surface and penetrates by capillary action.
- ② Reactive gel with stable structure is produced.
- ③ Reacts with suspended Ca to produce stable alkali calcium silicate, forming an adhesive protective layer



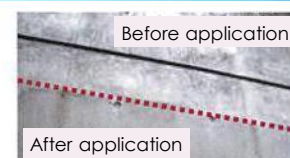
▲ Mechanism of Ever Prolong

Method for prolonging the life of concrete structures

Ever Prolong



Ever Prolong Method is a new maintenance method with a concrete reformer.



20 years after construction

▲ Application Examples

Key to Success & Challenges for Further Development

- Low initial cost, and the price is set to ensure market superiority in developing countries.
- Installation method is simple and easy to handle. In addition, concrete applied with Ever Prolong is maintenance-free, with a durability of 10 to 20 years after a single application, so there is no need to establish a local maintenance system.

Profile of Project Company

ZEN Co., Ltd: Established in May 2002. ZEN's main business is the renovation of condominiums and commercial buildings. ZEN has completed more than 10,000 projects in Japan, and is committed to environmental conservation and efficient use of natural resources, based on the principles of "gratitude, inspiration, trust". In order to extend the service life of buildings and to further develop the concrete technology in frame waterproofing, ZEN is working with Japan Prolong on the application, technical studies, and research on relevant technologies of Ever Prolong.

Japan Prolong Limited Company: Established in January 2013, Japan Prolong has been mainly engaging in research and development, domestic manufacturing and sales of Ever Prolong, focusing on the fields of concrete life extension and waterproofing of building frames. Ever Prolong was adopted in the New Technology Information System (NETIS) of the Ministry of Land, Infrastructure, Transport and Tourism in 2018.

12. Introducing a resilient hybrid renewable energy power generation control system against environmental changes

Kyudenko Corporation <http://www.kyudenko.co.jp/>

Challenges Addressed | ③ Floods, heavy rain & typhoons, ④ Extreme temperature changes

Adaptation Challenge Power supply in remote islands is often dependent on regional grids through diesel generators due to a lack of main power transmission network and therefore the power supply is not stable and chronically tight. In addition, remote islands are highly vulnerable to natural disasters on account of geographical characteristics. To counter these issues, it is imperative for them to be equipped with a resilient electric power system against diverse weather conditions.

Contribution Hybrid power generation control system introduced by Kyudenko Corporation is an on-grid system that overcomes the unstable supply of renewable energy and enables self-sustained and stable power supply. In addition, EMS (Energy Management System) enables the optimal control of renewable energy supply while countering abrupt meteorological and environmental changes.

Project Detail

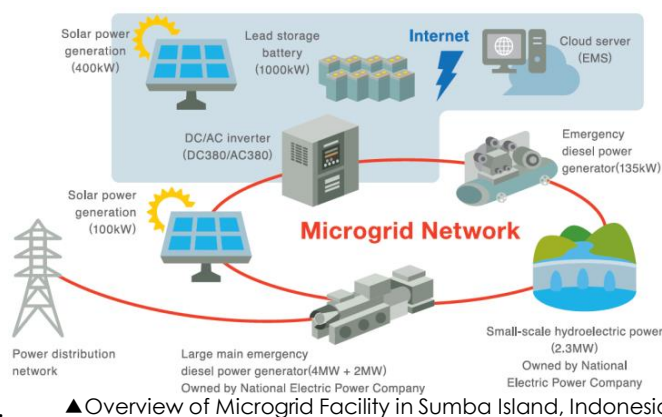
Background

Country | Indonesia

In the western side of Sumba Island, the Agency for the Assessment and Application of Technology Indonesia (Badan Pengkajian dan Penerapan Teknologi: BPPT) carried out demonstration tests of a hybrid power generation plant comprising solar power generation facilities, redox flow battery and emergency diesel power generators, where power generation and storage had difficulties and stable power supply for the microgrid was insufficient. Upon visit in October 2015 to the technology center of Huis Ten Bosch and microgrid developed by Kyudenko mainly leveraged on renewable energy, the officials from BPPT requested for the introduction of the plant. In addition, the Project was selected for the "Low Carbon Technology Innovation Project 2016" by the Ministry of Environment of Japan in July 2016 and demonstration project was conducted for 3 years. Based on local experience in power distribution and transmission, the company is working on the commercialization of the Project.

Business Model of the Project

An EPC project is being established, where Engineering, Procurement and Construction are carried out by a local entity upon order from power companies. Additionally, looking ahead to the IPP (Independent Power Producer) business in the future, the company is conducting a feasibility study to introduce biomass-solar hybrid power generation facilities on several remote islands in Indonesia.





Product & Technology

By introducing EMS where technologies for the generation and storage of renewable energy power are remotely controlled, a self-sustained and stable power supply is ensured for certain duration of time and at certain volume. Further, operation & management (O&M) method will be established based on the power output and meteorological data collected.

Power storage system: Lead-acid batteries will be used. Lead-acid battery is affordable but short-lived as its life is less than half the life of lithium-ion battery, however, the Company developed its own control system by controlling charge and discharge that doubles or more the life of lead-acid battery.



▲ Demonstration facility in Sumba Island, Indonesia

Key to Success & Challenges for Further Development

- The Project owes much of its success to the existing close relationship with local government authorities that enabled the development of a customized system that suits the local environment and requirement while minimizing costs.
- At present, the company is working on improvements for existing renewable energy power plants, as well as large-scale power generation projects using renewable energy as the core power source in several locations in Indonesia.
- Biomass power generation is considered as the core power source for microgrid. Study is being conducted on the environmental impact of raw materials that are not effectively used locally (EFB: empty fruit bunches of coconuts, abandoned wood, etc.), the possibility of local production and consumption, as well as long-term stable procurement.

Profile of Project Company

Kyudenko Corporation was established in 1944. In 1964, the Company launched air conditioning and piping installations ahead of its counterparts and thereafter aggressively diversified its management by delving into the environment, information, telecommunication and renewal services. The Company takes the environment-related services to be the 4th business field of its businesses following power distribution, electric facilities construction and air conditioning and piping construction. The Company also promotes the conventional wind power and solar power generation services while extending the business fields leveraged on its unique energy-saving technology. In July 2015, the Company built a power generation system using solar and wind power in the premises of the technology center and villas of the Huis Ten Bosch in Sasebo-city, Nagasaki and developed EMS to efficiently control the supply and demand of energy. The commercial power supply line has been detached since February 2016 and the electricity demand within the premises of villas has partially been covered with a stable supply of renewable energy generated under EMS.

13. Greater resilience in anti-disaster infrastructure through the world's first "Typhoon Power Generation" and communications satellite

Challenergy Inc. <https://challenergy.com/>

Challenges Addressed | ③ Floods, heavy rain & typhoons

Adaptation Challenge The Philippines, an island country in the Southwestern Pacific, is one of the most vulnerable countries to climate change, experiencing severe typhoons every year. In remote islands, delays in dissemination of disaster information and disaster recovery is a serious issue coupled with power supply and communications shutdowns after typhoons.

Contribution It is urgently needed to establish resilient infrastructure, stable energy supply, weather monitoring and early warning system. The Project in combination of the Magnus Wind Turbine and satellite communication serves as an adaptation in the field of energy and communication.

Project Detail

■ Background

Country | Philippines

Challenergy Inc. has, since its inception targeted island countries in the Pacific where severe typhoon damage is/will be feared due to climate change, and mountainous countries where installation of the conventional wind power generators is difficult. In 2018, the Company launched field tests of its 10kW prototype in the Ishigaki Island, Okinawa prefecture. In 2017, a feasibility study in the Philippines in collaboration with SKY Perfect JSAT Corporation under the "Climate Change Adaptation Effect Visualization Project" funded by the Ministry of Economy, Trade and Industry of Japan (METI) in 2017 was conducted. A joint venture company in the Philippines was launched in January 2019. Technology demonstration in Batanes Island, the north-most island of the country, has started in 2021. As of now, the 10kW models has begun mass production and is on sale. The 100kW models is scheduled for sale in 2025.

■ Business Model of the Project

The project mainly targets areas where electricity and communications infrastructure are poor and provides sustainable energy and reliable communication system in combination with highly resilient, environmentally friendly and affordable wind power generation with satellite communication. The project has been executed in collaboration with the following partners.

- Communications satellite, disaster communications infrastructure: SKY Perfect JSAT Corporation
- Philippines' joint venture partner: Natures Renewable Energy Development (NAREDCO)
- Marketing partner: State-run power company, public oil company, real estate development company, etc.



▲ Magnus x Vertical Axis Wind Turbine (left) and Magnus Effect (right)



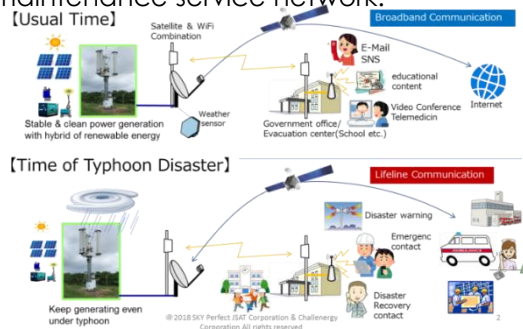
▲ Power generation experience at a maximum instantaneous wind speed of 30.4m/s.



Product & Technology

Magnus x Vertical Axis Wind Turbine (Challenergy): The product rotates using the “Magnus force” generated at the time of turbine rotation in the currents, as opposed to the conventional “Horizontal Axis Propeller Style” widespread in other areas, especially Europe. The turbine rotates even with mild wind and will not over-rotate even with typhoon and thus the turbine achieves the wind speed suitable for power generation. Power can be generated with wind from all directions. Magnus turbine is capable of producing power in times of strong or turbulent wind, leading to low failure rate, thereby improving capacity utilization rate.

Satellite Communications Technology (SKY Perfect JSAT): The technology is widely utilized as a communication infrastructure in digitally-divided areas due to its wide coverage and consistency in the broadcast of data and as a communication service in disaster-hit areas due to its flexibility and durability. The operation status and servicing/maintenance timing of the magnus wind turbine will be monitored real time using satellite communications for the establishment of a maintenance service network.



◀ Magnus x Vertical Axis Wind Turbine 10kW Demo Unit (Batanes, Philippines)

Key to Success & Challenges for Further Development

- Magnus wind turbine is characterized by greater power generation capacity under different wind speed situations and low breakdown ratio. These specifications differentiate it from conventional wind power and solar power generators and establishes itself as a remote power generation tool in remote islands and mountainous areas that are not connected to the main transmission grid making power supply difficult. The challenges are how to visualize the merits in life cycle costs to rationalize its prices as compared to existing wind and solar power technologies.
- The technology will be marketed overseas as a package of energy and communication services in consideration of limited public funds for disaster-related services.

Profile of Project Company

Challenergy Inc. was founded in 2014 as a start-up under the vision of “Innovating wind power generation for supply of safe and secure electricity for all humans”. The company is developing the “Magnus x Vertical Axis Wind Turbine” - a wind turbine without propellers, which can withstand and harness the power of typhoons. The company was selected as a “J-Startup” company in 2018, which is a support program for Japanese startup under METI. They exhibited their technology in the Japan Pavilion during the COP 24 (2018) and 25 (2019) as an innovative measure of adaptation and mitigation. The project was also introduced in the G20 Ministerial Meeting on Energy Transitions and Global Environment for Sustainable Growth in Karuizawa, Japan in 2019. As of now, the 10kW models has begun mass production and is on sale. The 100kW models is scheduled for sale in 2025.

14. Mitigating damage to energy supply system in times of disasters

Panasonic Holdings Corporation <https://holdings.panasonic/global/>

Challenges Addressed | ③ Floods, heavy rain & typhoons, ⑩ Economic loss & livelihood failure

Adaptation Challenge Increase in natural disasters associated with climate change affects people's lives significantly by damaging energy infrastructure, destabilizing supply network, and obstructing educational and medical activities.

Contribution Panasonic Holdings Corporation provides stand-alone power generation for emergency utilizing environmentally-friendly renewable energy such as "Solar LED Lights", "Solar Storage" and "Power Supply Containers". It serves as an adaptation measure in the field of energy to mitigate the threat to people's health and life due to the lack of access to power in times of major disasters.

Project Detail

Country | Uganda

■ Background

In 2006, then Uganda's Minister of State for the Vice President's Office visited Japan and toured the Company's solar facility (Solar Ark by SANYO), leading to the request from the Vice President for cooperation later on. Research and development was launched using its unique strength of energy storage and energy generation technology now known as "Solar Lanterns". The Company commenced "100 Thousand Solar Lanterns Project" in February 2013 aiming at donating 100 thousand solar lanterns to developing countries by 2018 when the Company marks its 100th anniversary. Since the project's inception, a total of 102,716 solar lanterns have been donated to 30 countries of regions mainly in Asia and Africa. Since 2018, the Company has continued to donate light to non-electrified community through "LIGHT UP THE FUTURE" Project, that took over the "100 Thousand Solar Lanterns Project".

■ Business Model of the Project

Panasonic Holdings Corporation provides Solar Lanterns or Solar Storage to be utilized for the programs by international organizations and NGOs in Asia and Africa where increase in disasters associated with climate change is feared to adversely affect life and environment of local community. In Indonesia, "Power Supply Containers" have been provided by the Company for remote islands through grant assistance for grassroots project by the Embassy of Japan in Indonesia to support children's education. Providing emergency power supply contributes to crime prevention and sustained education at night or blackout, or swift medical checkup and treatment in malaria-prone tropical regions.



Product & Technology

Panasonic Holdings Corporation offers an array of energy supply tools including the following.

- “Solar Lanterns”, an affordable solar LED lighting for low-income household while meeting the demand of non-electrified community for greater brightness.
- “Solar Storage”, a small power storage system with LED lighting using nickel-metal hydride battery with an expected life of five years and is capable of charging up to three smart phones or seven mobile phones.
- “Power Supply Containers”, a stand-alone photovoltaic power package capable of generating approximately 3kW of electricity.



▲Solar Storage



▲Brightness for Local Community (Ethiopia)

Key to Success & Challenges for Further Development

Next challenge is to achieve further dissemination in local market through cooperation with partners extending bulk sale projects in the target areas such as international organizations and NGOs while taking under consideration the utilization of public finance schemes.

Profile of Project Company

Panasonic Holdings Corporation was founded in Osaka in 1918 by Konosuke Matsushita, upholding the philosophy of extending life with easy access to electricity throughout the world. Since then the Company has taken on a wide range of initiatives. The Company has encouraged adaptation efforts as part of its project in alleviating the impact of climate change through its products, services and solutions while providing support for the growth of business activities under its CSR commitments including this project based on its corporate philosophy, “Make contributions to the progress of society and the well-being of people through our business activities” which has been committed since its foundation. The Company won the Good Design Award 2013, IAUD Silver Award 2013 under Social Design Category and iF Product Design Award 2014 for its Solar Lanterns and the Good Design Award 2015 for its Solar Storage.

15. Contributing to sustainable agriculture through “Bio-cycle”

Ajinomoto Co., Inc. <https://www.ajinomoto.com/>

Challenges Addressed | ⑥ Food insecurity

Adaptation Challenge In many developing countries where agriculture plays a key role for the economy, it is feared that climate change will bring shrinkage of arable farmland and subsequently results in drop in the agricultural yield.

Contribution The Ajinomoto Group successfully improved the quality of agricultural produce and raised the profitability of farmland through the operation of its “Bio-cycle”, a resource-recycling production model. Furthermore, the Ajinomoto Group has achieved reduction of consumption of chemical fertilizers (nitrogen-content), emission of carbon dioxide, and wastes generated during the production process.

Project Detail

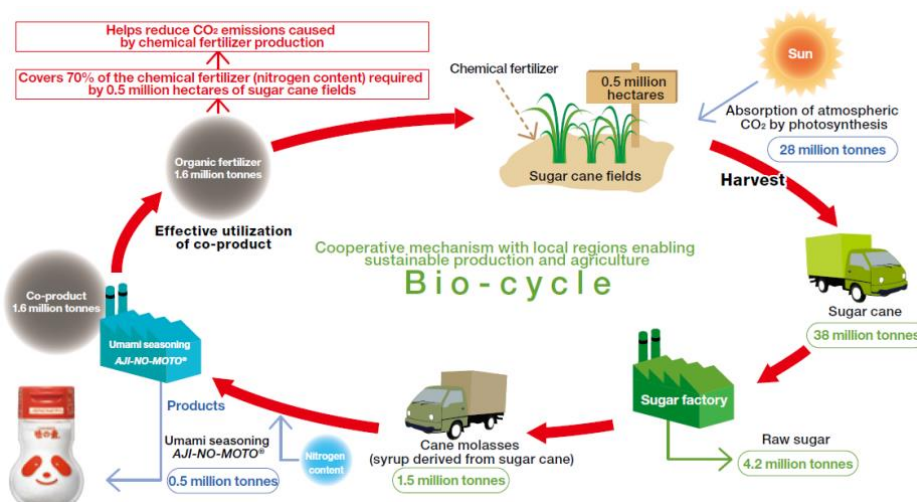
Background

Country | Brazil

The Ajinomoto Group has implemented “Bio-cycle” in its factories worldwide since 1960's, including the factory in Brazil, the biggest factory worldwide since the Company entered into Brazilian market, to secure the stable local procurement of ingredients for amino acid.

