Fiscal Year 2022

Visualization of Contributions of Japanese Companies in Adaptation Fields in Developing Countries

Summary Report

March 2023

Ernst & Young ShinNihon LLC

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Abbreviation	Description
AI	Artificial Intelligence
CDP	Carbon Disclosure Project
COP	Conference of the Parties
CTCN	Climate Technology Centre and Network
DCC	Department of Climate Change
DOSTE	Department of Science, Technology and Environment
ESG	Environmental, Social and Governance
EY	Ernst & Young ShinNihon LLC
FS	Feasibility Study
GCF	Green Climate Fund
GGA	Global Goal on Adaptation
GHG	Greenhouse Gas
GlaSS	Glasgow-Sharm el-Sheikh Work Programme on the Global Goal on Adaptation
IBST	Vietnam Institute for Business Science and Technology
ICD	International Cooperation Department
IFRS	International Financial Reporting Standards
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
ISSB	International Sustainability Standards Board
MARD	Ministry of Agriculture and Rural Development
METI	Ministry of Economy, Trade and Industry
MoAC	Ministry of Agriculture and Cooperatives
MOC	Ministry of Construction
MONRE	Ministry of Natural Resources and Environment, Vietnam
MNRE	Ministry of Natural Resources and Environment, Thailand
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
NDE	National Designated Entity
ONEP	Office of Natural Resources and Environmental Policy and Planning
TCFD	Task Force on Climate-related Financial Disclosures
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WRI	World Resources Institute

Chapter 1. Overview of the project

1.1 Background

In recent years, international negotiations on climate change issues have become more focused on international efforts in the area of adaptation to climate change impacts, in addition to mitigation. Since the decision to establish the Cancun Adaptation Framework was made in the Cancun Agreements at the 16th Conference of the Parties (COP16) of the United Nations Framework Convention on Climate Change (UNFCCC) in 2010, discussions in the area of adaptation have been progressing, including the establishment of the Adaptation Committee and the formulation of national adaptation plans. In addition, Article 7 of the Paris Agreement adopted in December 2015 also mentions the need to set global targets for adaptation and adaptation actions, and it is expected that detailed discussions on the scope of adaptation and the formulation of methods to measure the effects will continue to progress. Furthermore, funding from the Green Climate Fund (GCF), a multilateral fund under the United Nations, will be distributed equally to mitigation and adaptation measures according to the decision of the Board of Directors of the GCF.

In 2020, the Paris Agreement took effect, and countries began to act toward reducing greenhouse gas (GHG) emissions and adapting to the impacts of climate change based on their Nationally Determined Contributions (NDCs). On the other hand, the report of the Working Group I of the Sixth Assessment Report released in August 2021, by the Intergovernmental Panel on Climate Change (IPCC), revealed that anthropogenic climate change is causing extreme events such as heat waves, heavy rains, droughts, and tropical cyclones worldwide. In this context, adaptation to climate change is an urgent issue. Under these circumstances, at the COP27 in November 2022 which was held in Sharm el-Sheikh, Egypt, the way to move forward on achieving the Global Goal on Adaptation (GGA) was discussed during the Glasgow-Sharm el-Sheikh Work Programme on the Global Goal on Adaptation (GlaSS). It is expected that a framework will be adopted at COP28 in 2023 to guide the progress evaluation of GGA.

In the trend of Environmental, Social and Governance (ESG) investment, in June 2021, the Tokyo Stock Exchange revised its Corporate Governance Code, requiring companies listed on the prime market to enhance the quality and quantity of their climate change disclosure under the Task Force on Climate-related Financial Disclosures (TCFD) or equivalent international frameworks. In addition, at COP26 in November 2021, the Board of Trustees of the International Financial Reporting Standards (IFRS) Foundation established the International Sustainability Standards Board (ISSB) to develop internationally uniform and comparable sustainability disclosure standards. As a result of these developments, more companies are becoming increasingly aware of the risks and opportunities of climate change and incorporating them into their business strategies. While many companies are working on mitigation approaches that contribute to decarbonization and carbon neutrality as a

business opportunity, adaptation approaches to climate change is more of a response to the risks of climate change on their business activities. The recognition of adaptation as a business opportunity is less advanced than that of mitigation. In particular, awareness of adaptation business in developing countries is still low due to the challenges in business implementation. In Japan, which is vulnerable to the impacts of climate change, the private sector has developed a number of technologies and services that contribute to adaptation. There is great potential for the development of businesses that contribute to climate change adaptation in developing countries through the use of these technologies, experiences, and know-how cultivated in Japan and the development and continuation of businesses that see solutions for social issues caused by climate change as a business opportunity.

The Ministry of Economy, Trade and Industry (METI) has been conducting various activities to promote Global Warming Adaptation Business, including the preparation of the "Prospect of Global Warming Adaptation Business" by the Committee for Adaptation Business Revitalization, surveys, compilation and expansion of case studies on good practices for adaptation, preparation of a global warming adaptation business guidebook for new businesses, and holding seminars in Japan and abroad.

1.2 Objective

Based on the results of the past projects, this project aims to investigate the possibility of Japan's contribution to climate change adaptation projects in developing countries and how Japan should tackle the field of climate change adaptation, in order to further stimulate climate change adaptation businesses. Table 1-1 shows the activities conducted by Ernst & Young ShinNihon LLC (hereinafter referred to as “EY”) this fiscal year (FY2022) to achieve the objectives of this project.

Table 1-1 Activities of the Project

Objectives	Activities
Improving understanding and awareness of adaptation business by Japanese private sector, and foster market understanding to promote adaptation business	Study on market trends and visualization of contributions to promote and expand adaptation businesses ・ Expansion of Climate Change Adaptation Good Practices ・ Study on the climate change risks and the needs of adaptation businesses to improve resilience ・ Visualization of the contributions and consideration of measures to further promote adaptation businesses
Improving understanding and awareness of adaptation business by Japanese private sector of developing countries	International information dissemination of Japan’s activities ・ Online workshop for Vietnam and Thailand
Promoting adaptation businesses by supporting Japanese companies in formulation of projects	Follow-up activity for the project development ・ Support in formulation of projects for companies listed in the Good Practices

Source: EY

Chapter 2. Study on market trends and visualization of contributions to promote and expand adaptation businesses

2.1 Expansion of Climate Change Adaptation Good Practices

2.1.1 Update of Climate Change Adaptation Good Practice

Since FY2016, METI has been compiling the "Climate Change Adaptation Good Practices by Japanese Private Sector" (hereinafter referred to as "the Good Practices") annually in order to disseminate and share information of adaptation business activities by Japanese companies in developing countries.

This year, five new cases were added into the Good Practices (case No.5, 19, 20, 30 and 35), and three practices were withdrawn [Attachment 1: Climate Change Adaptation Good Practices by Japanese Private Sector in Developing Countries (English)].

Table 2-1 List of the Good Practices in FY2022

No.	Title	Company name	Remarks
1	Development of anti-disaster information system for utilizing forestry preservation project	Kanematsu Corporation / Hitachi Ltd.	Updated
2	Examining the Earth as "Earth Doctor"	Kawasaki Geological Engineering Co., Ltd.	Updated
3	Water projects for realization of cooperative and rich society	Kubota Corporation	No update
4	Protecting society and infrastructure from slope disasters	Kokusai Kogyo Co., Ltd.	No update
5	Strengthening the resilience of mountain roads through capacity building on slope disaster prevention	Japan Conservation Engineers & Co., Ltd.	Newly added
6	Protecting local community from threat of high tide and sea level rise	TAISEI CORPORATION	No update
7	Methodology for prevention of soil surface erosion with soil algae (BSC methodology)	Nippon Koei Co., Ltd.	Updated
8	Disaster risk reduction by river water level alarm system	Unimation System Inc.	No update
9	Disaster prevention system through real-time image data distributed by river monitoring cameras	eTrust Co., Ltd.	Updated
10	Functional paving materials made from waste roof tiles and bricks to reduce urban flooding and heat island effect	Ecosystem Inc.	Updated
11	Waterproofing and extending the service life of buildings with concrete repair materials	ZEN Co., Ltd. / Japan Prolong Limited Company	No update
12	Introducing a resilient hybrid renewable energy power generation control system against environmental changes	Kyudenko Corporation	No update
13	Greater resilience in anti-disaster infrastructure through the world's first "Typhoon Power Generation" and communications satellite	Challenergy Inc.	Updated

No.	Title	Company name	Remarks
14	Mitigating damage to energy supply system in times of disasters	Panasonic Holdings Corporation	Updated
15	Contributing to sustainable agriculture through “Bio-cycle”	Ajinomoto Co., Inc.	No update
16	Greater harvest through compost soil improver	Kawashima Co., Ltd.	No update
17	Greater resilience and higher income through “Agriculture sustainable for 100 years and beyond”	On The Slope Co., Ltd.	Updated
-	Circular model in the manufacture and sale of apparel added with social and environmental value of afforestation project	Sunford Co., Ltd.	Withdrawn
18	Adapting to changing cultivation environment for traditional crops	Dari K Co., Ltd.	No update
19	Water-saving agricultural technology using foamed porous glass	Tottori Resource Recycling, Inc.	Newly added
20	Greening and transforming arid lands into farmlands using rice husk briquettes and PLA Roll Planter®	Tromso Co., Ltd. / Toray Industries, Inc. / Oriental Consultants Global Co., Ltd.	Newly added
21	Generating energy and farming at one place with Solar Farm® technology	Farmdo Group	Updated
22	Circular-economy business model established through organic soil afforestation to prevent flood and protect ecosystem	from far east inc.	No update
23	Rejuvenation of arid areas through high-molecule film farming method	Mebiol Inc.	No update
24	High quality mung beans production in salinized lands	euglena Co., Ltd.	Updated
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.	No update
-	Paints for sustainable life	Kansai Paint Co., Ltd.	Withdrawn
26	Mitigating impact of frequent forest fire on plants and animals	Shabondama Soap Co., Ltd.	No update
27	Preventing spread of infectious diseases associated with climate change	Sumitomo Chemical Co., Ltd.	No update
28	Bicycle-type water purification system for securing a clean water supply	Nippon Basic Co., Ltd.	No update
29	Facilitating countermeasures against climate change through Big Data	Remote Sensing Technology Center of Japan	No update
30	Supply chain risk management through crisis visualization using AI	Spectee Inc.	Newly added
31	The world’s lightest & most compact X-band weather radar enables real-time monitoring of local extreme weather	Furuno Electric Co., Ltd.	No update
32	Securing sufficient and clean water through ion exchange membrane	AGC Inc.	Updated
33	Development of a tourism city through water treatment	Sanicon Co., Ltd. / Accrete Co., Ltd.	Updated

No.	Title	Company name	Remarks
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.	Updated
35	Safe water supply through an automatic “pay-as-you-fetch” fee collection system for hand pumps	Sunda Technology Global Co., Ltd.	Newly added
36	Curbing flood damage and solving water shortage with rainwater storage system	Sekisui Chemical Co., Ltd.	No update
37	Stable supply of water with high turbidity raw water compatible water purification equipment	Tohkemy Corporation	No update
38	Securing sustainable water resources through water-saving plants	JGC Holdings Corporation	No update
39	Realization of stable water treatment by underwater mechanical aerator and agitator	Hanshin Engineering Co., Ltd.	No update
-	Producing safe drinking water from saline and highly turbid surface water	Mitsubishi Chemical Aqua Solutions Co., Ltd.	Withdrawn
40	Addressing “water pollution caused by floods” and “decrease in water resources”	Yamaha Motor Co., Ltd.	No update
41	Minimizing financial losses caused by extreme weather events	Sompo Holdings, Inc.	Updated

Source: EY

In order to indicate how each case addresses specific climate change issues, a total of ten “Climate Change Challenges” have been identified below, based on the various issues listed in the IPCC Sixth Assessment Working Group I Report.

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

In addition, the format of the Good Practice guidebook was revised to include a “Challenges Addressed” column to describe climate change issues which are closely related to the particular case.

2.1.2 Hearing Survey on the Current Situation of the Good Practice

As a result of hearing survey on the current situation to 39 companies in the Good Practices (excluding five newly added companies), 11 cases had no progress, 9 cases have been expanding within the countries mentioned in the Good Practices, 8 cases have been expanding to other countries, and 8 cases did not answer (Figure 2-1). At the same time, main challenges and success factors in business development were also identified through the survey. Other survey items included financing methods, as well as opinions on the Japanese government’s support and utilization of the Good Practices guidebook.

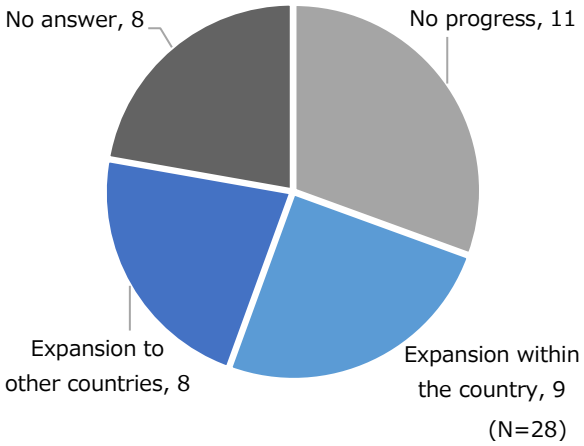

Figure 2-1 Current Situation of the Good Practices

Source: EY

Below are the main challenges to business development among companies in the Good Practices.

- High requirements in applying for government support schemes
- Difficulty in securing funds for technology research and development
- Difficulty in securing profits (due to factors such as small market size, decreasing renewable electricity purchase price, severe exchange rate fluctuations, high local consumption tax, etc.)
- Difficulty in securing human resources (for overseas business expansion, coordination with local governments, etc.)
- Logistics issues, including transportation, procurement and storage of products

On the other hand, below are the success factors in business development. In light of the challenges mentioned above, the utilization of government support schemes, human resources and networks are identified as important factors in the business progress of a company.

- Expansion through utilization of government support scheme
- Establishment of collaboration with local stakeholders with the cooperation of other Japanese companies operating in the region
- Increased company recognition and inquiries through continuous information dissemination (publicity through company website, participation in exhibitions, etc.)
- Increased awareness of local stakeholders and local needs

2.2 Study on the Climate Change Risks and the Needs of Adaptation Businesses to Improve Resilience

2.2.1 Climate Change Risks at Industrial Parks in Developing Countries and the Needs of Adaptation Businesses to Improve Resilience

As climate change progresses and the damage caused by meteorological disasters increases worldwide, there is an increasing risk that Japanese companies' overseas bases will be directly damaged by disasters or indirectly affected through damage in their supply chains. Against this backdrop, the project conducted a survey and analysis of possible future climate change-related disasters in overseas industrial parks where many Japanese-affiliated companies are concentrated, the potential impact of such disasters on the companies, and the countermeasures taken by the companies.

Taking into consideration the number of industrial parks where Japanese-affiliated companies are concentrated and the high physical risk of climate change, the survey was conducted on three countries, namely Vietnam, Thailand, and Indonesia, through literature and interviews with relevant organizations. The main results are shown in (1)-(4) below.

(1) Possibility of disasters due to climate change in the countries surveyed

The main disaster risks due to climate change can be classified into five categories, namely: sea level rise; drought; floods and torrential rains; extreme temperature changes; and water shortages[1]. The impacts of each risk are summarized in Table 2-2, although the degree of impact varies from country to country.

Table 2-2 Potential Impact of Each Disaster Risk

Disaster risk		Potential impact
1	Sea level rise	submersion, saltwater intrusion, coastal erosion
2	Drought	forest fires and smog, saltwater intrusion
3	Floods and torrential rains	river flooding, flash floods, landslides
4	Extreme temperature changes	decline in labor productivity, heat island effect
5	Water shortages	lack of industrial water

Source: EY (based on reports of the governments and international organizations)

(2) Location of industrial parks in the countries surveyed

Most of the industrial parks with a large number of Japanese-affiliated companies are located in or near major cities. Industrial parks with a particularly high concentration of more than 50 Japanese-affiliated companies were found in the vicinity of Bangkok in Thailand, Hanoi and Ho Chi Minh City in Vietnam, and West Java in Indonesia.

[1] The classification is based on the IPCC's definition of the key risks.

(3) Potential impact of disasters due to climate change on industrial park tenants

The World Resources Institute's (WRI) risk assessment tool[2] was used to investigate the risk of meteorological disasters in the areas where industrial parks with many Japanese-affiliated companies are located, which found that flood risk is high in all of the areas, and drought risk is also high in many of them.

In addition, among the companies that reside in the industrial parks, 16 Japanese-affiliated companies were selected and surveyed, including companies in the automotive and semiconductor industries, which are considered to be at high risk in case of supply chain disruptions, and companies whose responses to Carbon Disclosure Project's (CDP) "Climate Change 2021 Questionnaire"[3] were highly rated and whose disclosures were likely to be well documented. The results of the survey of the disclosure documents revealed that most the companies also recognize floods and torrential rains as the major disaster risk (Table 2-3). Similar results were obtained also from the interview survey.

Table 2-3 Disaster Risks Recognized by the 16 Companies

Disaster risk		**Number of companies recognizing risk of the disasters listed on the left regarding at least one of the countries surveyed**
1	Sea level rise	0
2	Drought	1
3	Floods and torrential rains	11
4	Extreme temperature changes	0
5	Water shortages	1

Note: The information was compiled from the responses to the CDP Climate Change 2021 Questionnaire and from the TCFD Report, Sustainability Report, and other company disclosure documents.

Source: EY (based on disclosure documents of the 16 companies)

(4) Countermeasures of industrial park tenants to disasters due to climate change

Based on a review of the disclosure documents of the 16 companies mentioned in (3) above, these companies have implemented or identified as needs countermeasures against floods and torrential rains that are mainly in the area of "resilient infrastructure against natural disasters"[4] at the local plant level. For example, these measures include the installation and use of facilities such as tide gates and drainage pumps. On the other hand, with regard to measures at the head office or supply chain level,

[2] World Resources Institute "Aqueduct" https://www.wri.org/aqueduct
[3] CDP Website https://www.cdp.net/en/companies-discloser
[4] In this project, seven promising areas have been identified in which the Japanese companies can make an international contribution in the field of adaptation to climate change. The seven areas are as follows (see Attachment 1 for details):
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; and Climate Change Finance.

many companies mentioned system measures before and after the disaster, i.e., systems and databases that enable visualization and understanding of the damage status of suppliers.

In addition, the interview survey revealed that companies operating industrial parks are also taking various disaster countermeasures in the area of "resilient infrastructure against natural disasters," etc., and contributing to disaster risk reduction for their tenants.

2.2.2 Policy Options for the Japanese Government to Improve Resilience of the Japanese Industries

Based on the results of the survey, we examined possible policies that the Japanese government could take regarding meteorological disaster risks faced by Japanese industries in overseas industrial parks and supply chains, classifying them into five categories according to their targets. The results are shown in Table 2-4. Furthermore, Figure 2-2 shows the overall effect of the implementation of the proposed policies.

Table 2-4 Policy Options for the Japanese Government

Category			Possible policy of the Japanese government
For the country where industrial park is located	(i)-a	Policy for companies residing in industrial parks	• Subsidy programs for implementation of meteorological disaster countermeasures, etc. • Disseminating the need to take measures
	(i)-b	Policy for companies operating industrial parks	• Investigation of measures being implemented by operators and examples of cost sharing, and sharing the results with operators
	(i)-c	Policy for the entire surrounding area/local government	• Financial and technical assistance from the Japanese government for area-wide measures that are difficult for companies to implement alone
	(i)-d	Policy for the central government	• Discussion and technical assistance to the central government and others for the development of national-level regulations related to meteorological disaster countermeasures
For the supply chain	(ii)	Policy on risks in the supply chain	• Disseminating the need for comprehensive supply chain risk reduction measures, including those not related to meteorological disasters, and supporting implementation of them

Source: EY

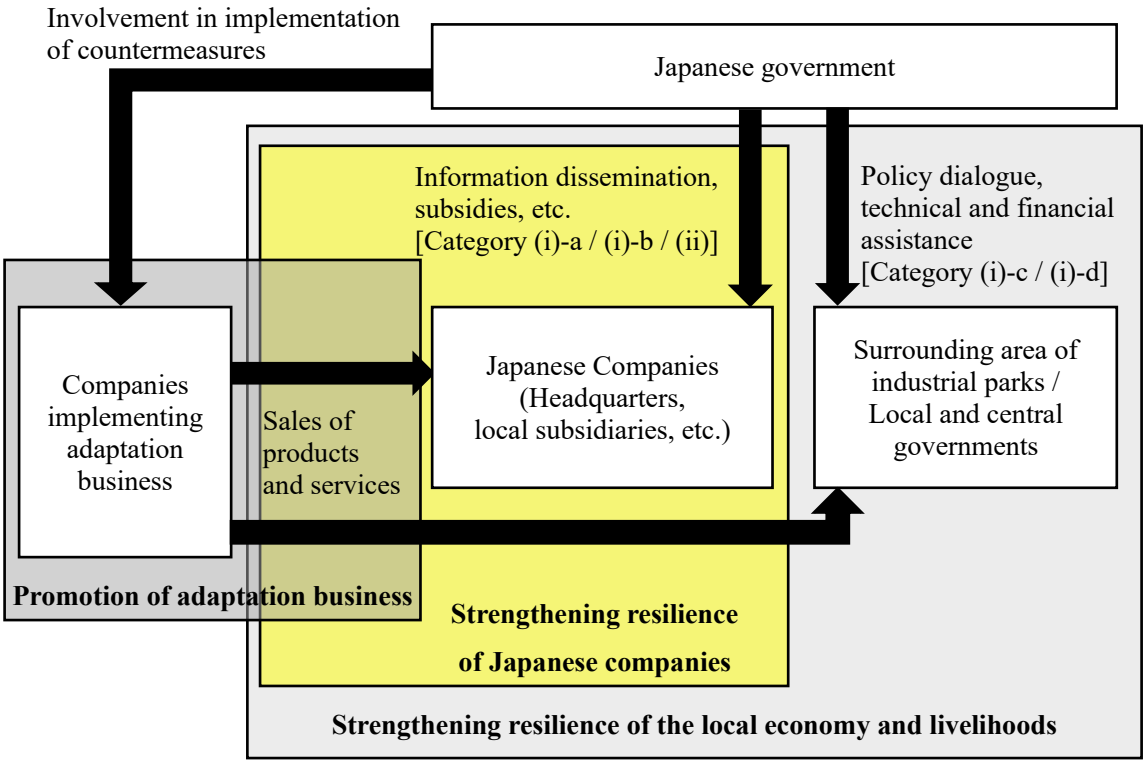

Figure 2-2 Overall Effect of the Implementation of the Proposed Policies

Source: EY

The main adaptation businesses and technologies for which high needs were identified through this survey are listed below by promising areas of adaptation business. Encouraging the use of these adaptation businesses and technologies through the above-mentioned policy measures is expected to have multiple effects: strengthening the resilience of Japanese companies and local economies and livelihoods; and promoting adaptation business. In addition, these efforts are expected to contribute, in the long run, to the international standardization and branding of adaptation business by Japanese companies.

[Resilient Infrastructure against Natural Disasters]

- Drainage and water storage facilities for flood control, etc.

[Sustainable Energy Supply]

- Distributed energy system

[Climate Monitoring & Early Warning]

- Flood level monitoring equipment and systems
- Disaster forecasting services
- Systems and databases that enable visualization and understanding of suppliers' damage status, etc.

[Secure Resources & Sustainable Water Supply]

- Water purification and reclamation facilities
- Water storage facilities

2.3 Visualization of the Contributions and Consideration of Measures to Further Promote Adaptation Businesses

2.3.1 Trial to Visualize the Contributions of Adaptation Businesses

Four cases were selected from this year's Good Practices guidebook to conduct a trial to visualize the contributions, based on "A Guide to Visualizing the Contributions of Adaptation Businesses". Among which, the trial visualization results for Ecosystem Inc. and Routrek Networks, Inc. have been presented in the online workshop for Vietnam and Thailand in Chapter 3.

Table 2-5 List of Cases for Trial Visualization

Case No.	Company Name	Case Title
9	eTrust Co., Ltd.	Disaster prevention system through real-time image data distributed by river monitoring cameras
10	Ecosystem Inc.	Functional paving materials made from waste roof tiles and bricks to reduce urban flooding and heat island effect
25	Routrek Networks, Inc.	Cultivation of fruit vegetable crops with optimized application of water and fertilizer using an IoT and AI based autonomous drip irrigation system
35	Sunda Technology Global Co., Ltd.	Safe water supply through an automatic "pay-as-you-fetch" fee collection system for hand pumps

Source: EY

2.3.2 Consideration of Measures to Further Promote Adaptation Business

In general, investment decisions are made based on financial returns, but in recent years, ESG and social impact investments have been on the rise, adding social and environmental impact to the evaluation axis. In order to attract investments to adaptation businesses, it is necessary to first understand (visualize) the business effects and then appeal (disclose) the effects to investors.

In this project, building on the results of the trial visualization described in the previous section, we considered improvements in the process of visualization of business effects or contributions and expanded the reference indicators. In the trial, since all of the cases were still in the research and demonstration phase and the actual business would be developed in the future or were in the process of development where the final results had not yet been determined, scenarios were set up for before and after the business implementation and the business effects were estimated according to the scenarios. Since this approach is considered to be effective in setting target values of business effects for businesses in such phases, it was added in "Step 3 Indicator Setting" of the visualization process in "A Guide to Visualizing the Contributions of Adaptation Businesses". In addition, the indicators used in the trial visualization are reflected in the reference indicators in "A Guide to Visualizing the Contributions of Adaptation Businesses" [Attachment 3: A Guide to Visualizing the Contributions of Adaptation Businesses (English, 2022 Revised Version)].

