Co-creating Digital Development to Achieve Society 5.0 for SDGs

【Annex: Use Cases】

May 29, 2020

Keidanren
(Japan Business Federation)

Japan International
Cooperation Agency (JICA)

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This co-creation document was drafted and edited by a “Co-creating Digital Ecosystem in Developing Countries” group under the Digital Transformation Taskforce (DXTF), in collaboration with the Keidanren Committee on Overseas Development Cooperation, its member corporations, and the International Cooperation Bureau, etc. JICA established the DXTF directly under the JICA President from December 2019 to May 2020.

Category A

Digital Assessments and Related Activities for Developing Country Institutions

Health and Medical Digital Assessment and Solution Matching

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

4) Others [consulting service utilizing assessment tools for digital health]

(2) Description

- The use of digital technologies as new solutions for health and medical challenges in low-and-middle-income-countries (LMICs) is expected to increase. Frameworks to assess status of policy, law and regulation, and ICT infrastructure in each country for the provision of digital health solutions are provided by the UN agencies such as WHO and ITU, and other international development organizations. However, they are not fully practical when we consider the installation of such technologies and services through public-private partnerships.
- Therefore, while referring to the existing frameworks for evaluating digital health environment provided by the UN agencies and international development organizations, we have developed our own analysis tools (see Figure 2 below) to assess 1) the capacity of ICT infrastructure, laws, standards and regulations which could become bottlenecks in introducing the technologies and services, and 2) the current status of actual operations under the current legal framework. For example, the components of laws, standards and regulations include the development and implementation of rules for medical records based on Medical Practitioners Act and the Medical Care Act, rules on electronic storage of those records, guidelines on the safety management of medical information, guidelines on telemedicine and non-contact medical assessment, standards on message exchange specifications in accordance with the High Level Seven (HL7) and the ones on data exchange specifications in accordance with Digital Imaging and Communications in Medicine (DICOM), and the Pharmaceutical and Medical Devices Act. By utilizing the tools, we conduct a desktop review and field survey consisting of interviews to local organizations and healthcare workers for the comprehensive environmental analysis.
- In addition, we conduct a desktop review and field survey based on “Global reference list of 100 Core Health Indicators” by WHO and assessment tools by IHME to analyze the health and medical challenges in your country and highlight the areas where investments are most in need.
- Then, using our own “Digital Health Solutions Data Base (DB)”, we propose the feasibility of introducing digital health solutions already put into practice and in the process of development in other countries. Our unique analysis tools can be shared upon signing of non-disclosure agreements (NDA) with our company. In this document, we will share only the framework of the DB is shown in Figure 3 below. Finally, we work on solution matching with domestic and overseas companies, including Japanese companies in our network.

2. Quantitative and Qualitative Impacts of Introduction

- Looking at the reality of the installation of digital health, the comprehensive study described above is limited, and it has already been recognized in many countries that the ad-hoc and opportunistic response could potentially harm stable provision of sustainable healthcare services in a long run. Using our comprehensive approach, we believe that we can contribute to improving people’s access to health and to proposing digital solutions with high returns from investment. For example, we could improve healthcare management by introducing digital health solutions through system investment, accelerate telemedicine, promote collaborations between home-based and hospital/clinic-based healthcare, and introduce new public health infrastructure utilizing drones and mobile laboratories, etc.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that another ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan, c) Grant Aid
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
   b) indirectly related to financial cooperation,
   c) institutional capacity building, d) collaboration with local start-ups

(2) Description on How JICA ODA Support Scheme may be Utilized

- We provide the consulting services described above in 1. (2) with the aim of improving people's access to health in LMICs through system investment in medical facilities to improve healthcare management, and promoting telemedicine and collaborations between home-based and hospital/clinic-based healthcare, by the combination of ODA Loan and Technical Cooperation.

4. Scale of the Project Type (Note: for reference only. Not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 mil. JPY
2) Technical Cooperation: b) around several 10 mil. JPY c) around 100 mil. JPY d) around several 100 mil. JPY

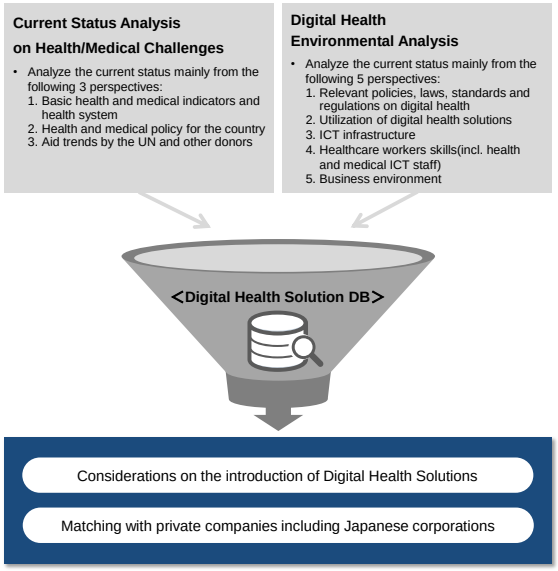
(2) Brief Justification of the Above Cost Assumption

- Equipment and services required for ODA Loan and Grant Aid varies depending on project. However, if a preliminary study on a specific medical facility and related systems is carried out in your country, it is expected to require several hundreds of millions JPY for the preliminary study. (study specifications are the same as below.)
- Expected research projects include data collection survey, preparatory survey, and technical cooperation to study development plans, etc. Estimated time and cost for the research projects: 1-2 years, 5 consultants x 3-15MM (50-70% of which is for field survey. i.e. 50-250 million JPY)

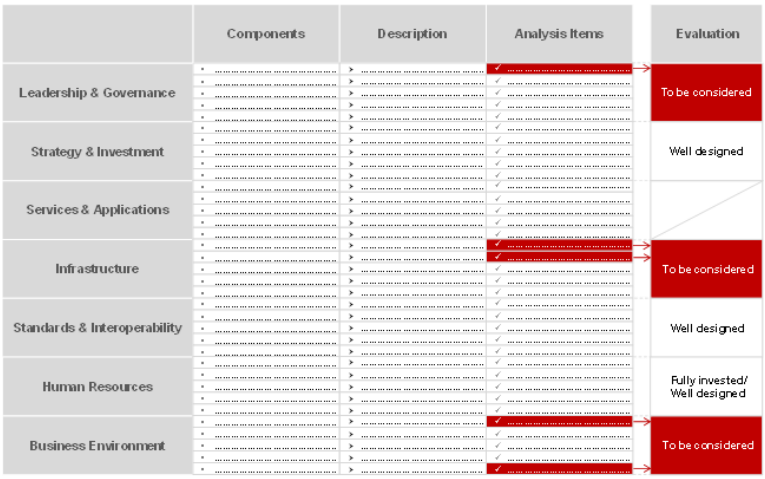
5. Proof of Technology / Applicability in Developing Countries, etc.