Business Model of the Project

“Bio-cycle” is a business model where resources are recycled for the recovery and reinforcement of natural resource capital. In Brazil, 99% of the byproduct (co-product) derived from amino acid fermentation process has successfully been recycled through the sale to local farmers as feed and organic fertilizer which will eventually be returned to farmland. In May 2012, a biomass boiler has been introduced as a step to “fuel bio-cycle” using bagasse, achieving stable procurement of energy used in the factory, approximately 40% of which is biomass fuel in 2014.



◀ Description of “Bio-cycle”:

The chart assumes worldwide annual production of approximately 0.5 million tonnes of the umami seasoning AJI-NO-MOTO® by the Ajinomoto Group using only sugar cane.



Product & Technology

Bio-cycle: A regional Co-product, left upon the isolation of amino acid from agricultural produce using resource-saving fermentation technologies, is utilized locally as fertilizer and feed. In Brazil, resource has repeatedly been recycled where Co-product derived from the process of isolating amino acid from molasses procured from sugar factory, is processed into organic feed and returned to sugarcane or grape plantation for their growth. The Company has expended this scheme to coffee farms since 2016.

Resource-saving fermentation technologies: Resource-saving and recycling-oriented fermentation technologies that reduce the use of sugar and other ingredients as well as discharge of water using cutting-edge bio technology.



▲A Grape Farmer in Brazil



▲Coffee farm

Key to Success & Challenges for Further Development

- Bio-cycle has become a norm in Brazil, a major agricultural country, where the use of fertilizer is common and there is sufficient domestic demand for the sale of Co-product as fertilizer. Bio-cycle has also gone beyond a mere resource recycling business and generated a diverse range of community-based benefits to the entire region such as products, byproducts, employment, consumption and lifestyle.
- The Ajinomoto Group aims to achieve “a ratio of renewable energy usage of 15% and higher” and promotes the expansion of Bio-cycle to the energy field through the production of biomass fuel using nonedible parts of fermentation ingredient.

Profile of Project Company

Ajinomoto Co., Inc. is a global food company founded in 1909. The Company has enlarged its business territory into the feed, medical and pharmaceutical, and chemical field based on amino acid and centered on bioscience and fine chemical technologies on top of condiments and processed food. It's one of the world's largest amino acid producers through fermentation in its 18 factories stretching over 9 countries of Asia, Europe and America. The Ajinomoto Group has encouraged sustainable production focused on the recovery and reinforcement of natural resource capital and establishment of a supply/value chain through the introduction of “Bio-cycle” in various parts of the world since 1960's. “Bio-cycle” is positioned as a business activity contributing to preserve “Food Resources and Biodiversity”, a core of the group's long-term environmental vision. The Company won the “Minister's Prize, the Ministry of Agriculture, Forestry and Fisheries” under the “Eco Products Awards” in 2016 and has throughout been selected for “FTSE4GOOD” since 2004 and “DJ Sustainability Index” since 2014.

16. Greater harvest through compost soil improver

Kawashima Co., Ltd. <http://www.kawashima.jp/>

Challenges Addressed | ② Droughts, ⑥ Food insecurity

Adaptation Challenge Aggravating water shortage due to increasing incidents of drought has wreaked havoc on agricultural production and led to the decline of self-sufficiency ratio of the country's food supply. Many developing countries where much of the working population consists of farmers are under vulnerable environment and it is an urgent socio-political issue to raise the agricultural productivity.

Contribution Through introducing Kawashima Co., Ltd.'s compost plants and assisting the establishment of an organic fertilizer supply system by producing high-quality compost processed from household waste and agricultural waste materials, will bounce the harvest while improving soil conditions and ultimately solve the issues surrounding food security and poverty.

Project Detail

■ Background

Country | Sri Lanka

Sri Lanka has been plagued by increasing household waste brought by economic development and transformed lifestyle. Household waste is dumped and left open in disposal sites, causing issues of foul smell, poor hygiene and contamination of underground water. The remaining life of disposal sites is getting shorter as well. Approximately 55% of the household waste is garbage, an organic waste material. Recycling garbage as compost through aerobic fermentation effectively reduces the volume of garbage. The Project was selected for the "Verification Survey with the Private Sector for Disseminating Japanese Technologies (SME Verification Survey)" by Japan International Cooperation Agency (JICA) in 2013 and started operation in April 2017. Since then, 9 plants were delivered to the government of Sri Lanka in the first phase of construction, and additional second phase of construction has been promoted in 2020.

■ Business Model of the Project

Kawashima Co., Ltd. exports the equipment manufactured in Japan to local governments. Local partner companies of Kawashima provide maintenance, manage operations and supervise project execution.



▲ Compost plant



▲ 9 system are under construction



Product & Technology

Compost Plant “RA-X”: A screw-shaped auto mixer that mixes organic waste material for even aeration and maintains aerobic fermentation at high temperature for effective production of high-quality compost. The device is affordable and easily maintained.

“BX-1”: An active microorganism feed that deodorizes and turns mud, sludge and animal wastes into compost. Its main ingredient is rice bran and it accelerates fermentation of compost while curbing odor during the fermentation process.

Both “RA-X” and “BX-1” are a unique technology of Kawashima and the former has been patented (Patent Number: 3607252). A project based on the both technology has been registered as Clean Development Mechanism (CDM) project in 2011.



▲Screw-shaped Compost Plant “RA-X”



▲Vegetable cultivated using compost

Key to Success & Challenges for Further Development

- Support from JICA through its SME Verification Survey was imperative for a new technology to prove its past achievement which is a must-have for its introduction.
- The Project turned into business through the successful establishment of relationship with local government and demonstration of technological and economic superiority.
- In the installation of the initial compost plants, Japanese construction company gave technical guidance to local installers.
- Kawashima implemented capacity building programs for local counterparts through the relationships with various partners including Kawasaki City Government, which provided guidance in the food waste sorting, successfully building up a supply chain for recycling food wastes.
- Compost plant business has increased local employment of women and contributed to solving the issues of poverty of women, which facilitates its local acceptance.
- The Company plans to extend the Project into Asia over a medium to long term.

Profile of Project Company

Kawashima Co., Ltd. was established in 1987 and developed “RA-X”, a compost plant in 2000. The Company manufactures and sells the plant and upholds the corporate mission to establish a recyclable society through its eco-friendly technology.

17. Greater resilience and higher income through “Agriculture sustainable for 100 years and beyond”

On The Slope Co., Ltd. <https://www.on-the-slope.com/>

Challenges Addressed | ⑥ Food insecurity

Adaptation Challenge Agricultural output in the Southeast Asia is feared to dip 5 to 30% by 2050 due to climate change. In Lao Republic, it is an impending challenge for agriculture to gain more resilience which accounts for approximately 30% of its GDP and is the principle means of livelihood of more than 65% of its nationals.

Contribution On the recognition that “insufficient knowledge and technology on agricultural system” and “lack of objective information regarding vulnerability assessment” are adaptation challenges to vulnerable countries, On The Slope Co., Ltd. strives for a business model to ensure long-term agricultural sustainability in local community through local production utilizing climate resilient species and guidance on harvest method while ensuring the stable profit return through domestic and overseas marketing channels.

Project Detail

■ Background

Country | Uganda, Lao Republic, Myanmar, Nepal, Thailand, Indonesia

The Company with an aim at business in developing countries since its inception, launched the “Uganda Organic Project” in 2012. Under the project, the crops extend from locally produced “Shea butter” to sesame in dry regions as well as “Vanilla beans” through agroforestry. In 2016, the Company launched the “Mekong Organic Project” which was supported as the “Climate Change Adaptation Effect Visualization Project” by the Ministry of Economy, Trade and Industry (METI) of Japan and subsequently the Company promoted the coffee production system through agroforestry instead of traditional forest burning by ethnic tribes in the mountains. As the Company launched the “Beyond the Sea Coffee” project, the project area is expanding since 2018 to Myanmar, Philippines and Nepal.

■ Business Model of the Project

The project focuses on the sales of merchandizes that maintain both environmental contribution and quality, produced based on environmentally-friendly, small-scale agricultural system that accommodates local climate, soil quality, historic and cultural context and thus contributes to the adaptation to climate change. The marketing channels extend from the Internet retail sales to wholesale of raw beans to roasters. Saffron Coffee was appointed as local partner in 2016 which is the sole company in the project area equipped with coffee refinery and processing facilities as well as export license.



▲ Laos Forest Coffee



▲ Coffee Beans



Product & Technology

Production technology: Organic farming, agroforestry: Under the project, Japan's high and versatile crop related technology is transferred through close-knit communication with producers. The technology is selected from a viewpoint of effective utilization of regional resources and applicability to different species while understanding the level of technology and knowledge of local farmers, regional soil environment and varying climate conditions.

Example: Agro-forest management (pruning method to accommodate change in the rainfall pattern and temperature, and shading), measures against pests, technology guidance on fertilization that raises soil water retention and productivity, and cultivation of new farm land.

Marketing system: "Farm to Table": Under the system, agricultural products will be marketed for export to Japan as merchandizes that maintain both environmental contribution and quality. The system aims to secure stable sales by constant purchase by consumers with whom a relationship has been built upon understanding of the "Story of production sites and producers" through detailed explanations.



▲ Coffee Plantation in Forests



▲ Cultivation as Part of Life



▲ Guidance for Local Farmers

Key to Success & Challenges for Further Development

- The project contributes to greater income of farmers based on close communication with farmers and preliminary research for the selection of crops and cultivation technology that accommodate regional conditions and by aiming at producing higher quality products through detailed cultivation guidance.
- Collaboration with influential farmers is expected to generate ripple effect.
- In production, the project is in pursuit of collaboration with private sectors and research institutions for the establishment of a quantitative benchmark for the judgment of fermentation and maturity level.
- The project successfully diversified the range of merchandize by transforming the coffee bean flesh that is usually wasted into dried "Cascara" in syrup.
- In developing sales network, the project has built relationships that encourage constant purchase of highly value-added merchandize by appealing to consumers and raising their awareness of the "Story" of production sites and producers.

Profile of Project Company

Founded in 2009. With the company concept of "agriculture sustainable for 100 years and beyond", the company aims to create sustainable agriculture and realize sustainable society. Considering the merits and demerits of not using pesticides and fertilizers, the company sells agricultural products that are grown without environmental burden, and also provides the support to new farmers who want to engage in such type of farming. In addition, the company develops various business both in Japan and overseas, including the operation of the restaurant named "OyOy" which serves dishes with its own vegetables, and "Beyond the Sea Coffee" which provides coffee cultivation advice, imports and sells in Asia. In 2018, the company was selected as a Regional Future Driving Company by the Ministry of Economy, Trade and Industry.

18. Adapting to changing cultivation environment for traditional crops

Dari K Co., Ltd. <http://www.dari-k.com/>

Challenges Addressed | ⑥ Food insecurity

Adaptation Challenge Irregular rainfall due to abnormal weather associated with climate change causes serious impact on agricultural products and erratic weather such as downpour and drought reduces crop yield.

Contribution Dari K Co., Ltd. promotes conversion from traditional agricultural products to high-quality cacao in Indonesia which requires less water and fertilizer. It serves as an adaptation measure in terms of sustainable food supply and stronger agricultural production base to promote weather-consistent agriculture and production of value-added crops which contributes to greater income of farmers.

Project Detail

■ Background

Country | Indonesia

The Project was selected for the “Preparatory Survey for BOP Business*” by Japan International Cooperation Agency (JICA) in 2014, and the “Climate Change Adaptation Effect Visualization Project” by the Ministry of Economy, Trade and Industry of Japan in 2015.

*Current: Feasibility Survey for SDGs Business

■ Business Model of the Project

Some regions in Indonesia are feared to suffer from reduced harvest of traditional crops due to a decline in rainfall. The Company aims to enhance adaptation capability of small farmers by encouraging conversion to cacao production which requires less water and fertilizer while mitigating vulnerability to climate change through adoption and permeation of high-value added cacao agroforestry. Having established a local subsidiary, PT. Kakao Indonesia Cemerlang (KIC) in 2016, the Company takes on specific measures such as raising cacao farmers' awareness, introducing fermentation technology and securing exit through the purchase of fermented high-quality cacao beans in order to establish a framework for added value at the upstream of supply chain and greater income of farmers. Also, the Company strives to improve the negative reputation of cacao grown in Indonesia through direct import and processing to produce high-quality chocolate products.



▲ Local farmers



Product & Technology

Dari K directly imports cacao grown in Indonesia, process and sell the final chocolate products. In Indonesia, cacao beans have been shipped without undergoing the process of "fermentation" which is imperative for tasty chocolate. To produce cacao beans in Indonesia that satisfy the quality requirements of the Japanese market, Dari K started with instilling the importance of fermentation to local cacao farmers. Subsequently, Dari K provided hands-on guidance on fermentation technology and directly bought from local farmers the fermented high-quality cacao beans as part of the initiatives to improve their revenue environment. At the same time, in order to rid the negative reputation of "poor quality without fermentation" labelled on Indonesian cacao beans and to raise the public awareness as high-quality cacao beans, Dari K imports Indonesian cacao beans for its own production and sale of chocolate merchandise. In addition, Dari K has started to hire Indonesian women actively for sorting operation of cacao beans, and also has promoted primary producers' diversification into processing and distribution (sixth sector industrialization). Furthermore, Dari K has been trying biogas generating system by using cacao husk.



▲Quality Assurance by President & CEO
Keiichi Yoshino with Local Staff



▲Checking Growth of Cacao Trees

Key to Success & Challenges for Further Development

Challenges ahead are to establish a value chain where farmers, chocolate manufacturers and consumers equally find value in. Further development will be sought through the achievement of following Triple Wins:

- (1) Farmers obtain knowledge and skill on how to grow high-quality cacao and enjoy higher income.
- (2) Dari K, as chocolate manufacturer, secures the procurement of high-quality cacao beans.
- (3) Consumers go beyond "donation" and spend on authentic high-quality products.

Profile of Project Company

Dari K Co., Ltd. was founded in March 2011 to manufacture and sell chocolate and other cacao-related products as well as for import and wholesale of cacao beans. The Company was acknowledged by Kyoto City in April 2016 as one of the "Enterprises to sustain upcoming 1000 years" and by the Ministry of Economy, Trade and Industry of Japan in May 2016 as one of the "VIBRANT (HABATAKU) Small and Medium Enterprises 300". In May 2017, Dari K won the "Engagement Award", under SDGs Business Award 2017 awarded by Kanazawa Institute of Technology and BoP Global Network Japan.

19. Water-saving agricultural technology using foamed porous glass

Tottori Resource Recycling, Inc. <https://www.t-rrl.jp/en/>

Challenges Addressed | ② Droughts, ⑤ Water insecurity, ⑥ Food insecurity

Adaptation Challenge In African countries, where there are many arid zones, securing water resources for purposes such as drinking water and agriculture irrigation has long been an issue. Climate change is causing severe droughts, making it increasingly difficult to secure water resources.

Contribution Tottori Resource Recycling has developed and manufactured Porous Alpha, a type of foamed porous glass which enables the application of water-saving agricultural technology, and contributes to the deployment of agriculture which can adapt to the decrease in water resources due to climate change.

Project Details

■ Background

Country | Morocco

Porous Alpha was initially developed to recycle waste glass, and its main applications in Japan were water purification and deodorization. Through joint research with the Arid Land Research Center of Tottori University, it was shown that Porous Alpha could also be used for soil improvement, leading to a study of water-saving agriculture using the product in African countries with many arid lands. Morocco, a semi-arid country where agriculture is a major industry and water-saving needs are high, has been chosen as the target site. The demonstration using JICA's Dissemination, Demonstration, and Business Development Project in Morocco has been highly successful, and the company plans to expand the project to other African countries.

■ Business Model of the Project

Porous Alpha manufactured in Japan is exported to Morocco and sold to farmers through a local sales subsidiary. Once the sales channels have been expanded to some extent, the company plans to consider establishing a local production system for Porous Alpha.