In addition, with regard to appealing to investors (disclosure), the existing disclosure status were investigated and effective disclosure methods that could be adopted in the future were considered. Firstly, a survey on the existing disclosure status was conducted, targeting companies listed on the Prime Market, which are considered to be relatively advanced in climate change information disclosure due to the requirement of Corporate Governance Code by the Tokyo Stock Exchange. 42 companies that are members of the TCFD Consortium, out of the top 50 companies in terms of market capitalization as of the data extraction date (16 August 2022), has been identified for the survey. TCFD-related disclosure information, integrated reports, sustainability reports, and other documents from the websites of the target companies were reviewed to study the establishment of adaptation-related targets, description of the deployment of adaptation-related products and technologies, and description of the company's risk management for climate change.

Table 2-6 Adaptation-related Disclosure Status

Item	Number of Companies with Disclosed Information	Disclosure Rate
Establishment of adaptation-related targets	6 companies	14.3%
Description of deployment of adaptation-related products and technologies	20 companies	47.6%
Description of the company's risk management for climate change	39 companies	92.9%

Source: EY

In particular, there was a noticeable delay in the establishment and disclosure of specific numerical targets for adaptation. The majority of companies set specific numerical CO2 reduction targets for mitigation measures, indicating a high level of interest and importance, as well as ease of measurement through unified indicators. On the other hand, adaptation measures are either not well positioned in management, or are limited to the aspect of risk management for the company. It is believed that many companies have yet to foster an awareness of proactive efforts to address the market opportunities. In the future, it is believed that incorporating the deployment of products and services that contribute to adaptation into the company's strategy, setting numerical targets, managing progress, and enhancing information disclosure by utilizing the "A Guide to Visualizing the Contributions of Adaptation Businesses" and other measures will appeal to investors, and eventually lead to the diffusion of adaptation businesses through fundraising.

2.3.3 English Translation of "A Guide to Visualizing the Contributions of Adaptation Businesses"

An English translation was prepared for "A Guide to Visualizing the Contributions of Adaptation Businesses" which was compiled in FY2020 [Attachment 2: A Guide to Visualizing the Contributions

of Adaptation Businesses (English, 2022 First Edition), as of August 2022]. As with the Japanese version, the guidebook consists of six steps to visualizing contributions, reference indicators for the seven areas of adaptation, and an example of contribution visualization. Following the update of the Japanese version of the guidebook, the English version was also updated [Attachment 3: A Guide to Visualizing the Contributions of Adaptation Businesses (English, 2022 Revised Version), as of March 2023]. In addition, the guidebook, which was included as a special feature in the Good Practices guidebook in FY2020, is now presented as a standalone document for both Japanese and English versions.

Chapter 3. International Information Dissemination of Japan's Activities

We have conducted international communications to disseminate information on successful cases of businesses related to climate change adaptation and the Japanese government's initiatives to government officials and private companies in developing countries, in order to promote the expansion of adaptation businesses in the future. In particular, we have aimed at understanding the adaptation needs of developing countries, introducing the technologies and services of Japanese companies that can contribute to those needs, and discussing them among the participants, in order to create opportunities for the formation of concrete adaptation business cases in these countries.

Bilateral online workshops have been held with Bangladesh, Vietnam, Indonesia, and Thailand in the FY2021 and FY2020 projects, and there has been interest in Japanese technologies that can contribute to adaptation needs of those countries. This year, while building on past results, we decided to select target countries from among the partner countries conducted in the past two years in order to further deepen discussions on the formation of specific projects to promote adaptation technologies and services. In addition, based on the experience of the bilateral online workshops conducted in FY2021 and FY2020, we recognize the challenges listed in Table 3-1. Therefore, this year's workshop was designed taking into account the points raised.

Table 3-1 Challenges identified in previous years and points of consideration for designing on-line workshop this year

Challenges	Points of consideration this year
The ministries in charge of climate change adaptation policy are different from those in charge of actual projects and areas to which the introduced technologies will contribute.	Invite participation of appropriate parties such as ministries/departments, research institutes and universities in charge of issues to which the technologies to be introduced will contribute.
Because the issues in the field of adaptation and the technologies to be introduced cover a wide range of fields, the participants' interest varies depending on the area of technologies introduced. It is challenging to deepen the discussion on one technology.	Limit the number of technologies/services to be introduced and give priority to discussion rather than one-way information sharing. The number of participants should also be limited, and the workshop should be held on a smaller scale, with priority given to discussion.
Government officials can express support for a project, but are unlikely to be the actual implementer of the project, making it difficult to lead to concrete discussions for subsequent activities.	Select and introduce projects for which local counterparts have already been identified as implementing agencies whenever possible. If not identified, try to invite appropriate candidate institutions to participate.
Online meeting makes it difficult to generate additional discussion among participants.	Prepare for discussions by meeting with participants in advance.

Source: EY

In particular, because the meeting was held online, many participants expected one-way information sharing, making it more challenging to encourage discussion among participants, find potential partners, and proceed to discussions on specific activities. This year, METI conducted a Feasibility Study (FS) in the field of adaptation in parallel, and we decided to select countries where local counterparts had already been identified and where there were companies actively engaged in adaptation business, utilizing these studies. As a result of consultation with METI, it was decided to hold bilateral online workshops in Vietnam and Thailand.

The workshops for Vietnam and Thailand were held on 7 December 2022 and 20 February 2023 respectively, with approximately 26 participants in the workshop for Vietnam and 60 participants in the workshop for Thailand. The agenda for each country is shown in Table 3-2 and Table 3-3, and presentation materials are shown in the attachment [Attachment 4: Presentation Materials of International Information Dissemination (Vietnam), Attachment 5: Presentation Materials of International Information Dissemination (Thailand)].

In Vietnam, in addition to those in charge of the adaptation sector of the Ministry of Natural Resources and Environment (MONRE) and those in charge of National Designated Entity (NDE) of Climate Technology Centre and Network (CTCN), the Ministry of Construction (MOC) and its affiliated research ministries, universities, and the Ministry of Agriculture and Rural Development (MARD) participated in accordance with technologies introduced.

Table 3-2 Online Workshop agenda for Vietnam

Time		Agenda	Presenters
Vietnam	Japan		
13:00	15:00	Opening Remarks	METI MONRE/ Department of Climate Change (DCC)
13:10	15:10	METI's activities for promoting private sector participation in climate change adaptation"	METI
13:15	15:15	Introduction of study result on the impact of climate change on business and introduction of "A guide to visualizing contributions of adaptation business"	EY
13:25	15:25	Experience of CTCN project in Vietnam	CTCN NDE
13:35	15:35	Key features of the National Adaptation Plan (NAP) Vietnam	MONRE/DCC
13:45	15:45	Q&A	All
13:55	15:55	Introduction of good practices 1: Heat reduction paving material	Ecosystem Inc.
14:10	16:10	Introduction of good practices2: Climate Smart Agriculture	Routrek Networks, Inc.
14:25	16:25	Q&A	All
14:35	16:35	Discussion on next steps for implementation of adaptation projects with promoting private sector participation in Vietnam	All
15:00	17:00	Closing Remarks	MONRE/DCC METI

Source: EY

In Thailand, the technologies introduced were limited to agriculture, with a particular focus on climate resilient agriculture, which is a priority in Thailand. For this purpose, with the cooperation of Office of Natural Resources and Environmental Policy and Planning (ONEP) under Ministry of Natural Resources and Environment (MNRE), relevant departments under the Ministry of Agriculture and Cooperatives (MOAC), research institutes, and universities were invited to participate. In addition, United Nations Development Programme (UNDP), which is implementing an adaptation project in agricultural sector in Thailand using the Green Climate Fund (GCF), was invited to introduce its project.

Table 3-3 Online workshop agenda for Thailand

Time		Agenda	Presenter
Thailand	Japan		
13:00	15:00	Opening Remarks	METI ONEP
13:10	15:10	METI's activities for promoting private sector participation in climate change adaptation"	METI
13:20	15:20	Update on Thailand's National Adaptation Plan	ONEP
13:30	15:30	Implementation of Climate Change Adaptation on Agricultural Sector in Thailand	MoAC, Office of Agricultural Economics
13:45	15:45	Thailand's Climate Change Adaptation Project in Agriculture Sector Introduction of GCF Project	UNDP Thailand
14:00	16:00	Q&A	All
14:05	16:05	Introduction of Kubota's activity to promote Smart Farming Technology	Innovation Center, Kubota Corporation
14:25	16:25	Introduction of Climate Smart Agriculture "Zero Agri"	Routrek Networks, Inc.
14:45	16:45	Q&A	All
14:50	16:50	Discussion on next steps for promoting climate resilient agriculture in Thailand	All
15:05	16:05	Closing Remarks	ONEP METI

Source: EY

During the discussion session, participants engaged in lively discussions. Comments were heard regarding expectations for the introduction of the technologies introduced, and there were also discussions among the participants regarding issues related to costs, standards, and criteria for introduction of technologies and services. Follow-up discussions were conducted with the participants who expressed interest in the technology, the results of which are presented in the next chapter.

Chapter 4. Follow-up Activity for the Project Development

Among the companies listed in the Good Practices guidebook, those interested in utilizing international networks (CTCN, etc.) and support scheme of the Japanese government and other organizations were provided with assistance in formulation of projects.

Including those who have continued to receive support since FY2021, we assisted three companies in formulation of projects this year. Specific details of the support provided are as follows.

Table 4-1 Status of follow-up activity

Company	Consultation Contents	Follow-up status
A	Interested in development of standards of proposed technology using CTCN's support scheme in Vietnam.	・ Provide an overview of the CTCN system. ・ Follow-up with MONRE, the NDE of CTCN, and the cooperating organization, Vietnam Institute for Business Science and Technology (IBST) (on-site interview and e-mail). ・ Provide information and advice on the preparation of CTCN Request Form.
B	Interested in the implementation of a technology dissemination pilot project using CTCN's support scheme in Egypt.	・ Accompanied the Egyptian Embassy in Japan to discuss necessary next steps for the implementation of the demonstration project, and requested them to contact the Ministry of Environment, Egyptian Environmental Affairs Agency (Ministry of Environment), which is the NDE.
C	Seek to implement the demonstration in Vietnam and Thailand, and would like to follow up on the coordination of the demonstration site and demonstration content.	・ Follow-up with Department of Science, Technology and Environment (DOSTE) and International Cooperation Department (ICD) of MARD in Vietnam (on-site interview and e-mail), received introduction of candidate municipalities for demonstration project sites, and requested future cooperation. ・ Interviewed JICA experts, received introduction of related projects currently being implemented in Vietnam, and requested future cooperation.

Source: EY

Regarding Company A, we discussed the possibility of using CTCN scheme through face-to-face meetings with MONRE, and requested support for implementation of the demonstration project, confirming their willingness to cooperate. In addition, with the cooperating organization (IBST), issues and experiences in the development of local standards were discussed, as well as the possibility of future collaboration.

As for company C, a follow-up meeting with MARD was conducted and a municipality interested in the technology was introduced. Discussions will continue with the aim of implementing a demonstration project.

Chapter 5. Issues and Proposals for Next Year and Beyond

During COP27 in November 2022 held in Egypt, climate change adaptation and addressing losses and damages associated with the adverse effects of climate change were once again high on the agenda. At the conference, METI, together with the Fukuoka headquarters of UN-Habitat, announced the launch of the "Sustainable Business of Adaptation for Resilient Urban future (SUBARU)" initiative, which aims to build climate change resilient cities in developing countries. Furthermore, the Ministry of Environment of Japan also announced the launch of the "Assistance Package by the Government of Japan for Averting, Minimizing and Addressing Loss and Damage (APLD)", which provides comprehensive support for losses and damages due to climate change, in cooperation with the international community. In addition to the support announced by the Japanese government, based on the COP26 commitment to double the adaptation finance by 2025, in 2022, countries have raised financial contributions of more than US$230 million for the Adaptation Fund. Several governments and international organizations have also pledged financial and technical support for adaptation.

Meanwhile, funding for adaptation projects remains scarce and is less than that of mitigation projects. According to Adaptation Gap Report 2022[5] by United Nations Environment Programme (UNEP), at least 84% of UNFCCC Parties have adaptation plans, strategies, laws, and policies in place, a 5% increase from the previous year. However, funding for the implementation of the plans and strategies has not kept pace, and international adaptation financing flows to developing countries are five to ten times below estimated needs, a gap that is widening. Annual adaptation financing needs are estimated at US$160-340 billion by 2030 and US$315-565 billion by 2050.

In order to deal with the funding shortfall, it is essential to involve the private sector in addition to strengthening public support. In Japan, information on climate change is increasingly being covered by various media, and private companies are becoming increasingly interested in the issue. Moreover, starting from 2022, companies listed on the Prime Market will be required to disclose information on climate change risks and opportunities in response to the TCFD, making it an urgent need for companies to address climate change and consider measures to deal with it. As it is increasingly important to consider the future impacts of climate change, it is expected that more companies will become interested in adaptation businesses.

Under these circumstances, in this year's project, the collection of Good Practices has been expanded through the addition of new cases, as in the previous year. This year, the guidebook has been revised to include climate change challenges addressed by each case, in order to aid developing countries to

[5] UNEP "Adaptation Report 2022 – Too Little, Too Slow" https://www.unep.org/resources/adaptation-gap-report-2022

understand what kind of technology is needed to address their issues. In the online workshop for Vietnam and Thailand, the number of participants was more limited than in the previous fiscal year in order to develop specific projects, but there were requests from local participants for a face-to-face meeting instead of an online meeting. Face-to-face discussions are believed to be more effective in building and strengthening relationships with counterpart institutions and potential partners, and it is hoped that such opportunities will be available in the next fiscal year and beyond.

In addition, a study on climate change disaster risks and the needs of adaptation business to improve resilience were conducted to foster market understanding for the promotion of adaptation business. A survey was conducted on industrial parks in developing countries with a significant number of Japanese company bases, regarding the risks caused by climate change and how are they being addressed. It was found that the awareness of risks other than floods and torrential rains remains low, and that they are not prioritized in overall risk management. A wide range of financial and technical support and information dissemination to raise awareness are required at the national, regional, and business levels. To address these issues, it is important for the Japanese government, private companies, academic institutions, and other organizations to work together and demonstrate Japan's support.

At the same time, a trial to visualize the contributions by adaptation businesses was conducted, as well as considerations on measures to further promote adaptation businesses. A survey was conducted on the current disclosure status, and it was found that while many companies actively set targets and disclosed the status for mitigation measures, target setting and disclosure for adaptation measures were limited. In the future, it is hoped that companies will visualize and disclose the contributions of adaptation businesses, which can stimulate a flow of funds from investors and improve the financing gap for climate change adaptation.

Addressing climate change has become one of the top priority issues for the international community and corporate activities. Adaptation efforts are particularly urgent in developing countries that are vulnerable to the effects of climate change. The potential for Japanese companies to contribute to solving these issues by utilizing their technology and experience is high, and it is expected that the number of adaptation business cases will increase in the future as a new business opportunity for companies.

Attachment

Attachment 1: Climate Change Adaptation Good Practices by Japanese Private Sector in Developing Countries (English)

(1) Climate Change Adaptation Good Practices by Japanese Private Sector in Developing Countries (March 2023)

Climate Change Adaptation Good Practices

by Japanese Private Sector in Developing Countries

March 2023

METI
Ministry of Economy, Trade and Industry

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

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

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Sustainable Development Goals (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

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

Country | Indonesia

■ Background

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

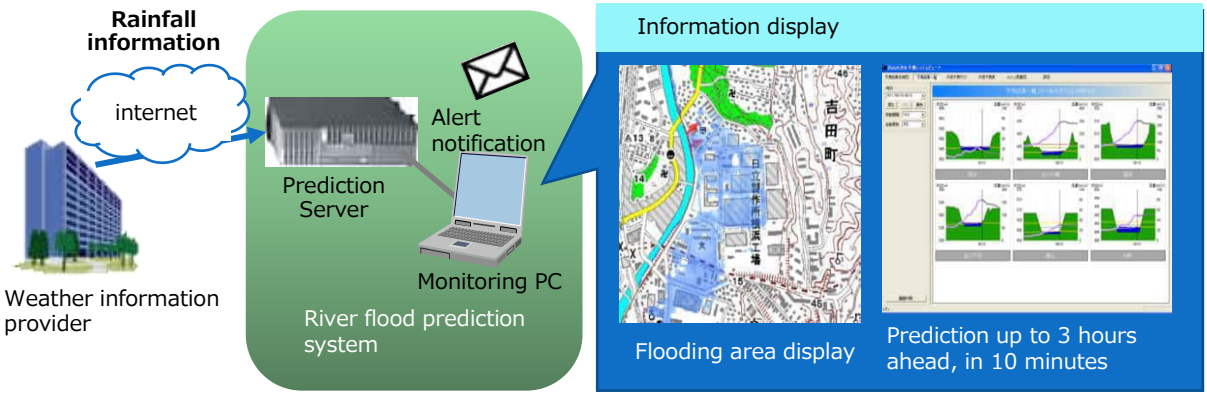
The project is executed in collaboration with a major local conglomerate, the Gobel Group which is a partner in the REDD+ Project. The Group helps in the sales coordination/management of disaster prevention information system to the prefectural governors and local heads of Gorontalo Province. In addition, 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

Related SDGs

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-dimention 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

Country | Vietnam

■ Background

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

Related SDGs

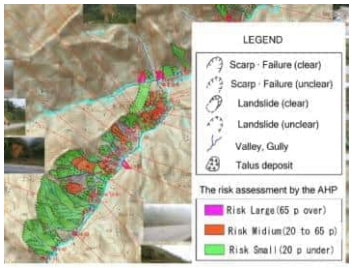
Product & Technology

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.

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

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.

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.

Related SDGs

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

Country | Ethiopia, Brazil, Bhutan

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.

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

■ 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.


▲ 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).

Related SDGs

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

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

■ Background

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

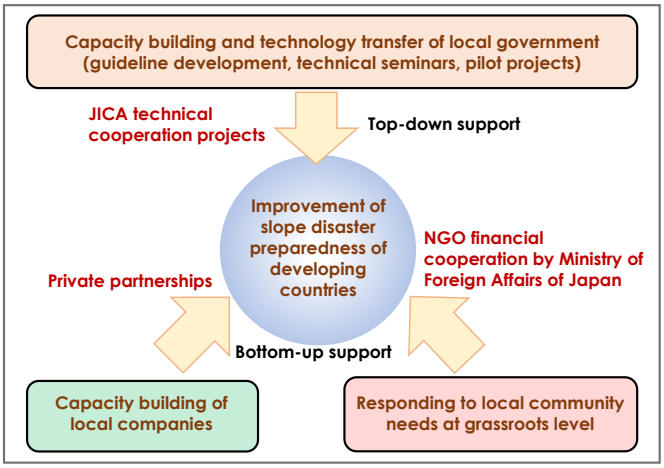
In Assam, JCE provides support for slope disaster prevention measures on mountain roads that are designated for maintenance. To enable sustainable maintenance, JCE supports capacity building of local consultants and EPC contractors who bid for the road maintenance, while working together on planning 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

Related SDGs

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.taisei.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

Country | Maldives

■ Background

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

Related SDGs

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

Country | Nepal, Malaysia

■ Background

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 Sohonsha 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.

Related SDGs

Product & Technology

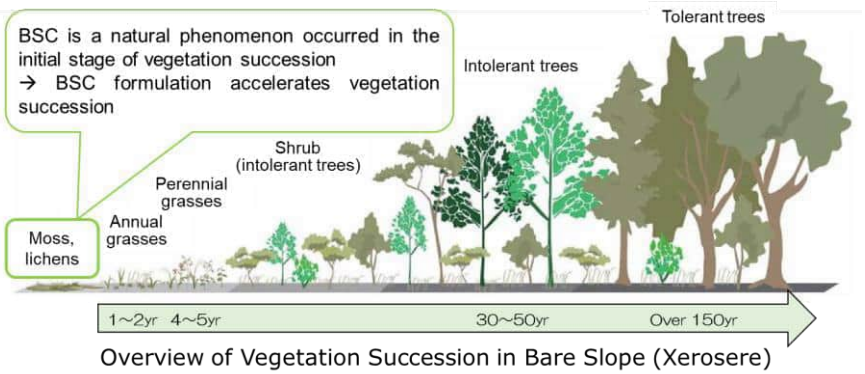
1) In the initial stage of vegetation succession, BSC (soil surface covered with algae, moss, etc.) is formed naturally, and as the environment improves, grass and other vegetation grows, followed by trees. By taking advantage of this phenomenon, this technology enables the formation of BSC in a short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



Overview of Vegetation Succession in Bare Slope (Xerosere)

Key to Success & Challenges for Further Development

After joint development with the PWRI, Nikken Sohonsha 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

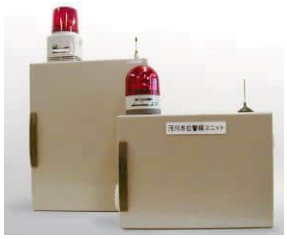
Country | Philippines

■ Background

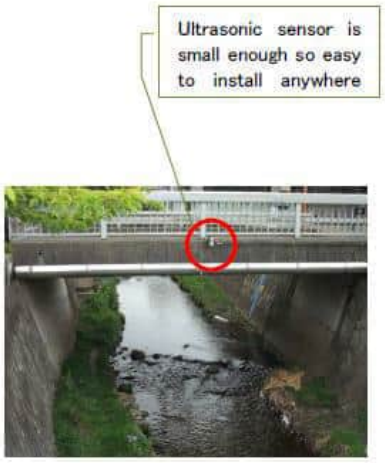
Unimation System Inc. (herein after Unimation) is a specialized company dealing in equipment for disaster prevention such as River Water Level Alarm System, Flood Warning Unit for Road, and Flood Warning System and has been selling the equipment in Japan. After the major flood disaster in Thailand in 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

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

■ Background

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

Country | Vietnam

■ Background

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

Related SDGs

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

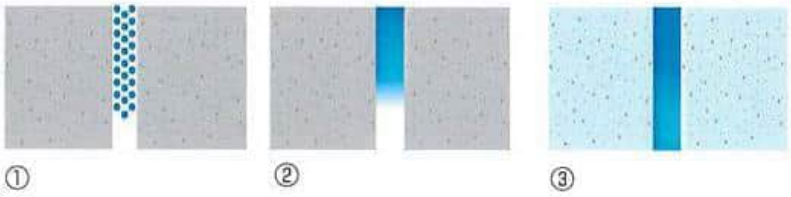
▲ Cracks on a building roof (Philippines)

Related SDGs

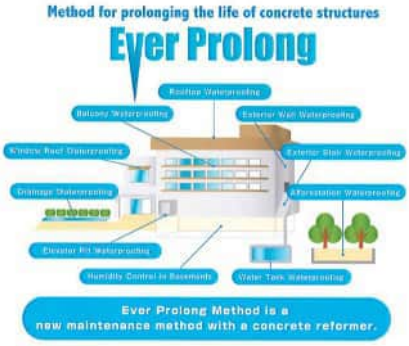
Product & Technology

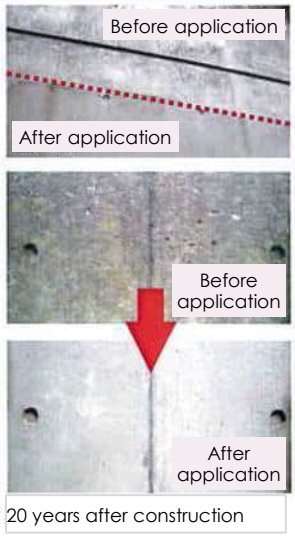
Ever Prolong: An odorless and harmless concrete modifier (repair material) consisting of a silicate-alkali mixture. When diluted with water and applied or sprayed on the concrete surface, it penetrates and fills the pores of the surface layer of a few centimeters to form a dense protective layer. It 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





▲ 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

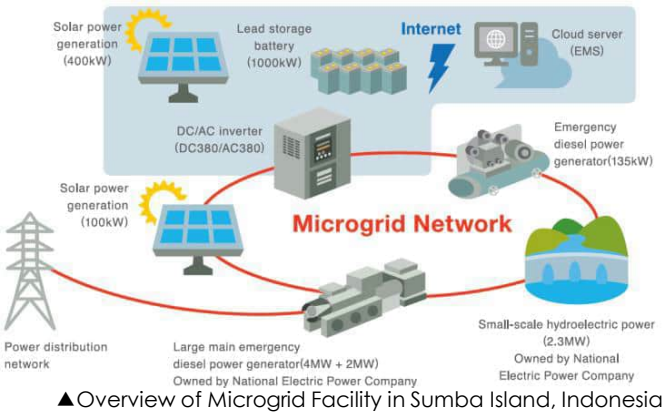
Country | Indonesia

■ Background

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.