- Although some activities are suspended due to COVID-19, we are implementing related activities in Africa and ASEAN, etc (ex; one digital health consulting project has been planned in Bangkok, Thailand since August 2019, and the one in Botswana since November 2019. Also, we have started data collection survey in Ukraine for JICA since February 2020).
- After signing the NDA with us, it is possible to share some information on the contents of the consulting services we provided in the past.

6. Reference Information



(Figure 1) Overview of the Service



(Figure 2) Image of Digital Health Environment Analysis

(Figure 3) Digital Health Solutions DB

Agile Leadership

to Promote Organizational Digital Transformation

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

4) Others [leadership reform of large-sized organization to survive accelerated competition against venture business in the age of digitalization]

(2) Description

Governments and businesses are required to accelerate decision-making at business forefront and leadership levels, facing competition against agile decision-making and leadership style embodied by technology ventures. In a small organization with a size of 10 staff, the entire team not only looks after the business forefront engaging directly with the clients, but also plays the role of leadership and management division (compliance, etc.), making very quick decisions. In large corporates, the reporting line is usually very complex both vertically and horizontally, often losing the lead time, such as waiting for the result of XX committees.

The methodology under this proposal designs the decision-making cycle based on the need of the business forefront, not the meeting schedule of the leaders, by introducing and delegating authority to agile team management at the business forefront.

As for the leadership level, we aim to bring transformation for accelerating activities at the team level. This transformation requires, among others, (a) change in governance (one-time approval of a bulk of budget, instead of item-wise budget such as sales promotion fee, development fee, administrative fee),(b) change in organization structure (delayering and simplifying decision making processes, changing into project based organization) (c) change in staff performance evaluation (make sure that his/her evaluation in the project prevails), and (d) change in IT architecture (introduction of micro service for foundation system, and (e) DevOps (collaboration between the Development team and Operations team), etc.).

If leadership is re-designed based on the above philosophy, we believe that the way large corporates run business will be fundamentally transformed, enabling dramatic reduction in time for decision-making, while still leaving the necessary functions.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

Generally speaking, by introducing the methodologies under this proposal, we can simultaneously achieve multiple goals, including fundamental improvement of customer satisfaction, reduction of product and service input to the market by half, 30% efficiency improvement in organization structure, and enhancement of employee satisfaction.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1)Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), b) Private-Sector Investment Finance (non-sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: c) institutional capacity building,

(2) Description on How JICA ODA Support Scheme may be Utilized

We plan to conduct ground survey by working with local governments to determine applicability of this model.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: b) around several billion JPY c) around several 10 billion JPY

2) Technical Cooperation: d) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

Past projects under this proposal costed around several billion JPY for organizations with several 100 to several 1000 people, implementing surveys, consulting services to system developments. We assume a cost equivalent to these past cases.

On the other hand, regarding our survey, we need to collaborate with developing country governments to identify organizations to investment, and to raise awareness of the leadership of these organizations by accompanying them to studies abroad. We assume that a larger cost may be required than in previous cases.

5.Proof of Technology / Applicability in Developing Countries, etc.

We have successfully implemented similar activities in developed countries, including large financial institutions. Therefore, we believe applicability and feasibility is high in developing countries as well.

6. Reference Information

Our proposal can break the compromise of large corporates being agile.

Establishing Human Resource Capacity to Promote Digital Reform utilizing Strategic Workforce Planning and BOT (Build-Operate-Transfer) Model

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

4) Others [human resource development to utilize digital technologies]

(2) Description

Governments and businesses face the challenge of lack of human resources to promote digital reform. For a digital reform, it is required to acquire diverse human resources, including designers, engineers, data scientists, entrepreneurs, and change leaders, but in many cases, organizations do not even know how many and what type of human resources are needed in the first place.

This project aims to clarify the type and number of human resources, by identifying the digital reform required for the country and/or organization (both public and private sectors) during the study phase. Next, we establish the organization (around a size of several 10 to several 100 people) by introducing and executing a mechanism to recruit, nurture and remunerate human resources, while promoting digital reform.

By adopting this approach, we believe that human resources and capacity will stay with the organization, enabling the organization to acquire the ability to promote digital reform utilizing internal resources.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

This proposal enables promotion of service development at a speed of double, triple compared to previous cases when most of the work was dependent upon external resources through contracts, by reforming the organization in a dramatic speed to internalize the ability to promote digital reform.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), b) Private-Sector Investment Finance (non-sovereign)
c) Grant Aid (sovereign)

2) Technical Cooperation: c) institutional capacity building

(2) Description on How JICA ODA Support Scheme may be Utilized

We plan to collaborate with developing country governments to conduct local survey to determine applicability of this model. When actually implementing this proposal, we assume a flow of (a) study phase to identify the subject (around several 10 million JPY to several 100 million JPY), (b) mechanism introduction phase (around 100 million JPY), and (c) organizational development phase by recruiting and nurturing skilled human resources globally. The cost for human resource recruitment and nurturing for the newly developed organization will depend on its size.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: b) around several billion JPY, c) around several 10 billion JPY