▲ Porous Alpha



▲ Farmland where
Porous Alpha is applied

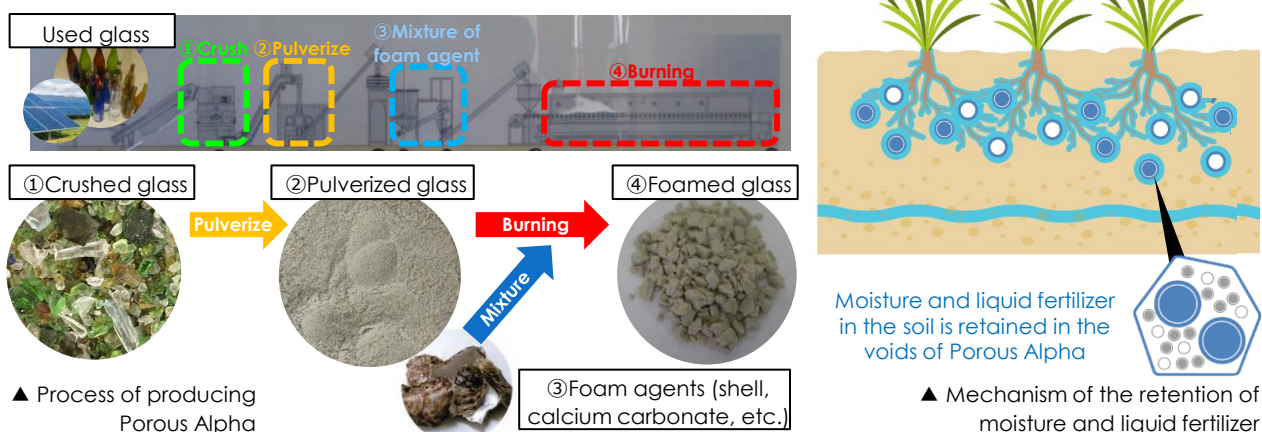


▲ Mixing Porous Alpha into soil



Product & Technology

Foamed porous glass "Porous Alpha": The product is made by crushing and pulverizing used glass bottles, mixing them with foaming agents such as calcium carbonate, and finally burning them at high temperature. It is an environmentally friendly product that meets Japanese environmental quality standards for soil, and suitable for use as a soil conditioner for agriculture. Since water and liquid fertilizer can be retained in the voids, mixing it into the soil improves moisture retention, and reduces costs and burden on the soil by using less fertilizer. Once mixed in, it can be used for a long time and requires almost no maintenance, making it easy to introduce in developing countries. When combined with drip irrigation, it can save an additional 50% of water and increase crop yields by 20% compared to drip irrigation alone. Unlike conventional foamed glass, the patented technology which neutralizes the elution of toxic substances makes the product compatible with a wider range of glass types, including wine bottles which contain heavy metals and solar panels which contain antimony.



Key to Success & Challenges for Further Development

- Through the demonstration project, the company was able to confirm the high effectiveness of the technology in saving water and improving yields, which was highly appreciated.
- On the other hand, since soil improvement using foamed glass is a new technology, there is no similar technology available at present, and it takes time to gain the understanding of local farmers. By targeting agricultural cooperatives and corporate farmers, it is expected that having them actually use the product and experience its effectiveness will promote sales.

Profile of Project Company

Established in December 2001, the company manufactures Porous Alpha, and develops and sells various applied technologies utilizing the product. In 2016, the company exhibited at the 6th Tokyo International Conference on African Development (TICAD VI) and introduced water-saving agricultural technology using Porous Alpha. The project in Morocco was listed in the "Ishigaki Monthly" magazine published by JICA in 2016, and in the "White Paper on Development Cooperation" by the Ministry of Foreign Affairs in 2017. In addition, the company received the Excellence Price at the 8th Monodzukuri Nippon Grand Award in 2020, for the technology for manufacturing foamed glass from used solar panel glass.

20. Greening and transforming arid lands into farmlands using rice husk briquettes and PLA Roll Planter®

Tromso Co., Ltd. <https://tromso.co.jp/en/>

Toray Industries, Inc. <https://www.toray.com/global/>

Oriental Consultants Global Co., Ltd. <https://ocglobal.jp/>

Challenges Addressed | ② Droughts, ⑥ Food insecurity

Adaptation Challenge Drought and the consequent desertification are becoming more serious due to climate change. In the semi-arid Sahel region, which stretches across the southern part of the Sahara Desert, the land available for agriculture is decreasing, and securing stable supplies of food and drinking water is a challenge.

Contribution The development of climate change-adaptive agriculture by combining the rice husk briquette production system "Grind Mill" by Tromso and biodegradable agriculture material "PLA (polylactic acid) Roll Planter®" by Toray Industries will promote greening and transformation of arid lands into farmlands and contribute to securing stable food supplies.

Project Details

■ Background

Country | Senegal

To address drought and desertification in the Sahel region, the "Great Green Wall Initiative (GGWI)", a long-term plan for reforestation and land restoration, was launched in 2007 under the leadership of the African Union. Also in 2016, JICA, the United Nations Convention to Combat Desertification (UNCCD), the Government of Kenya and the Government of Senegal have jointly launched the "African Initiative for Combating Desertification to Strengthen Resilience to Climate Change in the Sahel and the Horn of Africa (AI-CD)", to provide support for combating desertification in the region. With the aim to collaborate with such international efforts, the consortium comprising Tromso, Toray Industries (and group company Toray International), and Oriental Consultants Global (OCG) introduced a climate change-adaptive agricultural method using the Grind Mill and the PLA Roll Planter® to the Government of Senegal, which received positive response. A small-scale demonstration project with the Senegalese Agricultural Research Institute (ISRA) started in 2022, and further considerations on entering the GGWI will be made based on the results.

■ Business Model of the Project

A project to combine rice husk briquette "Momigalite" produced by Tromso's Grind Mill and Toray Industries' PLA Roll Planter® for agricultural use will be demonstrated in the public sector in collaboration with ISRA, to examine the effects on agricultural productivity. In the future, direct sales to farmers are considered.



▲ Risk husk briquette Momigalite



▲ PLA Roll Planter® experiment with cauliflower in India



Product & Technology

Rice husk briquette production system "Grind Mill" (Tromso): Produces wood briquette Momigalite by crushing, compressing, and heating rice husks. Momigalite can be used mainly as fuel, such as substitute for fossil fuels by greenhouse farmers in Japan, as well as substitute for firewood which is declining due to deforestation in foreign countries. Ground Momigalite can be used for soil conditioning, and has so far been supplied to farmers in Asian and African countries. In addition, it can also be used as bedding material for cattle barns and as compost.

Biodegradable agriculture material "PLA Roll Planter®" (Toray Industries): Tubular agricultural material made of plant-derived PLA fiber. PLA fiber is highly resistant to ultraviolet rays and durable, making it suitable for agriculture, and has no negative impact on the environment due to its biodegradable nature. During application, PLA Roll Planter® filled with soil is arrayed on the land and seeds root on it. Water and air sufficiently retained by the product help maintain the temperature around the root at an adequate level and enable crops to grow even on the desert, devastated land or concrete surface. Also, when combined with drip irrigation system, irrigation and fertilization can be performed more efficiently.

Greening and transformation of arid lands to farmlands using Momigalite and PLA Roll Planter® (Tromso, Toray Industries, OCG): Introduction of PLA Roll Planter® in arid lands creates an environment for crops to grow, along with ground Momigalite as a growth medium for the planters, contributes to increasing agricultural productivity and improving the farmer's income.

Key to Success & Challenges for Further Development

- The biodegradability characteristics and the ability to increase the farmers' income in a short period of time have been well received by local government officials.
- In order to maximize the implementation effect, adjustment is needed on the timing of application in accordance with the cultivation cycle.
- Since the initial investment cost is high for farmers, verification on the cost-effectiveness of the products is needed while utilizing public funds and blended finance.

Profile of Project Company

Tromso Co., Ltd.: Established in 2007. Manufactures and sells rice husk briquette production system "Grind Mill". Through the "Verification Survey with the Private Sector for Disseminating Japanese Technologies for Utilization of Resources through Rice Husk Briquette Machines" supported by JICA in 2013, Tromso started overseas expansion to Africa and ASEAN regions. Tromso exhibited Grind Mill and PLA Roll Planter® at the Virtual Japan Pavilion at COP27 (2022).

Toray Industries, Inc.: Established in 1926. Manufactures a wide range of products covering from daily sundries to chemical products for industrial purposes such as nylon, polyester, acrylic textiles, plastic, chemical and information technology materials. In 2015, Toray Industries won the Minister's Award from METI under the 24th Global Environment Award for PLA Roll Planter®.

Oriental Consultants Global Co., Ltd.: Established in 1957. Provides consulting and project development services in a wide range of fields, including environment and energy, agriculture and rural development, and disaster risk management.

21. Generating energy and farming at one place with Solar Farm® technology

Farmdo Group <https://farmdo.com/farmland.html>

Challenges Addressed | ⑥ Food insecurity

Adaptation Challenge In the agricultural sector, climate change causes (1) production instability, (2) shifting of suitable production areas, (3) soil degradation due to flooding and salinity increase, (4) water shortage, etc.

Contribution Farmdo supports the adaptation to climate change by deploying the Solar Farm® technology internationally which was developed in Japan. For its Mongolia project, Farmdo conducts training in Japan and locally for agricultural workers, including many women, to improve their skills in ag-tech. Farmdo also contributes to the capacity building of local people through regular technical training on the operation of solar power plants.

Project Detail

■ Background

Country | Mongolia, Chile

To improve the income of farmers and revitalize local economies, Farmdo is promoting farmer's markets, improving processing and delivery systems, and developing highly profitable cultivation systems. Group member Farmland owns approximately 200 solar power plants as of September 2022, of which 80 are solar farm®. Farmdo is currently expanding overseas to Mongolia and Chile, and is planning to introduce a solar farm in Singapore. Additionally, in September 2022, Farmdo plans to introduce a 230kWp solar plus battery storage system to a rose production and export company in Kenya after receiving a grant from UNIDO (United Nations Industrial Development Organization).

[Mongolia] Joint venture established in 2013; Conducted the 5th JICA Preparatory Survey (BoP Business Promotion Survey) in 2013, and was adopted twice (2015, 2016) as a JCM model project. Construction was completed in 2017 of the 10.4MW Solar Farm® on a total of 28 ha.

[Chile] Established a joint venture in 2019; 3MW solar power plant adopted for the JCM Equipment Subsidy in 2019, and began power sales in June 2021. Two additional solar power plants were selected in each 2020 and 2021 (total 6 MW) and are under construction. Another 6 MW were selected in 2022 and will be completed in May 2024. The company is also working with Ministry of Agriculture Chile to build a pilot plant of the Solar Farm®, construction completed in September 2022. Based on the demonstration examples of the pilot plant, Farmdo aims to spread the use of Solar Farm® in the country.

■ Business Model of the Project

Farmdo Group will invest and transfer technology via education and training, and develop solar PV sites with value-added agricultural practices. The profit is distributed to the farmers and local communities.



▲ 3 : Chile First Solar Power Plant
Power sales started in June 2021

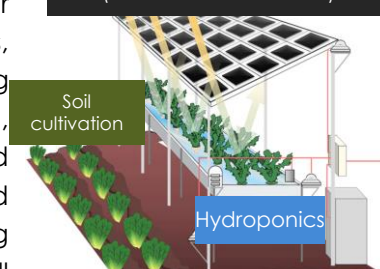
Related SDGs



Product & Technology

Solar Farm® is a "new form of agriculture" developed by Farmdo, as a farm-type solar power plant that combines agriculture and solar generation. It is a business model promotes local production for local consumption, production and sales of agricultural products, and improving the food self-sufficiency rate. Farmdo is incorporating bifacial solar panels to maximize the amount of power generation, while maintaining appropriate light transmittance. By using IoT and sensors, farm management can adapt to climate change and various regions. Hydroponics is effective for both water-saving agriculture and in areas where topsoil was lost due to heavy rainfall or where salt damage has occurred. Additionally, Farmdo is implementing labor-saving farming methods that combine drip irrigation, a coco-peat medium (solar grow bag), and weed control sheets, which the company plans to spread overseas.

See-through double-sided panel
(Transmittance: 30%~40%)



▼ (From left to right) Coco-peat, elevated hydroponics, soil cultivation, and pilot solar farm in Chile



Key to Success & Challenges for Further Development

■ Keys to success are follows:

- Sustainable system that contributes to local economy by local production for consumption
- Technology for producing vegetables with high added value such as safety, freshness, and taste along with efficient sales channels (33 stores in Tokyo metro and Gunma Prefecture)
- Capacity building of local residents by employment, education and training opportunities
- Deep commitment to business execution through self-investment.

- Our target is to establish a cost-competitive cultivation management system which is adaptable to climate change various climates in order to can spread Solar Farm and build business models suitable to local conditions through collaborations with local partners.

Profile of Project Company

Founded in 1994. Under the umbrella of Farmdo Group are Farmdo Co., Ltd. (sales of agricultural products and materials), Farm Club Co., Ltd. (production and sales of agricultural products and agro-tourism), Farmland Co., Ltd. (development of solar power generation and Solar Farm®). The group corporate philosophy is to contribute to improving the income of farmers through integrated group management. In 2013, 2019 and 2022 respectively, subsidiaries established in Mongolia, Chile and Kenya. In particular, Farmdo aims to support adaptation to climate change using solar farms overseas for which patents have been obtained in Japan, the United States, China, and Taiwan. In 2013, Farmdo was selected by the Ministry of Economy, Trade and Industry as a driving company for the regional future. In 2017, Our CEO Masayuki Iwai, was awarded the Order of Mongolia. Our Initiatives were introduced in the 2019 Environmental White Paper. Using the JCM, Farmdo is promoting the deployment of solar farms in Mongolia and Chile, and have set a goal of deploying them in 10 countries and 30 locations around the world in 20 years.

22. Circular-economy business model established through organic soil afforestation to prevent flood and protect eco system

from far east inc. <http://minnademiraio.net/>

Challenges Addressed | ③ Floods, heavy rain & typhoons, ⑥ Food insecurity

Adaptation Challenge Frequent drought, flood, typhoon and landslide due to climate change damages the eco system and agricultural industry, which is a key industry in many developing countries.

Contribution Afforestation activity utilizing organic soil improver by from far east inc. serves for windbreak, prevents landslide and promotes the recovery of eco system as well as contributing to greater productivity of agricultural produce and medical/pharmaceutical ingredients.

Project Detail

Background

Country | Cambodia

The Company has operated beauty school in Cambodia since 2013. In collaboration with IKTT (Institute for Khmer Traditional Textiles) for the procurement of dye materials, it developed a comprehensive vegetation plan as adaptation project based on IKTT's forest recovery project called "Traditional Forest" to grow plants for preventing flood. The Company has expanded the business through implementation of the "Climate Change Adaptation Effect Visualization Project" by the Ministry of Economy, Trade and Industry of Japan from 2014 to 2016.

Business Model of the Project

The Company has established a circular economy business model in the villages of Cambodia branded "Forest Wisdom" under which afforestation, product development, sales in Japan market (through about 700 shops of Aeon, Tokyu Hands, etc.) as high value-added and re-investment into the environment are carried out. Stable supply of ingredients has been established through the reinvestment of profits into the expansion of afforestation areas.



▲Business Model of the Project



▲Vegetation in the project

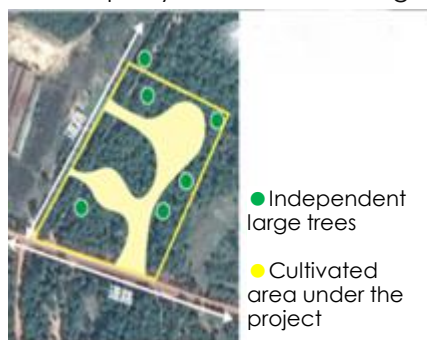


◀Products for Japan Market:
(Top Left) Moringa Tablet
(Bottom Left) Moringa Oil
(Right) Organic Shampoo



Product & Technology

- The Company produces beauty merchandize including cosmetics and hair coloring products. Via its corporate website and effective marketing strategy, distribution network of about 700 shops has been established with major domestic retailers.
- The Company has started selling overseas mainly in China.



◀ Vegetation plan



◀ Afforestation



◀ Cultivation



◀ Cultivated plants



◀ Oil extraction

Key to Success & Challenges for Further Development

- The Company utilized IKTT's local network and its own expertise as well as the relationship through the MOU entered into with Angkor Thom County to establish circular economy business model that provides local assistance with profits generating.
- While a part of the ingredient processing has been localized, it intends to introduce distillers to the local operation to produce high value-added products leading to higher income of farmers and further development.

Profile of Project Company

from far east inc. was founded in 2003 as a developer and distributor of beauty merchandize. With the management philosophy of “delivering emotional and physical happiness from Japan to the World” the Company introduces high standard technologies accumulated in the Japanese beauty industry to developing countries for the establishment of business together with local community that substantiates “environmental protection = economic development”. The Company has launched through its own E-commerce website and domestic retailers in Japan the sale of natural cosmetic products under the “minnade mirai o” (together for the future) brand using the ingredients procured from “Forest Wisdom” project launched in Cambodia in 2014. The achievement of the Project was presented at COP21 held in Paris in 2015. The Project won “SDGs Business Award 2017 Grand Prize” in May 2017, the first initiative organized by the Kanazawa Institute of Technology and BoP Global Network Japan.