▲Overview of Microgrid Facility in Sumba Island, Indonesia

Related SDGs

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

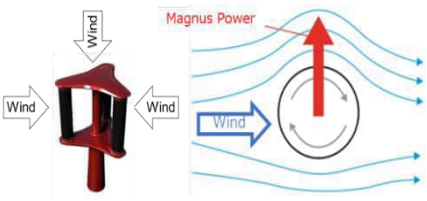
Country | Philippines

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)

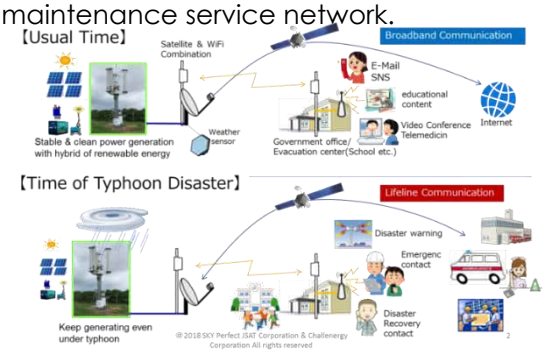
▲Power generation experience at a maximum instantaneous wind speed of 30.4m/s.

Related SDGs

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.

Related SDGs

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

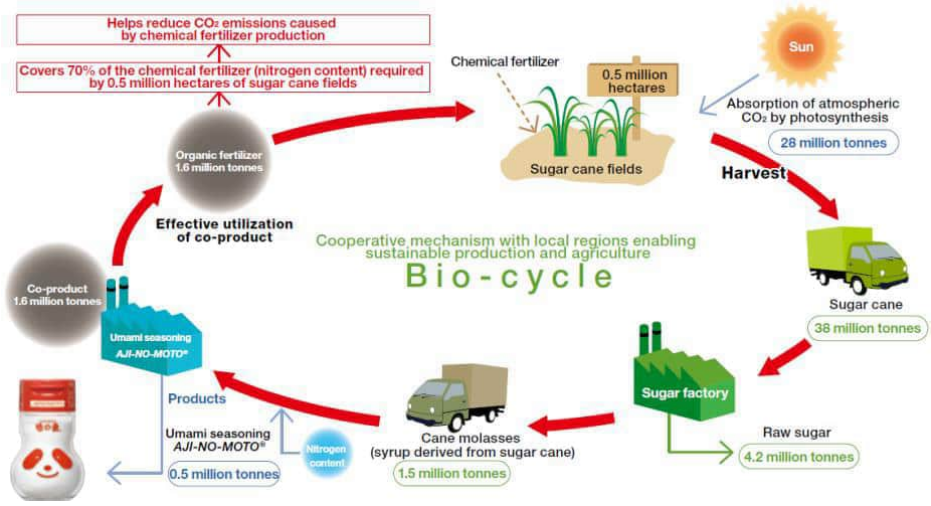
■ Background

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.

Related SDGs

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

Country | Sri Lanka

■ Background

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

Related SDGs

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 an 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 agro-forestry 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.

▲ Laos Forest Coffee


▲ Coffee Beans

■ 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.

Related SDGs

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.


▲Coffee Plantation in Forests

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.


▲Cultivation as Part of Life

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.


▲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

Country | Indonesia

■ Background

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

Related SDGs

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

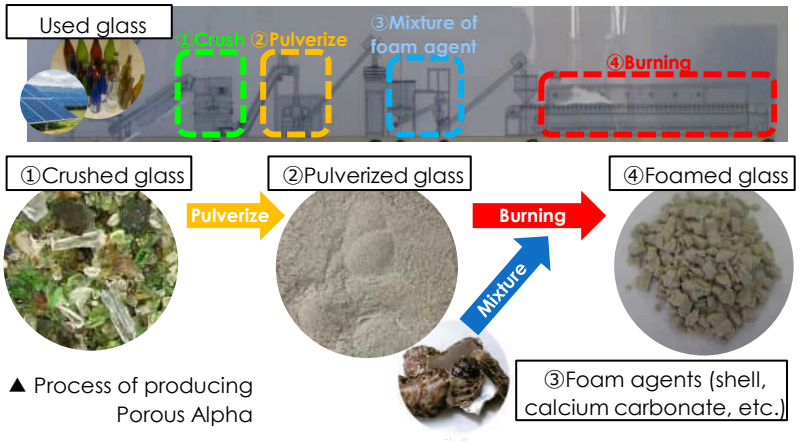
▲ Farmland where Porous Alpha is applied

▲ Mixing Porous Alpha into soil

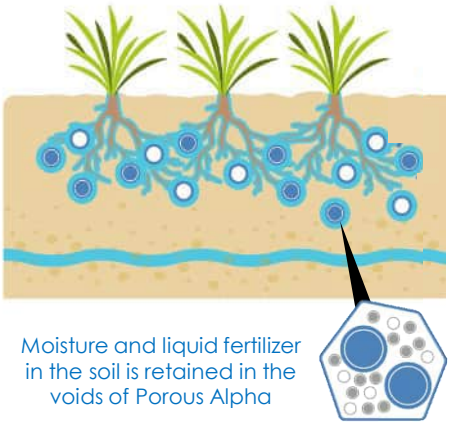
Related SDGs

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.



▲ Process of producing Porous Alpha



▲ Mechanism of the retention of moisture and liquid fertilizer

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

Related SDGs

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

Country | Mongolia, Chile

■ Background

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.

▼ 1 ・ 2 : Mongolia 10.4MW Solar Power Plant & Solar Farm®

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

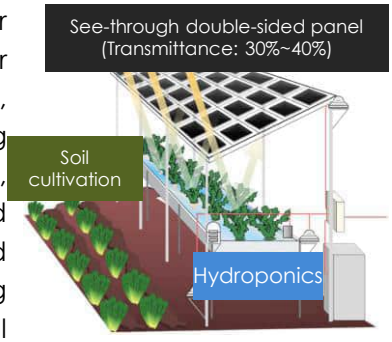
■ Business Model of the Project

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.

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.



▼(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

Country | Cambodia

■ Background

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

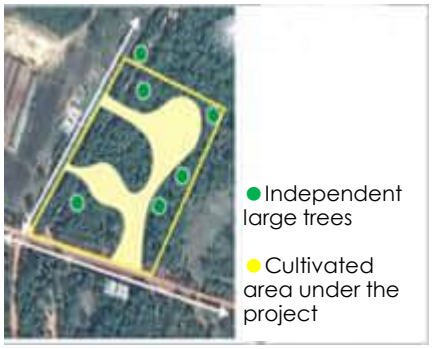
▲Vegetation in the project

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

Related SDGs

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 retailors.
- 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

Country | UAE, China, etc.

■ Background

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.

▲Chairman Dr. Mori with "Imec®"

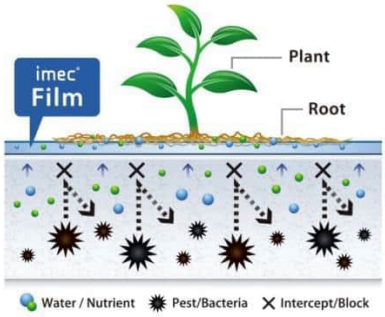
▲Tomato farming by local people

▲Tomato farm in Dubai Desert

Related SDGs

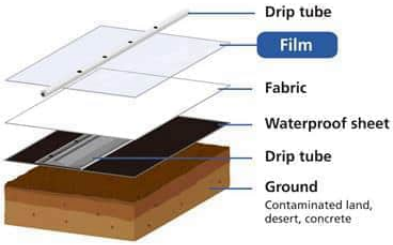
Product & Technology

"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.



▲"Imec®" Film

- 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

Mebiol 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

Country | Bangladesh

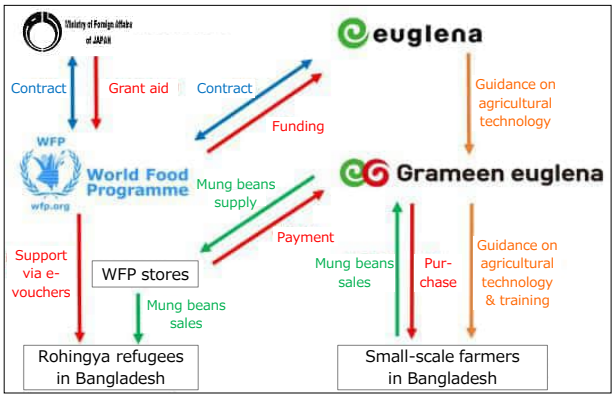
■ Background

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

Related SDGs

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

Country | Vietnam

■ Background

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

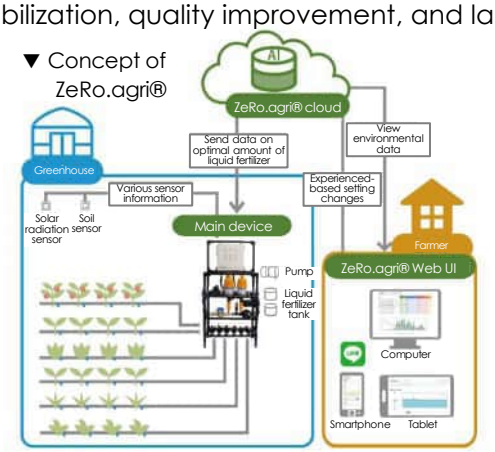
▲ Cultivation example (melon)

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.

▼ Concept of ZeRo.agri®



◄▲ 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

Country | Indonesia

■ Background

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.

Related SDGs

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.

Related SDGs

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 repellant 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.

◀Child elated with "Olyset® Net"

Photographs © M.Hallahan

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.

◀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

Country | Bangladesh

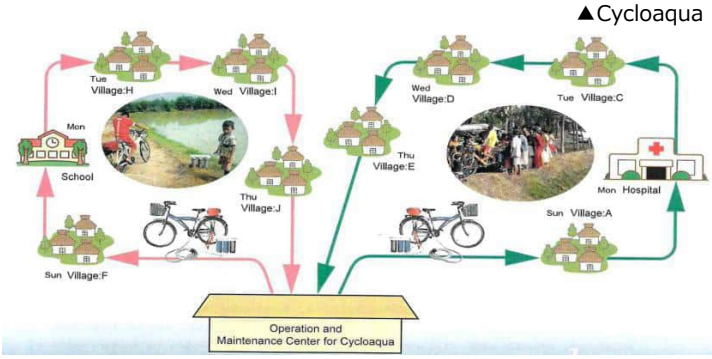
■ Background

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

Related SDGs

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

Country | Thailand, Myanmar

■ Background

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 Sompo 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.

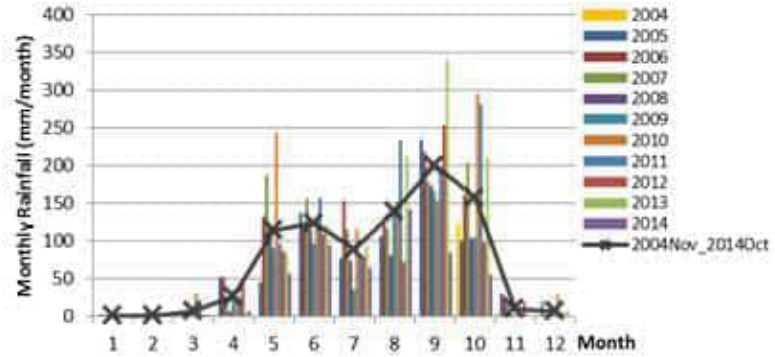
■ Business Model of the Project

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

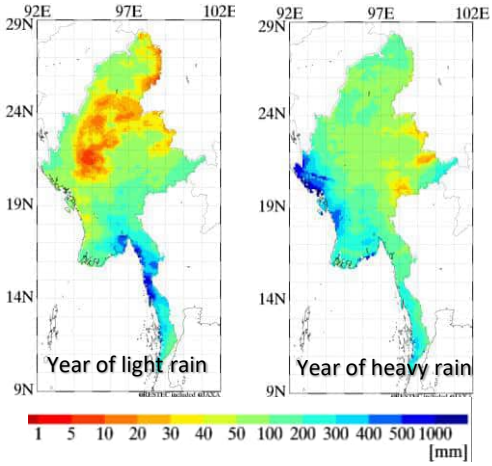
Related SDGs

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

Country | Philippines

■ Background

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

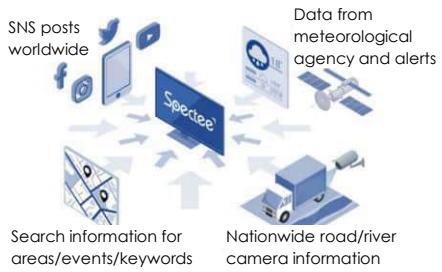
The company has developed "Spectee Pro," a data analysis platform for crisis visualization, offered to local governments, private companies, and news media in Japan based on monthly subscription. It is used by local governments for evacuation guidance and rescue of citizens based on each situation and 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)

Related SDGs

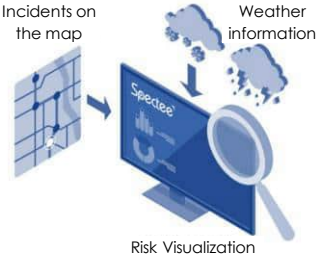
Product & Technology

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.



▲ Instant collection of crisis information

▲ Real-time notification



▲ Visualization of damage and risks

▲ Information distribution flow

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

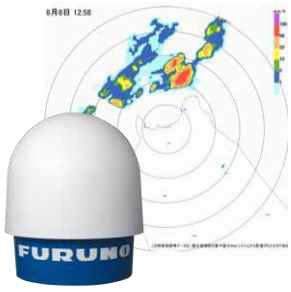
Country | Vietnam, Indonesia, Singapore, etc.

■ Background

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

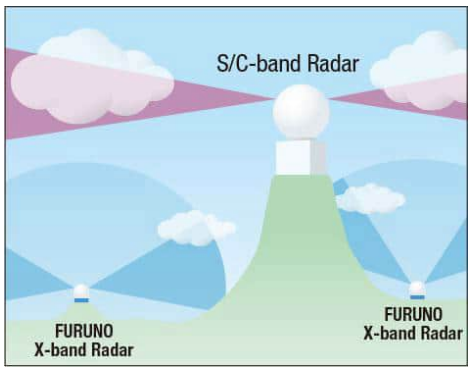
Related SDGs

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

Related SDGs

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

Country | Vietnam

■ Background

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

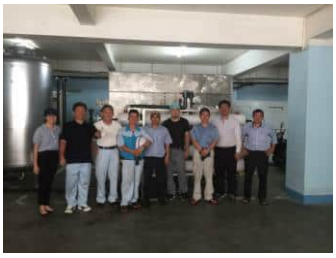
Related SDGs

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

Country | India, Vietnam

■ Background

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.

Related SDGs

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)

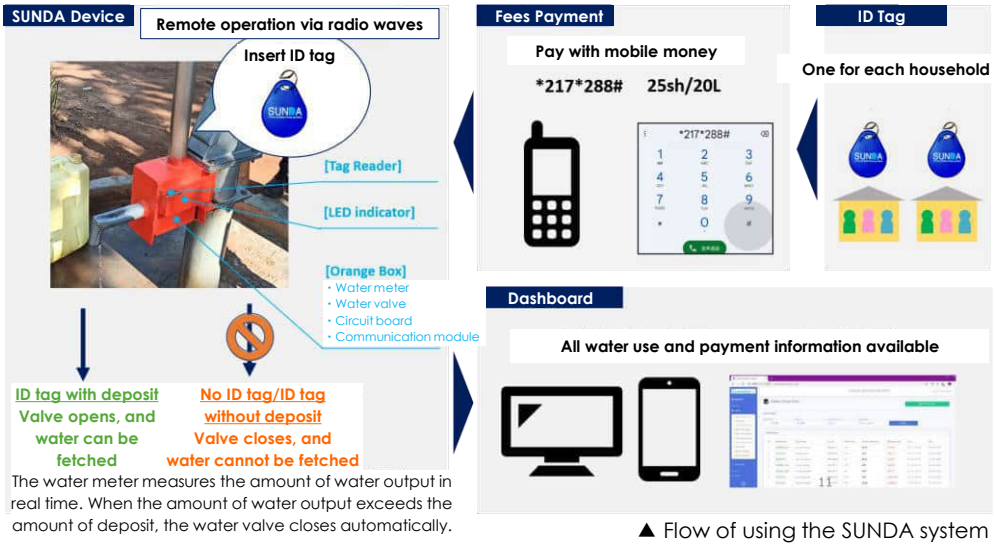
▲ Hand pump-equipped borehole

▲ Installation of SUNDA system

Related SDGs

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.



▲ Flow of using the SUNDA system

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

Country | India

■ Background

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

Related SDGs

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.

▲CROSS-WAVE

- 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.

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

Country | Laos

■ 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.

▲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.

Related SDGs

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

Country | Oman, Saudi Arabia, Indonesia, etc.

■ Background

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.

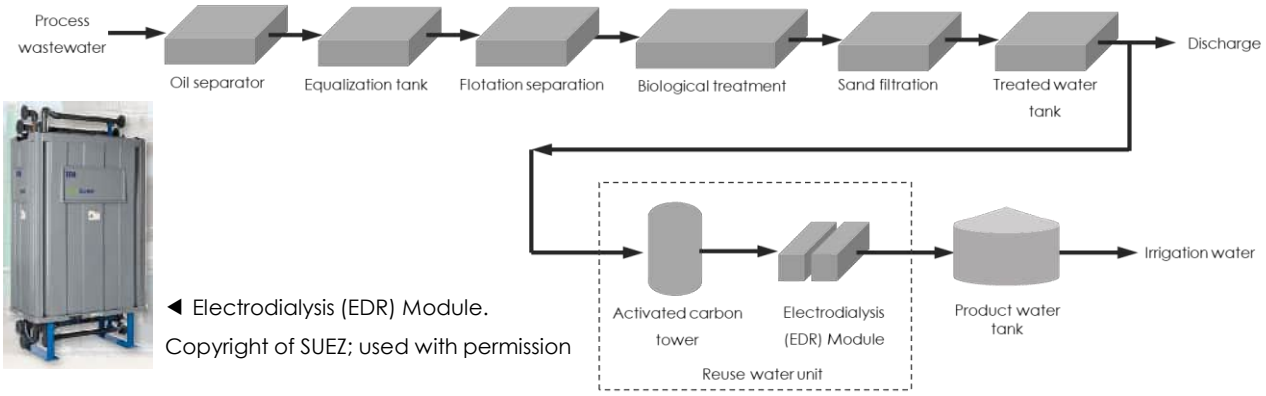
▲Oil refinery plant in Oman

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 electrodialysis 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



◀ Electrodialysis (EDR) Module.
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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 has 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 has installed in the wastewater treatment facilities in Chine, 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 though 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, Thaipei, 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

Country | Indonesia, Madagascar, Senegal, Benin etc.

■ Background

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.

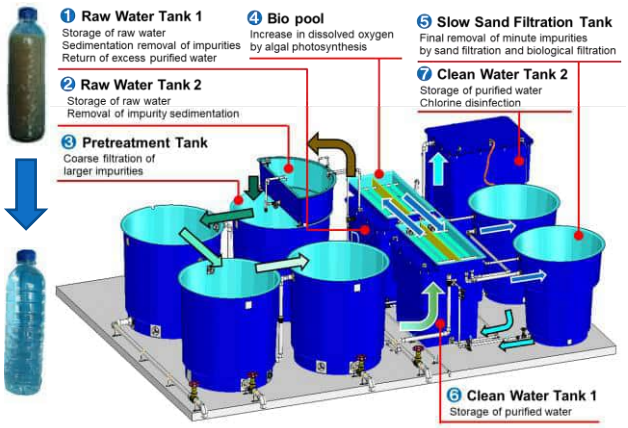
▲Yamaha Clean Water Supply System

▲A happy child

Related SDGs

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.



▲System Outline

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

Country | Thailand

■ Background

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.

Related SDGs

Product & Technology

Utilizing expertise acquired by weather derivatives products, the Sompo 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.

Sompo International Holdings Ltd., which is responsible for the group's overseas insurance business, launched the AgriSompo initiatives as an integrated platform to offer agriculture insurance globally in 2017. Sompo 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 AgriSompo.

▲Hearing survey (Myanmar)

▲Briefing session (Thailand)

Key to Success & Challenges for Further Development

The Sompo Group develops insurance products and services through engagements ad 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.

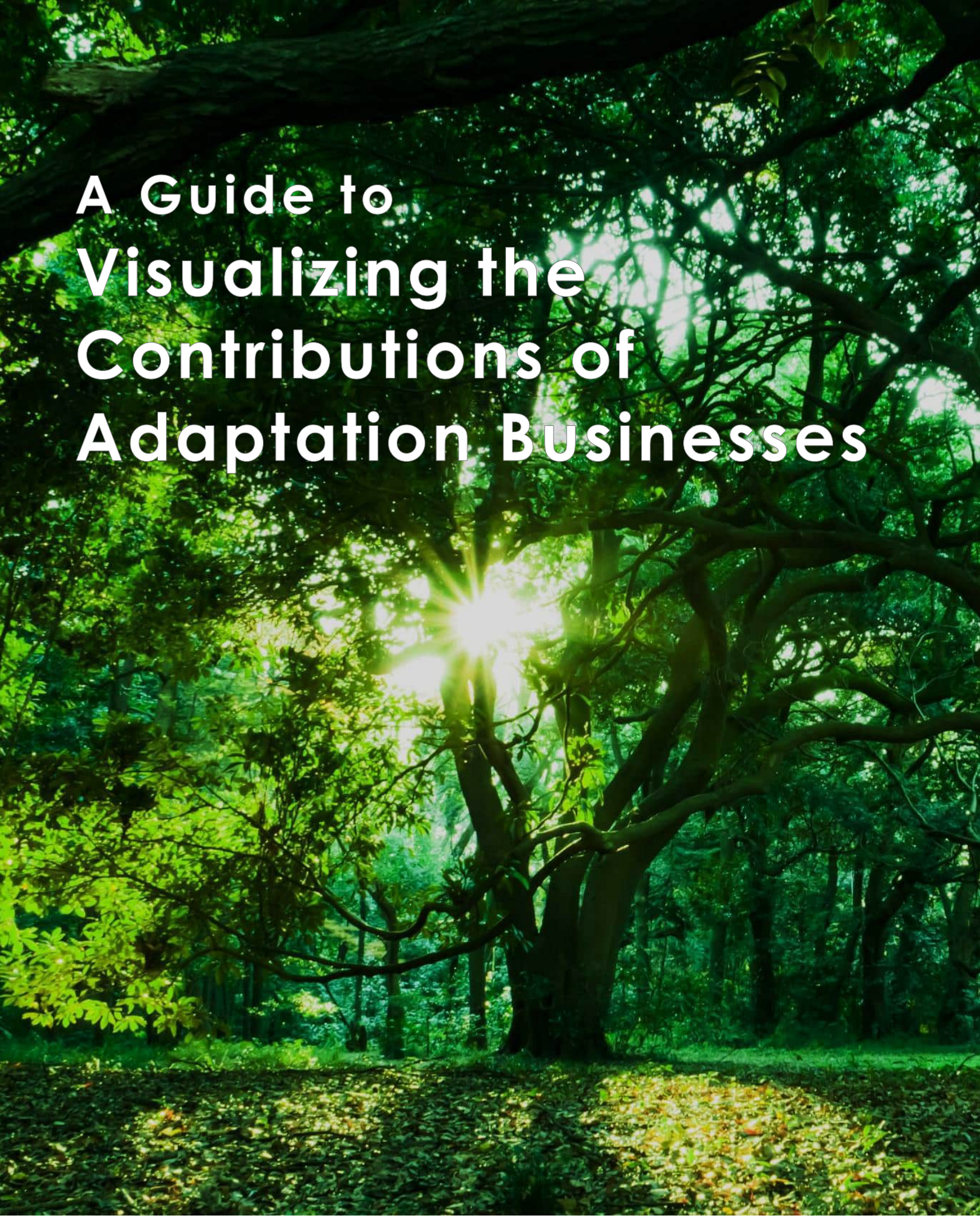
Profile of Project Company

Sompo Holdings, Inc. was established on 1 April 2010 as a holding company with a merger of Sompo 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 Sompo Group incorporates the social challenges, strategies, and actions that the Group is tackling into our management framework, and is working to achieve Sompo'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".

Attachment 2: A Guide to Visualizing the Contributions of Adaptation Businesses (English, 2022 First Edition)

(1) A Guide to Visualizing the Contributions of Adaptation Businesses



A Guide to Visualizing the Contributions of Adaptation Businesses

METI
Ministry of Economy, Trade and Industry

This document 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.

1. The Purpose of this Guide

Adaptation businesses bring multifaceted benefits, including solutions to social issues caused by climate change. While economic benefits can be presented in monetary terms, it is often difficult to visualize other benefits. On the other hand, understanding the effects and disclosing them to investors and other external parties can be a new appeal feature for companies.

The movement to evaluate non-economic benefits is becoming mainstream internationally. The United Nations Sustainable Development Goals (SDGs) have set forth 17 goals and 169 targets common to the world to be achieved by 2030, and an increasing number of companies are proactively addressing these. In addition to existing financial information, ESG investment, which takes into account environmental, social, and governance factors, is also becoming more widespread, and ESG efforts are becoming more important in raising funds from investors.

In light of these social trends, A Guide to Visualizing the Contributions of Adaptation Businesses has been compiled to help companies in visualizing the contributions (effects) of their climate change adaptation businesses.

2. Steps to Visualizing Contributions

There are currently no set rules or procedures regarding the visualization of the contributions of adaptation businesses. The scope of the visualization varies as well – in some cases, it may be the strategy and business content of the entire company, while in other cases, it may be a specific project.