2) Technical Cooperation: d) around several 100 million JPY

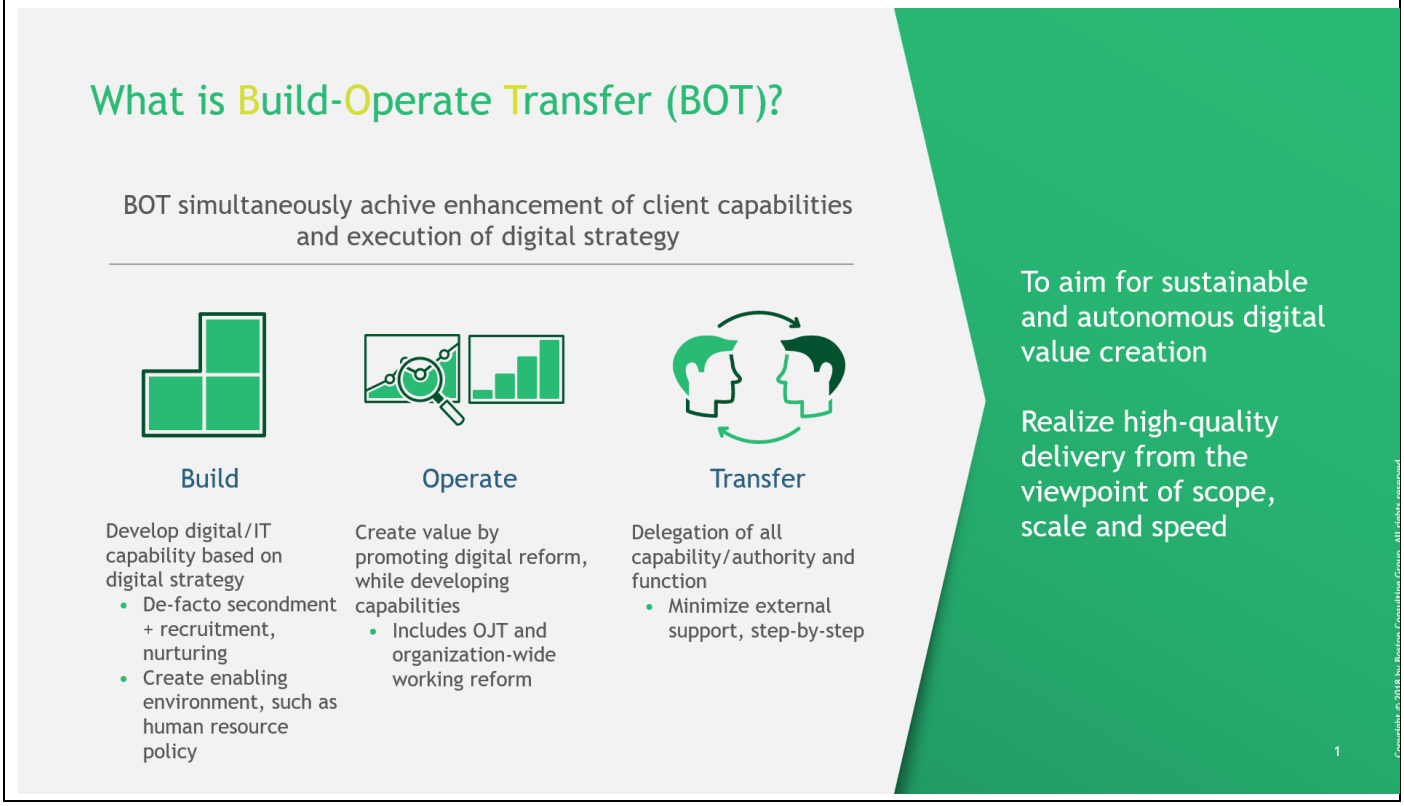
(2) Brief Justification of the Above Cost Assumption

In past projects, it costed around several billion JPY to develop a model for several 100 people. We assume a similar cost in other cases. On the other hand, as for the survey, we need to collaborate with developing country governments and actually establish an organization to implement business activities. Therefore, there is a possibility that a budget of around several 100 million JPY for the survey stage may be required.

5.Proof of Technology / Applicability in Developing Countries, etc.

Similar activities have been conducted in developed countries (Japan, France, etc.) in around 2016 to 2019, with several success cases. Therefore, we believe applicability and feasibility is high in developing countries as well.

6. Reference Information



Digital Reform Assessment for Infrastructure Authorities

(Telecom, Electric Power, Gas, Water, Transport, etc.)

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

4) Others [assess the utilization level of various digital technologies]

(2) Description

This proposal is to assess whether digital technologies are fully utilized by infrastructure authorities, particularly those owned publicly. The assessment will be based on 6 perspectives: strategy, core activities, new business development, human resources and working culture, data utilization and ecosystem.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

If this assessment framework is applied, digital investment to acquire business advantage over others will be possible. For example, in an evaluation covering 81 telecom operators in 40 developed countries from 2012 to 2017, operators that obtained the highest scores (highest 25%) increased the market share by an average of 7%, as opposed operators with the lowest scores (lowest 25%) lost the market share by 11%.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), b) Private-Sector Investment Finance (non-sovereign)
c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
c) institutional capacity building

(2) Description on How JICA ODA Support Scheme may be Utilized

We plan to implement the assessment after we identify the subject through local survey to determine the applicability of this model, in collaboration with developing country governments.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: b) around several billion JPY
2) Technical Cooperation: d) around 100 million JPY

(2) Brief Justification of the Above Cost Assumption

This proposal is largely to conduct studies. However, there have been cases in which investment was required to enhance digital maturity of the organization. If such investment takes place for large infrastructure authorities in each country, we assume that an investment with a size of around several billion JPY will be required.

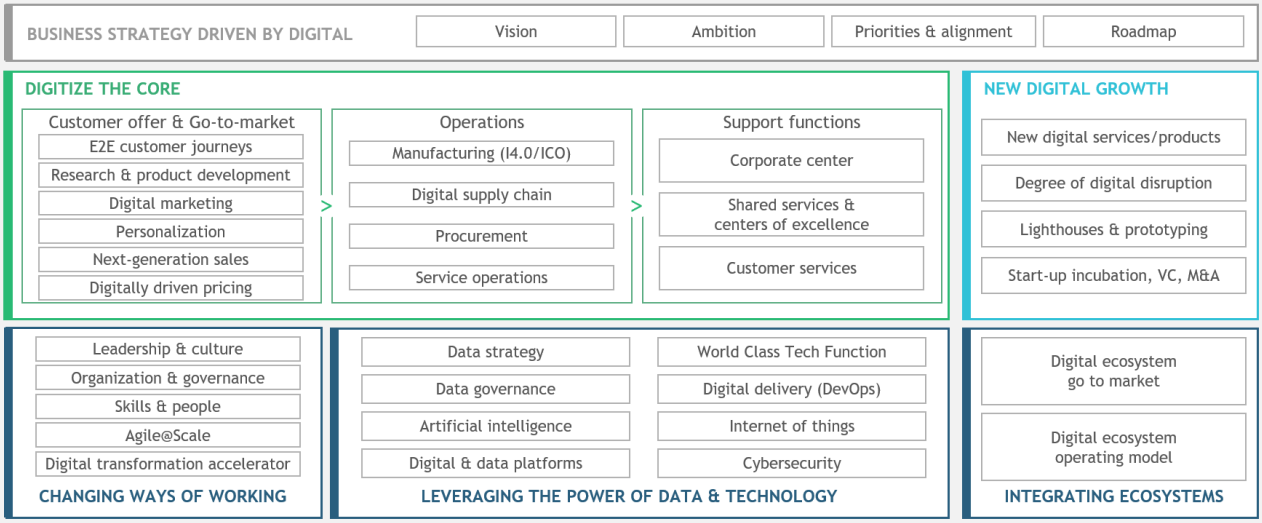
5. Proof of Technology / Applicability in Developing Countries, etc.

Globally, we have implemented this assessment for over 1,000 companies in developing countries.