23. Rejuvenation of arid areas through high-molecule film farming method

Mebiol Inc. <https://www.mebiol.co.jp>

Challenges Addressed | ⑥ Food insecurity

Adaptation Challenge Shortage of water and soil degradation triggered by climate change affect the stable food supply and food quality.

Contribution Mebiol Inc. developed a high-molecule film farming method called “Imec®” that enables the production of highly-nutritious agricultural crops under harsh environment as well as creating jobs for local community. The technology serves as an adaptation measure by contributing to greater economic capacity for stable food supply and stronger production base.

Project Detail

■ Background

Country | UAE, China, etc.

The Company was founded in 1995 by Dr. Yuichi Mori who engaged in research and development of membrane/hydro-gel materials used for dialysis and other medical and pharmaceutical products in an attempt for application to agriculture. Approximately ten years were spent for the development of “Imec®”, a film farming method to produce safe and highly nutritious agricultural crops. The business in Japan expanded mainly among new agricultural ventures and new entrant farmers. “Imec®” that enables “Agriculture by anyone, anywhere” is increasingly recognized to meet the demand of farmers for recovery and rejuvenation of their farms severely hit by major earthquakes in Japan, or to meet the demand of areas overseas not suitable for farming. The method is accredited for its water-saving effect in desert areas of Middle East and is also becoming popular in China where soil/water contamination is a major concern.

■ Business Model of the Project

The Company is a fabless company with a key business focus on R&D and marketing, sourcing revenues from royalty payments for the patented “Imec®” technology with patent registered in 130 countries. For overseas business, “Imec®” is exported from Japan and farm facilities are procured locally. Sales and cultivation advices are provided by local agents.



▲Tomato farming by local people



▲Tomato farm in Dubai Desert



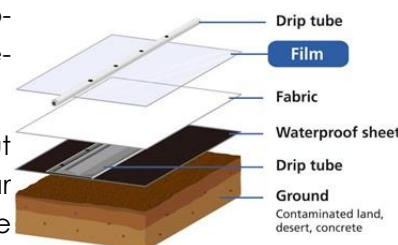
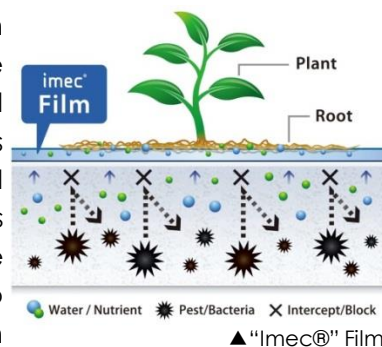
▲Chairman Dr. Mori with “Imec®”



Product & Technology

“Imec®”: A sustainable agricultural technology for the production of safe and highly nutritious agricultural crops by applying the membrane and hydro-gel technology developed for medical and pharmaceutical purposes into agriculture. High-molecule films enable the cultivation of diverse agricultural crops such as fruits and leaf vegetables on the films. In March 2018, the technology was newly registered as the “Sustainable Film Farming” on the Sustainable Technology Promotion Platform (STePP) of the Tokyo Office of the United Nations Industrial Development Organization (UNIDO). The main features of Imec® are as follows.

- No-soil farming: Only water and nutrients penetrate the nano-sized pores on the films and thus the infiltration of disease-causing germs and viruses will be prevented while saving water.
- High water retention: The films, retaining ample water but keeping dry surface, control the nutrition value (sugar concentration, etc.) of vegetables. Water and fertilizers are much saved as compared to conventional farming methods as the anti-seeping sheets help retain the water and fertilizer supplied from seeping externally.



▲Simple and Affordable “Imec®” System consisting of fluid supply equipment and Cultivation Bed

Key to Success & Challenges for Further Development

Simple and versatile technology

- The technology can be introduced so long as water and power source are provided, and compared to conventional hydroponic culture, it greatly curbs the consumption of water, fertilizer, electricity, heavy oil and labor costs, leading to low-cost and highly profitable farming business.
- The technology can be marketed throughout the world regardless of business environment.
- Despite the need for installation of a water purification equipment along with the technology, the technology well maintains profitability due to low water consumption.

Profile of Project Company

Mebioli Inc. was founded in 1995 as a R&D venture for the purpose of utilizing hydro-gel materials in the agricultural field. In the domestic market, cultivation of high-quality tomato is in a full-fledged operation using “Imec®” which enables high profitability, and the total cultivation area stretches to 40 hectares. In overseas markets, the company launched business in the Middle East, China, Brazil and so on. The company was awarded the “Special Mention Award” of the “University-originated Venture Award - Award for Academic Startups -” by Japan Science and Technology Agency (JST) in 2016, the “Small and Medium Enterprise Agency Director-General’s Award” of the Japan Venture Award by SME Support Japan in 2017, the “Japan Techno-Economics Society Chairman’s Award” by the Japan Techno-Economics Society in 2018, “The International Award: Innovative Ideas and Technologies in Agribusiness” by UNIDO ITPO Italy in 2019, and “Green Sustainable Chemistry Award” by Japan Association for Chemical Innovation in 2021.

24. High quality mung beans production in salinized lands

euglena Co., Ltd. <http://www.euglena.jp/>

Challenges Addressed | ⑥ Food insecurity

Adaptation Challenge The issue of soil salinization due to the influx of salt water into rivers and underground water on account of the rising sea level and coastal erosion triggered by climate change are gaining significance.

Contribution By engaging in mung beans production utilizing agricultural technology based on appropriate cultivation management in regions affected by soil salinization, euglena Co., Ltd. has contributed to improving lives of local residents through reducing poverty by generating job opportunities for farmers, increasing income and enhancing nutrition with cultivation technology for better crop yield and quality of mung beans.

Project Detail

Background

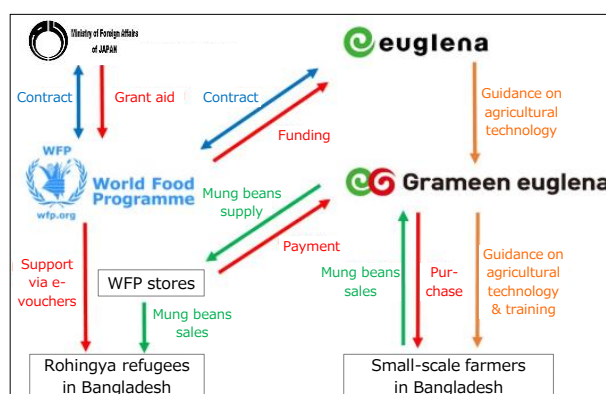
Country | Bangladesh

In Bangladesh, euglena Co., Ltd. established a joint venture (currently Grameen euglena) with Grameen Group in 2010. The trigger of business creation was that Mr. Yukoh Satake, Co-CEO of Grameen euglena visited to village area of Bangladesh by study tour and conducted a field survey there. A trial cultivation of mung beans also started in the same year. Through implementation of the "Climate Change Adaptation Effect Visualization Project" supported by the Ministry of Economy, Trade and Industry of Japan from 2012 to 2015, the large-scale cultivations and exports to Japan have started since 2012.

Business Model of the Project

Grameen euglena guides farmers on cultivation method, sells mung beans in Bangladesh, and sorts mung beans to meet required quality in Japan to supply mung beans to Japanese bean sprout producers. In 2019, the project has also started a food support for Rohingya refugees inflowing from Myanmar to Bangladesh through the collaboration with World Food Programme (WFP). In 2022, a second collaboration has been agreed.

Grameen euglena purchases mung beans from contract farmers and utilize the products for food support to Rohingya refugee. The necessary activity costs will use a portion of the grant provided by WFP agreed with Ministry of Foreign Affairs of Japan.



▲Business model



Product & Technology

- Business model: Sowing seed, Plowing, calcium fertilizer, review of seeding period
- Technical training for process of harvested crop: Drying method by farmer, Sorting method
- Verifying effect of rotating crop: Survey by the field and conditions, survey of root nodule bacteria by the harvest period



▲Sorting mung beans



▲Packing mung beans

Key to Success & Challenges for Further Development

- Success of the Project is largely attributable to its community-based style such as the launch of a Joint venture with local partner which helped to nurture trust with the government of Bangladesh as well as the establishment of a value chain through the development of sales network in Japan.
- The number of contract farmers reached approximately 6,000 in 2022. The harvested products have been also utilized for food support to Rohingya refugees since 2019 through the collaboration with WFP.
- The Project eyes the diversification of crops and harvest areas for further growth of business while contributing to better global environment at the same time.

Profile of Project Company

euglena Co., Ltd. was incorporated in 2005 with the corporate philosophy of "Make People and the Earth Healthy". The Company strives to solve the global food and environmental issues through its business activities such as the research and development, production and sale of microalgae euglena (Japanese name: Midori-mushi (green bug)). The scope of business of the Company leveraged on the technology stretches from healthcare (food and cosmetics) to energy and environment (bio diesel fuel and bio jet fuel). Mung bean project in Bangladesh is one of the businesses which represents its aim of sustainable development of human and the earth. President Mitsuru Izumo of euglena Co., Ltd. was selected as Young Global Leader 2012 by the World Economic Forum (Davos Forum), and won the Prime Minister's Award under the First Nippon Venture Award (2015), the Minister of Education, Culture, Sports, Science and Technology under the Sixth Technology Management and Innovation Award (2018), the SDGs Promotion Headquarters Chief's Award (by Prime Minister) under the Fifth Japan SDGs Award (2021), as well as the 8th Tadao Ando Cultural Foundation Award (2022).

25.

Cultivation of fruit vegetable crops with optimized application of water and fertilizer using an IoT and AI based autonomous drip irrigation system

Routrek Networks, Inc. <https://www.routrek.co.jp/>

Challenges Addressed | ⑥ Food insecurity

Adaptation Challenge The impact of climate change on agriculture is significant, including water shortages for agriculture due to decreasing water resources and poor crop growth due to changes in weather.

Contribution Routrek Networks' ZeRo.agri® is an autonomous drip irrigation system that utilizes IoT and AI to reduce and optimize the use of water and fertilizer. In addition, AI analyzes environmental data on soil and solar radiation as well as weather forecasts to adjust the concentration of liquid fertilizer and other factors on extremely hot days, thereby contributing to improved yield and quality.

Project Details

■ Background

Country | Vietnam

Routrek Networks has been planning to expand business in the Asian monsoon region, which has similar climatic conditions to Japan, and conducted demonstration experiments in China (Shanghai), Thailand, and Vietnam, all of which were successful in cultivation. Among them, Dalat highland of Vietnam was selected as the first overseas project site, in terms of climatic conditions, proximity to agricultural consumption areas, and ease of branding. In 2017, the company conducted a JICA feasibility survey and succeeded in multiple cropping using ZeRo.agri® (cultivation of four varieties with one ZeRo.agri® unit). Currently, the company is preparing for commercialization.

■ Business Model of the Project

Towards deployment in developing countries, hardware is planned to be procured locally to reduce costs. Software is expected to be licensed and license fees will be collected from local business partners (sales agents). Promotional activities are also considered, to enable farmers in Vietnam to use ZeRo.agri® to grasp the harvest amount and timing, and provide information to the distribution market, thereby adding value (increased unit sales price) to their crops.



▲ A farm in Vietnam



▲ ZeRo.agri® in a farm in Vietnam



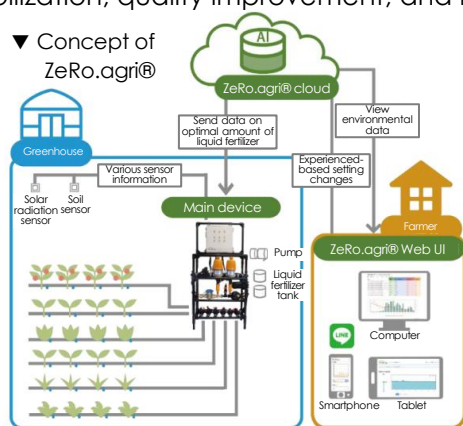
▲ Cultivation example (melon)

Related SDGs



Product & Technology

ZeRo.agri®: A drip irrigation system that automatically controls irrigation and fertilizer management by acquiring soil moisture and solar radiation data, using IoT and AI. The system consists of the ZeRo.agri® main device combined with various sensors, and a Web UI where one can check the irrigation and fertilization status as well as sensor information. An AI-based cloud system connects the main device and Web UI, and optimizes the supply amount and concentration of liquid fertilizer. Based on the information acquired by the environmental sensors, the AI estimates the daily transpiration amount required by the crops, and irrigates and fertilizes through the drip tube, enabling highly accurate management that is difficult to achieve manually, and minimizing the amount of water and fertilizer used. (Target values for automatic control can also be manually set based on the farmer's own experience, and the history of these setting changes will lead to further improvements in the accuracy of AI.) Automatic control using AI will also contribute to yield stabilization, quality improvement, and labor saving.



◀ ▲ ZeRo.agri®

Key to Success & Challenges for Further Development

- Since it is different from conventional farming methods, it is necessary to provide farmers with careful explanations and training on how to use the technology. In addition, when transitioning from conventional farming methods, (1) backing up the technology with production data (cultivation results) from ZeRo.agri® in each region, (2) developing a local support system for farmers, and (3) supportive measures from the government, local authorities, etc. will be key to the dissemination of the technology.

Profile of Project Company

Established in August 2005, with the aim to realize a sustainable society through M2M (now IoT) technology which connects devices to devices via the Internet. The company entered the agricultural sector in 2011 and launched a full-scale digital farming business in 2015. The AI irrigation and fertilization system ZeRo.agri® and related services have been developed, and about 300 units have been introduced throughout Japan (as of September 2021). In 2018, the company received the 4th Nippon Venture Awards (Agriculture Venture Business Award, Minister of Agriculture, Forestry and Fisheries Award). In the same year, the company was selected as a J-Startup company by the Ministry of Economy, Trade and Industry and as one of the representing innovations in Japan on the "Innovation Japan" website by the Prime Minister's Office. In addition, the company is aiming to accelerate its smart agriculture business by raising Series C funds in 2020.

26. Mitigating impact of frequent forest fire on plants and animals

Shabondama Soap Co., Ltd. <https://www.shabon.com/>

Challenges Addressed | ⑨ Ecosystem loss

Adaptation Challenge Rise in temperature associated with climate change is said to accelerate dryness in mountainous areas and forests, making them prone to forest fire which triggers air pollution and adversely affect the health of people in a wide range. Loss of forests also aggravates the collapse of ecosystem, impairs food production base due to the impact on food chain and transformation of harvest environment as well as extinction of plants and animals as a resource for pharmaceutical supplies.

Contribution Shabondama Soap Co., Ltd. developed soap-based extinguishing agent without synthetic surfactant agent, used as an eco-friendly yet high-performance fire extinguishing agent which is a foam mixed of water and air that performs quick fire extinction with much lesser water consumption as compared to purely water-based fire extinguisher. Curbing loss of forests associated with climate change serves as adaptation measure in the field of health & sanitation, food security & strengthening food production base.

Project Detail

■ Background

Country | Indonesia

Forest fire in dried peat land is extremely hard to put out and lasts long due to its high content of carbon. Indonesia, where almost half the world's tropical peat land belongs to, is named "Global Powder Keg" and forest fire poses a strong threat to the country. Shabondama Soap conducted a study and demonstration project in 2013 under Japan International Cooperation Agency (JICA) program to demonstrate fire extinguishing agent for peat land in Indonesia.

■ Business Model of the Project

Its sale started in 2015 for major local supplier of fire extinction machinery and materials. Shabondama Soap conducted a market survey in Indonesia from 2016 under JICA program. The Company strives to conserve the habitat of plants and animals through the measures against peat land haze hazard caused by forest fire in dry season, and protection of forests by means of fire extinction. The Company eyes the possibility of local production in future.



Product & Technology

Soap-based extinguishing agent is mainly made of less-poisonous soap. It not only dissolves fast but is also friendly to ecosystem as its surfactant effective vanishes upon combination with naturally-abundant minerals such as calcium and magnesium. It is highly credited for fast absorption and having no need to be washed away especially in case of architectural fire incident. In 2007, the product received Minister for International Affairs and Communications Award by the Cabinet Office, Japan, for its distinguished achievement in industry-academia-government collaboration. It also attracts much attention as a prospective contributor in countering forest and peat fire in vast land of Southeast Asia, Russia and Australia.



▲ Soap-based extinguishing agent



▲ Fire extinction



▲ Project Briefing to Local Affiliates

Key to Success & Challenges for Further Development

- The soap-based product has widely been accepted in local market for its environmental friendliness and immediate effect in solving the cross-border issue of haze hazard caused by forest fire.
- Stronger cost-competitiveness through local production is the next challenge to achieve a greater share on local market.