Table 1 shows an example of the steps to visualize the contributions of a specific project. To visualize, it is important to prepare well before the start of the project and collect effective data during project implementation.

Table 1. Steps to Visualizing Contributions

Preparation	**Step 1** Target Selection	Identify the target project for visualization.
	Step 2 Logic Setting	Identify the logic of the inputs, outputs and outcomes of the target project.
	Step 3 Indicator Setting	Set indicators to measure outcomes that can be quantified. Set target values whenever possible.
Project in Progress	**Step 4** Data Collection	Collect data for the set indicators on a regular basis.
Project in Progress – After Completion of the Project	**Step 5** Analysis	Analyze the collected data to find out if the expected results are being achieved.
	Step 6 Reporting and Improvement	Based on the analysis results, report results to stakeholders and others relevant parties, and make improvements as necessary.

The details of each step are as follows.

- **Step 1 Target Selection**: Clarify which project of the company in which country (countries) should be targeted for visualization.
- **Step 2 Logic Setting**: Organize the logic (cause-and-effect relationship) of the inputs, outputs, and outcomes of the target project (Table 2). Outcomes that are measured without clear logic are difficult to recognize as the effects of the project. Therefore, it is important to make the logic easy to understand for third parties.

Table 2. Inputs, Outputs, and Outcomes

Inputs	Resources (people, goods, and money) to be invested for the target project.
Outputs	Goods and services provided through the inputs.
Outcomes	Changes and effects brought about by the outputs. If possible, divide the time axis into short-term and long-term.

- **Step 3 Indicator Setting**: Set indicators to measure outcomes. While some outcomes are qualitative and difficult to measure, indicators should be set for outcomes that can be quantified. When setting indicators, data availability, comparability, validity, and sustainability should be considered. In addition, setting target values in advance whenever possible makes it easier to measure effectiveness and monitor progress.
- **Step 4 Data Collection**: Collect data on the indicators (the same data should be obtained at least three times – before the project starts (baseline), at the midpoint of the project, and at the end of the project). In the case of a project without an end date, it is recommended to set the frequency of data collection in advance, such as once a year.
- **Step 5 Analysis**: Compare the data obtained after the project started with the data before the project started (baseline) and analyze the effects of the project.
- **Step 6 Reporting and Improvement**: Report the analysis results to stakeholders and other relevant parties. If the expected results are not achieved, analyze the causes and consider improvements to the project.

3. Reference Indicators by Sector

As the specific indicators are determined based on data availability, validity, and so on, below is a summary of websites that can serve as a reference. Although there are no organizations or websites that deal with reference indicators which are specific to adaptation businesses, there are websites can be cited as reference indicators for relevant themes such as the SDGs (Table 3).

Table 3. Websites on Reference Indicators

	Name (Managing Organization)	Overview and URL
A	SDG Indicators (United Nations Statistics Division)	169 targets and 232 indicators have been set for all 17 SDGs. https://unstats.un.org/sdgs/indicators/indicators-list/
B	SDG Compass – Inventory of Business Indicators (Global Reporting Initiative, UN Global Compact, World Business Council for Sustainable Development)	A collection of existing business indicators related to the SDGs. Filter searches and data downloads are available by specific SDGs or business themes. https://sdgcompass.org/business-indicators/
C	JICA Indicator Reference by Development Strategic Objective (Japan International Cooperation Agency)	Examples of indicators according to the type of development objective, for Financial Assistance, Grant Aid and Technical Cooperation projects. https://www.jica.go.jp/english/our_work/evaluation/indicators/index.html
D	IRIS+ Metrics (Global Impact Investing Network)	A set of indicators compiled and improved over time, which can be linked to the SDGs. https://iris.thegiin.org/metrics/

Based on the websites in Table 3, reference indicators related to seven areas where Japanese companies can expect adaptation business opportunities are summarized below by business area and technology (Table 4). It should be noted that these are some of the examples and do not represent all indicators. It is important to set indicators for which outcomes can be appropriately measured according to the nature of the project.

Table 4. Reference Indicators of the Seven Areas of Adaptation

*Sources [A] to [D] refer to the Name column in Table 3.

Business and Technology Examples	Reference Indicators [Source*]
(1) Resilient Infrastructure against Natural Disasters	
Resilient road systems • Road repair and maintenance taking into consideration climate change impacts • Promotion of climate change adaptation in transportation infrastructure	• Percentage of rural population living within two kilometers of all seasonally accessible roads [A] • Reduction in the number of days per year of impassable roads due to natural disasters (days/year) [C]
Resilient buildings • Resilient building design and materials • Waterproofing through coatings, impervious materials, multi-layering etc. • Flood and cyclone shelters	• [Evacuation facilities] Number of times a facility is used in the event of a disaster (times/year) [C] • [Evacuation facilities] Ratio of the number of people that can be accommodated in the facility to the local population (%) [C] • [Evacuation facilities] Number of evacuees (people saved) during a cyclone [C]
Assisting communities that are vulnerable to disasters • Assessment of vulnerability to disasters • Creation of hazard maps • Creation of disaster preparedness plans	• Number of accesses to webpages providing geographic information on disaster preparedness [C] • Percentage of municipalities that have published hazard maps and conducted disaster drills [C] • Percentage of people who know the location of evacuation facilities [C] • Percentage of people who are prepared to withstand disasters [C] • Experience in conducting evacuation drills under the cooperation of government and community [C]
Flood countermeasures • Drainage pumps • Drainage systems to deal with urban flooding • Levees • River construction and dredging • Flood prevention through integrated water resource management	• [Levee construction] Maximum annual flow rate (m^3), maximum annual water level (m) and discharge capacity (m^3/sec) at the flood control reference point [C] • [Drainage] Capacity of drainage channels (m^3/sec), capacity of drainage pump stations (m^3/sec) [C] • [Drainage] Decrease in the number of waterlogging events in the target area, decrease in the area of waterlogging [C]

(Continued on the next page)

Business and Technology Examples	Reference Indicators [Source]
(1) Resilient Infrastructure against Natural Disasters (continued)	
Tsunami and storm surge countermeasures • Seawall construction • Coastal barriers and tidal barriers • Prevention of coastal erosion	• [Seawall construction and dredging] Increase in the number of observation points [C] • [Seawall construction and dredging] Increase in the number of data transmission points [C] • [Seawall construction and dredging] Decrease in shore maintenance cost due to the construction of solid seawalls [C]
Soil erosion, mudslide, and landslide countermeasures	• [Erosion control dam] Reduction of water storage capacity/sediment discharge [C] • [Erosion control dam] Number of mudslide disasters with respect to the standard amount of rainfall [C] • [Landslide prevention facilities] Landslide mitigation [C]
Disaster prevention through forest preservation and reforestation	• Forest area, number of trees planted [C]
(2) Sustainable Energy Supply	
Reduction of power generation output fluctuations • Systems/operations that minimize fluctuations in hydroelectric and renewable energy generation even during climate change	• Average power outage duration [B] • Frequency of power outages [B] • Duration of power generation [D]
Distributed energy system • Emergency power generation system • Mini-grids and micro-grids	• Percentage of population with access to electricity [B] • Average power outage duration [B] • Frequency of power outages [D]
Hybrid power generation system	• Power generation capacity [D]
(3) Food Security and Strengthening Food Productive Base	
Resilience and productivity improvement in agriculture • Resilient cultivation/production • Crop diversification and varieties that are resilient to risks such as salinization, drought, floods, heat waves and diseases • Land management techniques to combat soil erosion, desertification, and salinization • Soil nutrient management and remediation • Pest and vermin management • Food storage facilities resilient to extreme weather conditions • Precision (smart) agriculture • Irrigation efficiency improvement	• Percentage of area applying productive and sustainable agriculture [A] • Production value per unit labor by size of agricultural/pastoral/forestry company [A] • Agricultural income of farmers [C] • Livelihood of farmers [C] • Agricultural yield per farming area [C] • Productivity of target crop [C] • [Irrigation] Water pumped per second (m^3/sec) [C] • [Irrigation] Irrigable area [C] • [Crop diversification] Types of crops [D]

(Continued on the next page)

Business and Technology Examples	Reference Indicators [Source]
(3) Food Security and Strengthening Food Productive Base (continued)	
Resilience and productivity improvement in pastoral industry • Livestock diversification • Climate resilient livestock • Livestock management (breeding and feeding system)	• Production value per unit labor by size of agricultural/pastoral/forestry company [A] • Revenue improvement of dairy farmers [C] • Adoption of improved breed and rearing management techniques by X% of dairy farmers in the target area [C] • Types of livestock [D]
Resilience and productivity improvement in fishing industry • Climate resilient aquaculture technology and equipment • Fisheries management and conservation	• Types of fish [D]
(4) Health and Sanitation	
Prevention of water pollution caused by extreme weather events, sewage infrastructure and water quality management	• Percentage of wastewater treated safely (prevalence of sewage treatment facilities) [A] • Degree to which environmental impacts have been reduced by products and services [B] • [Sewage infrastructure] Amount of wastewater treated [D]
Prevention of infectious diseases through insect repellent products, etc.	• Number of malaria cases per 1,000 persons [A] • Number of malaria cases in the target area (cases/year) [C]
(5) Climate Monitoring and Early Warning	
Weather monitoring and forecasting system	• Upper-air observation capability (when there is no precipitation: <wind direction/speed> from xx to xx kilometers above ground; when there is precipitation: <wind direction/speed> from xx to xx kilometers above ground; <temperature> up to xx kilometers above ground) [C] • Frequency and extent of rainfall information provided to disaster prevention related organizations [C] • Number of observation points (unit/km^2) [C] • Increase in observation coverage/density [C]
Weather information provision service	• Types of advisories and warnings issuable [C] • Weather forecast frequency (times/day) [C] • Coverage of disaster information [C]
Early warning system	• [Flood forecasting and warning system] Accuracy of precipitation and water level observation, space-time density [C]

(Continued on the next page)

Business and Technology Examples	Reference Indicators [Source]
(5) Climate Monitoring and Early Warning (continued)	
Climate modeling and disaster simulation	• Accuracy of analytic models [C]
Climate change monitoring	• Reduction of missing observation data [C]
(6) Secure Resources and Sustainable Water Supply	
Water supply infrastructure • Management and networking of water pipes • Small-scale wind/solar pumps	• Percentage of population using safely managed drinking water services [A] • Population with access to water [C] • Volume of water supply (m^3/day) [C]
Securing water resource • Desalination • Groundwater utilization • Rainwater harvesting • Water purification/reutilization • Water storage facilities	• Percentage of population using safely managed drinking water services [A] • Distance from business premises to water supply [B] • Quality of drinking water [B] • Estimated improvement in individual access to improved water sources (e.g., number of employees with improved access to water at work, number of consumers with access to water at a reduced cost, etc.) [B] • Percentage and total amount of water recycled and reused [B] • Rainwater quality under the application of regulations and standards [B]
Monitoring and information management of ecosystems, natural resources, and water resources	• Degree of implementation of Integrated Water Resources Management (0-100) [A] • Change in area of aquatic ecosystem over time [A] • Percentage of fishery resources at biologically sustainable levels [A]
(7) Climate Change Finance	
Weather index insurance	• Number of applicants [D] • Average insurance premium [D]
Private sector investment and financing in agriculture and other sectors	• Balance of medium- to long-term loans for agricultural capital formation [C] • Number of farm households and groups of farm households on medium- to long-term loans for agricultural capital formation (units, groups) [C]

4. Example of Contribution Visualization

The following is an example of setting inputs, outputs, outcomes and indicators, in the case of a project to introduce resilient cultivation and food production methods (Figure 1).

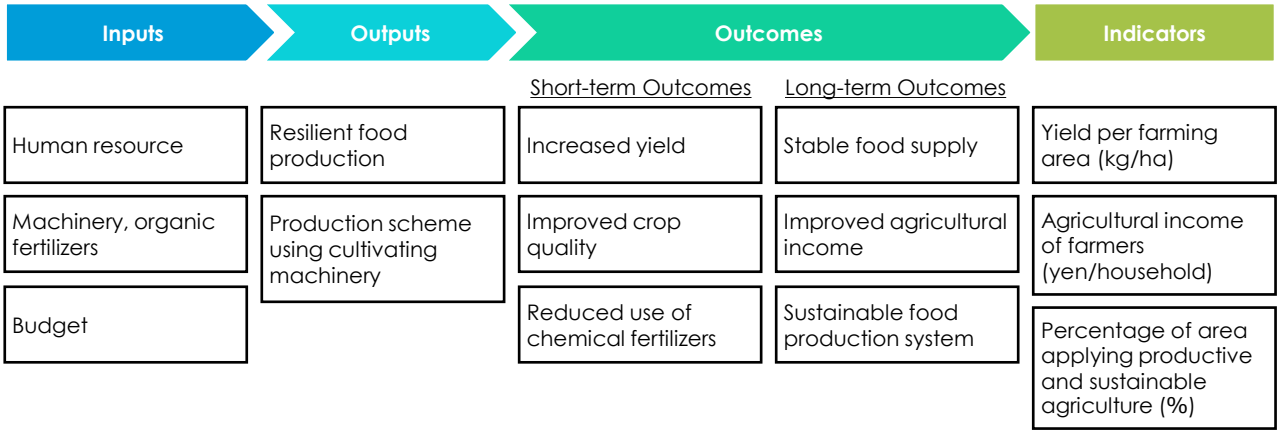


Figure 1. Example of project to introduce resilient cultivation and food production methods

In this case, the three indicators are (1) yield per unit farming area, (2) agricultural income of farmers, and (3) percentage of area applying productive and sustainable agriculture. Data of each indicator is confirmed in advance as a baseline before the project starts (it is also recommended to set a target value for the project for each indicator). After the project is implemented, the progress of the indicators are confirmed periodically, such as once a year, to visualize the contributions of the project.

It is preferable to use data that are guaranteed to be objective, such as published values from international organizations, federal governments, and local governments. However, if it is difficult to obtain data specific to the project site, or if there are no published values for the relevant data, a questionnaire survey or sample survey can be conducted to collect data. In addition, it is desirable to use the same data source before and after the project implementation as much as possible for the purpose of comparison.

5. Afterword and References

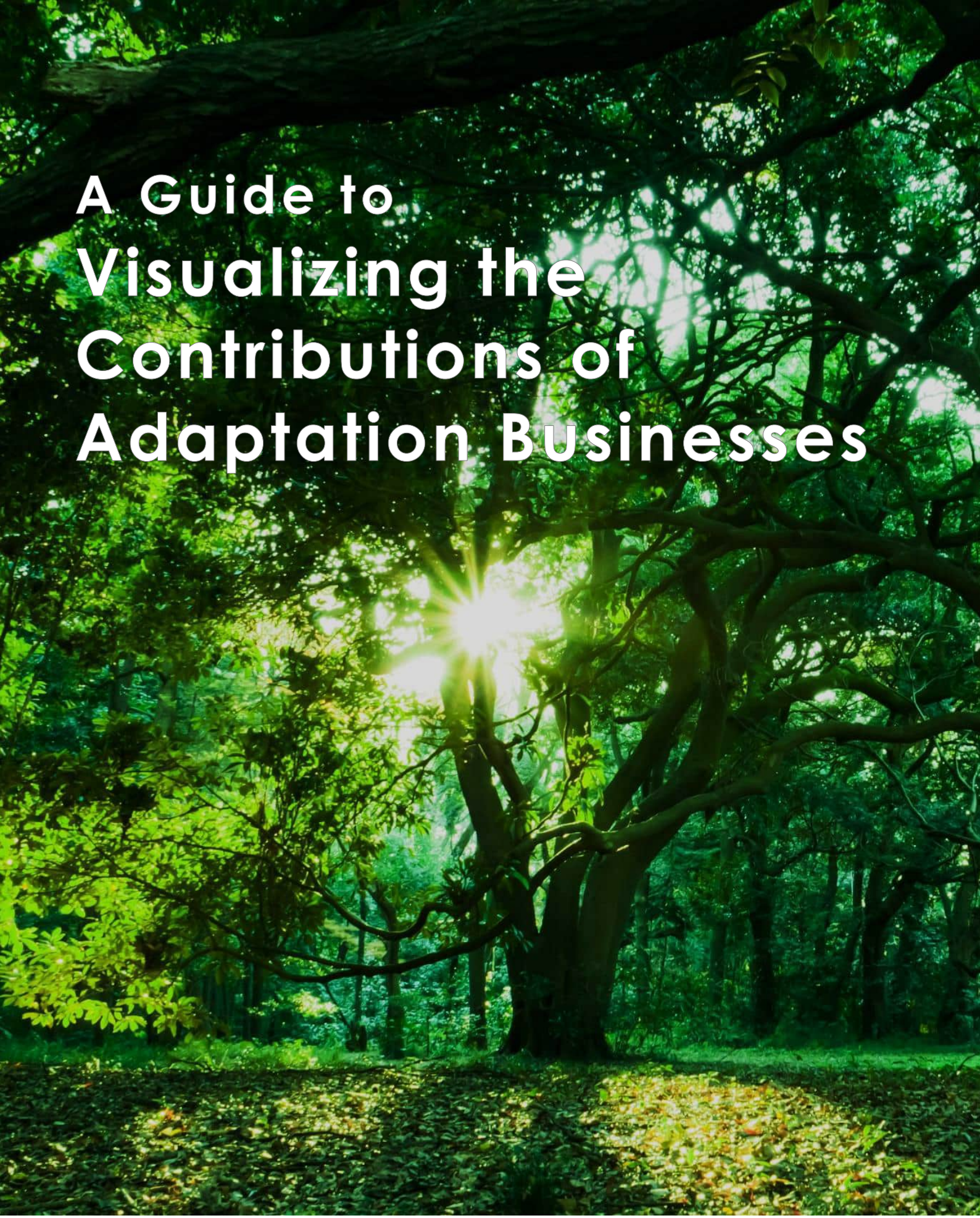
The visualization steps and area-specific indicators described in this guide were prepared by Ernst & Young ShinNihon LLC, based on the following references. As mentioned in the guide, there is no established evaluation method for visualizing the contributions of adaptation businesses at this point, but it is hoped that this guide will help visualize the contributions and further promote climate change adaptation efforts.

References

- GSG National Advisory Board "Social Impact Assessment Tool Set (Ver.2.0)"
- JICA "JICA Guidelines for Project Evaluation (Ver.1.1)"
- GRI, UN Global Compact, WBCSD "SDG Compass"
- GRI, UN Global Compact "Analysis of the Goals and Targets"
- GRI, UN Global Compact "Integrating the Sustainable Development Goals into Corporate Reporting: A Practical Guide"
- Nippon Foundation "The Logic Model Creation Guide"
- CTCN "Monitoring and evaluation for adaptation"

Attachment 3: A Guide to Visualizing the Contributions of Adaptation Businesses (English, 2022 Revised Version)

(1) A Guide to Visualizing the Contributions of Adaptation Businesses



A Guide to Visualizing the Contributions of Adaptation Businesses

METI
Ministry of Economy, Trade and Industry

This document 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.

(Last Updated: March 2023)

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Adaptation businesses bring multifaceted benefits, including solutions to social issues caused by climate change. While economic benefits can be presented in monetary terms, it is often difficult to visualize other benefits. On the other hand, understanding the effects and disclosing them to investors and other external parties can be a new appeal feature for companies.

The movement to evaluate non-economic benefits is becoming mainstream internationally. The United Nations Sustainable Development Goals (SDGs) have set forth 17 goals and 169 targets common to the world to be achieved by 2030, and an increasing number of companies are proactively addressing these. In addition to existing financial information, ESG investment, which takes into account environmental, social, and governance factors, is also becoming more widespread, and ESG efforts are becoming more important in raising funds from investors.

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- **Step 3 Indicator Setting**: Set indicators to measure outcomes. While some outcomes are difficult to measure, indicators should be set for quantifiable outcomes. When setting indicators, data availability, comparability, validity, and sustainability should be considered. In addition, setting target values in advance whenever possible makes it easier to measure effectiveness and monitor progress. Target values can be validated by identifying the changes before and after implementation of the project in a hypothetical scenario and estimating the project effects according to the scenario.
- **Step 4 Data Collection**: Collect data on the indicators in at least three phases – before the project starts (baseline), at the midpoint of the project, and at the end of the project). In the case of a project without an end date, it is recommended to set the frequency of data collection in advance, such as once a year.
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* Sources [A] to [D] refer to the Name column in Table 3. Indicators without sources are original indicators set by Ernst & Young ShinNihon LLC.

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(1) Resilient Infrastructure against Natural Disasters	
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Assisting communities that are vulnerable to disasters • Assessment of vulnerability to disasters • Creation of hazard maps • Creation of disaster preparedness plans	• Number of accesses to webpages providing geographic information on disaster preparedness [C] • Percentage of municipalities that have published hazard maps and conducted disaster drills [C] • Percentage of people who know the location of evacuation facilities [C] • Percentage of people who are prepared to withstand disasters [C] • Experience in conducting evacuation drills under the cooperation of government and community [C]
Flood countermeasures • Drainage pumps • Drainage systems to deal with urban flooding • Levees • River construction and dredging • Flood prevention through integrated water resource management • Water storage facilities	• [Levee construction] Maximum annual flow rate (m^3), maximum annual water level (m) and discharge capacity (m^3/sec) at the flood control reference point [C] • [Drainage] Capacity of drainage channels (m^3/sec), capacity of drainage pump stations (m^3/sec) [C] • [Drainage] Decrease in the number of waterlogging events in the target area, decrease in the area of waterlogging [C] • [Drainage] Reduction in stormwater runoff in the target area

(Continued on the next page)

Business and Technology Examples	Reference Indicators [Source]
(1) Resilient Infrastructure against Natural Disasters (continued)	
Tsunami and storm surge countermeasures • Seawall construction • Coastal barriers and tidal barriers • Prevention of coastal erosion	• [Seawall construction and dredging] Increase in the number of observation points [C] • [Seawall construction and dredging] Increase in the number of data transmission points [C] • [Seawall construction and dredging] Decrease in shore maintenance cost due to the construction of solid seawalls [C]
Soil erosion, mudslide, and landslide countermeasures	• [Erosion control dam] Reduction of water storage capacity/sediment discharge [C] • [Erosion control dam] Number of mudslide disasters with respect to the standard amount of rainfall [C] • [Landslide prevention facilities] Landslide mitigation [C]
Disaster prevention through forest preservation and reforestation	• Forest area, number of trees planted [C]
(2) Sustainable Energy Supply	
Reduction of power generation output fluctuations • Systems/operations that minimize fluctuations in hydroelectric and renewable energy generation even during climate change	• Average power outage duration [B] • Frequency of power outages [B] • Duration of power generation [D]
Distributed energy system • Emergency power generation system • Mini-grids and micro-grids	• Percentage of population with access to electricity [B] • Average power outage duration [B] • Frequency of power outages [D]
Hybrid power generation system	• Power generation capacity [D]
(3) Food Security and Strengthening Food Productive Base	
Resilience and productivity improvement in agriculture • Resilient cultivation/production • Crop diversification and varieties that are resilient to risks such as salinization, drought, floods, heat waves and diseases • Land management techniques to combat soil erosion, desertification, and salinization • Soil nutrient management and remediation • Pest and vermin management • Food storage facilities resilient to extreme weather conditions • Precision (smart) agriculture • Irrigation efficiency improvement	• Percentage of area applying productive and sustainable agriculture [A] • Production value per unit labor by size of agricultural/pastoral/forestry company [A] • Agricultural income of farmers [C] • Livelihood of farmers [C] • Agricultural yield per farming area [C] • Productivity of target crop [C] • [Irrigation] Water pumped per second (m^3/sec) [C] • [Irrigation] Irrigable area [C] • [Crop diversification] Types of crops [D]

(Continued on the next page)

Business and Technology Examples	Reference Indicators [Source]
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Resilience and productivity improvement in pastoral industry • Livestock diversification • Climate resilient livestock • Livestock management (breeding and feeding system)	• Production value per unit labor by size of agricultural/pastoral/forestry company [A] • Revenue improvement of dairy farmers [C] • Adoption of improved breed and rearing management techniques by X% of dairy farmers in the target area [C] • Types of livestock [D]
Resilience and productivity improvement in fishing industry • Climate resilient aquaculture technology and equipment • Fisheries management and conservation	• Types of fish [D]
(4) Health and Sanitation	
Prevention of water pollution caused by extreme weather events, sewage infrastructure and water quality management	• Percentage of wastewater treated safely (prevalence of sewage treatment facilities) [A] • Degree to which environmental impacts have been reduced by products and services [B] • [Sewage infrastructure] Amount of wastewater treated [D]
Prevention of infectious diseases through insect repellent products, etc.	• Number of malaria cases per 1,000 persons [A] • Number of malaria cases in the target area (cases/year) [C]
(5) Climate Monitoring and Early Warning	
Weather monitoring and forecasting system	• Upper-air observation capability (when there is no precipitation: <wind direction/speed> from xx to xx kilometers above ground; when there is precipitation: <wind direction/speed> from xx to xx kilometers above ground; <temperature> up to xx kilometers above ground) [C] • Number of observation points (unit/km^2) [C] • Increase in observation coverage/density [C]
Weather and disaster information provision service	• Types of advisories and warnings issuable [C] • Weather forecast frequency (times/day) [C] • Coverage of disaster information [C] • Frequency and extent of weather and disaster information provided to disaster prevention related organizations and local communities
Early warning system	• [Flood forecasting and warning system] Accuracy of precipitation and water level observation, space-time density [C]

(Continued on the next page)

Business and Technology Examples	Reference Indicators [Source]
(5) Climate Monitoring and Early Warning (continued)	
Climate modeling and disaster simulation	• Accuracy of analytic models [C]
Climate change monitoring	• Reduction of missing observation data [C]
Global or wide-area disaster situation visualization system	• Number of observation points (unit/km^2) [C] • Increase in observation coverage/density [C]
(6) Secure Resources and Sustainable Water Supply	
Water supply infrastructure • Management and networking of water pipes, management of wells • Small-scale wind/solar pumps	• Percentage of population using safely managed drinking water services [A] • Number of facilities which provide drinking water • Amount of maintenance cost collected per facility which provide drinking water • Population with access to water [C] • Volume of water supply (m^3/day) [C]
Securing water resource • Desalination • Groundwater utilization • Rainwater harvesting • Water purification/reutilization • Water storage facilities	• Percentage of population using safely managed drinking water services [A] • Distance from business premises to water supply [B] • Quality of drinking water [B] • Estimated improvement in individual access to improved water sources (e.g., number of employees with improved access to water at work, number of consumers with access to water at a reduced cost, etc.) [B] • Percentage and total amount of water recycled and reused [B] • Rainwater quality under the application of regulations and standards [B]
Increasing water-use efficiency	• Change in water-use efficiency over time [A]
Monitoring and information management of ecosystems, natural resources, and water resources	• Degree of implementation of Integrated Water Resources Management (0-100) [A] • Change in area of aquatic ecosystem over time [A] • Percentage of fishery resources at biologically sustainable levels [A]
(7) Climate Change Finance	
Weather index insurance	• Number of applicants [D] • Average insurance premium [D]
Private sector investment and financing in agriculture and other sectors	• Balance of medium- to long-term loans for agricultural capital formation [C] • Number of farm households and groups of farm households on medium- to long-term loans for agricultural capital formation (units, groups) [C]

4. Example of Contribution Visualization

The following is an example of setting inputs, outputs, outcomes and indicators, in the case of a project to introduce resilient cultivation and food production methods (Figure 1).