6. Reference Information

Framework for Digital Reform Assessment

To comprehensively assess strategy and institution using 36 items in 6 domains



Note: I4.0 = Industry 4.0; ICO = BCG's Innovation Center for Operations; VC = venture capital; M&A = mergers and acquisitions; E2E = end to end

Cyber Security Incident Handling Training

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

4) Others [cyber security technology, methods for incident response]

(2) Description

Cyberattacks against governments and enterprises have become more sophisticated and complexed and we need to respond to ever-changing cyberattacks. This proposal enables participatory and practical defense exercise for response to cyberattacks generated under a simulated LAN environment of actual government agencies, etc. The program used under this exercise allows executing a series of incident handling (early finding, detecting and responding to damages) utilizing actual equipment and software against imitation cyberattacks, that are generated based on recent actual cyberattack cases.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Allows experiences of a series of incident handling from finding to responding to attacks
- Gives the opportunity to obtain capacity and skills required for incident handling against targeted attacks, in addition to raising awareness about the lack of such capacity and skills

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

2) Technical Cooperation: b) indirectly related to financial cooperation (same sector, etc.),
c) institutional capacity building,

(2) Description on How JICA ODA Support Scheme may be Utilized

We plan to implement Technical Cooperation in the area of Cyber security incident handling training. Please note that in order to implement the activities, special consideration is required in terms of remuneration, etc., because we require cyber security experts with high-level of knowhow to give lectures.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

2) Technical Cooperation: b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

We perform an exercise with a duration of 2 to 3 days by providing actual LAN environment and dispatching lecturers and tutors, for a class with around 20 to 30 attendants in one country in Asia, etc.

5. Proof of Technology / Applicability in Developing Countries, etc.

Actual cases:

- We have actual experience of implementing the exercise for central and local governments in Japan.
- Since 2015, we have been actually performing exercises in Asia (Thailand, Malaysia, India, Philippines, etc.)

- Since 2018, we have been actually performing exercises for government officials from counties in ASEAN at a center operated by the Thailand government.

Target countries

- In Asia, etc. where the training can be conducted in English

6. Reference Information

Cyber security incident handling training

Cyber exercise program based on actual corresponding procedure against cyber security incident

Purpose

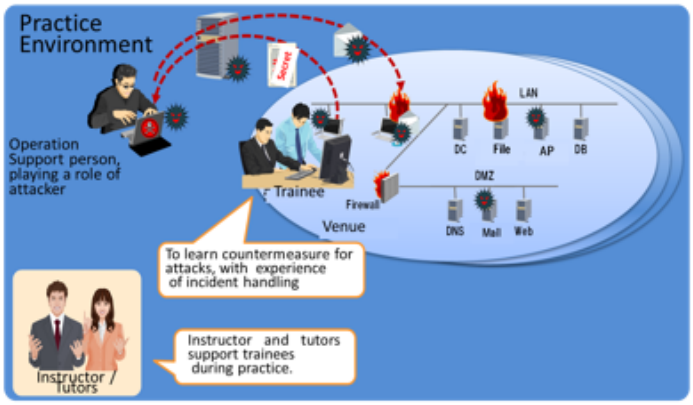
- To improve ability to respond to cyberattacks
  grasping whole situation and its cause, handling incidents properly and communicating with relevant persons (CISO, employees , vendors etc.)

Target Person

- IT security managers and engineers of government and enterprise such as CSIRT(Computer Security Information Response Team)

Details

- 4 people/team X N teams
- 2-3 day training
  (Lectures + exercise)
- Experience cyberattacks under simulated networks



Digital Assessment for Public Institutions

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

4) Others [assessment for utilizing digital technology]

(2) Description

It is expected that the importance of utilizing digital technology will increase for more efficient operation of public institutions. Additionally, by planning and promoting the use of digital technology, public institutions can take the lead by obtaining useful experience and know how prior to wider use of digital technology within the industry.

This proposal is to shed light on the status quo and target the utilization of digital technology by public institutions, from 6 angles: 1) Business decision-making and Analytics, 2) Data and Information, 3) Technology and Infrastructure, 4) Process and Integration, 5) Organization and Governance, 6) Culture and Talent. In case there is a gap between the status quo and target, we will identify the causes and explore countermeasures before coming up with action plans. Our proposal is to create efficient, effective solutions by promoting the introduction of various digital technologies, based on action plans.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

The proposed framework has been applied to many enterprises for the assessment of holistic maturity, enabling the identification of efficient and effective ways to introduce and promote digital technology. Additionally, by combining the identification of the status quo through accumulating bottom-up information, and top-down target, we will promote to share common understanding among the stakeholders for the introduction of digital technology which will lead to support for highly feasible action plans.

3. Possible JICA ODA Support Scheme Applicable for these Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

2) Technical Cooperation, Research　C) Institutional capacity-building

(2) Description on How JICA ODA Support Scheme may be Utilized

(NOTE) We plan to implement basic information collection through survey or feasibility study.

4. Project Type Scale (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

(2) Brief Justification of the Above Cost Assumption

(NOTE) We assume around 2.5 to 3.5 experts conducting the assessment within 4 to 6 months.

5. Proof of Technology / Applicability in Developing Countries, etc.

We have multiple practical business cases for applying this proposal to Japanese enterprises, including status quo survey towards preparation of company-wide digital strategy for major financial service company, and support for preparation of AI and data utilization for major human resource service company.

6. Reference Information

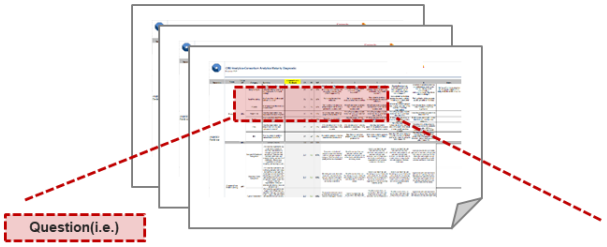
In order to promote digital transformation (DX), the important first step is to recognize the status quo in an accurate manner. We aim to assess the status quo using a holistic framework based on rich application experience, and to present a foothold for subsequent DX activities.

Focus Area for Assessment (i.e.)

Business Decisions & Analytics	• Which business goal should be the target for utilizing analytics
Data & Information	• What is the policy to guarantee necessary data structure and quality to achieve the business goal
Technology & Infrastructure	• What is technology and infrastructure functions to assess the external company's necessary data
Organization & Governance	• What is the governance function and organizational structure for maximizing the impact of analytics
Process & Integration	• What is the project and operation process to implement analytics
Culture & Talent	• What is the talent development policy to accelerate decision-making using analytics, from management to the field

Assessment Sheet (i.e.)

Promote maturity survey after scrutinizing assessment items based on the status quo and needs.



Question(i.e.)