Profile of Project Company

Shabondama Soap Co., Ltd. was founded in 1910 as "Morita Hanjiro Shoten" (Shabondama Soap Co., Ltd. since 1975). Since 1974, through its efforts to develop products that are kind to both people and the environment, the Company produce and sell additive-free soaps containing no chemical or synthetic additives. In 2001, upon request from regional fire department in Kitakyushu recognizing the need for fire extinguisher with consumption of less water, which was triggered by the lessons learned from the Great Hanshin Awaji Earthquake where damaged water pipelines aggravated fire disasters, the Company launched a joint development project with the University of Kitakyushu and commercialized soap-based fire extinguishing agent which has been in the market since 2007. Soap-based foam extinguishing agent business in Indonesia meets its corporate philosophy of contributing to society and conservation of planet's environment through its business activities.

27. Preventing spread of infectious disease associated with climate change

Sumitomo Chemical Co., Ltd. <https://www.sumitomo-chem.co.jp/>

Challenges Addressed | ⑧ Spread of infectious diseases

Adaptation Challenge Rising temperature associated with climate change is feared to transform and expand the habitat of infectious disease vector and host organism, leading to the outbreak of infectious diseases and increase in the number of patients in new territories.

Contribution Sumitomo Chemical Co., Ltd.'s "Integrated Vector Management (vector pest eradication)" based on the strong technology of the Company serves as adaptation measure in the field of health and sanitation.

Project Detail

Background

Country | Tanzania

"Olyset® Net", a mesh screen woven with insecticide agent against malaria, was developed in an attempt to help contain the serious outbreak of malaria in Africa by applying the conventional technology used for mesh screen in factories as bug shield. In response to the World Health Organization (WHO) recommendation of mosquito net woven with insecticide agent as opposed to its conventional approach of encouraging diffusion of insecticide agent, the Company filed the product with WHOPES, an evaluation scheme under the WHO group in 2000, and was granted its recommendation as the world's first mosquito net with long-lasting effect. Since then, the product developed into an integrated solution as the "Integrated Vector Management" in collaboration with a range of technologies including space dissemination and larva prevention, etc.

Business Model of the Project

Collaboration with public bodies: Based on recommendation by international organizations, such as WHO and developing country governments, "Olyset® Net" is supplied to more than 80 countries through international organizations including the Global Fund and United Nations Children's Fund (UNICEF). Production is carried out locally near consumers through collaboration with overseas companies. The product produced locally by a joint venture with a Tanzanian company and has contributed to the development of local economy through the creation of job opportunities backed by maintaining production capacity to meet global demand together with the production base in Asia.





Product & Technology

Mosquito-repelling net with long-lasting effect (Olyset® series): To counter malaria, the net is made of polyethylene woven with pyrethroid insecticide that gradually releases agent through “Control-Release” technology, which is more durable than polyester and the repellent effect lasts more than three years. The product includes Olyset® Net to Olyset® Plus with intensified effect.

New active residual diffusion agent (SumiShield® 50WG): To counter malaria, the product is a residual diffusion agent for indoor use that contains clothianidin as the effective agent. The product effectively works on malaria vector mosquito which is resistant to the conventional pyrethroid or carbamate-type residual diffusion agent with great residual effect.

Spray agent (SumiPro®EW): To counter dengue and Zika, the product is composed of metofluthrin, a highly-active agent to knock down mosquitos (Eminence®/SumiOne®) and cyphenothrin with a strong fatal effect (Gokilaht®-S) as well as PBO, a synergist for augmented effect. The product is suitable for dense and small spraying or smoking, and far reaching.

Larva prevention agent with long-lasting residual effect (SumiLarv®2MR): To counter dengue and Zika, the product has an effect to prevent mosquitos to emerge from pupas. It has a long-lasting residual effect compared to conventional products.



◀ Child elated with “Olyset® Net”

Photographs
© M.Hallahan



◀ Manufacturing
Factory of
“Olyset® Net”

Photographs
© M.Hallahan

Key to Success & Challenges for Further Development

- Extensive introduction of Olyset® Net was achieved by promptly responding to the policy change of WHO as part of the anti-malaria measures and swiftly obtaining its recommendation, as well as by making proposals to the developing country governments including its approval process.
- Top management commitment enabled “Local first” principle which led to mass production structure through cooperation with local companies that led to the creation of a unique distribution structure.
- Despite the difficulty in the effective protection of products with patent due to competing products, the Company aims at a greater market share under the Sumitomo Chemical brand by exerting a range of technologies based on the accumulated data on ecosystem and environment in each region.

Profile of Project Company

Sumitomo Chemical was founded in 1913 for the purpose of mitigating impacts of pollution by producing fertilizer from sulfur dioxide, a byproduct of copper refinery process. Since then, the Company has been working to create economic value and social value in an integrated manner. The Company and its over 100 group companies currently supply an array of products worldwide to support many industries and people's lives and is the world's largest supplier household pesticide ingredients. The Company is engaged in “Sumika Sustainable Solutions”, the in-house product certification scheme to recognize environmental contribution including adaptation and is a recipient of the GBC Health Business Action on Health Awards 2012 and the Minister of Foreign Affairs' Award under the Japan SDGs Award 2018 for its dedication to social and environmental activities including “Olyset® Net”.

28. Bicycle-type water purification system for securing a clean water supply

Nippon Basic Co., Ltd <http://www.nipponbasic.ecnet.jp/>

Challenges Addressed | ⑤ Water insecurity

Adaptation Challenge Due to the impact of climate change, it is becoming increasingly difficult to obtain drinking water. At the same time, there is a greater awareness about the importance of washing hands with clean water to reduce the spread of viruses.

Contribution Nippon Basic's bicycle-type water purification system contributes to securing a clean water supply by purifying river water. The equipment is operated without the use of electric power, thus providing access to safe water even in areas where power is not supplied.

Project Details

Background

Country | Bangladesh

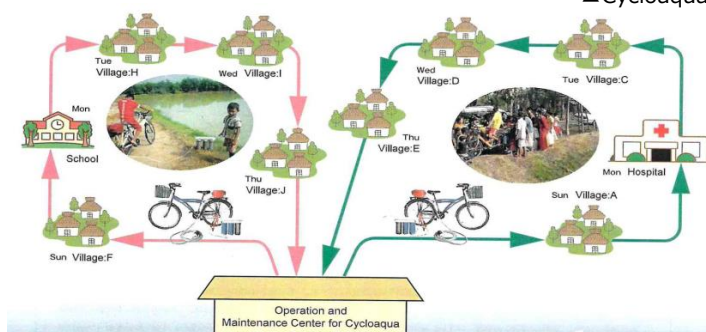
To secure drinking water for emergencies, Nippon Basic previously produced a bicycle-type water purification system (Cycloclean) in Japan; however, as the company's manufacturing staff grew older, domestic production became difficult. After its product was adopted for JICA's BOP business promotion survey and a program for supporting overseas expansion of SMEs, the company launched a survey in Bangladesh and disclosed its techniques to a local bicycle manufacturer. With the support of a fund, Nippon Basic began local production of Cycloaqua to export products to Japan.

Business Model of the Project

Currently, Nippon Basic is involved only in the production side in Bangladesh; however, it also plans to sell its product locally in the future. The company aims to first sell the system, and then replacement filters consisting of 3 layers (pre-filter, hybrid carbon filter, and MF hollow fiber membrane filter) on a regular basis. The company imports MF hollow fiber membrane filter from Japan since it cannot be procured locally. Because the filters are expensive for local residents, Nippon Basic aims to teach locals how to maintain filters by cleaning them with a detergent specially developed by its local partner to extend the useful life of the filters.



▲Cycloaqua



▲Operation diagram of Cycloaqua



Product & Technology

To purify water with Cycloaqua, a bicycle mounted with the product is pedaled, causing a pump in the box on the backseat to draw river water and filter it into drinking water. Bicycles with built-in pump boxes are produced in Bangladesh. Nippon Basic succeeded in lowering the cost of production of the Bangladesh model by 75-80% by downgrading the pump.

The water purification element consists of 3 layers (pre-filter, hybrid carbon filter, and MF hollow fiber membrane filter) and is able to purify 20-30 tons of river water per unit.



▲ Cycloclean (former product name) purifying water for distribution among local residents affected by flooding

Key to Success & Challenges for Further Development

- Business is being developed with trusted local business partners.
- People will recognize the value of the product by using it, but it is difficult to encourage people to make the initial purchase, so a free trial is needed. Another challenge is funding.
- The company believes that product development from the viewpoint of locals is key, and accordingly targets local production for local consumption. It may also be necessary to downgrade the product to allow for low-cost development.

Profile of Project Company

Nippon Basic was established in 2005. Its main products are a compact water purification system and compact desalination system. Domestic customers (e.g., apartment managers and gyms) buy bicycle-type water purification systems to secure drinking water in the case of an emergency. The company is now shifting its business focus to developing countries with limited access to drinking water.

The company also sold its compact desalination system (Desaliclean 9000) to Oxfam, and that product supported local residents in securing drinking water in the southernmost point of Bangladesh, where sea water entered the river due to global warming. In addition, Nippon Basic collaborates with Oxfam to teach proper handwashing techniques to local people with water purified using Cycloaqua to prevent the spread of COVID-19.

29. Facilitating countermeasures against climate change through Big Data

Remote Sensing Technology Center of Japan <https://www.restec.or.jp/>

Challenges Addressed | ③ Floods, heavy rain & typhoons

Adaptation Challenge Changes in the pattern of rainfall and temperature particularly pose a serious threat to developing countries of which the economy is mostly dependent on traditional agriculture.

Contribution The Remote Sensing Technology Center of Japan (RESTEC) provides solutions to users in responding to climate change mainly through the visualization and statistic processing of satellite observation data.

Project Detail

■ Background

Country | Thailand, Myanmar

RESTEC has operated the satellite observation for over 35 years as a remote-sensing specialist agency, ranging from receiving and processing of the Earth observation data, development, revision and verification of the ground systems and data provision for users. As international cooperation is inevitable in conducting observations on a global scale, RESTEC has been engaged in various international activities through partnership with organizations, such as the Japan Aerospace Exploration Agency (JAXA) and Asian Development Bank, including assisting Thailand for flood observation in response to the major flood that struck Bangkok in 2011 and providing information on food supply and agricultural meteorology for Asian countries. In 2014, in cooperation with Sompō Holdings, Inc (Reference: Case Number 41) that had already launched “Weather Index Insurance” for farmers in Thailand, RESTEC successfully addressed the issue of poor infrastructure for weather observation and lack of historical meteorological data that had hindered the development of such insurance and developed one in Myanmar. The “Weather Index Insurance” utilizing the rainfall estimates taken from satellite data is the first-of-its kind activity by a Japanese entity.

■ Business Model of the Project

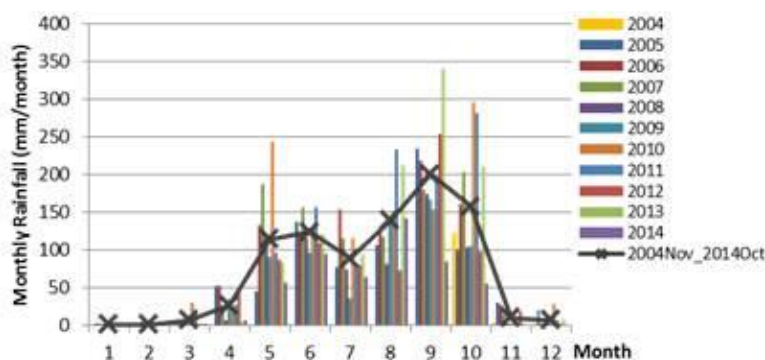
RESTEC offers statistic processing of the rainfall data from JAXA satellites (GSMaP data) for “Weather Index Insurance” project in Myanmar by Sompō Japan and contributes to visualization of the data. The next step is offering the a smart-phone application for local farmers.

Related SDGs

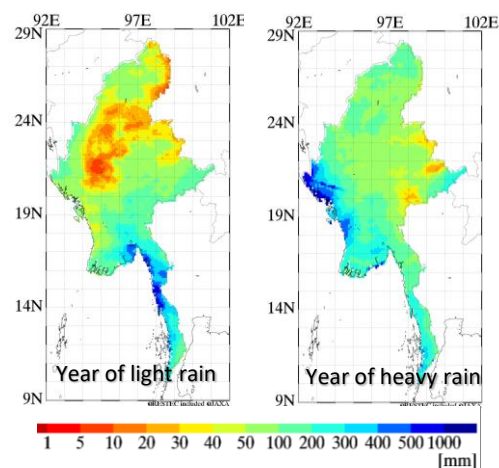


Product & Technology

The observation equipment (sensors) loaded on satellites, applied with the remote-sensing technologies that enables remote observation of the Earth's surfaces, provides users with the data collected from satellites, aircrafts, automobiles, observation towers, ships and buoys and makes contributions across such fields as forestry management, water resource management, food safety and security, disaster observation, and national land management.



▲ Comparison of monthly cumulative rainfall at discretionary areas in years from 2004 to 2014, displaying the differences from the annual average rainfall of each year.



▲ Cumulative rainfall map for the month of May in Myanmar, showing the differences of year 2005 with less rainfall and year 2010 with more rainfall

Satellite rainfall data are adopted for monitoring of monthly cumulative rainfall and comparative analysis with past data. Visualized results will be provided to users.

Key to Success & Challenges for Further Development

For greater awareness across the private sector and social impact, the forthcoming initiatives will be as follows:

- Highlighting the value of remote-sensing data to the society through the extended deployment of applications which will facilitate the infrastructure incorporating both tangible and intangible elements.
- Contributing to the achievement of Society 5.0 and SDGs through a business model established on 4Cs – Customer Value, Cost, Convenience and Communication.

Profile of Project Company

RESTEC was established in 1975, and launched the operation of image analysis equipment in 1976 and satellite data distribution business in 1978. Since then, RESTEC has consistently built up a range of remote-sensing technologies ranging from the operation of satellites to the receiving, processing, and analysis of observation data. Based on these technological capabilities, RESTEC has aggressively pressed ahead with developing human resources through training and cooperating with other agencies on international projects. By providing users with the data collected from satellites, aircrafts, automobiles, observation towers, ships and buoys through the remote-sensing technologies, RESTEC strives to contribute across a range of fields including forestry management, water resource management, food safety and security, disaster observation, and national land management.

30. Supply Chain Risk Management through Crisis Visualization Using AI

Spectee Inc. <https://www.spectee.co.jp/>

Challenges Addressed | ③ Floods, heavy rain & typhoons, ④ Extreme temperature changes

Adaptation Challenge Weather-related disasters, which are becoming more severe due to climate change, can destabilize business activities by causing human casualties and damage to infrastructure at supply chain bases.

Contribution Spectee provides a solution that enables real time crisis visualization by using AI to collect and analyze social media data, weather information, and other data. By grasping the occurrence of disasters and incidents which can affect each location in the supply chain through visualization, users can quickly develop measures to avoid or mitigate damage and ensure the safety of related personnel, thereby improving the resilience of the entire supply chain.

Project Details

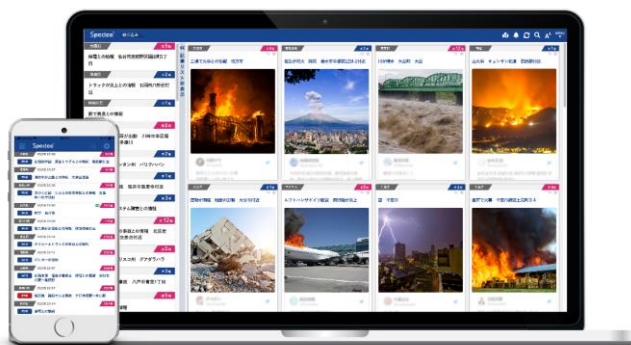
Background

Country | Philippines

The Great East Japan Earthquake in 2011 has shown signs of potential for utilizing useful information transmitted through social media, which led to the conception of the business. Until now, the company has developed its business in Japan, but it is now working to expand overseas, starting with the Philippines. The Philippines is a disaster-prone country like Japan, and English is widely spoken and social media usage rate is high. In addition, numerous Japanese companies are actively expanding their businesses in the Philippines, and many of them have supply chain bases there, so there is a high demand for crisis management solutions.

Business Model of the Project

The company has developed "Spectee Pro," a data analysis platform for crisis visualization, offered to local governments, private companies, and news media in Japan based on monthly subscription. It is used by local governments for evacuation guidance and rescue of citizens based on each situation and condition, by private companies for business continuity and employee safety management, infrastructure and human risk management at supply chain bases, and by news media for disaster reporting, respectively. Currently, through the project with JICA, a feasibility study on the localization of the platform and business development is underway.