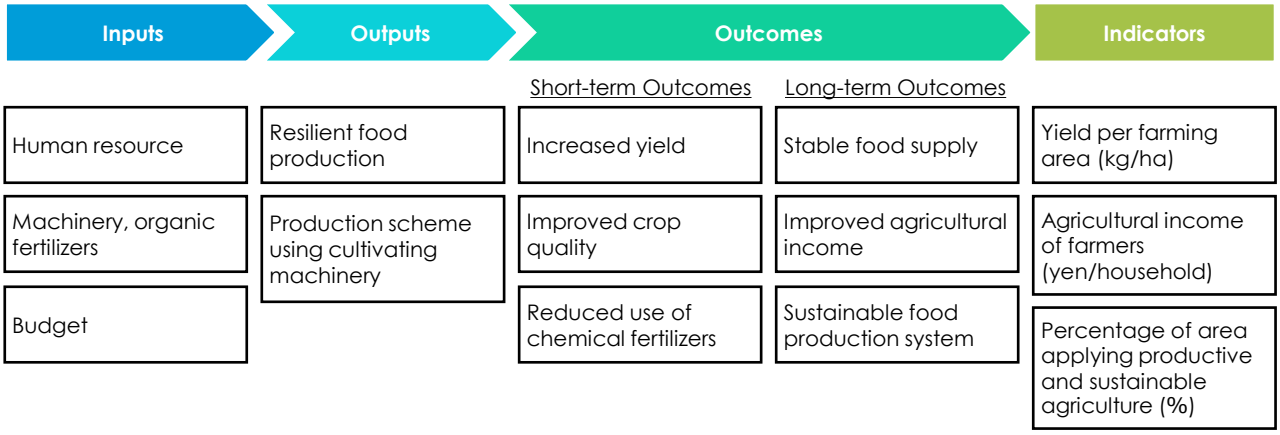


Figure 1. Example of project to introduce resilient cultivation and food production methods

In this case, the three indicators are (1) yield per unit farming area, (2) agricultural income of farmers, and (3) percentage of area applying productive and sustainable agriculture. Data of each indicator is confirmed in advance as a baseline before the project starts (it is also recommended to set a target value for the project for each indicator). After the project is implemented, the progress of the indicators are confirmed periodically, such as once a year, to visualize the contributions of the project.

It is preferable to use data that are guaranteed to be objective, such as published values from international organizations, federal governments, and local governments. However, if it is difficult to obtain data specific to the project site, or if there are no published values for the relevant data, a questionnaire survey or sample survey can be conducted to collect data. In addition, it is desirable to use the same data source before and after the project implementation as much as possible for the purpose of comparison.

5. Afterword and References

The visualization steps and area-specific indicators described in this guide were prepared by Ernst & Young ShinNihon LLC, based on the following references. As mentioned in the guide, there is no established evaluation method for visualizing the contributions of adaptation businesses at this point, but it is hoped that this guide will help visualize the contributions and further promote climate change adaptation efforts.

References

- GSG National Advisory Board "Social Impact Assessment Tool Set (Ver.2.0)"
- JICA "JICA Guidelines for Project Evaluation (Ver.1.1)"
- GRI, UN Global Compact, WBCSD "SDG Compass"
- GRI, UN Global Compact "Analysis of the Goals and Targets"
- GRI, UN Global Compact "Integrating the Sustainable Development Goals into Corporate Reporting: A Practical Guide"
- Nippon Foundation "The Logic Model Creation Guide"
- CTCN "Monitoring and evaluation for adaptation"

Attachment 4: Presentation Materials of International Information Dissemination (Vietnam)

(1) METI / Climate Change Adaptation Policies of Japan
(2) EY / Introduction of study result on impact of climate change to industrial park in Viet Nam and introduction of "A guide to visualizing contributions of adaptation business"
(3) DCC, MONRE / Experience of CTCN project in Viet Nam
(4) DCC, MONRE / Key features of the National Adaptation Plan (NAP) for the period 2021-2030, and the resources needed for the implementation of NAP
(5) Ecosystem Inc. / Aiming for sustainable urban development – Turn construction waste into functional pavement using recycled bricks and roof tiles
(6) Routrek Networks, Inc. / Digital Farming Makes Agriculture Sustainable: Private Sector Contribution to Climate Change Adaptation in Viet Nam

Note: The contents of (6) are the same as (6) in "Attachment 5: Presentation Materials of International Information Dissemination (Thailand)", therefore the attachment is omitted.

METI
Ministry of Economy, Trade and Industry

Climate Change Adaptation Policies of Japan

December 2022

Hitomi Furuya

Global Environmental Affairs Office,

Industrial Science and Technology Policy and Environment Bureau,

Ministry of Economy, Trade and Industry

1. Our missions

- Contribute to climate change adaptation in Asian countries, promoting involvement of private sectors.

1. Make adaptation efforts **efficient and sustainable**
2. **Attract investments** across sectors
3. **Enhance resilience** of community

Negative impacts of climate change

Global economic output could decrease by **11-18%** by **2050** due to climate change.[2]

According to the CDP analysis of S&P 500 companies, physical climate risks will potentially have **$40-50 billion** in impacts by 2026.[3]

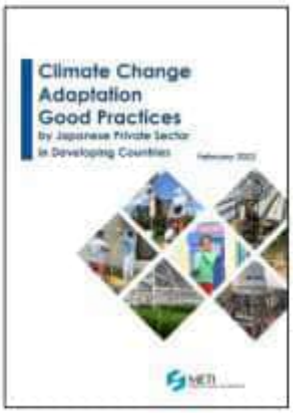
Source: Critical Business Actions for Climate Change Adaptation, WEF, November 2022

2. METI's activities - 1

- Identify and promote understanding of adaptation technologies

Areas of adaptation with a potential implementation of private technologies

- Resilient infrastructures to natural disasters
- Stable supply of Energy
- Food Security & Strengthening Food Productive Base
- Health & Sanitation
- Climate Monitoring & Early Warning
- Secure Resources & Sustainable Water Supply
- Climate Change Finance



- **39 examples**
- English version available

2

3. METI's activities -2

- Formulate **public-private partnership projects**

1. Focus on **local circumstances**
2. **Promote diverse partnerships**, such as cities and private sectors
3. Enhance involvement of startup companies and SMEs

Started on Nov 16, 2022

SUBARU initiative

~**SU**stainable **B**usiness of **A**daptation for **R**esilient **U**rban future~

Discussion with UN Habitat at COP27

METI Ministry of Economy, Trade and Industry

UN HABITAT FOR A BETTER URBAN FUTURE

*Regional office for Asia and the Pacific

■ UN Habitat offices in 17 countries

Afghanistan, Cambodia, China, Fiji, India, Iran, Japan, Laos, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Solomon Islands, Sri Lanka, Thailand, Vietnam

*Solomon Islands is closed due to vacancy

4.Cooperation with International Organizations

①Climate Technology Centre and Network (CTCN)

- CTCN funds up to 25,000 dollars on technical assistance projects of adaptation/mitigation measures upon request from governments of developing companies.
- CTCN participates in public-private workshop held by METI every year
- **Project collaboration between CTCN and METI is considered.**

②Green Climate Fund (GCF)

- Finances private sector investments (from a minimum of less than 10 million dollars up to a maximum of more than 250 million dollars) of adaptation/mitigation measures upon request from governments of developing companies.
- Japan's accumulate contribution to the fund is second after UK.
- CTCN participates in public-private workshop held by METI every year
- **Project collaboration between GCF and METI is considered**

③UN-Habitat

- Promotes socially and environmentally sustainable cities in rural areas of developing countries.
- **Collaboration between UN-Habitat and METI for implementation of adaptation technologies in these sustainable cities**

④African Development Bank (AfDB)

- Japan and African countries made a commitment in TICAD 8 to cooperate with AfDB and other relevant organizations to mobilize the funds for adaptation and mitigation projects

5. Examples of Adaptation Business -1

▲Related SDGs

ECOSYSTEM Inc.

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

◆Torrential rains, typhoons and hurricanes are 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.
◆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.

▲Waste roof tiles and bricks

▲ Vehicle-mounted manufacturing plant (Mobacon)

▲Road paved with waste roof tiles and bricks

"Climate Change Adaptation Good Practices by Japanese Private Sector in Developing Countries" February 2022 (METI)

5. Examples of Adaptation Business -2

▲Related SDGs

Routrek Networks, Inc.

J-Startup

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

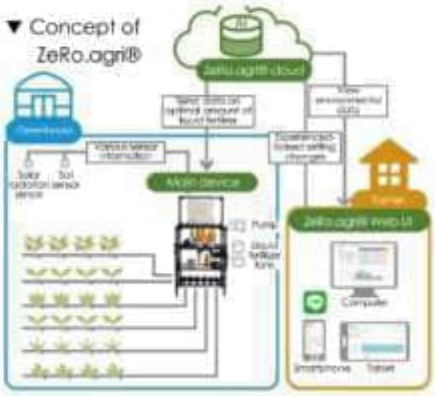
◆The impact of climate change on agriculture is significant, including water shortages for agriculture due to decreasing water resources and poor crop growth due to changes in weather.

◆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.

▲ A farm in Vietnam

▲ ZeRo.agri® in a farm in Vietnam

▼ Concept of ZeRo.agri®



Introduction of study result on impact of climate change to industrial park in Viet Nam and Introduction of "A guide to visualizing contributions of adaptation business"

Ernst & Young ShinNihon LLC

7 December 2022

EY
Building a better working world

Introduction of study result on impact of climate change to business:

Case of industrial park in Viet Nam

Mr. Mitsuru Shikanai
Senior Consultant
Climate Change and Sustainability Services (CCaSS)

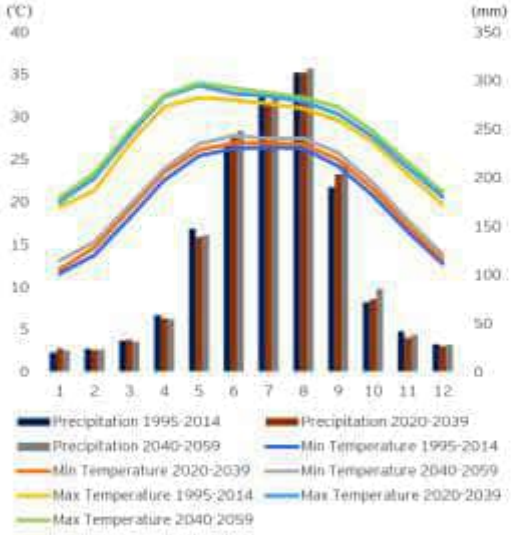
Study on climate change risks in industrial parks

- A study on climate change risks was conducted on large industrial parks which are occupied by many Japanese companies.

Source: World Bank Group "Climate Change Knowledge Portal"; World Resources Institute "Aqueduct"

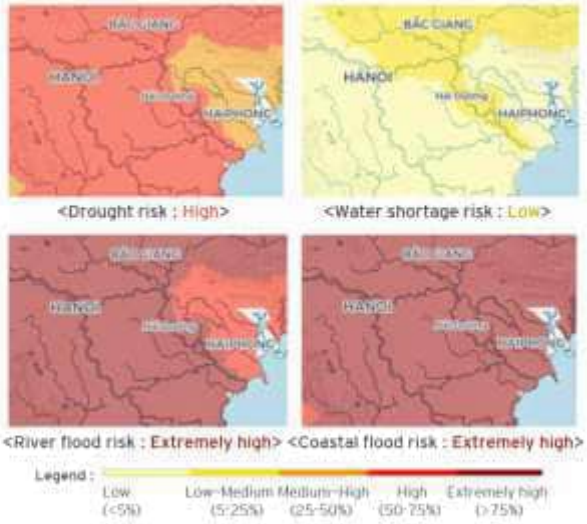
Climate change risks in each region

- Climate forecast and disaster risk in the North (Hanoi City)



Projections of Temperature and Precipitation

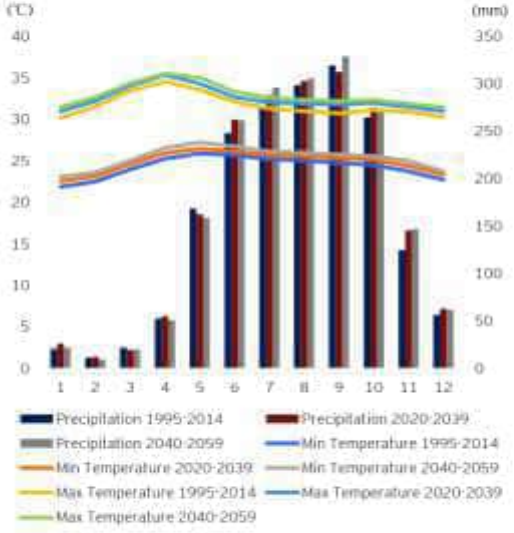
Source: World Bank Group "Climate Change Knowledge Portal"
https://climateknowledgeportal.worldbank.org/country/vietnam/climate-data-projections



Source: World Resources Institute "Aqueduct"
https://www.wri.org/aqueduct

Climate change risks in each region

- Climate forecast and disaster risk in the South (Ho Chi Minh City)



Projections of Temperature and Precipitation

Source: World Bank Group "Climate Change Knowledge Portal"
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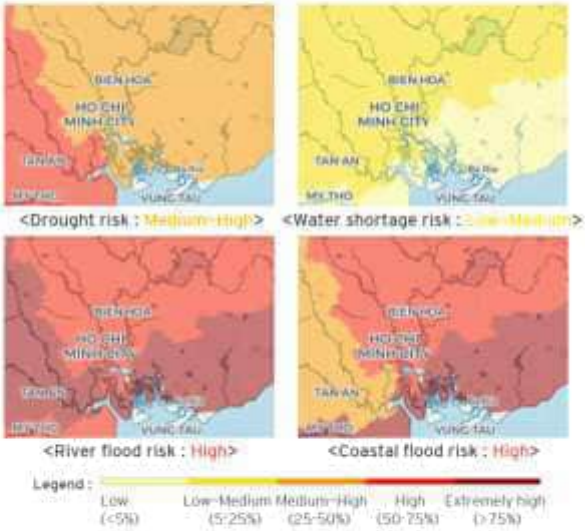


Source: World Resources Institute "Aqueduct"
https://www.wri.org/aqueduct

Climate change adaptation measures by Japanese companies (ongoing or under consideration)

- Factory level: Measures to strengthen infrastructure
- Head office/supply chain level: System support before/after disaster

	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
Local factory level	➢ Disaster-resilient buildings ➢ Rainwater harvesting systems ➢ Tidal gates, drainage pumps, drainage systems ➢ Repair and renovation of building roofs, walls, drainage ditches, etc. ➢ Planting mangroves for flood protection	➢ Captive power generation		➢ Air conditioning to prevent heat stroke		➢ Wastewater treatment and reuse ➢ Technology to reduce water usage	
Head office level					➢ Alternative production and supply system in the event of a disaster ➢ Flood risk visualization using hazard maps		
Supply chain level					➢ Systems and databases to determine and manage disaster risks of suppliers ➢ Systems and databases to visualize and track damage of suppliers ➢ Systems to promptly identify alternative suppliers in the event of a disaster ➢ IT/IoT systems for factories to cope with fluctuations in production due to floods		

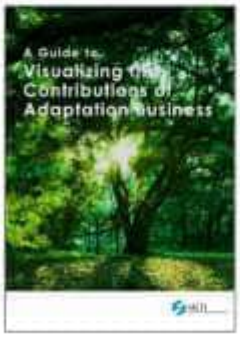
Introduction of "A guide to visualizing contributions of adaptation business"

Ms. Kei Sakakibara
Manager
Climate Change and Sustainability Services (CCaSS)

A guide to visualizing contributions of adaptation business

- METI has published a guide to visualizing contributions of adaptation business

Current Situation	Because of the wide range of effects of adaptation contributions, there are currently no set rules or procedures regarding the visualization of the contributions of adaptation business.
Needs	Understanding the effects and disclosing them to investors and other stakeholders can be a new appealing feature for companies, in aspect of ESG investment trend.
METI's Approach	"A Guide to Visualizing the Contributions of Adaptation Business" has been compiled and published to help companies in visualizing the contributions (effects) of their climate change adaptation businesses. This guide shows an example of the steps to visualize the contributions of a specific project.



Available at:
https://www.meti.go.jp/policy/energy_environment/global_warming/jcm/pdf/a_guide_to_visualizing_contributions_R4.pdf

EY

Visualizing Steps

- Example of the steps to visualize the contributions of a specific project

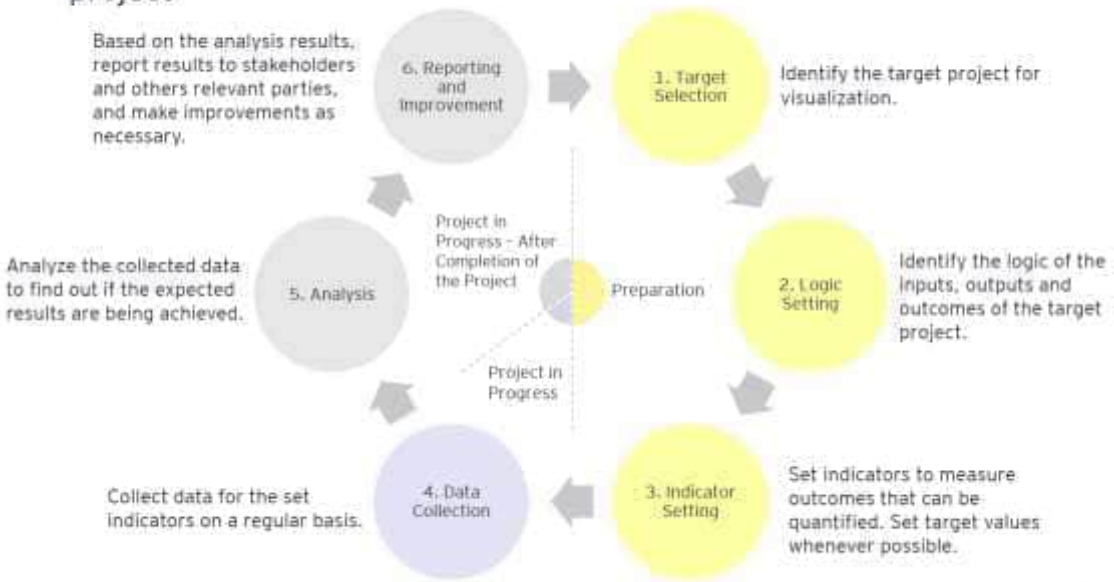


Figure. Steps to Visualizing Contributions

Example of Contribution Visualization

- Example of setting inputs, outputs, outcomes and indicators (Step 2-3), in the case of a project to introduce resilient cultivation and food production methods

Inputs	Outputs	Outcomes		Indicators
		Short-term Outcomes	Long-term Outcomes	
Human resource	Resilient food production	Increased yield	Stable food supply	Yield per farming area (kg/ha)
Machinery, organic fertilizers	Production scheme using cultivating machinery	Improved crop quality	Improved agricultural income	Agricultural income of farmers (yen/household)
Budget		Reduced use of chemical fertilizers	Sustainable food production system	Percentage of area applying productive and sustainable agriculture (%)

Figure. Example of project to introduce resilient cultivation and food production methods

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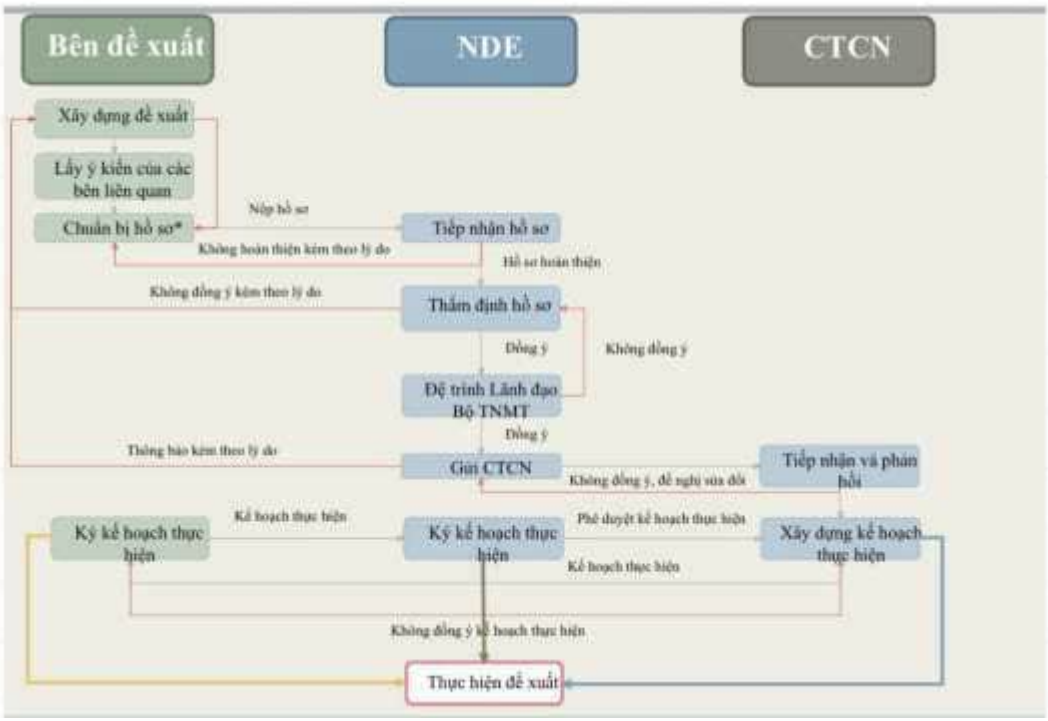
ey.com/en_jp

Quy trình tiếp cận Mạng lưới và Trung tâm Công nghệ Khí hậu (CTCN) tại Việt Nam

Chu Thị Thanh Hương
Cục Biến đổi khí hậu



Trân trọng cảm ơn!

MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT

DEPARTMENT OF CLIMATE CHANGE

Key features of the National Adaptation Plan (NAP) for the period 2021 - 2030, and the resources needed for the implementation of NAP

Adaptation division, Department of Climate Change, MONRE

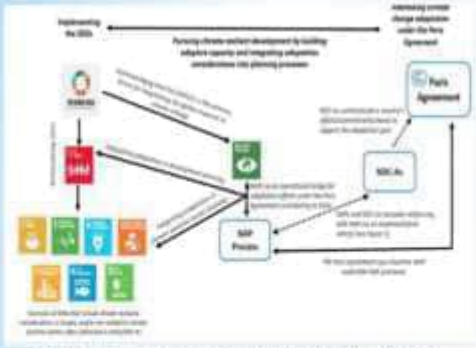
Hanoi – Dec 2022

CONTENTS

PART I.