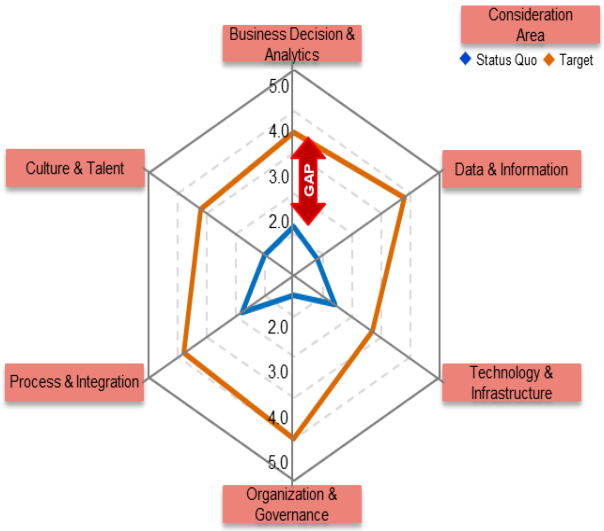
Dimension	Focus	Focus WT	Category	Question	1
Analytics Driven Decision Making	Analytics Driven Decision Making	40%	Customer & Distribution Management	How does the organization use 'customer and distributer' information and analytics to manage its customers and distributes?(Customer and distributor information and analytics includes customer-level profitability, lifetime value, acquisition and relation modeling, channel analytics, etc.)	'Customer and distributor' decisions based on anecdotal evidence and 'gut reaction of managers. Decision criteria vary greatly across the organization

Focus Area / Question — Maturity Level Assessment (i.e.)

Assessment for Status Quo (i.e.)

Analyze for target and holistic maturity of your company, category-wise assessment result, which is the sum of aggregate score of individual indicators (Fit & Gap result).

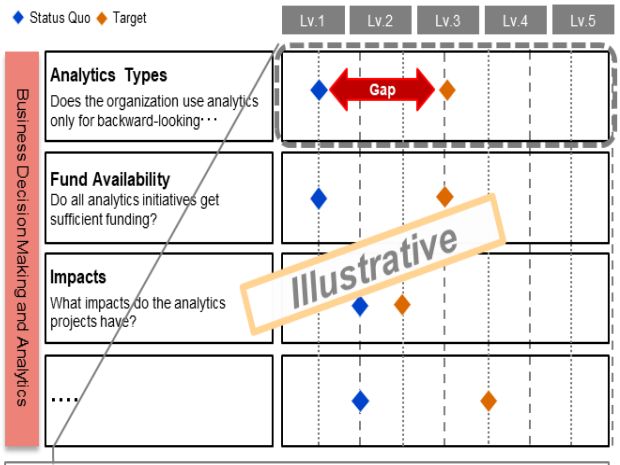
(NOTE) We will identify the details and cause of index range (right figure), if the absolute value of the primary index is low, or if there are large gaps (Fit&Gap Result)



Fit&Gap Result (i.e.)

Conduct Fit&Gap on each area with detailed questions.

(NOTE) Reference: 16 questions in business decision making and analytics area



(Status Quo) Only Descriptive Analytics are used. Focusing only on describing, summarizing, and analyzing historical data ("What happened?")
(Target) Organization uses predictive analytics to predict future outcomes based on past data and trends ("what could happen?")

Category F

Digital Frontier Projects

F-1: Platform Projects

No.	Primary SDGs	Secondary SDGs	Title of Proposal	Page No.
F1-1	1, 9, 17	2, 4, 7, 8, 12	Data Driven Solution for Social Challenges in Developing Countries ～Contributing to Enhancement of Livelihood through Solving Social Challenges in Developing Countries utilizing Big Data and Partnership with Start-ups～	17
F1-2	2, 4, 6	8, 9, 13, 14, 15	Sustainable Food Production Eco-cycle based on Digital Agriculture Platform ～Simultaneously Contributing to Higher Productivity, Human Resource Development and Environmental Conservation utilizing IoT, Big Data and AI～	19
F1-3	8	1, 16	Blockchain Platform for Traceability of Scarce Resources and Products and for Equitable Profit Sharing Mechanism	21
F1-4	9	4	Government Common Platform for Developing Countries ～Supporting Governments and Public Institutions in Developing Countries to Develop IT Infrastructure utilizing Public Cloud～	23
F1-5	9, 13, 15	2, 4	Establishment of Smart Seed-Breeding Platform ～New Variety Development by Conserving Crop Genetic Resources and Uncovering Useful Traits～	25
F1-6	11	8, 9, 17	Upgrading Civil Services and Industrial Promotion based on Development of Unified Smart City Platform (City OS) at National and Regional Levels	27
F1-7	11	9	Recommendation System to Support Road Intersection Traffic Improvement using AI Image Analysis ～Solution for “Transport Safety” and “Traffic Congestion” using Surveillance Camera Images～	29

Data Driven Solution for Social Challenges in Developing Countries

～Contributing to Enhancement of Livelihood through Solving Social Challenges in Developing Countries utilizing Big Data and Partnership with Start-ups～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [accumulating public and citizens data in integrated public data platform]

2) Information Analysis and Decision Making (IoT, AI, etc.) [creation of social development solution business utilizing integrated public and citizens data]

(2) Description

1) We expect that “data driven solution for social challenges” will be widely used in a world after a progress of digital transformation. There will be a mechanism to link citizens data such as national ID, public service data such as electricity and transportation, and data regarding personal and public enterprise activities through API. Opening of these data, which were held internally by public institutions respectively, promotes creation of new type of business and optimization of public infrastructure by cooperating with data from the private sector.

2) Promotion of digital transformation will be driven by creative activities by the private sector, but the public sector can also support it by digitalizing and developing public services with clear objectives. Therefore, JICA should provide services such as a) preparation of strategic blueprint, b) digitalization of citizens data and public services, and c) nurturing entrepreneurs who can stimulate digital transformation, with sharing the vision described in 1) above with developing countries.

3) In terms of the API development to link public and private data, supports for entrepreneurs to utilize the digital national IDs for their business will be the first step. For example, entrepreneurs trying to provide electronic payment methods utilizing the block chain technology could be good candidates to support. Regarding the nurture of entrepreneurs, we propose to set up a start-up ecosystem supporting implementation of PoC based on an industry-government-academia collaboration in a specific country in parallel with the API development. Our aim is to scale-up and implement similar activities in other countries after making a progress in these initial activities.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

1) With clearly defining the role of both the public and the private sectors in a post-digital transformation society, re-developing public infrastructure services will promote the private sector driven digital transformation. We expect a world after the transformation will more closely realize the Universal Basic Income.

2) The expected use case based on data utilizing digital technologies are the following.