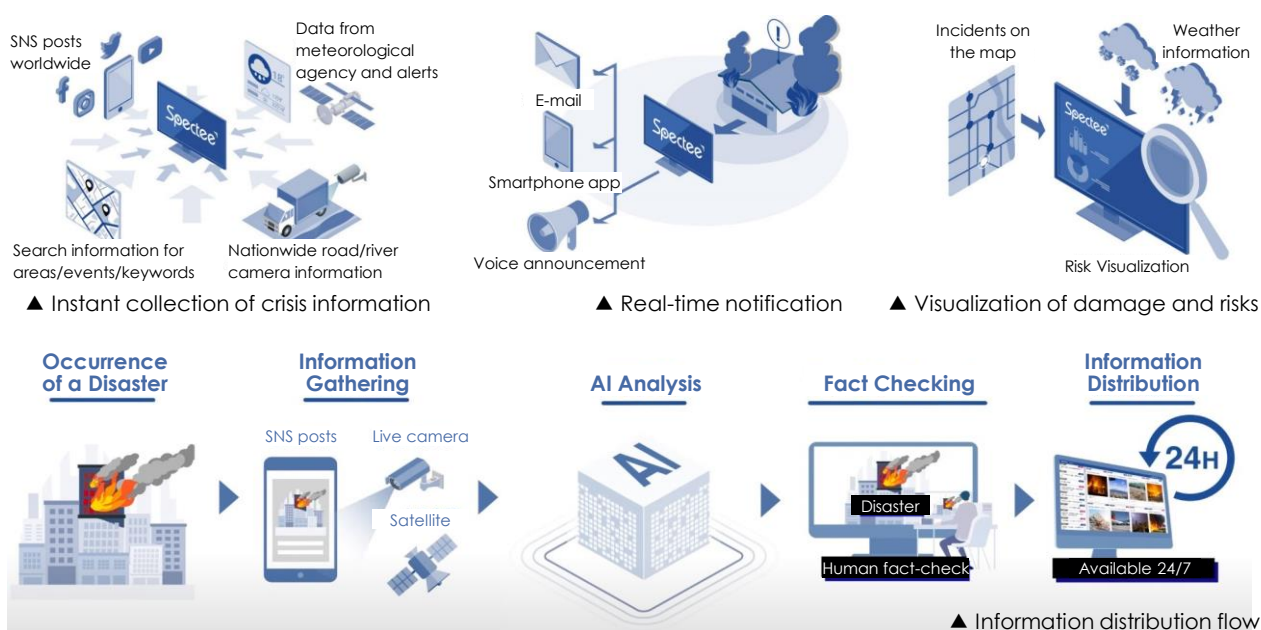


▲ Spectee Pro screens
(PC and smartphone apps)



Product & Technology

Data analysis platform "Spectee Pro": A platform that visualizes crisis incidents related to a target area on a map, filtered by category (such as weather disasters, fires, and accidents) as well as by region and municipality. The AI instantly analyzes social media data from around the world and identifies location based on objects and text found in the posted images (patented technology). The platform uses AI analysis and human fact-checking to eliminate misinformation and ensure accuracy before distributing information to users. Users can either directly search for information on the platform, or register their location of interest in advance and set up notifications (via e-mail or smartphone app notifications) to be sent when a crisis incident occurs within a specified range from the location.



Key to Success & Challenges for Further Development

- The speediness of grasping and analyzing crisis incidents and the ability to visually confirm the level of damage have been highly appreciated.
- Future challenges include improving the accuracy of data analysis through the higher availability of 5G and more frequent acquisition of satellite data, as well as realizing future predictions through simulations.

Profile of Project Company

Established in November 2011, Spectee aims to improve the resilience of society and realize a sustainable world through crisis visualization. The company released a test version of Spectee in May 2014, and officially released a significantly updated version, Spectee Pro, in March 2020.

The company received the TechCrunch Tokyo "Sakura Internet Award" in 2016, the Ministry of Internal Affairs and Communications' "INNO-vation Program" sponsor's special award in 2018, and the Japan Newspaper Publishers and Editors Association's "Encouragement Award for Technology Development" in 2019.

31. The world's lightest & most compact X-band weather radar enables real-time monitoring of local extreme weather

FURUNO ELECTRIC CO.,LTD. <https://www.furuno.com>

Challenges Addressed | ③ Floods, heavy rain & typhoons

Adaptation Challenge Due to the impact of climate change, localized weather disasters are becoming more frequent and extreme in many parts of the world. Intense urban precipitation, river flooding, and landslides are causing greater harm to humans, infrastructure and industry, as well as negatively impacting the economy.

Contribution Furuno's compact X-band weather radar can quickly and precisely detect local weather changes that have been difficult to observe with conventional large radar systems, contributing to reducing the damage caused by localized heavy rainfall disasters. In addition, the low-cost and lower-power consumption design of the radar will enable use in developing countries and municipalities that have had difficulty in introducing weather radars.

Project Details

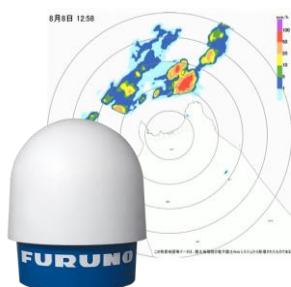
■ Background

Country | Vietnam, Indonesia, Singapore, etc.

Since Furuno successfully commercialized the world's first practical fish finder in 1948, it has maintained the leading global market share in marine radar technology. In 2008, sudden and localized torrential rain caused the Tsuga River in Kobe to rise sharply, resulting in a water-related accident. To prepare for such disasters, Furuno started R&D of a compact radar in 2009. Since its launch in 2013, around 90 units have been in operation in Japan and abroad as of 2020.

■ Business Model of the Project

Sudden floods and landslides caused by short-term localized heavy rains are a frequent occurrence in developing countries located in the tropics. Furuno will promote the introduction of compact X-band radars and provide weather observation and disaster prevention monitoring solutions to governments and municipalities in developing countries that have had difficulties in introducing conventional large radars due to the costs. It will create new markets and applications by enabling simple, low-cost installation and operation.



▲ Meteorological monitoring system



▲ Localized heavy rainfall



▲ Urban flooding



Product & Technology

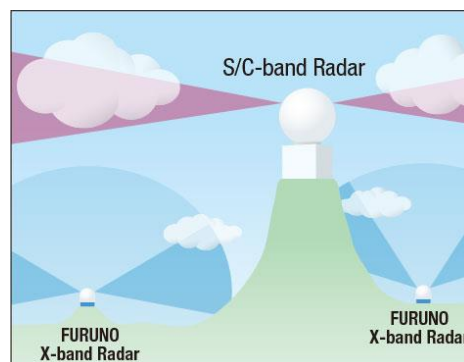
Furuno's compact X-band weather radar is the world's smallest and lightest weather radars at about 1 m in diameter and 68 kg. Not only does it save space and allow for installation by hand in existing buildings, but it also significantly reduces installation costs and construction time. Unlike conventional C-band radars, it allows for precise observation of rainfall in a narrow observation area. It can be installed in urban and mountainous areas and enables responses to local disasters such as torrential rains. In addition, the low-cost, low-power consumption design will allow it to be introduced to governments, municipalities, research institutes, and private companies in developing countries.



▲Installation by hand



▲Installation example (Vietnam)



▲Comparison with large radar

Key to Success & Challenges for Further Development

- Furuno's compact X-band weather radar is advantageous over other products due to its small size, light weight, and a design that allows for easy installation and maintenance.
- The product has a potential market in developing countries due to its low-cost and low-power consumption design and ability to be operated using household power sources.
- Although the cost is lower than conventional products, governments of developing countries and local governments have limited financial resources.

Profile of Project Company

Since being the first in the world to commercialize a fish finder in 1948, Furuno has provided many world-first and Japan-first products in the field of marine electronics based on its unique ultrasonic and electronic technologies. With sales offices in more than 80 countries around the world, the company has built a solid position and brand as a comprehensive manufacturer of marine electronics equipment on a global scale. Furuno integrates the knowledge, experience, skills, and know-how cultivated in its business with the three core technologies of sensing, signal processing, and information and communication technologies to provide solutions not only for the marine industry, but also for various industrial sectors.

Furuno's Meteorological Observation System won the Best Resilience Award in the corporate and industrial category at the 2017 Japan Resilience Awards, which is sponsored by the Resilience Japan Promotion Council.

32. Securing sufficient and clean water through ion exchange membrane

AGC Inc. <http://www.agc.com/>

Challenges Addressed | ⑤ Water insecurity

Adaptation Challenge Issues surrounding water have increasingly become serious worldwide caused by water shortages due to drought and other meteorological phenomena as well as rise in salt content in underground water. At the same time, drainage regulations have been tightened to protect the surrounding environment and secure the quality of water.

Contribution AGC Inc.'s water purification system, where water is purified and desalinated using ion exchange membrane, will ensure stable supply of water suitable for agriculture and drinking and contribute to better health and sanitation of the surrounding environment and residents.

Project Detail

■ Background

Country | Israel, China, India

In response to enquiry from an Israeli public organization plagued by high level of salt content in well water exceeding World Health Organization (WHO) benchmark in the late 1990's, the water purification system was installed in more than 10 sites. Subsequently the demand rose in China where drainage regulations have been tightened and the system was introduced together with ZLD (Zero Liquid Discharge) facilities to purify water and recover valuables such as sodium sulfate at industrial plants. Activities are under way for the system to be installed in India where shortage of water caused by drought and contamination of underground water are getting increasingly serious.

■ Business Model of the Project

AGC has designed the electrodialyzer at the heart of the system and exports the core technology ion exchange membrane. The electrodialyzer and accessory units are manufactured by local engineering partners and delivered as a system to the clients such as government agencies and private companies.



◀ Electro Dialysis
Purification System



Product & Technology

Electro Dialysis Purification System: By combination of electricity and ion exchange membrane developed by AGC called "SELEMION™", ionic substances dissolved in water are separated for desalination. Water is then ensured safe to drink or suitable for daily life and agriculture. The system is characterized as follows:

- Resource-saving: Ion exchange resin used in soft-water equipment usually requires regular regeneration process to remove hard substances built up during use, to recover performance. This process is not needed in this system, therefore the dosage of medical agent can be cut significantly.

- Energy-saving: Water is utilized more efficiently than the conventional RO (Reverse Osmosis) process and power consumption is less as high-voltage pump is not required.

- Countering unstable power environment: Powered by direct current and leveraged on solar panel system, the system can be installed on a site where power source is limited.



▲ Bottled drinking water

Key to Success & Challenges for Further Development

- The products have been widely accepted by local communities due to the customized system that meets the local requirements and regulations.
- The Company strives to raise cost efficiency through various measures, such as the creation of value chain in China based on the recovery of valuable materials and improvement of local production ratio which will remain a key for greater cost competitiveness for future development.

Profile of Project Company

The AGC Group operates globally in approximately 30 countries and regions with AGC Inc. as its core.

Backed by the strengths of world-class technology and know-how cultivated over many years, the Company provides building materials, automotive materials, display glasses, electronic components, chemical products, pharmaceutical & agrochemical related products and services and ceramics to customers in a wide range of industries.

33. Development of a tourism city through water treatment

Sanicon Co., Ltd. <http://www.sanicon-group.com/>

Accrete Co., Ltd. <https://www.accrete-inc.com>

Challenges Addressed | ⑤ Water insecurity, ⑦ Air, water & land-based pollution

Adaptation Challenge Water pollution and its shortage frequently caused by climate change pose threats to regional water resources and industrial development.

Contribution Water purification technology of Sanicon and Accrete contributes to the provision of safe and secure water by maximizing the underground water resources of each region.

Project Detail

■ Background

Country | Vietnam

Sakai City and Binh Dinh Province of Vietnam have enjoyed a long-term exchange, such as interaction between local companies through Consulate-General of Vietnam in Osaka. The Provincial delegation, with perspectives to develop economically while protecting environment, visited the water purification and treatment facilities that Sakai City-based Sanicon Group has planned, designed, installed and maintained, which led to the provision of guidance on maintenance and operation in the Province. Among them, CONSTRUCTION JOINT STOCK COMPANY 47 (CC47), a major local company in the growing tourism industry was planning a water purification project for well water in their hotel premises to ensure the supply of safe water at their own hotels, and was keen to introduce the technology of Sanicon and Accrete. Thereafter in May 2017, well-water purification facilities were introduced to Seagull Hotel by leveraging on the water supply knowhow and water purification technology, which enabled the supply of safe and secure water for tourists and paved a way for sustainable development of the local economy. In addition, during the COVID-19 outbreak, Seagull Hotel opened its guest rooms to the infected. Even under this circumstance, the water purification system facilities was able to provide a continuous supply of safe water without any trouble, despite limited maintenance supplies and response time.

■ Business Model of the Project

Upon site visit in Vietnam by a mission consisting of the Osaka Chamber of Commerce and Industry, the Kansai Bureau of Economy, Trade and Industry (METI-KANSAI) and Sakai City, a local entity was established in Ho Chi Minh City in 2008 aimed at business with Japanese companies operating in Vietnam. In 2014, a wholly-owned local entity of Sanicon was established in Hanoi and in 2017, another wholly-owned local entity was established in Qui Nhon City, Binh Dinh Province for import of core technology from Japan and delivery of equipment to Seagull Hotel, as well as providing guidance on construction, maintenance and management. Engineers are dispatched regularly from Japan for sales promotion and providing technology guidance.



▲ The view of the area with rising sea level



▲ Seagull Hotel along beautiful coastline



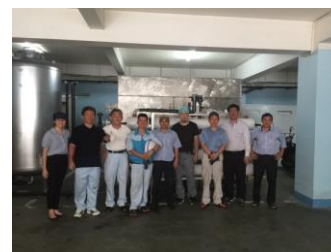
Product & Technology

UF membrane (Ultrafiltration membrane) water treatment: The treatment successfully eliminates germs and viruses. By creating parallel flow to the membrane surface, turbid substances and colloids in the water supplied to the membrane are reduced to prevent them from accumulation on the membrane surface while being filtered which is called the cross flow filtration method. As compared to more common and affordable RO membrane (reverse osmosis membrane), the method enables reuse of 95% of the water to be filtered with greater power efficiency of the pumps and longer durability and thus is fit for use in developing countries. Also, UF membrane is capable of leaving hardness and ion levels at the optimum level so local flavor is maintained while safety is assured, as opposed to RO membrane that removes salt and ion to the extreme.

Guidance on maintenance and management method: A comprehensive flow of construction, ordinary maintenance and operation is based on the Japanese method for sustainable supply of safe water including orderly maintenance around the septic tank and water supply facility, opening/closing of covers, existing water receiving tank and resin coating of the inner surface of the elevated water tank, etc.



▲ Water purification equipment



▲ Team of Japanese and Vietnamese engineers

Key to Success & Challenges for Further Development

- Strong connection with Binh Dinh Province established through a long-term exchange between the Province and Sakai City facilitated the establishment of local entity and granting of license. In addition, acceptance of technology was mainly because of the construction, maintenance and management guidance provided at the same time.
- In Binh Dinh Province, demand for water infrastructure is rising for large resort facilities and village areas but the key for water purification technology to gain awareness is to raise awareness for the need of water treatment technology, maintenance and management, as well as to develop local regulations. The project is focused on the sale of equipment system that accompanies a contract of maintenance and management simultaneously.

Profile of Project Company

Sanicon Co., Ltd. was established in 1972 upon reorganization of the former Kansai Water Treatment Plant Management Center founded in 1970 as part of the expansion of their business, and started construction, maintenance and management of water supply and treatment facilities as its main business. The Company launched technology cooperation with Vietnam in 1997. In 2006, Accrete Co., Ltd. was established as a subsidiary which focuses on development of optimal system making use of various water treatment technologies. Under the corporate motto of pursuing the optimal solution for securing, purifying and recycling limited water resources which is imperative for life while aiming for the preservation of sustainable global environment, the Company strives to protect human health, and seek security and safety of people's living through its projects both in and outside Japan.

34. Contributing to the reduction of non-revenue water and stable supply of safe water by detecting leaks from buried water pipes

Suidou Technical Service Co., Ltd <http://www.suidou-tec.co.jp/>

Challenges Addressed | ⑤ Water insecurity

Adaptation Challenge In the case of water supply facilities that are supplied by timed water supply or low water pressure, cracks and holes that occur in water pipes cause the intake of external substances and lead to contamination of tap water. In addition, inadequate public health due to the shortage of water supply, which became prominent during the COVID-19 crisis, is a major hindrance to the prevention of infectious diseases. Moreover, there are still many health hazards caused by water shortage.

Contribution Water leakage detection technology and products from Suido Technical Service (STS) make it possible to investigate and identify leakage from buried water pipes, one of the main causes of non-revenue water (NRW). Improving the NRW rate contributes to adapting to the reduction and deterioration of water resources due to climate change, and also benefits public health. Prevention of precious water contributes to the stabilization of the management of water utilities and the supply of safe water to users.

Project Detail

■ Background

Country | India, Vietnam

India: By utilizing the JICA Project Formulation and Dissemination/Demonstration scheme between 2013 and 2017, it has contributed to reduction of water leakage rate, improvement of water supply service, soundness of water supply business for Bangalore Water Supply and Sewerage Board as counterpart organization. After the end of the project, a NRW countermeasure department was set up within the department. Subsequently, in 2017, with the support of the JETRO Specialized Program and JETRO Bangalore Office, STS received a direct contract from the Karnataka State Government to conduct training on water leakage surveys for the staff of the Waterworks Bureau. Currently, STS aims to expand its business in India in partnership with a local infrastructure company.