THE CONTEXT OF DEVELOPING AND ADOPTING THE NATIONAL ADAPTATION PLAN FOR THE PERIOD 2021-2030, WITH A VISION TO 2050

I.1. INTERNATIONAL CONTEXT

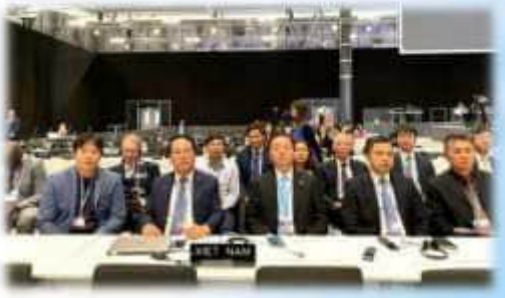


Linkage among NDC, NAP & SDG

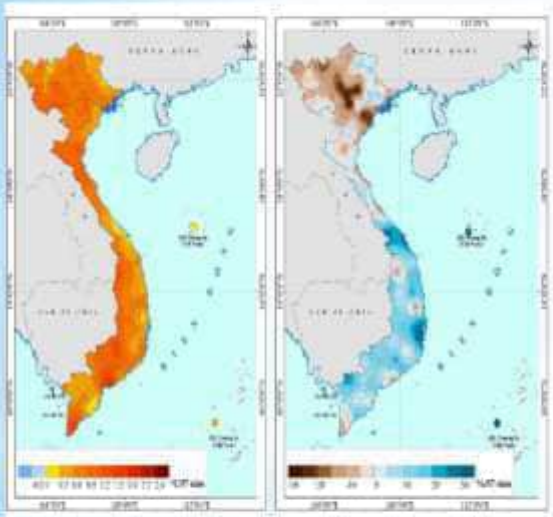
Source: GIZ, 2017

At the COP21 in 2015, the Parties to the United Nations Framework Convention on Climate Change ratified the Paris Agreement. This is the historic agreement, the first global legal basis binding the responsibilities of all Parties to respond to climate change.

Viet Nam needs to identify climate change adaptation actions; gaps in strengthening institutional capacity, policy implementation, financial resources, human resources, and technology to adapt climate change; prioritized adaptation actions for the period 2021-2030.



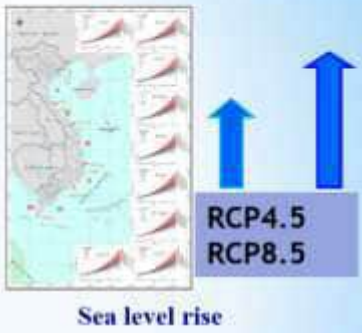
I.2. NATIONAL CONTEXT



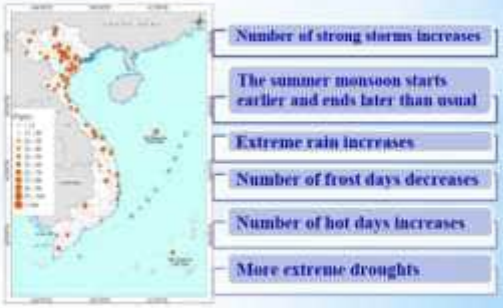
Changes in annual average temperature (°C) and annual rainfall (%) in the period 1958-2014

Source: IMHEN, 2016

Flood risk

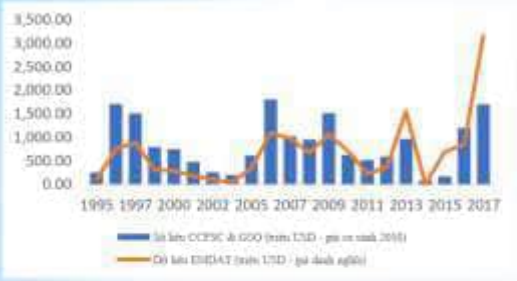


Sea level rise

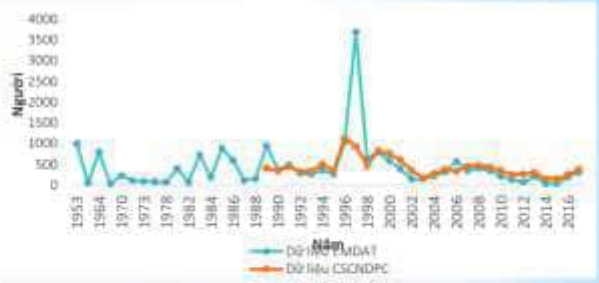


Extreme weather

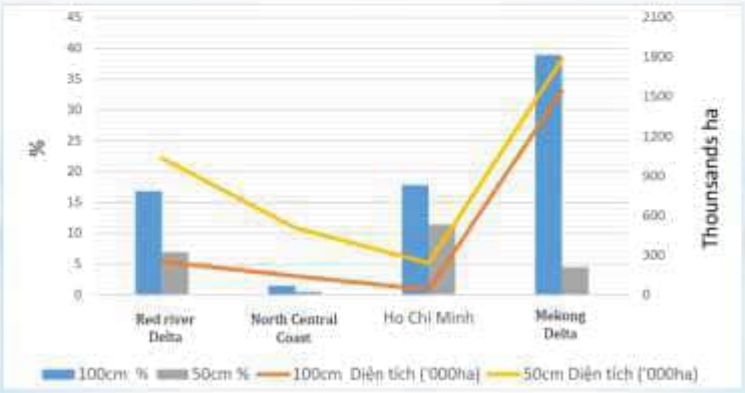
I.2. NATIONAL CONTEXT (cont.)



Damages caused by natural disasters in Vietnam

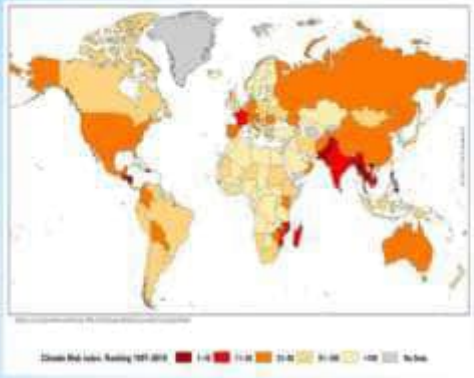


Death toll from natural disasters in Viet Nam



Area at risk of flooding due to sea level rise

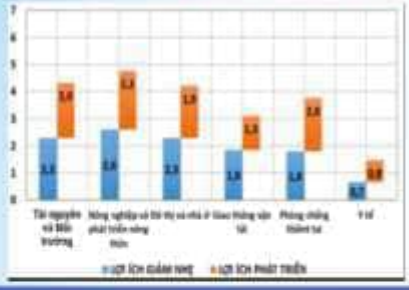
I.2. NATIONAL CONTEXT (cont.)



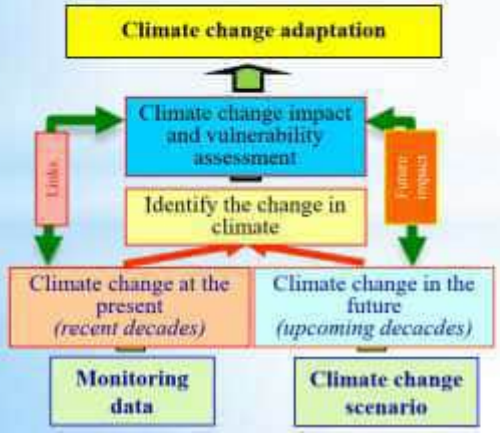
Vietnam is one of ten countries severely affected by climate change

- Requirements for climate change response, natural disaster prevention and control, resource management and environmental protection should be at the centre of development decisions.
- Climate change adaptation must be integrated in related legal documents, strategies, and planning.
- Climate change adaptation must be linked with sustainable development, enhancing the resilience of natural and social systems and taking advantage of the opportunities of climate change.

I.2. NATIONAL CONTEXT (cont.)



Synergy and co-benefits between climate change adaptation and socio-economic development



THỦ TƯỚNG CHÍNH PHỦ

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự do - Hạnh phúc

Số: 1055/QĐ-TTg

Hà Nội, ngày 20 tháng 7 năm 2020

QUYẾT ĐỊNH
Về việc ban hành Kế hoạch quốc gia thích ứng với biến đổi khí hậu giai đoạn 2021 - 2030, tầm nhìn đến năm 2050

ĐẾN Số: ... Ngày: 24/7/20

THỦ TƯỚNG CHÍNH PHỦ

Căn cứ Luật Tổ chức Chính phủ ngày 19 tháng 6 năm 2015;

Căn cứ Nghị quyết số 93/NQ-CP ngày 31 tháng 10 năm 2016 của Chính phủ phê duyệt Thỏa thuận Paris thực hiện Công ước khung của Liên hợp quốc về biến đổi khí hậu;

Theo đề nghị của Bộ trưởng Bộ Tài nguyên và Môi trường,

QUYẾT ĐỊNH:

Điều 1. Ban hành kèm theo Quyết định này Kế hoạch quốc gia thích ứng với biến đổi khí hậu giai đoạn 2021 - 2030, tầm nhìn đến năm 2050.

Điều 2. Quyết định này có hiệu lực thi hành kể từ ngày ký.

Điều 3. Các Bộ trưởng, Thủ trưởng cơ quan ngang bộ, Thủ trưởng cơ quan thuộc Chính phủ, Chủ tịch Ủy ban nhân dân các tỉnh, thành phố trực thuộc trung ương và các cơ quan liên quan chịu trách nhiệm thi hành Quyết định này./.

Nơi nhận:
- Ban Bí thư Trung ương Đảng;
- Thủ tướng, các Phó Thủ tướng Chính phủ;
- Các bộ, cơ quan ngang bộ, cơ quan thuộc Chính phủ;
- HĐND, UBND các tỉnh, thành phố trực thuộc trung ương;
- Văn phòng Trung ương và các Ban của Đảng;
- Văn phòng Tổng Bí thư;
- Văn phòng Chủ tịch nước;
- Hội đồng Dân tộc và các Ủy ban của Quốc hội;
- Văn phòng Quốc hội;
- Tòa án nhân dân tối cao;
- Viện kiểm sát nhân dân tối cao;
- Kiểm toán Nhà nước;
- Ủy ban Giám sát tài chính Quốc gia;
- Ngân hàng Chính sách xã hội;
- Ngân hàng Phát triển Việt Nam;
- Ủy ban Trung ương Mặt trận Tổ quốc Việt Nam;
- Cơ quan trung ương của các đoàn thể;
- VPCP: BTCN, các PCN, Trợ lý TTg, TGĐ Cổng TTĐT, các Vụ, Cục, đơn vị trực thuộc, Công báo;
- Lưu: VT, NN (3b).

KT. THỦ TƯỚNG
PHÓ THỦ TƯỚNG

Trịnh Đình Dũng

PART II.

MAIN CONTENTS OF THE NATIONAL ADAPTATION PLAN FOR THE PERIOD 2021 - 2030, WITH A VISION TO 2050

II.1. GOAL AND OBJECTIVES

1. Goal

The National Adaptation Plan aims to minimize vulnerability to and risks of climate change by strengthening resilience, the adaptation capacity of communities, economic sectors and ecosystems and by promoting the integration of climate change adaptation into strategies and planning.

2. Specific objectives

To improve the effectiveness of climate change adaptation by enhancing the state management of climate change including adaptation activities and promoting the integration of climate change adaptation into strategies and planning.

To enhance the resilience and adaptation capacity of communities, economic sectors, and ecosystems through investments in adaptation actions, science and technology, and awareness raising for climate change readiness

To reduce disaster risks and mitigate damages, be ready to respond to increasing natural disasters and extreme climate events due to climate change

II.2. TASKS AND SOLUTIONS

1. Improving the effectiveness of climate change adaptation by enhancing the state management of climate change and promoting the integration of climate change adaptation into strategies and planning

Developing and completing the national legal framework on climate change; implementing activities to form a basis for the development of the Law on Climate Change

Reviewing, updating, and developing new socio-economic, sectoral planning based on climate change scenarios

Promoting the integration of climate change adaptation into strategies and planning

Monitoring and evaluating to enhance the effectiveness of climate change adaptation, including the promulgation of criteria in assessment of the effectiveness of adaptation activities; developing and operating a monitoring and evaluation system for climate change adaptation activities

Promoting adaptation actions with co-benefits in ensuring disaster prevention, reduction of climate change risks and economic, social, environmental effectiveness.

Strengthening international cooperation and fulfilling the obligations to the United Nations Framework Convention on Climate Change

II.2. TASKS AND SOLUTIONS (cont.)

2. Strengthening resilience and enhancing adaptation capacity of communities, economic sectors, and ecosystems through investment in adaptation actions, science and technology and awareness raising for climate change readiness

Improving the natural systems and infrastructure to enhance resilience of sectors/fields to climate change

Improving the adaptability of natural ecosystems and biodiversity in the context of climate change through strengthening the management of ecosystems and biodiversity

Developing and upscaling ecosystem-based and community-based adaptation models; increasing the participation of local communities in biodiversity monitoring, conservation, and management

Managing and protecting forests and improving forest quality through solutions for forest regeneration, restoration, and enrichment.

Raising awareness and enhancing knowledge about climate change and natural disasters for different levels of authorities, social organizations and communities; enhancing capacity, developing female human resources and promoting gender equality in climate change adaptation.

Researching and developing technologies with a focus on new and advanced technologies in climate change adaptation

II.2. TASKS AND SOLUTIONS (cont.)

3. Disaster risk reduction, damage mitigation and readiness to respond to increasing natural disasters and extreme climate events due to climate change

Readiness to respond to climate change hazards through strengthening climate change monitoring, hydro-meteorological observation, forecast, warning and transmission of information on natural disasters and extreme weather

Ensuring safety for irrigation works and natural disaster prevention works in order to actively respond to natural disasters increasing both in frequency and intensity

Improving disaster risk management systems; identifying, zoning, and forecasting disaster risk levels; strengthening management capacity and measures and promotion of disaster risk reduction; focusing on the community-based disaster management solutions; promoting local knowledge in disaster prevention to minimize vulnerability; and enhancing readiness to cope with extreme weather and climate events

Mitigating damage caused by natural disasters due to short-term, medium-term, and long-term impacts related to climate change through timely and effective implementation of disaster prevention measures

Preventing erosion along river banks and coastlines; coping with increasing droughts and salinity intrusion; addressing losses and damages due to climate change impacts

II.3. IMPLEMENTATION PHASES

Phase 2021 - 2025

- Focusing on completing mechanisms and policies on climate change adaptation;
- Preparing the legal basis and technical conditions to promote the integration of climate change into policies, strategies, and planning;
- Implementing tasks and priority solutions to adapt to climate change, enhance the capacity to respond to natural disasters, and minimize damages caused by natural disasters and unusual climate and weather

Phase 2026 - 2030

- Strengthening the coordination and integrating activities in the implementation of tasks and solutions
- Improving the resilience capacity of the infrastructure system, the adaptability of natural ecosystems and biodiversity
- Enhancing the resilience of natural ecosystems, protecting and conserving biodiversity in the context of climate change.
- Promoting adaptation actions that have co-benefits in climate change mitigation and are economically, socially, and environmentally effective.

Vision to 2050

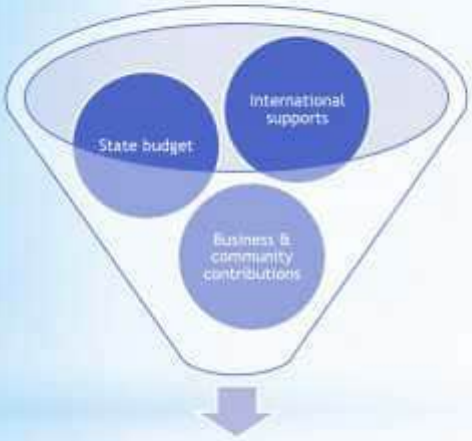
- Promoting the achievements of NAP implementation
- Enhancing the adaptation capacity to climate change
- Integrating climate change adaptation into all socio-economic activities, taking opportunities of climate change for socio-economic development

II.4. LIST OF TASKS FOR IMPLEMENTATION OF NAP

PART III.

RESOURCES MOBILISATION FOR THE IMPLEMENTATION OF NATIONAL ADAPTATION PLAN FOR THE PERIOD 2021 - 2030, WITH A VISION TO 2050

III. RESOURCES MOBILISATION FOR THE IMPLEMENTATION OF NAP



- Mobilizing resources is important for the implementation of climate change adaptation activities.
- The implementation of NAP requires a variety of resources including financial, technical and human resources. Among these, financial resources are the most important for implementing adaptation actions at both national and local levels..
- Resources for the implementation of NAP are mobilized from different channels, in compliance with the provisions of the State Budget Law, the Law on Public Investment , the Law on Investment and other relevant laws..
- Financial resources for adaptation activities can be mobilized from channels including: State budget (including central and local budgets); international supports; businesses and community contributions.

III.1. MOBILISATION FROM STATE BUDGET

STATE BUDGET

- To balance the fund from the central and local budgets.
- To integrate in the implementation plans, strategies, planning, programs, schemes and projects of ministries, and local agencies
- National science and technology programs.
- National Science and Technology Development Funds.

III.2. MOBILISATION FROM BUSINESS AND COMMUNITY

The State creates a legal basis, applies economic and market tools to ensure effective implementation of climate change adaptation policies and laws, and encourages and facilitates financial institutions, domestic and foreign businesses to invest in and support the implementation of NAP.

III.3. MOBILISATION FROM INTERNATIONAL SUPPORTS

Global Environmental Fund(GEF)

- The GEF Fund is an executive organization of the financial mechanism of the UNFCCC.
- Climate change adaptation is an area in which the GEF holds great importance.
- Since 1998, Vietnam has received 17 projects supports from the GEF mainly for GHG emission reduction activities with a total grant of more than USD 50 million..

Adaptation Fund (AF)

- Operating since 2009. AF officially associated with the funds under the framework of the UNFCCC.
- The Fund's goal is to support climate change adaptation activities, and this is a financial channel which could be accessed in the implementation of the NAP.

Green Climate Fund (GCF)

- GCF was established in 2010 to support projects, programs, policies and other activities on climate change adaptation and GHG emission reduction in developing countries.
- To date, Vietnam has received 2 projects supports from GCF with a total funding of 115.8 million USD.

Bilateral and multilateral cooperation

- Bilateral support, including direct activities with ministries and provincial agencies.
- Multilateral technical assistance, provided by development banks and UN organizations on climate change, including the integration of climate change adaptation into sector activities.
- Support from NGOs includes support for climate change adaptation at community and local levels.

TÀI NGUYÊN VÀ MÔI TRƯỜNG

THANK YOU!

ECO SYSTEM Inc.

G I S

Goal

To make cities around the world more recycle-oriented.

Issue

In a developed city or a developing city in the future...

As urbanization progresses, and the ground is covered with concrete and asphalt, there are increasing risks of the 'heat island' phenomenon and heavy rains causing urban flooding.

Solu-tion

We are working to provide solutions by offering the following:

① Permeable paving materials

② Water-retaining pavement materials

③ Know-how and technology to produce the above

④ Pavement material manufacturing equipment

Mobile plant (MOBACON)

Actually ...

In Japan, people are having trouble with the processing of Waste Roof Tiles.

Destruction of Waste Roof Tiles

Most of this ends up in Landfills.

Convert WRT to construction materials!

WRT available in large quantities

Processing (crushing)

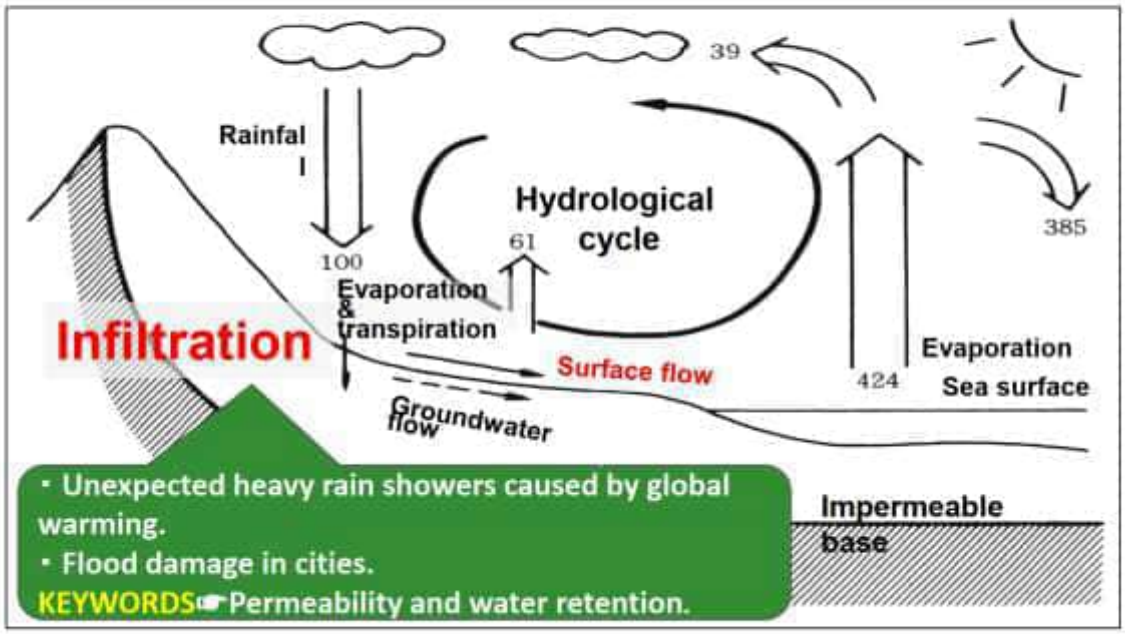
Gardening material

Paving material

Grades and Uses for Crushed Recycled WRT			
Sand	Gravel and Chips		
	S	M	L
			

Features of roof tile pavement material

The Water Cycle



Recycled roof tile pavement

Recycled roof tile pavement

Roof tile pavement is “COOL”

Ishikawa Prefecture

Ready-mixed concrete plant

Recycled WRT Paving Material
(Permeability & Water Retention)

Cool paving material

Improve the local environment with recycled WRT paving material!

Cool paving materials in use all over Japan

Roof tiles and bricks＝Ceramic products

JAPAN: Roof tiles > Bricks

Vietnam: Roof tiles < Bricks

(Bricks→Construction Demolition Waste)

Both roof tiles and bricks are made
by firing clay at high temperatures.
If it is fired, our know-how can be utilized.
Japan disposes of more roof tiles than bricks.

Ceramic products are found all over the world.

Ceramic products are used all over the world.
In particular,
Europe makes heavy use of both roof tiles and bricks,
which are hard and can be recycled
as pavement aggregates.

There are many roof tiles and bricks
used in Asia and South America as well.

Ceramic products all over the world

Roof tiles and brick.
(Germany)

Scenery of roof tiles
(Italy)

The building is mostly brick
(India)

House under construction
(Indonesia)

House under construction
(Vietnam)

Roof tiles and bricks
(Bolivia)

Make cities around the world recycle-oriented future cities

Waste material from building demolition.

Brick & Roof Tile Factory
Manufacturing processes generate about 5 to 7% defective products, which then become waste.

Large amount of ceramic waste

Landfill disposal site, or Illegal dumping?

A fixed plant has high installation & operating costs.

Crush and Particle size adjustment.

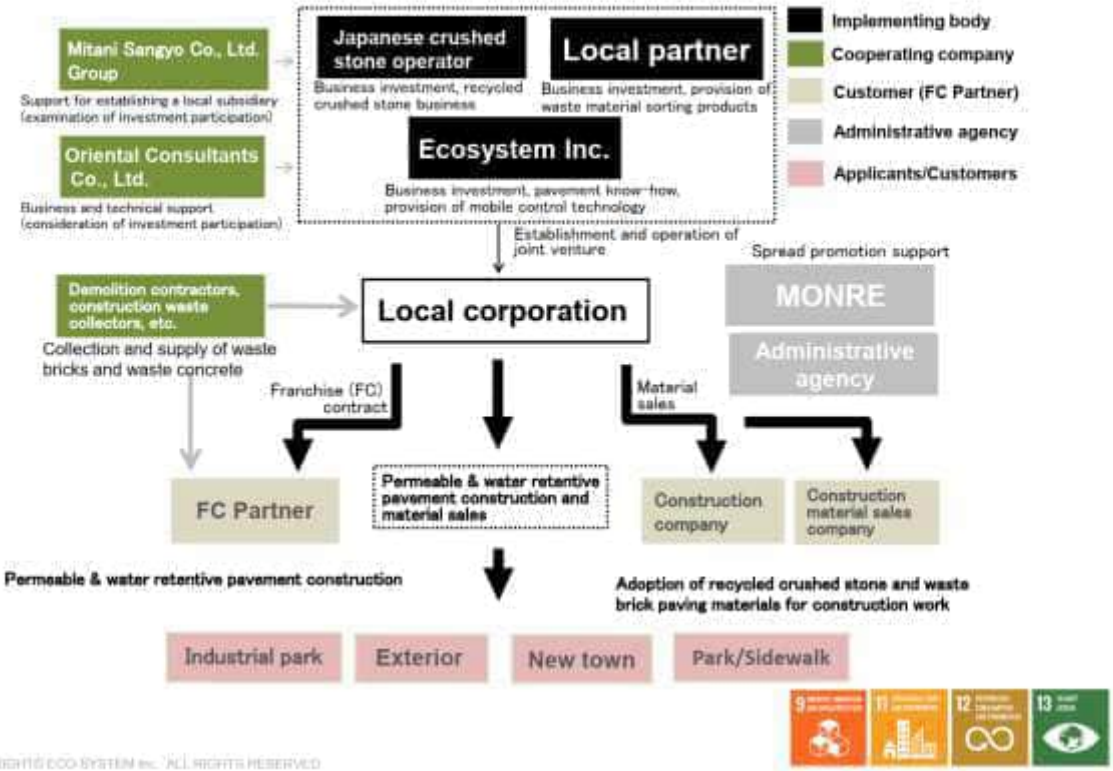
Local Partner Company

On-board ready-mixed concrete plant. [MOBICON]
It can also be used as a non-fired brick manufacturing machine.