- Public sector: digital government (citizens registration, various licenses, online tax application, recording, and permission), digitalization of infrastructure (security, transportation, medical services, education, sanitation, geography, etc.)
- Private sector: formalization of informal sector using digital payment (including personal credits and loans), enhancement of productivity and logistics through digitalization of agriculture, mobility, etc.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), b) Private Sector Investment Finance (non-sovereign), c) Grant Aid (sovereign)

2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
d) collaboration with local start-ups, e) others (supporting instruments for feasibility study and proof of concept)

(2) Description on How JICA ODA Support Scheme may be Utilized

- Case 1: Development of related infrastructure using ODA Loan and Grant Aid (establishment of data platform, reform of digital ID system, hard and soft infrastructure development (such as security, transport, medical services, education, sanitation, electricity, road, water) to be serviced by the public sector utilizing digital technology)
- Case 2: Equity investment and/or loan to private sector business (such as agriculture, payment, mobility, medical service) using Private Sector Investment Finance
- Case 3: Nurturing local start-ups and supporting proof of concept activities by the private sector utilizing Technical Cooperation and program for supporting proposal by Japanese enterprises

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: b) around several billion JPY
2) Technical Cooperation: c) around 100 million JPY

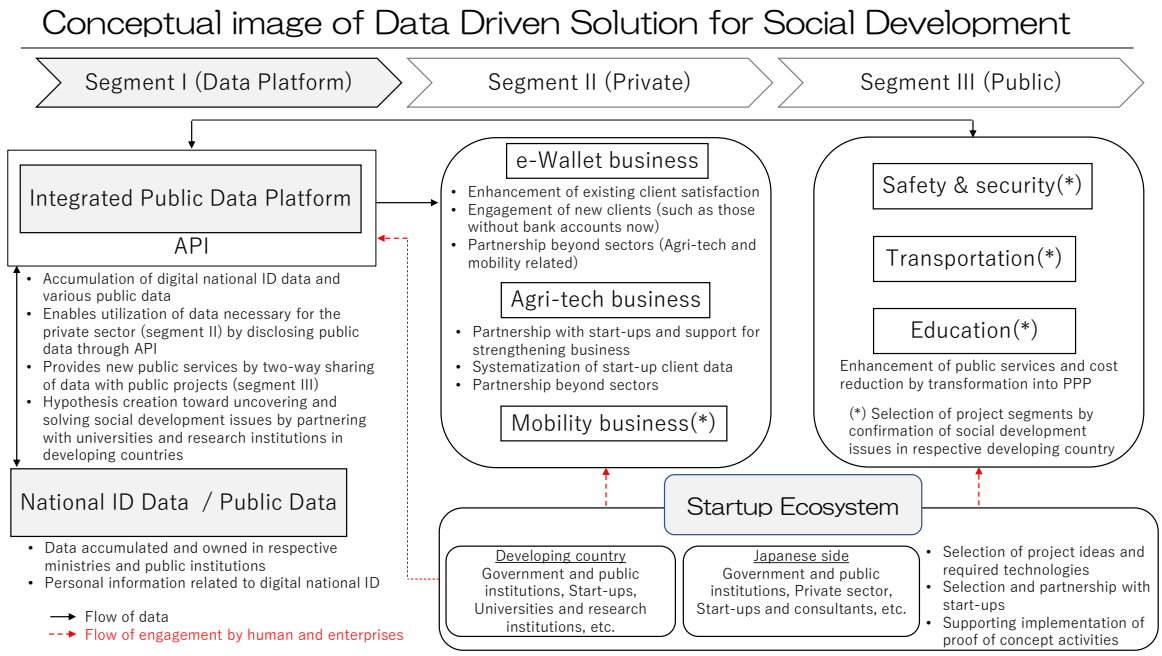
(2) Brief Justification of the Above Cost Assumption

- Cost for ODA Loan, Grant Aid, and Private Sector Investment Finance for supporting establishment of data platform, reform of digital national ID system, digital public infrastructure project and private sector business is not available at this moment.
- In the initial stage, we expect a cost of around 100 million JPY for supporting creation of start-up ecosystem, program to nurture local start-ups and proof of concept activities by the private sector.

5. Proof of Technology / Applicability in Developing Countries, etc.

At this point in time, the proposal is still in the concept stage, and no actual case of application. The proposed Integrated Public Data Platform with API is a concept similar to India Stack already being put to use in India. On the contrary, digitalization of infrastructure (such as signaling system linked to location information (traffic congestion)) have not been actually applied anywhere in the world, but we expect these digitalized infrastructure will prevail in a world after a progress of digital transformation.

6. Reference Information



Sustainable Food Production Eco-cycle based on Digital Agriculture Platform

～Simultaneously Contributing to Higher Productivity, Human Resource Development and Environmental Conservation utilizing IoT, Big Data and AI～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [visualization of environmental growth data collected from high-precision sensors and stored on cloud]

2) Information Analysis and Decision Making (AI, etc.) [supporting decision-making based on scientific knowledge by prediction of harvest time and proposal of appropriate field work, etc through analysis of environmental growth information by AI]

(2) Description

This solution supports decision-making by predicting and proposing actions, in addition to collection and analysis of environment growth information (temperature, relative humidity, water temperature, soil moisture, soil electrical conductivity, solar conductivity, CO2 concentration, etc.) by ICT. The main features are the following five points.

1) High-performance, tough and easy-to-use hardware: regardless of open-field cultivation or greenhouse horticulture, and even under extreme environments such as harsh winter in cold regions and intense heat near the equator, the hardware operates steadily without losing the data. Additionally, it operates by simply turning on and off the switch.

2) Visualization of the growing environment: Present and past data stored on the cloud is accessible anytime, anywhere through IT terminals (smartphones, tablets, etc.). Producers can confirm these data and contents of field work to provide agricultural guidance at an appropriate timing.

3) AI proposes “the next move”: AI provides the producers “actionable” information (what to do now (or next)), such as concrete cultivation method and harvest prediction, based on expert knowledge and scientific basis of plant science.

4) Converting experience and intuition into “Wisdom”: Enables the use of experiences and intuitions of veteran farmers by converting them into numerals and navigation as wisdom. Newcomers can easily compare their own environmental growth data and utilize their know-how.

5) Workshop for capacity building and human resource development: Workshop by experts to realize scientific agriculture, and IoT tools and applications on the ground.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

Such as succession of cultivation technique, productivity enhancement, and stable production are common issues for producers throughout the world. By utilizing the IoT/AI technologies described above, it is possible to a) establish cultivation know-how (cultivation manuals), b) enable stable and high-quality production, and c) improve cultivation technique of newcomers to promote early independence. Additionally, appropriate field work proposals based on data prevents over-fertilization, thereby contributing to environmental conservation.