Vietnam: From 2013 to 2016, through a public-private partnership between JICA and Yokohama City Waterworks Bureau, STS participated in the "Safe Water Supply Project in Vietnam with Private Technology in Yokohama" and implemented a project for Hue Water Corporation in Vietnam. The corporation highly valued STS's leak detection technology and concluded an MOU with STS. STS is currently providing training on water leakage surveys to other water utilities in Vietnam in cooperation with Hue Water Supply Corporation, to improve the operation of water utilities by reducing non-revenue water, and to ensure safety and security in provision of water in Vietnam.

■ Business Model of the Project

The following three businesses related to water leakage investigation are core overseas businesses; (1) Provision of on-site water leakage investigation service by STS investigators, (2) Conducting training for measure on non-revenue water for water utilities, and (3) Sales of leak detection monitoring equipment and plastic meters.



Product & Technology

- Provision of leakage investigation services using various investigation equipment.
- Provision of human resource development training for non-revenue water reduction for the purpose of technology transfer of leakage detection.
- Provision of water leakage monitoring equipment and plastic meters.

In developing countries, the focus is on technology transfer of intangible assets, such as knowledge, sound hearing technology, know-how, and processes for actually detecting leaks locally, rather than providing equipment. If local staff can acquire STS's survey technology, NRW due to water leakage can be reduced. NRW reduction is equivalent to additional water resources development, which not only makes efficient use of water resources but also minimizes environmental impact. Energy efficiency in water intake, water treatment and water transfer can be improved, which can contribute to mitigating climate change.



▲ Water leakage monitoring equipment L-sign / L-chaser



▲ Water leakage survey training



▲ Identified water leakage point

Key to Success & Challenges for Further Development

- First of all, utilizing subsidy schemes of government agencies and local governments such as JICA, JETRO, IDEC, and the Yokohama City Waterworks Bureau, they implemented projects internationally and built trusting relationships with government agencies of partner countries.
- In addition, it has taken an approach to collaborate with local private companies and work toward continuous project formulation for water utilities. Utilizing the Ministry of Economy, Trade and Industry's internationalization internship project, the company accepted an intern from Indonesia in 2019 for further development. The intern will be hired from 2020 to expand business in Indonesia. Aiming for diversity management.

Profile of Project Company

Suido Technical Service Co., Ltd. was established in 2002 as a specialized company for water leakage investigation. Its goal is to create a sustainable society where everyone can receive the benefits of water with peace of mind by contributing to the sustainable supply of safe and secure water through our business activities. Its mission is to provide a stable supply of safe water through prevention from water leakage.

In 2018, STS was selected by the Ministry of Economy, Trade and Industry's Small and Medium Enterprise Agency as "300 small and medium-sized enterprises and small businesses in 2018."

35. Safe water supply through an automatic “pay-as-you-fetch” fee collection system for hand pumps

Sunda Technology Global Co. Ltd. <https://www.sundaglobal.com/>

Challenges Addressed | ② Droughts, ⑤ Water insecurity

Adaptation Challenge Many people in Uganda still obtain domestic and drinking water from unsanitary reservoirs. Supply from these surface water sources have become increasingly unstable due to droughts and floods, which are becoming more severe due to climate change. The installation of boreholes with hand pumps has been promoted as a stable means of obtaining safe water. However, due to the complexity of collecting water usage fees from residents and the unfairness of the cost burden, many boreholes have been left unrepaired as a result of the inability to self-sustain financially.

Contribution Sunda Technology Global introduces an automatic “pay-as-you-fetch” fee collection system on hand-pumped boreholes, enabling fair and transparent maintenance of these boreholes, and contributing to the promotion of sustainable and safe water use.

Project Details

Background

Country | Uganda

In rural areas of Sub-Saharan Africa, the population with access to safe water is limited. As for Uganda, approximately 50% of the population currently has access to safe water from hand pump-equipped boreholes, but many still use unsanitary reservoirs. At present, more than 60,000 hand pumps have been installed nationwide, but the collection of fees and maintenance after installation poses a challenge, and about 30% of these boreholes remain broken and unrepaired. In order to solve the problems of hand pump-equipped boreholes, SUNDA, an automatic “pay-as-you-fetch” fee collection system that does not depend on human resources, has been developed.

Business Model of the Project

In Uganda, management of hand pumps by area service providers (organizations under the control of the Ministry of Water and Environment dedicated to maintain hand pumps) in each region has become more common in recent years. The SUNDA system will be sold to these maintenance contractors. The contractors will install the SUNDA system on the hand pump-equipped boreholes (both existing and new) and conduct initial maintenance, and Sunda Technology Global's local subsidiary will provide operational support thereafter.



▲ Conventional water source (reservoir)



▲ Hand pump-equipped borehole



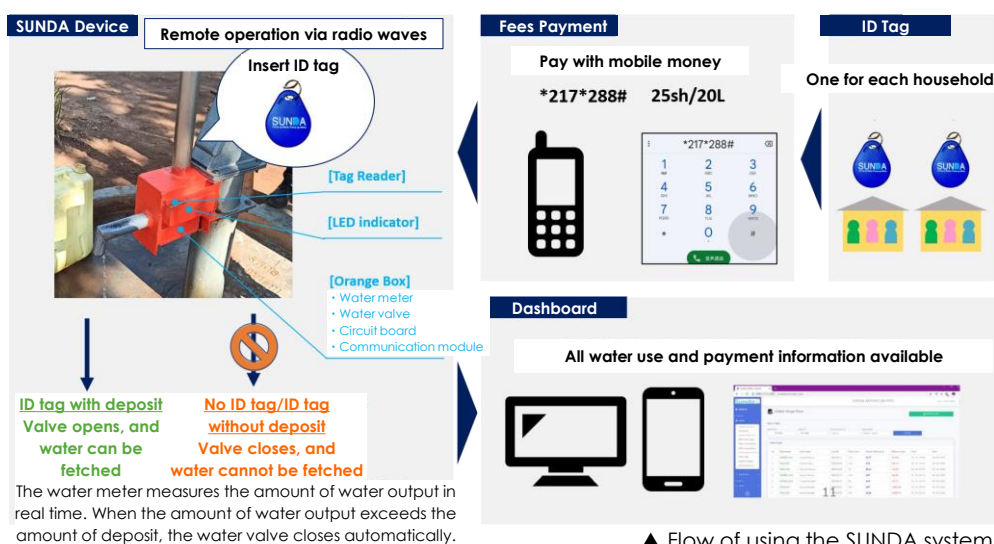
▲ Installation of SUNDA system

Related SDGs

1 NO POVERTY 	2 ZERO HUNGER 	3 GOOD HEALTH AND WELL-BEING 	4 QUALITY EDUCATION 	5 GENDER EQUALITY 	6 CLEAN WATER AND SANITATION 	7 AFFORDABLE AND CLEAN ENERGY 	8 DECENT WORK AND ECONOMIC GROWTH 	
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE 	10 REDUCED INEQUALITIES 	11 SUSTAINABLE CITIES AND COMMUNITIES 	12 RESPONSIBLE CONSUMPTION AND PRODUCTION 	13 CLIMATE ACTION 	14 LIFE BELOW WATER 	15 LIFE ON LAND 	16 PEACE, JUSTICE AND STRONG INSTITUTIONS 	17 PARTNERSHIPS FOR THE GOALS

Product & Technology

Automatic “pay-as-you-fetch” fee collection system for hand pumps “SUNDA”: This system uses mobile money to collect water usage fees based on the amount of water fetched, and consists of an ID tag reader, water meter, water valve, circuit board, and communication module. The electricity required to operate the system is provided by an externally attached solar panel and battery. Users are provided with an ID tag, to which they charge (prepaid) mobile money and insert it into the SUNDA device, enabling them to use the hand pump. The fee is deducted based on the amount of water fetched, which can be confirmed via the monitoring dashboard on a PC or smartphone.



Key to Success & Challenges for Further Development

- The success of the SUNDA system was due to: (1) the company's ability to secure machine parts suppliers through its own network, established through the founder's experience in the Japan Overseas Cooperation Volunteers (JOCV); (2) the product design and maintenance system that enabled sustainable operation of the SUNDA system installed in Uganda; and (3) the acceleration of adoption and improvement of the SUNDA system as part of a JICA technical cooperation project.
- Reducing the frequency of maintenance by improving the durability of the equipment is a future challenge.

Profile of Project Company

Established in March 2020 as a start-up company in Kyoto, Japan. In July 2020, the Ugandan subsidiary Sunda Technologies Uganda was established. The company name "Sunda" means "pump" in Luganda, local language of Uganda. Under the slogan "Pump up Water, Pump up Africa," the company aims to create an environment that secures safe water in Africa through the provision of services including the SUNDA system. The company received the Japan Entrepreneur Award in 2021. In October 2021, the company has signed a memorandum of understanding with the Ugandan Ministry of Water and Environment to disseminate the SUNDA system countrywide.

36. Curbing flood damage and solving water shortage with rainwater storage system

SEKISUI CHEMICAL CO., LTD. <https://www.sekisui.co.jp/>

Challenges Addressed | ② Droughts, ③ Floods, heavy rain & typhoons, ⑤ Water insecurity

Adaptation Challenge Water shortage brought upon by drought due to climate change results in damage in agricultural production. At the same time, increase of extreme weather events leads to growth in flood damage.

Contribution "CROSS-WAVE", a rainwater storage system developed by SEKISUI TECHNO MOLDING CO., LTD., a subsidiary of SEKISUI CHEMICAL CO., LTD., contributes to the reduction of flood damage at heavy rain. In addition, a rainwater storage stores rainwater and is used as a rainwater tank.

Project Detail

■ Background

Country | India

In India, factories must be built equipped with mandatory rainwater storage facilities to counter chronic water shortage. Against such background, the Company entered into the overseas market in 2010 and achieved 10,000 over deals both in the domestic and overseas markets as of 2020. Rainwater, in general, is stored in a pond created on the factory premises but CROSS-WAVE which can be installed underground of the parking space, etc. meets the demand of many project owners. The Company has also extended projects in overseas countries such as Taiwan and Indonesia where the typhoon induces serious flood damage. ASEAN is eyed as the next target.

■ Business Model of the Project

A local subsidiary of the Sekisui Chemical Group leads the projects in each country through collaboration with local consulting firms and sells the products through distributors. The products are manufactured locally in India and imported from Japan in other countries.



▲ Installation of CROSS-WAVE



Product & Technology

CROSS-WAVE: Rainwater storage systems that enable recycling of rainwater by controlling the influx of rainwater to the sewage pipes and rivers at heavy rain, used as plastic materials to store rainwater in underground storage tanks for recycling or control of outflow. The systems have following advantages as compared to the concrete storage tanks.

- Short construction period and affordable cost.
- Recycled plastic materials that contribute to low emission of carbon dioxide in the product lifecycle.
- Load capacity design that enables the use of land above for parking space, etc. while preventing land subsidence.
- High porosity that creates underground space to retain water for the outflow control and effective use of rainwater, as well as slow release of rainwater upon temporary storage after torrential rain to prevent overflow. Rainwater in the storage can be used to water fields and flush toilets.



▲ CROSS-WAVE

Key to Success & Challenges for Further Development

- The Product has successfully been adopted in India as a result of close cooperation with local governments at the onset of drafting standards.
- The Company strives to build close relationship with local governments through collaboration with consulting firm familiar with local affairs.
- Another reason for the Product to be readily accepted by countries is its resilience and simplicity for construction work and maintenance that originate from the product properties.
- Towards further achievements, the next challenges are to streamline the standards to expand local production and to ensure the introduction of high-quality products as well as the methods for performance evaluation.

Profile of Project Company

SEKISUI CHEMICAL CO., LTD. is a leading resin manufacturer founded in 1947, with a growing array of products ranging from daily sundries such as cellophane tape and plastic pail to pipe materials that underpin both the public and private infrastructure, high-performance materials for electronics and transport equipment, medical products and the revolutionary unit-constructed housing called “Sekisui Heim”. With prominent technology and quality, the Company heads the development as a frontier in the fields of “residential and social infrastructure creation” and “chemical solutions” under the Group Vision as part of its contribution to better lives of people and environment worldwide. The Company also advances environmental contribution as a center of business based on the SEKISUI Environmental Sustainability Vision. CROSS-WAVE is internally certified as “Products to Enhance Sustainability” which facilitates the adaptation to climate changes as well as to intensification of natural disasters. The Company has been selected as one of “Most Sustainable Corporations in the World Index (Global 100)” for four consecutive years since 2018, for which the World Economic Forum (WEF) ranks 8,080 major companies around the world.

37. Stable supply of water with high turbidity raw water compatible water purification equipment

Tohkemy Corporation <http://www.tohkemy.co.jp/index.html>

Challenges Addressed | ⑤ Water insecurity

Adaptation Challenge In developing countries where water supply facilities are not provided, rainwater, river (surface water), groundwater, etc., which are not treated for water purification, are used as domestic water, and are exposed to health hazards such as diarrhea and conjunctivitis. In addition, there is a concern that the increase in turbidity due to the increase in rainfall or the depletion of water resources due to the decrease in rainfall will become more severe due to the effects of climate change.

Contribution Tohkemy's high-turbidity raw water-compatible water purification system can purify ultra-highly turbid water stably and efficiently, providing a stable supply of domestic water and improving the health and sanitation of residents by improving water quality.

Project Detail

Background

From 2015 to 2018, JICA promoted, demonstrated, and commercialized the project (support for small and medium-sized enterprises). Demonstration Project for Spreading and Demonstrating Water Purifiers for Raw Water. The purpose of this project was to provide a stable supply of safe water, correct regional differences in water supply services, and purify stable and inexpensive surface water, which becomes extremely turbid in rainy weather. Through this project, Tohkemy's high turbidity compatible water purification system (1000m³ / day: equivalent to about 6,600 people) has been installed and is operating as a tap water supply system in Paksan City.

Country | Laos



▲ Children are happy with purified water



▲ River water with high turbidity



▲ Paksan district water purification system building



▲ High turbidity raw water compatible type water purification equipment

Business Model of the Project

This is a public-private partnership with the Lao government, Lao government officials, JICA, and other stakeholders. The government will promote the standardization of reasonable equipment that meets local needs while utilizing public funding schemes such as JICA, and will consider business development in Laos and other developing countries in the future.



Product & Technology

Tohkemy's high-turbidity raw water-purifying water purification system consists of a fiber filtration system (Acti Fiber) and a sand filtration system. With this device, it is possible to purify river water with a turbidity of more than 1000 NTU, which is often found in areas with a rainy season, to a WHO standard of 5 NTU or less.

The features of the high turbidity raw water compatible water purifier are as follows.

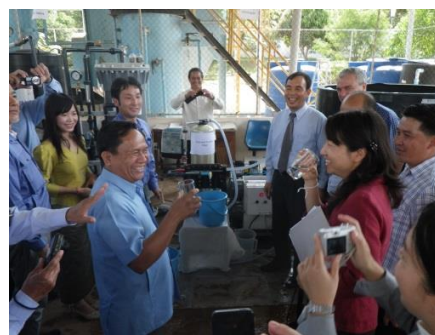
- Fiber filtration technology for small and high turbidity (patented)
- Reduces desalination cost to about 1/3 compared to coagulation sedimentation facility
- Installation space is compact and on-site installation time is shortened



◀ High turbidity raw water compatible type water purification equipment



▲ High turbidity raw water compatible type water purification equipment



▲ Stakeholders drinking water purified by the device

Key to Success & Challenges for Further Development

- Established Lapon Company Limited in Laos in 2011 as a local partner company. It is possible to cooperate for the smooth implementation of projects in Laos.
- Demand for water treatment technology is increasing in areas where water services are not yet established. In particular, securing and stable supply of domestic water for residents is an urgent issue, and the need for high-turbidity raw water-compatible water purification equipment is increasing, especially in developing countries.
- In the future, we will not only utilize public funding schemes such as ODA, but also expand our sales channels in Laos and other developing countries as our own business.

Profile of Project Company

Tohkemy Co., Ltd. (Headquarters: Osaka City) is a manufacturer and distributor of water treatment materials and equipment, including filter materials for water treatment, chemical injection pumps, stirrers, control equipment, and small equipment. Since its establishment in August 1965, the company has manufactured and sold filtration media and water treatment unit products, as well as constructed and maintained water purification plants, etc. in Japan. In addition to Laos, South Korea, Taiwan, China, Indonesia, Thailand, Malaysia, India, Brazil, Russia, the Philippines, Vietnam, etc. have been delivered products (including delivery via plant manufacturers or trading companies).

38. Securing sustainable water resources through water-saving plants

JGC Holdings Corporation <https://www.jgc.com/en/>

Challenges Addressed | ⑤ Water insecurity

Adaptation Challenge In regions where there is expected to be less rainfall and longer dry seasons in the future due to climate change, it is becoming a challenge to cope with declining freshwater resources such as river water and groundwater. Moreover, in closed water areas with minimal ocean currents, over-dependence on seawater will lead to increased seawater temperature and salinity.