A recycle-based future city where water circulates.

We can also manufacture and supply special ready-mixed products for infrastructure maintenance, responding to every demand.

Business model envisioned in Vietnam



Adaptation feasibility study in Vietnam

Overview of the adaptation FS being conducted, etc.

(1) Investigation on the possibility of contributing to adaptation (permeable/water-retentive pavement and recycling)

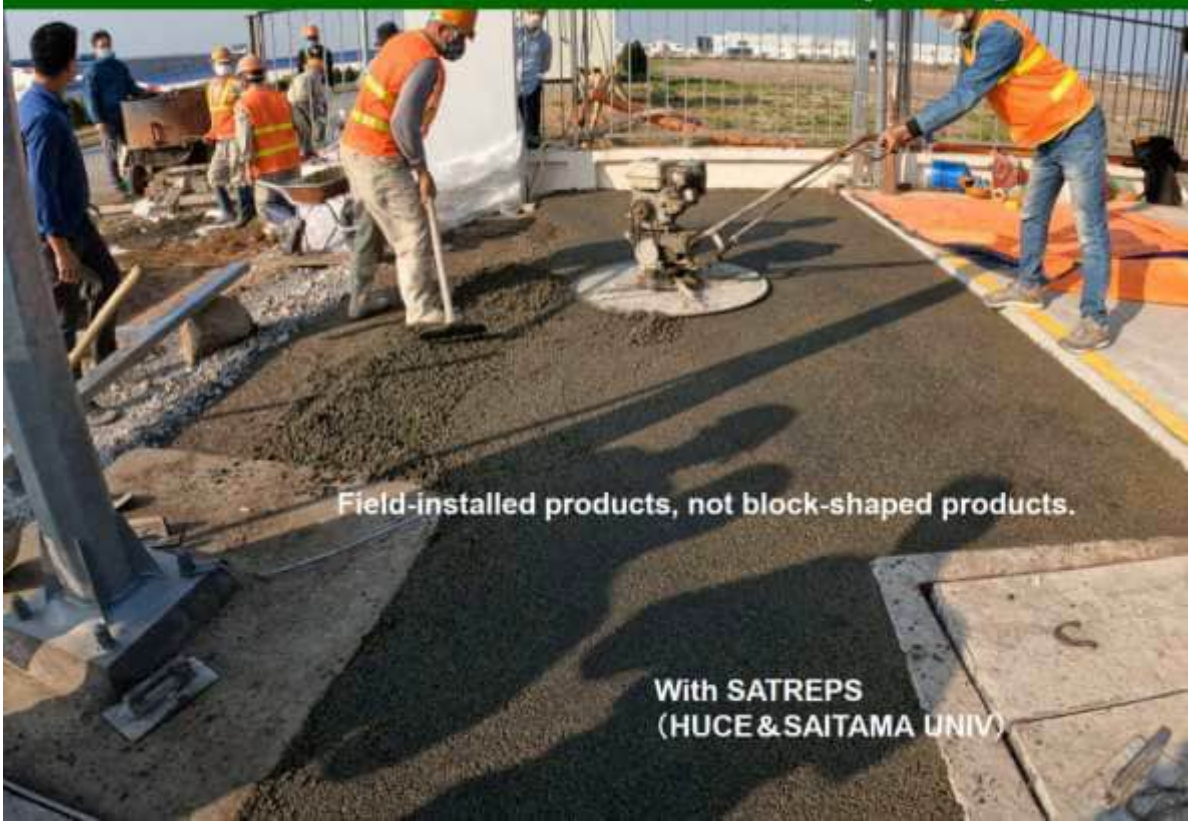
(2) Examination of issues and commercialization for dissemination of proposed technology
- Introduction method, business model, deployment plan
- Arrangement of requirements for proposed technology, arrangement of Japanese standards and systems
- Examination of standards for recycled permeable pavement materials

(3) Examination of results and evaluation methods when the proposed technology is introduced

(4) Consideration of debriefing sessions and utilization of CTCN, etc.
- Introduction of proposed technologies and Japanese systems and standards to related organizations
- Coordination with related organizations regarding the use of schemes such as CTCN
- Adjustments for demonstration(Re-molding products such as blocks)

Demonstration construction (Haiphong site)

Demonstration construction (Haiphong site)



Demonstration construction (Hanoi site)

Demonstration construction (Hanoi site)

Monitoring of demonstration sites

DEEP C industrial park (one month after construction)

Inside HUCE
(one month after construction)

Monitoring items

1. Cracks, deformation, deterioration, etc.
2. Permeability in rainy weather
3. Clogging of pavement surface due to dust, etc.
4. Pavement surface temperature, etc.

Demonstration construction (Hanoi site)

Video of water permeability (inside HUCE)

Trial of visualization

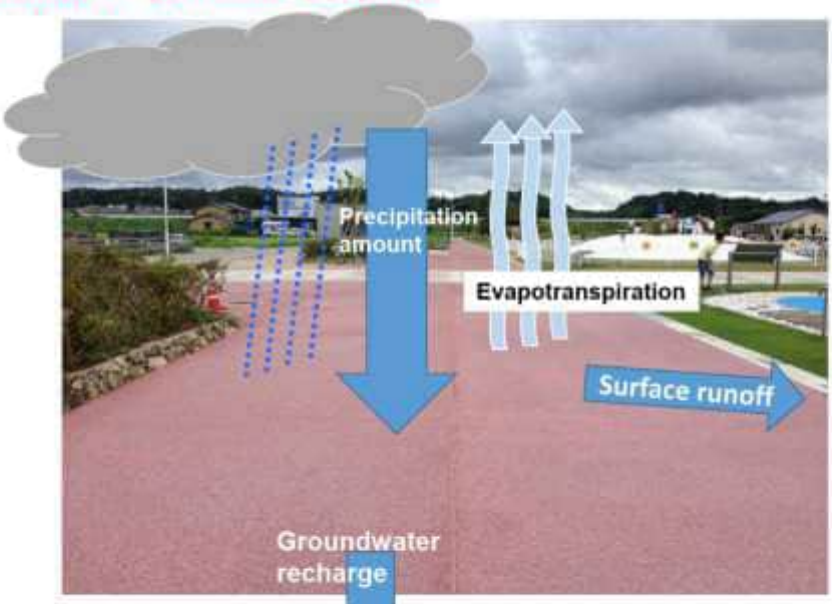
Input	Output	Outcome (short term)	Outcome (Long term)	Index*
Personnel	Roads with permeability and water retention functions **	Improvement of pavement permeability and water retention	Mitigation of urban floods	Permeability and water retention rate of pavement (%)
Waste tiles and bricks, and other necessary materials		Reduction of pavement surface temperature	Suppression of the heat island phenomenon	Surface temperature (°C) and temperature difference with surrounding area (°C)
Budget				
In-vehicle paving material manufacturing plant "Mobacon"				
	Secondary effects (mitigation, etc.)			
		Reduction of construction demolition waste	Realization of resource recycling	Amount of construction demolition waste used (kg or t) and recycling rate (%)
			Reduction of CO2 emissions	CO2 emissions per ton of pavement material (kg-CO2/t) and pavement area (m2)

* Indicators were for short-term outcomes.

** In addition to water permeability and water retention functions, the product also features a high degree of scenic beauty.

Visualization Trial ~Impact Evaluation Example~

Evaluation of permeable pavement

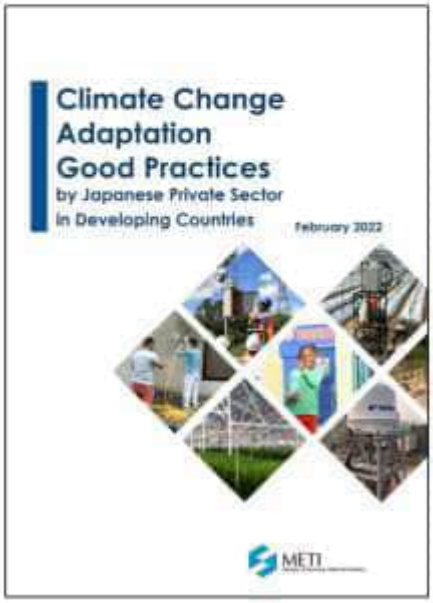


Investigate and quantify these quantities. Conducted a simulation of the possibility of adaptation contribution.

METI "Good Practice Case Studies"

METI
Ministry of Economy, Trade and Industry

Posted in Adaptation Business "Examples of Adaptation Good Practices by Japanese Companies"



1	Development of anti-disaster information system for utilizing forestry preservation project	Kanemoto Corporation / Hitachi Ltd.	9 11 13
2	Examining the Earth as "Earth Doctor"	Kawasaki Geological Engineering Co., Ltd.	9 13
3	Water projects for realization of cooperative and rich society	Kubota Corporation	3 4 8 11 13
4	Protecting society and infrastructure from slope disasters	Kokusai Kogyo Co., Ltd.	11 13
5	Protecting local community from threat of high tide and sea level rise	TAISEI CORPORATION	9 11 13
6	Methodology for prevention of soil surface	Nippon Koei Co., Ltd.	4 11 13 15
7	monitoring cameras	Information System Inc.	11 13
8		eRad Co., Ltd.	11 13
9	Functional paving materials made from waste roof tiles and bricks to reduce urban flooding and heat island effect	ECOSYSTEM Inc.	4 11 12 13
10	Waterproofing and Extending the Service Life of Buildings with Concrete Repair Materials	JSH Co., Ltd. / Japan Polyvinyl Limited Company	9 11 12 13
11	Introducing a resilient hybrid power generation control system against environmental changes	Kyudenko Corporation	7 13
12	Greater resilience in anti-disaster infrastructure through the world's first "Typhoon Power Generation" and communications satellite	Challenge Inc.	7 9 13
13	Mitigating damage to energy supply system in times of disasters	Panasonic Corporation	1 3 4 5 7 13
14	Contributing to sustainable agriculture through "Bio-cycle"	Ajinomoto Co., Inc.	2 12 15

Introduced along with companies that represent Japan.

Company Profile & Mission Statement

ECO SYSTEM Inc. Ecosystem Roof tile

- Establishment
  - 1994/12/15
- Capital
  - 19.8 million yen
- 7 employees (21 groups in total)
- Company permission / license
  - Industrial waste disposal industry (waste roof tile)
  - Construction industry (civil engineering / paving work industry)

"ECO SYSTEM"

In addition to our company name,

it is at the heart of our philosophy.

Starting in 1994,

as a pioneer of WRT recycling,

this company has worked to protect the

global environment and to create a more

beautiful ecosystem for future generations.

I have taken the initiative,

through the recycling of WRT,

to improve the global ecosystem.

That is our mission.

Attachment 5: Presentation Materials of International Information Dissemination (Thailand)

(1) METI / Climate Change Adaptation Policies of Japan
(2) ONEP, MNRE / Update on Thailand's National Adaptation Plan
(3) Office of Agricultural Economics, MoAC / Climate Change Adaptation on Agricultural Sector in Thailand
(4) UNDP Thailand / Thailand's Climate Change Adaptation Project in Agriculture Sector
(5) KUBOTA Corporation / Introduction of DX of Greenhouse Horticulture
(6) Routrek Networks, Inc. / Digital Farming Makes Agriculture Sustainable: Private Sector Contribution to Climate Change Adaptation in Thailand

Note: (5) is not open to the public.

METI
Ministry of Economy, Trade and Industry

Climate Change Adaptation Policies of Japan

February 2023

Hitomi Furuya

Global Environmental Affairs Office,
Industrial Science and Technology Policy and Environment Bureau,
Ministry of Economy, Trade and Industry

1. Our missions

- Contribute to climate change adaptation in Asian countries, promoting involvement of private sectors.

1. Make adaptation efforts **efficient and sustainable**
2. **Attract investments** across sectors
3. **Enhance resilience** of community

Negative impacts of climate change

Global economic output could decrease by **11-18%** by **2050** due to climate change.[2]

According to the CDP analysis of S&P 500 companies, physical climate risks will potentially have **$40-50 billion** in impacts by 2026.[3]

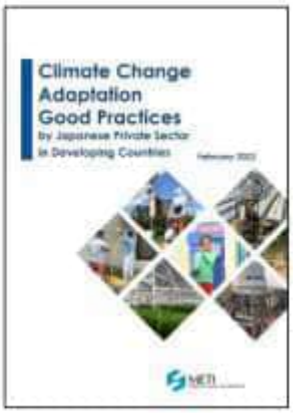
Source: Critical Business Actions for Climate Change Adaptation, WEF, November 2022

2. METI's activities - 1

- Identify and promote understanding of adaptation technologies

Areas of adaptation with a potential implementation of private technologies

- Resilient infrastructures to natural disasters
- Stable supply of Energy
- Food Security & Strengthening Food Productive Base
- Health & Sanitation
- Climate Monitoring & Early Warning
- Secure Resources & Sustainable Water Supply
- Climate Change Finance



- **39 examples**
- English version available

2

3. METI's activities -2

- Formulate **public-private partnership projects**

1. Focus on **local circumstances**
2. **Promote diverse partnerships**, such as cities and private sectors
3. Enhance involvement of startup companies and SMEs

Started on Nov 16, 2022

SUBARU initiative

~**SU**stainable **B**usiness of **A**daptation for **R**esilient **U**rban future~

Discussion with UN Habitat at COP27

METI Ministry of Economy, Trade and Industry

UN HABITAT FOR A BETTER URBAN FUTURE

*Regional office for Asia and the Pacific

■ UN Habitat offices in 17 countries

Afghanistan, Cambodia, China, Fiji, India, Iran, Japan, Laos, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Solomon Islands, Sri Lanka, Thailand, Vietnam

*Solomon Islands is closed due to vacancy

4.Cooperation with International Organizations

①Green Climate Fund (GCF)

- Finances private sector investments (from a minimum of less than 10 million dollars up to a maximum of more than 250 million dollars) of adaptation/mitigation measures upon request from governments of developing companies.
- Japan's accumulate contribution to the fund is second after UK.
- CTCN participates in public-private workshop held by METI every year
- **Project collaboration between GCF and METI is considered**

②Climate Technology Centre and Network (CTCN)

- CTCN funds up to 25,000 dollars on technical assistance projects of adaptation/mitigation measures upon request from governments of developing companies.
- CTCN participates in public-private workshop held by METI every year
- **Project collaboration between CTCN and METI is considered.**

③UN-Habitat

- Promotes socially and environmentally sustainable cities in rural areas of developing countries.
- **Collaboration between UN-Habitat and METI for implementation of adaptation technologies in these sustainable cities**

Workshop on Private Sector Contribution to Climate Change Adaptation in Thailand

Update on Thailand's National Adaptation Plan

Mr. Suphat Phengphan

Climate Change Management and Coordination Division
Office of Natural Resources and Environmental Policy and Planning (ONEP)

20 February 2023, Monday 13:00-15:15 (Thai Time)/
15:00-17:15 (Japan Time) via Zoom Conference

World Map of the Global Climate Risk Index 2000 – 2019

Countries most affected by extreme weather events (2000-2019)	
1	Puerto Rico
2	Myanmar
3	Haiti
4	Philippines
5	Mozambique
6	The Bahamas
7	Bangladesh
8	Pakistan
9	**Thailand**
10	Nepal

Source: Germanwatch and Munich RE NatCatSERVICE

National Policies and Plans

Level 1

National Strategy (2018 – 2037)

Strategy 5: Eco-Friendly Development and Growth

Level 2

Master Plans under National Strategy

National Reform Plan

- Climate Change Law
- GHG Inventory

13th National Economic & Social Development Plan (2023-2027)

Level 3

Climate Change Master Plan 2015 - 2050

Adaptation | Mitigation | Enabling Environment

NAMA

7– 20 % from BAU by 2020

NDC Action Plan

30-40% from BAU by 2030

Energy | Transport | IPPU | Waste

National Adaptation Plan (NAP)

BCG Model

National Energy Plan Framework

RE 50 | EV 69 | EE 30

National Adaptation Plan (NAP)

VISION

"Thailand is resilient and adapt to the impacts of climate change to achieve sustainable development"

MISSION

1. Establish the climate resilience into the national development
2. Enhance capacities and awareness at all level
3. Develop database, research, knowledge, and technology

Sectoral Integration

6 Sectors

Office of the National Water Resources (ONWR)

Ministry of Agriculture and Cooperatives (MOAC)
Office of Agricultural Economics (OAE)

Ministry of Public Health (MOPH)
Department of Health (DOH)

Ministry of Interior (MOI)
Department of Public Works and Town & Country Planning (DPT)

Department of Disaster Prevention and Mitigation (DDPM)

Ministry of Tourism and Sports (MOTS)
Department of Tourism (DOT)

Ministry of Natural Resources and Environment (MONRE)
Office of Natural Resources and Environmental Policy and Planning

Master Plan on Water Resource Management

CC Action Plan for Agriculture

H-NAP

Comprehensive Plan

Thailand's National DPM Plan

MOU with related agencies

National Adaptation Plan (NAP)

Agriculture

Target Productivity and food security maintained amidst climate change risks and impacts

Measure

Based on the principles of categorizing the production systems at risk

1. Cropland
2. Livestock farm
3. Fisheries and aquaculture
4. Supporting mechanisms

Highlighted Adaptation Measures for Agriculture sector under NAP

adjustment in agricultural patterns, Precision farming including insect, pests protection and risks from disasters, whether floods, droughts or storms

Integrating new technology and agricultural innovations with the local wisdom in improving the agricultural production process

Support networks' building for climate change adaptation in the agricultural sector

Using insurance system caused for disaster from climate change

Promote production with New Theory Agriculture, Sustainable Agriculture, and Integrated Farming

Promote measures for soil conservation, rehabilitation, and soil fertility maintenance such as undertaking cover cropping, contour tillage, and crop selection according to soil and climatic conditions

Taking gender into account as well as using new technology, innovations and the local wisdom and supporting mechanisms

Updated the adaptation implementation in Thailand

- **Thailand's NAP submission**
- **NAP Marine project (GCF project) :**

Development of risk and vulnerability information for analysing impact of climate change in agriculture, fisheries and tourism sectors including alternative measures development in marine and coastal areas.

- **Development of climate service database under the MOU between ONEP and the Thai Meteorological Department (TMD)**:

To develop specific climate data services (Specific Climate Data Service) such as agriculture, tourism and natural resources (marine and coastal).

- **Pre-assessment study in agriculture and natural resources sectors**:

Development of climate change information by sectors and resilience index data at the area level.

- **CBIT project**:

Development of metrics, indicators and methodologies for tracking adaptation targets in the NAP as well as integrating V&A data into adaptation policy formulation of the agricultural sector.

Barriers and challenges in the implementation of adaptation measures in Thailand

- **Limitation of knowledge**:

The personnel that are key to the implementation of adaptation measures lack knowledge of the impacts of climate change and the appropriate adaptation measures.

- **Lack of continued financial support**:

Some multi-year adaptation projects lack continued financial support, slowing down the progress of adaptation actions.

- **Lack of central database**:

Different government agencies have their own climate change data and lack coordination and integration of data on climate change projection and impacts.

- **Lack of national climate information center**:

Thailand does not have national information center that compiles climate-related information.

- **Lack of access to adaptation technologies**:

Not all adaptation technologies are accessible by stakeholders

Thank You

Climate Change Management and Coordination Division
Office of Natural Resources and Environmental Policy and Planning (ONEP)
Ministry of Natural Resources and Environment

118/1 Tipco Tower 2, Rama VI Road, Phaya Thai,
Bangkok 10400, THAILAND
Tel: 66 2265 6500 ext. 6784, 6842
Email: ccmcpolicy@gmail.com
http://climate.onep.go.th

Climate Change Adaptation on Agricultural Sector in Thailand

February 2023

Contents

- Thailand's NDC and the policy in agricultural sector
- Implementation of Climate Change Adaptation in Agricultural Sector
- Climate Change Strategic Plan for Agricultural Sector 2023 – 2027 (Draft)
- The ultimate target of adaptation co-benefits

Thailand's NDC and the policy in agricultural sector

National Adaptation Priorities

Maintain and Increasing and
- > Productivity
- > Food Security
- > Ability to Respond
- > Manage Climate Risks

Agricultural Sector and National Policies

National Policies

Bio-Circular-Green Economy (BCG) model as a strategy of Thai government to create sustainability and inclusiveness to Thailand's economy, society and the environment

Ministry of Agriculture and Cooperatives : MOAC

Vision To provide farmers with good quality of life, with safe food for consumption, with their generation of income for the land

Mission
1. To promote farmers units and encourage them to be self-reliant, have good quality of life and sustain occupations
2. To promote production of agricultural product and value added food that meet market demands and consumer standards
3. To research and development an infrastructure for agricultural production
4. To develop and transfer agricultural technology focusing on effective, sustainable and environmental-friendly use of agricultural resources

3

Implementation of Climate Change Adaptation in Agricultural Sector

- GAP
- Site Specific Nutrient Management
- Water and Soil Management
- Plant and Animal Breeding
- Technology & Innovation
- NTA and Etc..

CSA

2019
A Study on Farmers' adaptation to climate change

Adaptation Co-benefit

2018-2023
The project to increase production efficiency and reduce GHGs from rice fields (Thai Rice NAMA)

Technologies :
- AWD
- SSNM
- Biomass management (no burning)

Area : 6 provinces

2022
A Study on Farmers' Decision-making behavior under climate change

2023-2028
The project to increase efficiency from rice fields under climate change (Thai Rice GCF)

Technologies : Same as Thai Rice NAMA

Area : 21 provinces

4

Implementation of Climate Change Adaptation in Agricultural Sector *(continued..)*

NAP-Ag
Integrating Agriculture in National Adaptation Plans

Outcome
1. CC strategic plan for agricultural sector
2. Capacity development programme
   > CC Cost-benefit analysis
   > Multi-criteria analysis
   > Impact Evaluation
   > Theory of change
3. Develop local CC risk assessments and planning processes for adaptation activities

2015-2019

2023-2025

2021-2025

Scaling up Climate Ambition on Land Use and Agriculture (SCALA)

M&E of Adaptation Actions in Agriculture and Food Security Sector
under
The Capacity Building Initiative for Transparency (CBIT)

Climate Change Strategic Plan for Agricultural Sector 2023 – 2027 (Draft)

Vision: Thai agricultural sector has capability and resilient to climate change, depend on information and favorable environment

Mission 1
Enhance the adaptability of farmers and related businesses throughout the supply chain

- CSA
- Increasing adoption/technology throughout the supply chain
- Soil fertility and access to water resources

Mission 2
Contribute the reduction of GHGs emission throughout the agricultural supply chain in order to reduce the long-term impact of CC

- Environmentally friendly and low-carbon products
- Supporting the low-carbon agricultural market

Mission 3
Database & knowledge dev. , raising awareness of the impacts of CC and the importance of adaptation, and the contribution of reduction of GHGs emissions.

- Develop an efficient resource & risk management system
- Increase research & knowledge
- Develop database and knowledge transfer

Mission 4
Develop potential of people in agriculture and promote network cooperation in order to deal with CC in all sectors.