1) Munakata City, Fukuoka Prefecture, Japan

Scientific cultivation of strawberries by 22 local farmers and extension workers led to achieving the initial sales target in the first year of introduction. It increased sales by 800 thousand JPY/ 10a on average (FY2017 4,560 to FY 2018 5,370 thousand JPY) . Greenhouse horticulture

2) Republic of Colombia

This solution was introduced in rice farming activity under JICA-JST SATREPS project. We have conducted scientific cultivation pilots and awareness raising activities to local farmers and extension workers. Furthermore, we have documented local cultivation know-how as shared wisdom, making it easier for new farmers and pave the way to economic independence. These activities were well received locally, and led to a new multiple-year, inter-governmental project. We are also implementing collaborative projects with international organizations. As a result of capacity building activities, consultations on new project ideas from the government, UN agencies and other international organizations have increased.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), b) Private Sector Investment Finance (non-sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial Cooperation c) institutional capacity building,

(2) Description on How JICA ODA Support Scheme may be Utilized

We wish to develop this project idea into a stand-alone frontier digital technology project. Additionally, we aim to implement technical cooperation and public-private-partnership activities.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

3) Rough Assumption of Cost

3) Financial Cooperation: a) around several 100 million JPY
4) Technical Cooperation: d) around several 100 million JPY

4) Brief Justification of the Above Cost Assumption

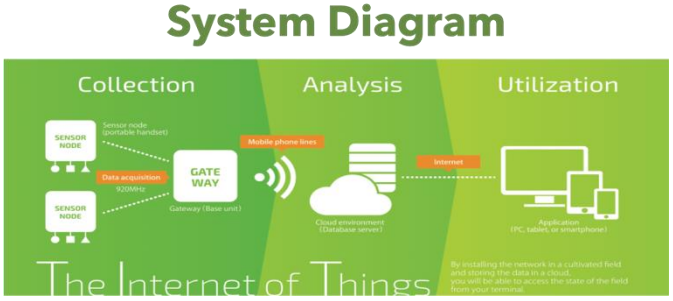
It will cost around 300 million JPY for approximately 50 farms.

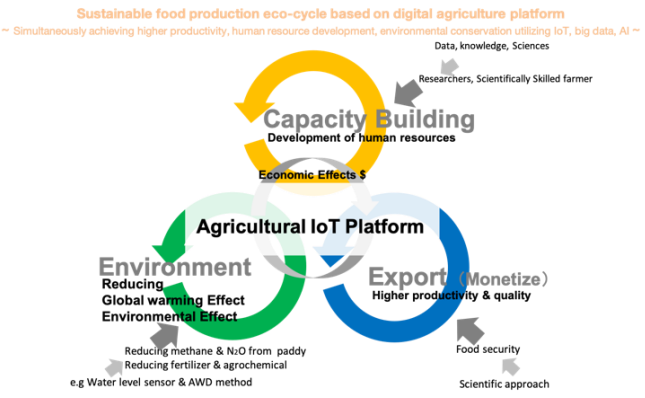
5. Proof of Technology / Applicability in Developing Countries, etc.

In Japan, we have many actual cases, including Munakata City, Fukuoka Prefecture. More than 90% of the projects and solutions introduced are being used beyond the project implementation period, for multiple years. In the Republic of Colombia, there are cases of introducing this solution, and multiple-year projects are ongoing.

- Equipment operation has been confirmed (communication function need to be verified for different countries)
- Multiple languages can be used (Japanese, English, Spanish, Chinese)
- Many experiences in awareness raising activity (workshops) to local extension workers and farmers
- Experience in cooperating with international organization in agricultural field

6. Reference Information





Blockchain Platform for Traceability of Scarce Resources and Products and for Equitable Profit Sharing Mechanism

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [obtain data by IoT sensor, store data by blockchain]
2) Information Analysis and Decision Making (AI, etc.) [authentication by AI]

(2) Description

Generally speaking, it is difficult to develop mechanisms to authenticate and to guarantee identity of scarce resources (precious metals, jewelries, etc.) and long lasting and valued products / art works. Additionally, it is a challenge to cope with inequality of profit distribution when multiple transactions take place.

These resources and products generate value through multiple transactions after mining, manufacturing and processing, but people intervening in transactions tend to acquire more profits than those mining, manufacturing or processing the product, who are the real value creators. Such practice can be regarded as an inequitable exploitation.

The proposed mechanism uses blockchain to record the series of processing and transaction from the beginning of birth of the scarce resources and products. We aim to equitably distribute the profits to those engaged in mining, manufacturing, and processing, by authenticating the identity of the resource and product in each of the transactions, and by sending an equitable share of the profit to contributors based on the recorded information that is linked to the value created at each transaction.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

We aim to enable justice payment to workers in developing countries engaged in the upstream (correct the structure of exploitation), by appropriately evaluating the value of mining, manufacturing, and processing of scarce resources and production. In past examples, we have designed business models that brought around several 10 billion JPY against several billion JPY initial investment (a return of around 5 to 10 times the investment).

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), b) Private-Sector Investment Finance (non-sovereign)
   c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
   d) collaboration with local start-ups

(2) Description on How JICA ODA Support Scheme may be Utilized

We aim to collaborate with developing country governments to implement local studies to determine applicability of this model, and to establish organizations to implement projects. We expect to use the support of the organization for (a) development, manufacturing and operation of IoT sensors to manage products, (b) development of infrastructure for **blockchain and surrounding**/support payments, and (c) operation of cloud-type data centers

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: b) around several billion JPY, c) several 10 billion JPY

2) Technical Cooperation: d) around several 100 million JPY

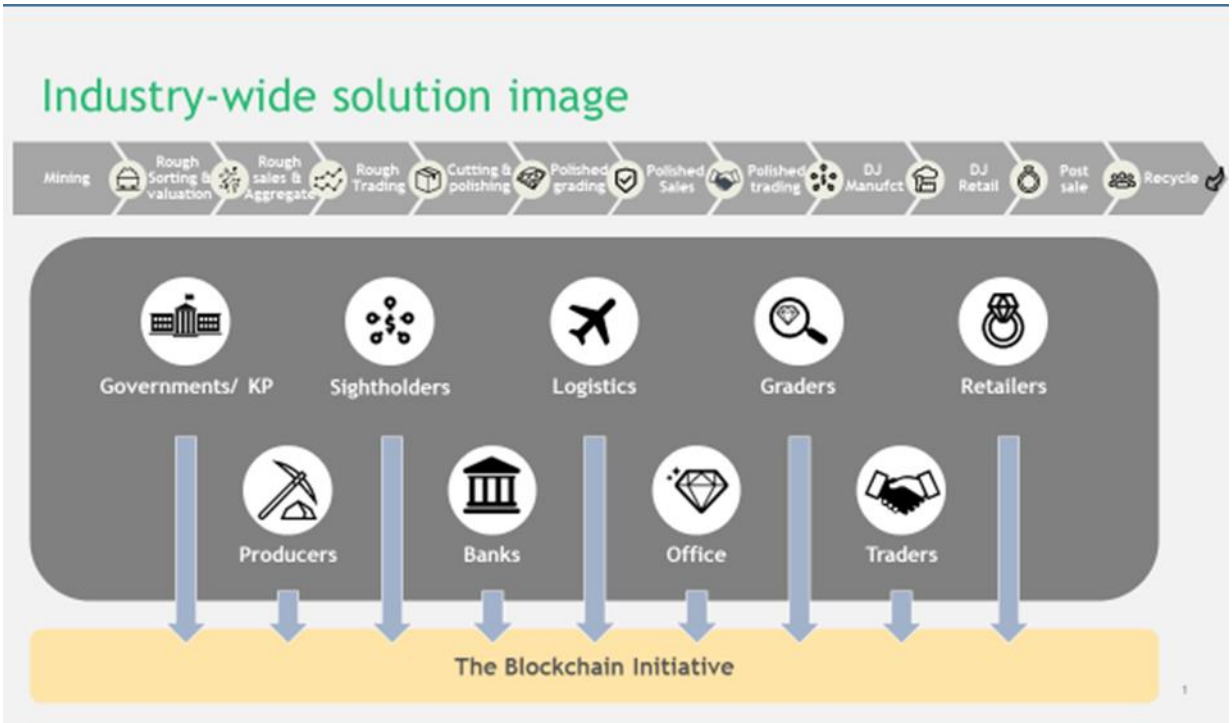
(2) Brief Justification of the Above Cost Assumption

In past projects, the cost was around 10 billion JPY for developing similar models. We assume a cost at equivalent levels for other cases. On the other hand, as for surveys, we expect larger amount of cost compared to previous cases, because we will establish organizations to implement projects, in collaboration with developing country governments.