Contribution JGC is proposing a water-saving plant that combines the selection of service water, wastewater, cooling water and heat transfer systems with the reuse of wastewater to reduce water intake and drainage, taking into account constraints on water sources and the overall water balance of the plant.

Project Details

■ Background

Country | Oman, Saudi Arabia, Indonesia, etc.

JGC Group builds plants and facilities around the world in a wide range of fields, including oil & gas, energy infrastructure such as power plants and steel & metal plants, industrial infrastructure, and social infrastructure such as hospitals and environmental facilities.

In areas where there are concerns about future restrictions on water resources and the risk of depletion, client needs for water conservation are high and the concept of a water-saving plant reduces the long-term impact on the surrounding water environment, helping clients to realize their capital investment plans. Water treatment is an energy-intensive process in plants and is an important factor when designing a plant.

■ Business Model of the Project

JGC provided FEED (Front End Engineering Design) and EPC (Engineering, Procurement, Construction) services for an oil refinery plant in Oman. The plant treats wastewater generated during the oil refining process to bring it below discharge water quality standards, and partially reuses it as irrigation water for the plant. JGC also provided water-saving plants in Saudi Arabia and Indonesia. Many of the clients are state-owned companies and private oil majors.



▲ Oil refinery plant in Oman

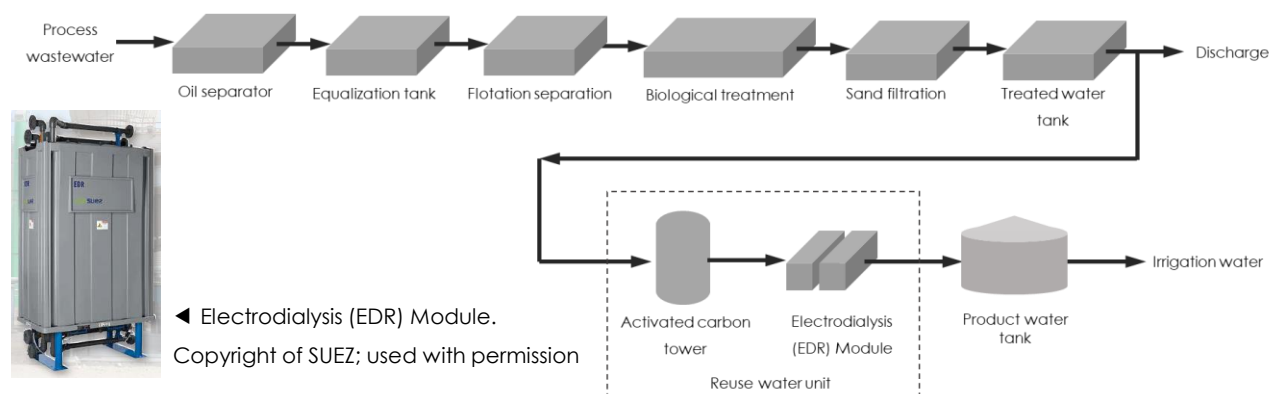
Related SDGs



Product & Technology

In the oil refinery plant in Oman, advanced removal of organic compounds such as phenol and soluble salts such as sodium and chlorides are required in order to reuse the wastewater from the oil refining process for irrigating the plant's green areas. For this purpose, a reuse water unit consisting of an activated carbon adsorption tower and electro dialysis module was installed. This advanced treatment allows 30-40% of the planned wastewater to be reused as irrigation water for the plant. The installation of this water reuse system also contributes to the use of sustainable water resources by reducing the amount of seawater intake and wastewater discharge required for water desalination.

System flow of wastewater treatment



Key to Success & Challenges for Further Development

- In addition to water conservation to reduce the impact on the environment, JGC also provides clients with economic benefits such as reducing water treatment costs.
- As the risk of climate change becomes more apparent, it is expected that there will be greater awareness about the need to secure and sustainably use water resources, and the need to conserve water and reuse wastewater.

Profile of Project Company

Since its establishment in 1928 as Japan's first engineering company, JGC has expanded its business domain from oil and gas to infrastructure, and has conducted more than 20,000 projects in over 80 countries around the world. JGC is now engaged in comprehensive engineering, functional materials, and consulting businesses, mainly in the fields of energy, society and lifestyle, and industry. Under the corporate slogan of "MISSION DRIVEN," JGC aims to solve sophisticated and complex issues in order to achieve a sustainable society. Based on the idea that engineering is essentially a business activity that contributes to environmental conservation, JGC is contributing to reducing environmental impacts, manufacturing low-carbon and environmentally-friendly high-performance materials, and commercializing environment-related technologies.

39. Realization of stable water treatment by underwater mechanical aerator and agitator

Hanshin Engineering Co., Ltd. <http://www.hanshin-pm.co.jp/>

Challenges Addressed | ⑤ Water insecurity

Adaptation Challenge Exhaustion of water resource due to expansion of the desertification and drought under climate change is a serious issue worldwide.

Contribution Hanshin Engineering realizes highly efficient and stable water treatment through technology of underwater mechanical aerator and stirrer. Especially, by introducing the technology in developing countries with serious climate change impact, the technology supports securing water resources and stable provision of water as well as improvement of regional living environment and health / sanitation.

Project Detail

■ Background

Country | Malaysia, Indonesia, Philippines, etc.

Hanshin Engineering Co., Ltd. provides water treatment technology such as underwater mechanical aerator and stirrer in the public works of Japan. The underwater mechanical aerator and stirrer has been installed at some 1,000 locations with some 11,000 facilities, which is approximately half of the water treatment plants in Japan. Also, since the market in Japan became matured, business started in 2010 in Southeast Asian countries where are expected for economic growth in near future. So far, the underwater mechanical aerator and stirrer have been installed in the wastewater treatment facilities in China, Taipei, Thailand, Malaysia, Indonesia, the Philippines.

(1) Advanced wastewater treatment and resource recycling in palm oil factory in Malaysia

The underwater mechanical aerator and stirrer was introduced in the wastewater treatment plant of the palm oil factory in Malaysia through the Pilot Project under FY2013 Supplementary Budget Scheme for Small and Medium Enterprises Overseas Expansion Support Project. The technology accomplished treated water quality at BOD20mg/L. In addition to upgrading the wastewater treatment, it contributed to resource recycling through carbonization of sludge, conversion to fuel, and composting.



▲ Wastewater treatment plant in palm oil factory in Malaysia

(2) Activities in rubber glove manufacturing plant in Malaysia and aquaculture facilities in Thailand

"Development of energy-saving underwater mechanical aerator and agitator for the wastewater treatment system in ASEAN region" was implemented under the Subsidy Scheme for Carbon Dioxide Emission Control (Project for Creating Innovation of Low-carbon Technology for Developing Countries) in FY2017 and FY2018. Under the project, the following are examined; improvement of performance of the products, which is the improvement of transfer performance of oxygen as air supply function, long life of the products through improvement of motor bearing and development of motor cooling mechanism, and stable use of the products with development of alien substance entrapment prevention mechanism.

■ Business Model of the Project

Profitable network is structured through cooperation with local governments, private companies and other stakeholders. Also, approaches to end users in both overseas and Japan are promoted by cooperating with an engineering company who well knows the situation of local water treatment.

Related SDGs



Product & Technology

Underwater mechanical aerator and stirrer “Aquarator®” are functionable for both aerobic and anaerobic tanks. In the aeration process, the air which is supplied from blower is refined through the proprietary structure and gas-liquid mixing solution is spread all over the reaction tank. Some features are shown below.

- High efficiency of oxygen dissolution and high energy efficiency (Energy-saving at max. 30% is realized by renewing from existing air diffuser to the Aquarator®).
- Since the sludge does not remain at the bottom of tank with good condition, wastewater treatment process become stable.
- Less maintenance activity. No clean up activity by removing the sludge in the water tank.



▲Aquarator® by Hanshin Engineering Co., Ltd.



▲before aeration



▲just after aeration



▲under aeration

Key to Success & Challenges for Further Development

- Unique quality service can be provided with high precision product development based on technology and know-how, and abundant achievements and experiences in Japan, which have been accumulated for more than half a century.
- Demand of water treatment technology is increasing in the developing countries due to serious depletion of water resources with effect of climate change. Highly efficient and stable water treatment technology like Aquarator® can respond to such demand.
- International business is successfully utilizing the support project by Team E-Kansai in addition to public financial scheme such as commissioned projects of JICA project and subsidiary scheme of GEC.
- Accumulation of experience with public schemes, effects of promotion and networks structured though frequent site visits are huge advantages.
- Hanshin Engineering will extend sales network by structuring personal connections further and improve sales and production system so as to provide high-quality products, technologies and services.

Profile of Project Company

Hanshin Engineering was established in Nov. 1950. Head office is located in Osaka City. Manufacture and sales of gear reducers, equipment for river facilities, equipment for water treatment, and equipment for industrial equipment. After the underwater mechanical aerator and stirrer “Aquarator®” was developed in 1975 first in the world, its manufacturing and sales were started. A number of the “Aquarator®” have been installed in Japan, and currently there are distributors in China, Taipei, Malaysia, Thailand, and Indonesia.

Hanshin Engineering recognizes that conservation of global environment is the most significant issue common to mankind; therefore, many of our corporate activities aim to protect the global environment and contribute to society on environment. Especially, Hanshin Engineering contributes to the environmental measure toward the climate change through development and sales of water treatment and water regulation machinery.

Hanshin Engineering will deepen cooperation with local partner companies, improve production system such as increase of production amount and shortening of production duration, and actively promote international business.

40. Addressing “water pollution caused by floods” and “decrease in water resources”

Yamaha Motor Co., Ltd. <https://global.yamaha-motor.com/>

Challenges Addressed | ⑤ Water insecurity, ⑦ Air, water & land-based pollution

Adaptation Challenge Increase in floods associated with climate change has aggravated pollution of water source, raised the number of sick people due to poor health, and hindered socioeconomic growth.

Contribution Introducing “Yamaha Clean Water Supply System”, a small-sized water purifier developed by Yamaha Motor Co., Ltd. as an adaptation measure in villages of Asia and Africa will contribute to supporting resilience building of the regions.

Project Detail

■ Background

Country | Indonesia, Madagascar, Senegal, Benin etc.

Based on the home water purification system developed by Yamaha Motors Co., Ltd. In the 1980s following the complaints from the company's expatriate families that “tap water was murky and had rusty smell”, the prototype of the present system, was sold and operated on experimental basis. Thereafter, the company developed the system suitable for villages and has introduced it to various regions in Asia and Africa.

■ Business Model of the Project

The system has been introduced by local governments and NGOs to medical and educational facilities and rural areas in countries vulnerable to water pollution such as Indonesia, Madagascar, Senegal and Benin, drastically reducing the outbreak of diarrhea, fever and other illnesses. The system has freed residents of their water drawing labor and enabled them to shift their activities toward production and learning. The system has led to creation of new business , such as water delivery and ice making in some cases.



▲ Yamaha Clean Water Supply System

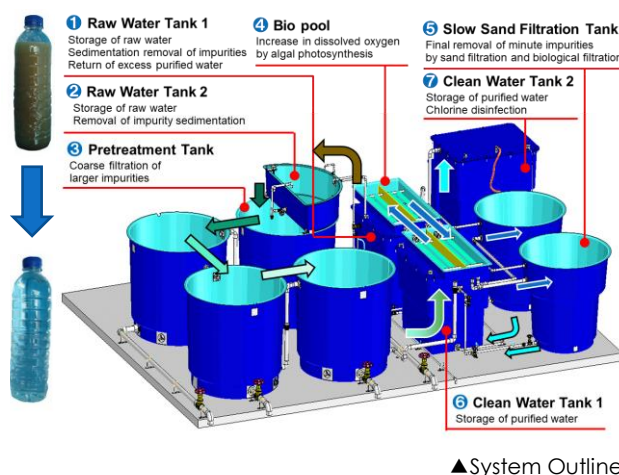


▲ A happy child



Product & Technology

“Yamaha Clean Water Supply System” purifies water through “Slow Sand Filtration” using sand and gravel. Physical dirt and rubbish in the surface water pumped up are removed through “Pretreatment Tanks” filled with sand and gravel. Photosynthesis by the algae which naturally forms inside the tanks increases the density of oxygen dissolved in the water and enhances water treatment by microorganism. The system’s requiring no coagulants or membranes enables self-sustained operation and maintenance by local community without the need for advanced technology and high costs for operation and maintenance.



Key to Success & Challenges for Further Development

- The barriers to introduction is overcome by advance education on sanitation and maintenance procedure in addition to realizing low running cost and easy maintenance.
- Realizing co-benefit by encouraging self operation by local partners through setting up “water committees”. The committee would contribute to creating local jobs through launching new businesses such as water sales business and mobile phone charging service in areas with no grid electricity but equipped with solar panels.
- The company has achieved a sustainable business model through the establishment of framework contributing to the overall development of regional society and economy.

Profile of Project Company

Yamaha Motor Co., Ltd. was set up in 1955 as a motorcycle manufacturer. Since then the company not only pursues values in existing markets, but it has engaged in “Social Value Creation Business”, represented by Yamaha Clean Water Supply System, which creates new markets through effort to resolve social issues taking sustainable economic growth and environmental preservation into consideration. The company has entered into African market in the 1960s and launched an array of projects including motorcycle delivery of vaccines and doctors, promotion of employment through the development of motorcycle taxi business, guidance on the method of fishing and management of catch for modern fishery while introducing outboard motors. The company also promotes local manufacturing of fishing boats made of FRP (Fiber-Reinforced Plastics) as a replacement for wooden ones in a bid for industrial development, job creation, safe operation, and minimizing deforestation, all of which have contributed to the development of African nations. “Yamaha Clean Water Supply System” won the Good Design Award 2013. Our work to encourage the use of safe water at villages with a Yamaha Clean Water Supply System using *kamishibai* storytelling (Japanese-style storytelling using picture cards) was recognized with an award from the committee of judges at the 8th Good Life Awards put on by Japan’s Ministry of the Environment.

41. Minimizing financial losses caused by extreme weather events

Sompo Holdings, Inc. <https://www.sompo-hd.com>

Challenges Addressed | ⑩ Economic loss & livelihood failure

Adaptation Challenge The insurance product is an effective mean of minimizing financial risks and also an adaptation measure in the field of risk finance associated with climate change.

Contribution Sompo Holdings, Inc. has been providing the Weather Index Insurance in South Asia aiming at reducing agricultural business risks associated with extreme weather in Southeast Asian countries, where agriculture is a key industry that is vulnerable to climate change.

Project Detail

■ Background

Country | Thailand

The Sompo Group, in cooperation with Japan Bank for International Cooperation (JBIC), has carried out studies on risk finance approach to address climate change since 2007. Weather Index Insurance was launched for sale in 2010 in Northeast Thailand.

■ Business Model of the Project

Weather Index Insurance is an insurance product that pays out a contractually predetermined insurance amount when a weather index – such as temperature, wind speed, rainfall, or hours of sunshine – fulfills certain conditions regardless of actual losses. It enables a rapid claim handling and contributes to an immediate disaster restoration without a site investigation for a loss assessment.

In addition, it lowers the costs of loss assessment. Therefore, the product is highly evaluated as an effective mean for farmers in terms of rapid claim handlings and clear liabilities.





Product & Technology

Utilizing expertise acquired by weather derivatives products, the Sampo Group, in cooperation with JBIC, has carried out studies on risk finance approach to address climate change since 2007. Weather Index Insurance was launched in 2010, which is aimed to compensate rice farmers in Northeast Thailand for shortfall in crops caused by drought.

Sampo International Holdings Ltd., which is responsible for the group's overseas insurance business, launched the AgriSampo initiatives as an integrated platform to offer agriculture insurance globally in 2017. Sampo Holdings Group launched a parametric weather insurance program for longan fruit farmers in Thailand in 2019. (Longan fruit is one of the major Thai agricultural exports.) This insurance program was developed using satellite data with technology provided through AgriSampo.



▲Hearing survey (Myanmar)



▲Briefing session (Thailand)

Key to Success & Challenges for Further Development

The Sampo Group develops insurance products and services through engagements and collaborations with various stakeholders. The group held dialogs with local farmers, Agricultural Development Bank, and local agriculture bureaus on local weather situation and demands for insurance.

Profile of Project Company

Sampo Holdings, Inc. was established on 1 April 2010 as a holding company with a merger of Sampo Japan Insurance Inc. and Nipponkoa Insurance Co., Ltd., developing a range of businesses centered on the domestic P&C insurance, overseas insurance and reinsurance, domestic life insurance, nursing care & seniors, and digital businesses.

The Sampo Group incorporates the social challenges, strategies, and actions that the Group is tackling into our management framework, and is working to achieve Sampo's Purpose, which is expressed as "With 'A Theme Park for Security, Health and Wellbeing', create a society in which every person can live a healthy, prosperous and happy life in one's own way".