- Raising awareness of CC
- Strengthening the capacity of people in accordance with the area-based context

Mission 5
Driving CC Strategic Plan mechanism

- Enhance integration between MOAC and non-MOAC agencies
- Improve and develop regulations, laws, incentives and the environment to adjust behaviours

Climate Change Strategic Plan for Agricultural Sector 2023 – 2027 (Draft)

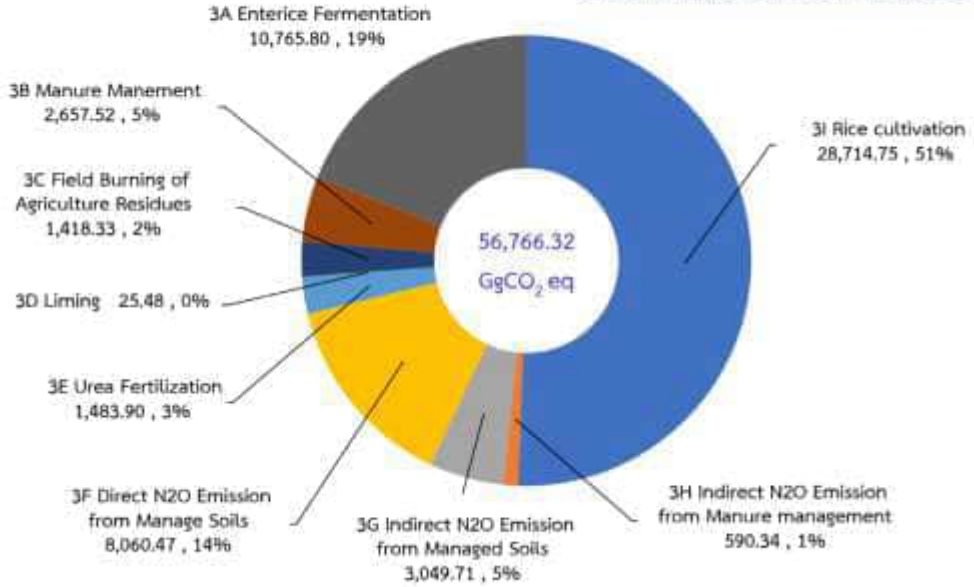
Indicators

1. The value of damage in agricultural sector and disaster assistance decreased by 20 percent during 2023-2027, compared to 2017-2022
2. The yields of major agricultural commodities are 20 percent less damaged, by CC, compared to 2017-2022
3. The market value of low-carbon agricultural products grows 5% annually
4. The agricultural sector reduces GHG emissions by 1 million tons of CO_2eq
5. Carbon credits in agriculture can be traded in international market
6. Current researchers involved in CC are developed at least 100 researchers annually
7. The new researchers involved in CC in agriculture sector has increased at least 100 researchers annually
8. Agricultural sector has an easily and accessible CC database

The ultimate target of adaptation co-benefits is to contribute the reduction of GHGs

GHG Emissions in Agriculture Sector 2019

Source: Thailand's Fourth Biennial Update Report



Thank you

Office of Agricultural Economics
Email: tare.oae@gmail.com
Tel. +662 579 6580

Thailand's Climate Change Adaption Project in Agriculture Sector

Introduction of GCF Project

Project Information

Implementing Partner:	• Royal Irrigation Department (RID), MOAC
Project Objective:	• To adapt water management and agricultural livelihoods in the Yom and Nan river basins to climate change induced extreme weather events (droughts and floods), with the paradigm shift to move towards climate risk informed water and livelihood management through tailored climate information, technical support, and the adoption of innovative technologies and practices, such as ecosystem-based adaptation.
Duration:	• 2022 - 2026
Budget:	• Total Budget $ 33,911,323 GCF Project Financing 17,533,500 Confirmed co-financing $ 16,377,823 (RID = $ 16,263,940 | Krungsri Bank = $ 113,883
Project Location:	• Phitsanulok, Sukhothai, and Uttradit provinces
Status:	• Received FAA in January 2022

Strategies

Align with the country's 20 Year Agricultural Development Plan (2017 – 2036)

Entail the roll-out of innovative technologies for climate solutions and advances use of IoT platforms, as part of the country's MoAC Digital Agriculture Strategic Plan (2017 – 2021)

Improve the water management capacity of RID and local communities in critical area between the Yom and Nan rivers

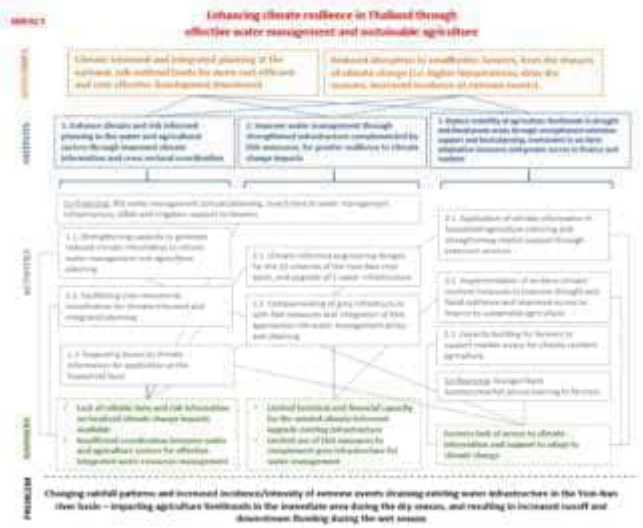
Address barriers based on the theory of change, barriers and solution analysis

Strengthen the resilience of water infrastructure and agriculture-resilient communities to cope with increasing climate change induced floods and droughts in the Yom and Nan river basins

Enhance capacity of the RID to incorporate climate change risk information to water management planning process and integrated EbA approaches into their portfolio of adaptive solutions

Engage with numerous stakeholders, both at national and local levels.

Theory of Change



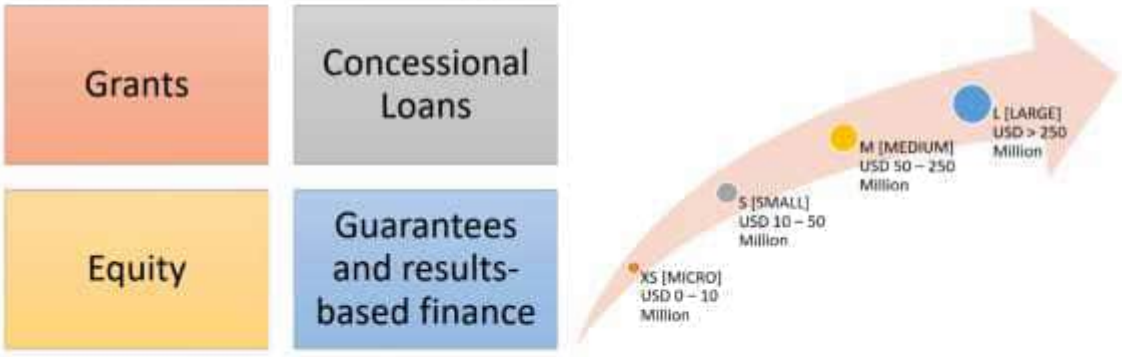
Outputs and activities

Output	Activity	Executing Entity	Responsible Parties/ Executing Entity
Output 1: Enhance climate and risk informed planning in the water and agricultural sectors through improved climate information and cross sectoral coordination	1.1. Strengthening capacity to generate tailored climate information to inform water management and agriculture planning	RTG acting through the Ministry of Agriculture and Cooperatives	KMUTNB (RP) and RID (EE)
	1.2. Facilitating inter-ministerial coordination for climate-informed and integrated planning		KMUTNB (RP)
	1.3. Expanding access to climate information for application at the household level		KMUTNB (RP)
Output 2: Improve water management through strengthened infrastructure complemented by EbA measures, for greater resilience to climate change impacts	2.1. Climate-informed engineering designs for the 13 schemes of the Yom-Nan river basin and upgrade of 2 water infrastructure		RID (EE)
	2.2. Complementing of grey infrastructure with EbA measures and integration of EbA approaches into water management policy and planning		GIZ (RP) and RID (EE)
Output 3: Reduce volatility of agriculture livelihoods in drought and flood prone areas through strengthened extension support and local planning, investment in on-farm adaptation measures and greater access to finance and markets	3.1. Application of climate information in household agriculture planning and strengthening of related support through extension services		RID (EE)
	3.2. Implementation of on-farm climate resilient measures to improve drought and flood resilience and improved access to finance for sustainable agriculture		RID (EE)
	3.3. Capacity building for farmers to support market access for climate resilient agriculture products		RID (EE)

How to apply for funding?

Areas of action in which GCF seeks to invest

Fund's resources

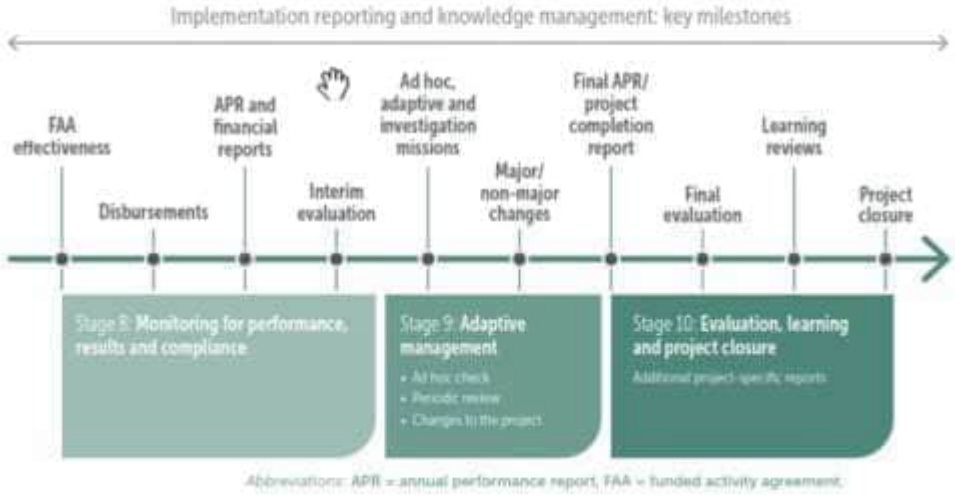


Criteria

GCF Project/Programme Activity Cycle

Project Approval Process

Milestone of GCF project/programme cycle



Timeframe from project approval to completion

THANK YOU

Digital Farming Makes Agriculture Sustainable

Private Sector Contribution to Climate Change Adaptation in Thailand"

20th February 2023

Routrek Networks, Inc.
Leader in connected technology

Start M2M technology on 2005, and launched digital farming business to provide turn key IoT/AI solution for greenhouse

Provide turn key " Connected Technology (M2M)" into multiple applications

RouteMagic

2005
IP based M2M solution

2008
Zigbee based M2M solution

2009
Wi-Fi based M2M solution

2010
3G based monitoring solution for Agri

2013
IoT x agriculture "Zeroagri" Prototype released
1st generation

2015
Plant growth algorithm with AI
2nd generation

2022
ZeRo.agri Ship 350 systems

Focus on Digital Farming market

- Routrek focused on developing & commercializing innovative turn-key IoT solutions at non-connected field.
- Creating agriculture focused IoT technologies since 2010.
- Launched autonomous drip irrigation solution in 2013.
- Value added autonomous fertigation with drip irrigation in 2022.

Turning point of agriculture to data-driven farming from conventional experience based farming to keep food security

Japan domestic issues:
- Aging and decreasing farming population
- Low productivities of young new farmer
- Price competitiveness with imported crop
- Adaptation of climate change

Asian issues:
- Increasing food demand by grows population
- Water shortage (39% shortage in 2030)
- Environment pollution by chemical fertilizer
- Low productivities by cultivating technology

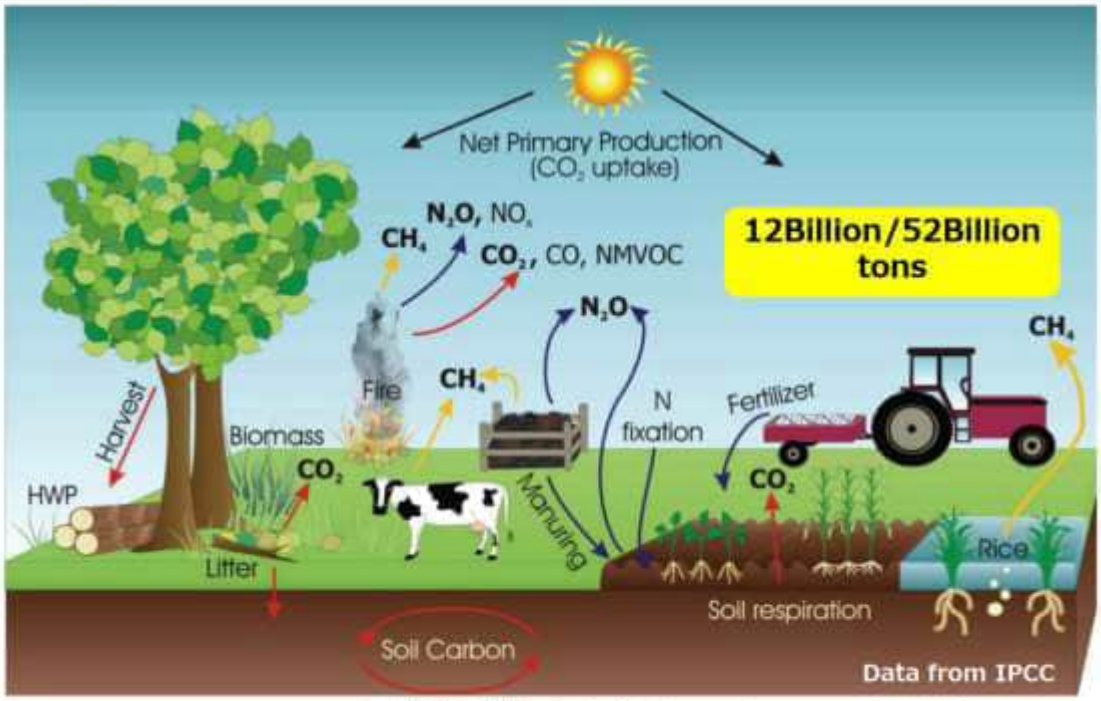

New farmer support


Expand cultivation scale


Better quality


Higher Yield

World's agriculture, forestry and fisheries contribute to carbon neutral by reducing emission of greenhouse gas (GHG)



ZeRo.agri is cloud based autonomous drip irrigation & fertigation system targeting to small to medium size of greenhouse

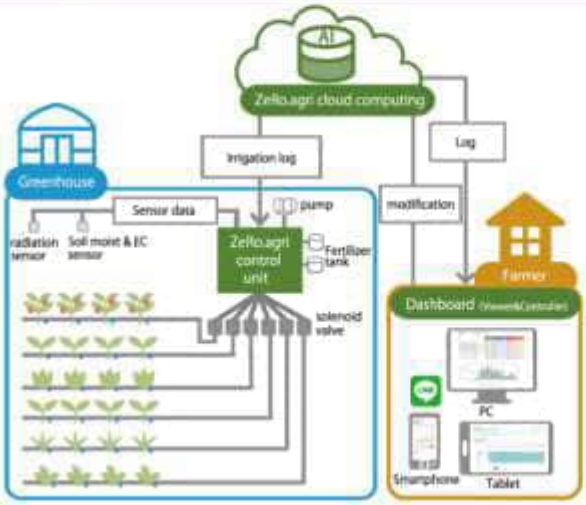
Patented technology at USA, Israel and Japan, and patent pending at other countries

ZeRo.agri is;

- The remote irrigation & fertigation control system for soil & soilless environment at green house
- Integrated unique IoT and AI technologies by joint research with Routrek Networks, Meiji University and Netafim.

ZeRo.agri system overview

Simple user interface for remote control system



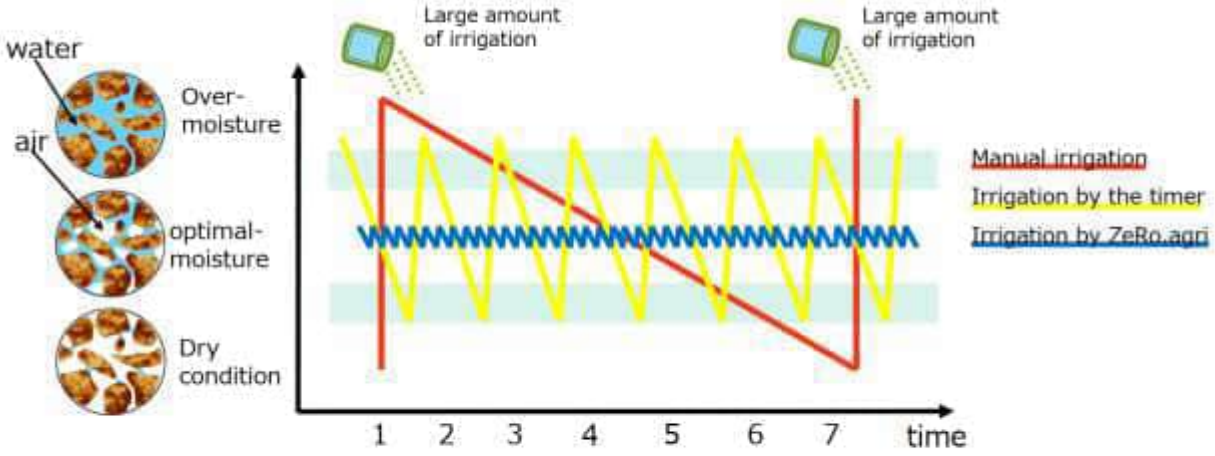
Autonomous algorithm with IoT/AI based computing system

1st: Monitoring solar radiation, soil moisture, EC through IoT sensors
2nd: Calculating and predicting value of moisture and fertilizer inside soil
3rd: Dynamically controlling water and fertilizer valve connecting with tube
4th: Able to adjust soil moister and fertilize simply with a farmer's experience

【Key function of autonomous irrigation control】

Realize a high accuracy irrigation difficulty by manual

Small amount and high frequency drip irrigation and fertigation makes maximize of crop potential as well as soil condition

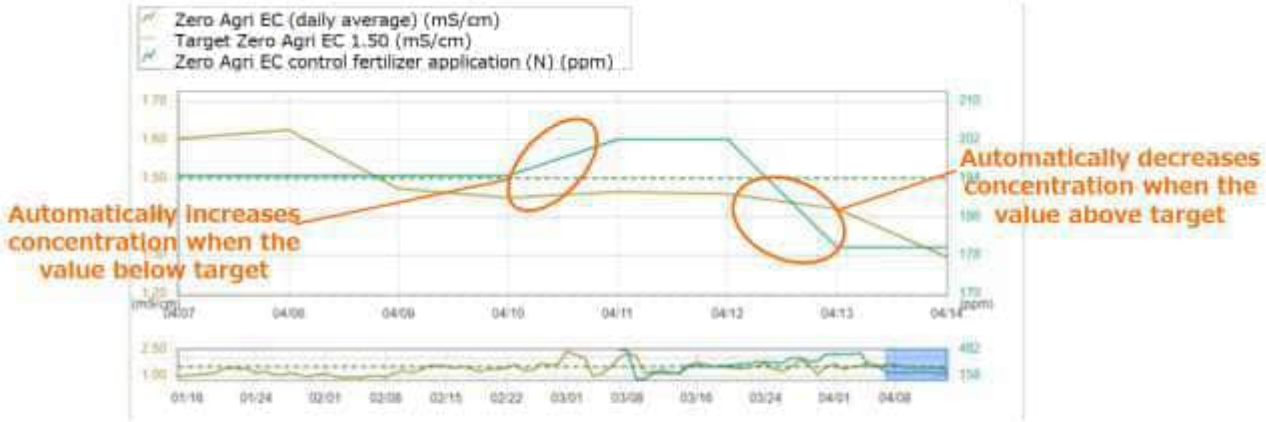


【AI fertilizer control function】

Optimal fertilizer application in groundwater sensitive soil

EC control function (newly added in 2022)

AI automatically adjusts the amount of fertilizer applied only by setting a target EC value



- **Easy adjust of the optimal fertilizer concentration with a smartphone**
- **Prevents excessive fertilizer application and contributes to sustainable agriculture**

【Key function for climate change】

Autonomous adjustment of liquid fertilizer concentration

Autonomous control liquid fertilizer

Agri theory

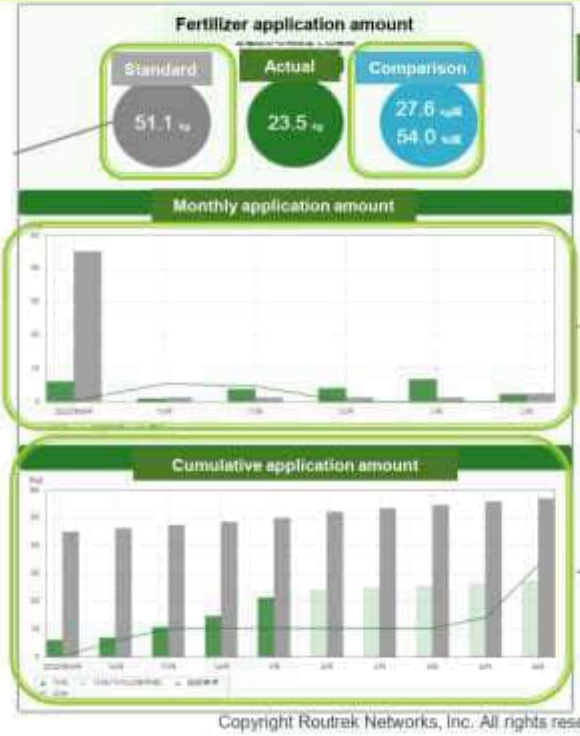
-Using the nature that "High concentrated liquid fertilizer is difficult for root to absorb"
-ZeRo.agri enable automatically control concentration of liquid fertilizer,
-supply low concentration on extremely high temperature, and root absorb enough water , and then supply high concentration on temperature becoming low

TIME	8	9	10	11	12	13	14	15	16	17	18	19
Fertilizer supply	NORMAL			LOW						HIGH		

40% higher yield than no action for climate change

【Monitoring function for chemical fertilizer】

Quantify the reduction amount and rate of chemical fertilizer through smart agriculture



Fertilizer application standards

Visualization of reduction

Visualization of the amount and rate of reduction in comparison with standard

Comparison with previous year

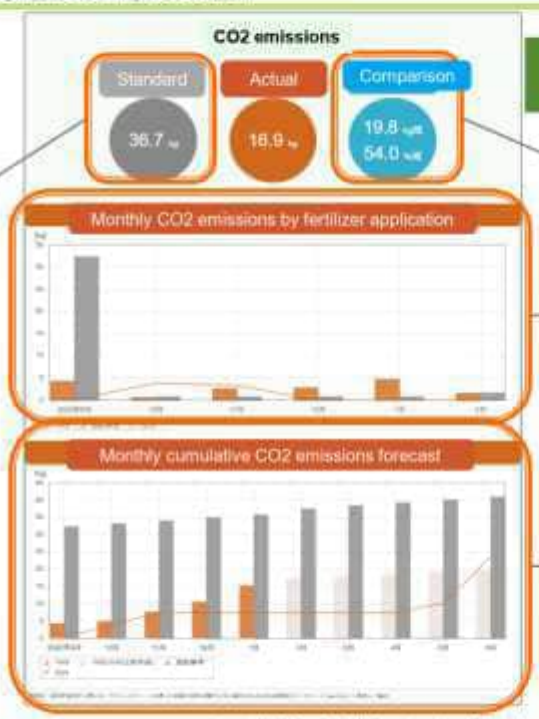
Predicts future fertilizer application based on accumulated application amount

【 Carbon neutral function 】

ZeRo.agri

Quantify CO2 emissions and reduction rate due to chemical fertilizer reduction

CO2 emissions of standard fertilizer application level



Visualization of CO2 emission reductions

Visualization of CO2 emission reduction in comparison with standard

Comparison with previous year

Predicts future CO2 emissions based on average amount of applied fertilizer

ZeRo.agri

350 units of 20kinds of fruit vegetables in 40 prefecture at green house in Japan

ASPARAGUS

EGGPLANT

CUCUMBER

TOMATO

STRAWBERRY

GREEN PEPPER

Case1. **Better quality** makes Income Improve

<Grower Information>	
Prefecture	Aizu wakamatsu, Fukushima prefecture
Cultivated Crop	Big Ball Tomato
Type of Cultivation	May～October
Area under Cultivation	17a(1700㎡)
Farming history	10years

	Effects
Increase yield	Before 12.4t/10a ▶ After ZeRo.agri 13.7t/10a — 10.4% increase
Quality	Region average 33% Grade A ▶ ZeRo.agri 60% Grade A — 27Point increase
Sales Total	35% increase
Reason	Better quality Compare with conventional

Case2. **Higher yield** makes Income Improve

<Grower Information>	
Prefecture	Yatsushiro, Kumamoto prefecture
Cultivated Crop	Big Ball Tomato
Type of Cultivation	August～June
Area under Cultivation	170a(1.7ha)
Farming history	7years

	Effects
Effect on Increase Productivity	Before 22,553 kg ▶ After ZeRo.agri 28,058 kg — 24% increase
Reason	Measuring and controlling collectry moisture and EC by ZeRo.agri

Case3. **Scale expansion** makes Income Improve

<Grower Information>	
Prefecture	Yatsushiro, Kumamoto prefecture
Cultivated Crop	Big Ball Tomato
Type of Cultivation	August～June
Area under Cultivation	40a (4000㎡)
Farming history	10years

	Effects		
Saving time	Before 7 hour/week	After ZeRo.agri 0.5 hour/week	90% decrease
Cultivation scale	Before 40a 4000㎡	After ZeRo.agri 70a 7000㎡	75% increase
Reason	Saving time makes cultivation scale up		

Many awards won in the area of innovative start up in Japan

" Japan venture Grand Prize"
Agriculture sector

"IoT Acceleration Lab Award
the 2nd place Grand Prix
Ministry of Economy, Trade and Industry of Japan

Certified J-Start up
By Ministry of Economy, Trade and Industry of Japan

"Innovation Award"
Ministry of Internal Affairs and Communications

"JEITA venture award"
Japan Electronics and Information Technology Industries Association

Mission and value proposition

Expected Effects of the Project

The project with "ZeRo.agri®" by Routrek Networks is expected to have the following effects (contributions). These effects will be confirmed in the future through the project implementation.

Project Effects by Routrek Networks

Inputs	Outputs	Outcomes		Indicators
		Short-term Outcomes	Long-term Outcomes	
Human recourse	Highly accurate irrigation and fertilizer management	Improvement of quality and yields of agricultural crops	Stable food supply	Yield per unit (kg/ha)
An automated drip irrigation system "ZeRo.agri®"	Production system with "ZeRo.agri®"		Improvement of farmers' income	Farmers' agricultural income (Local currency/household)
Greenhouse and other materials		Reduction of water use	Stable supply of water resource	Water consumption (L/year)
Budget			Reduction of fertilizer-derived CO2 emissions	CO2 emissions (kg-CO2/year)
		Automation of agricultural work	Reduction of labor burden	Working hours (man-hours/day)

Note) Direct effects to climate adaptation contribution

Video distribution of ZeRo.agri
a solution for water shortage & excess fertilizer

Digital Farming makes Agriculture Sustainable

https://www.japan.go.jp/technology/innovation/digitalfarming.html

Innovation Japan at the government of Japan

Taking Fertilizer into the Future

https://www3.nhk.or.jp/nhkworld/en/ondemand/video/2074147/

by NHK (Japan Broadcasting Corporation)