5. Proof of Technology / Applicability in Developing Countries, etc.

In the past, a major mineral resource company formulated a venture with external partners and introduced similar mechanism to serve as infrastructure for multiple developing countries. Therefore, we believe applicability and feasibility of this proposal is high.

6. Reference Information



Government Common Platform for Developing Countries

～Supporting Governments and Public Institutions in Developing Countries to Develop IT Infrastructure utilizing Public Cloud～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

2) Information Analysis and Decision Making (AI, etc.) [supporting modernization of information system owned by companies and public institutions in developing countries, utilizing cloud service]

(2) Description

- Governments, public institutions, education institutions and NGOs in countries around the world face a common agenda to achieve complex missions utilizing limited fiscal resources and information system assets. Leaders in government agency and the public sector show great interest in the power and speed of "public cloud," which is being used by millions and already invested heavily in terms of service development. They are interested, because they wish to serve their citizens more effectively, achieve progress in science, offer helping hands to a broader range of citizens, and allocate more time and resources for missions they are supposed to focus more. In the past, government agencies in developing countries faced the following common limitations: 1) They cannot grasp the entire number and respective function of the information system they own, meaning they do not have the overall "blueprint," and 2) they cannot draw a strategic roadmap to modernize the system for transition to cloud.
- In a support project to develop IT infrastructure development for developing country governments and public institutions utilizing public cloud, we can establish and operate government and public services at the world's highest level, under a high-level security and IT governance. This is made possible by a) identifying the "infrastructure" information system resource to be commonly used across different ministries and agencies, and b) develop an ecosystem on the infrastructure utilizing public cloud, transforming the outdated information system in developing countries into a could service equivalent to those used in developed countries. Actual use cases include, among others, "developing a website for disaster response," "promotion of agile development," and "establishment of ecosystem for development and test," which indicate the possibility of using the cloud system for many varieties of cases. This concept is in line with the policies of the Japanese Government, such as "quality infrastructure" and "development of digital infrastructure." By utilizing the public cloud service already being used by many private enterprises, governments and public institutions in the world, we aim to development operate "infrastructure" information system resource to be commonly used across different ministries and agencies, for governments and public institutions in developing countries

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

By using "hypothetical server on the cloud which are safe and scalable," "cloud storage which is both expandable and durable," etc., a dramatic cost reduction impact of up to 20 to 80% (compared to on-premise system before transition to cloud) and development of IT ecosystem based on latest technology can be achieved.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)

(2) **Description on How JICA ODA Support Scheme may be Utilized**

- We first ask government agencies and public institutions in the target country to own an account of cloud service. Then, we ask that a sub-account derived from the account to be distributed, with limited accessibility, to 1) local start-ups in the developing country, 2) Japanese start-ups planning to operate in the developing country, 3) respective public institutions in the developing country, and/or 4) companies from Japan, the developing country, etc. that will be contracted by local public institutions to develop information system.
- The cost for utilization of the cloud service attached to the account will be partly (or wholly) paid out of the proceeds of the funds from JICA's financial cooperation. Very roughly speaking, 1) development and operation of the government common platform, 2) support for transition, or new development of, information system of each ministry and agency to be on the platform, 3) operation of each system utilizing the cloud resource on the government common platform, will be required. We need to work with local system integrators to implement and procure (through tenders as necessary) the services.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY to b) around several billion JPY

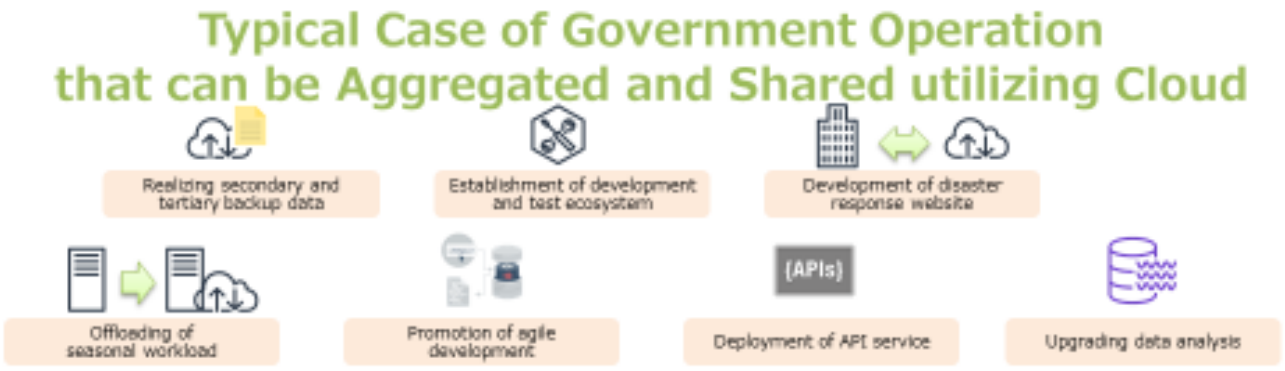
(2) Brief Justification of the Above Cost Assumption

- We obtain high marks in terms of price competitiveness in various market surveys regarding our work for developing infrastructure utilizing cloud service, compared to development and operation on-premise cases. Even when the scale of financial cooperation is relatively small, we can offer support for many institutions and applications. Please note, however, in order for us to fix the price, we need to estimate the cost based on interview of items such as 1) the number and nature of the application, 2) function to be allocated to the common part, and 3) duration of contract and operation (it may be more cost-effective under a single payment, multiple-year coverage disbursement method).
- A very rough estimate of the cost would be around several 100 million JPY to around several billion JPY. A rough breakdown will be: 1) development and operation of the government common platform: around several 10 million JPY to several 100 million JPY, 2) support for transition, or new development of, information system of each ministry and agency to be on the platform: around several 100 thousand JPY to several million JPY per institution (variable depending on the scale and complexity of the system), 3) operation of each system utilizing the cloud resource on the government common platform: several 100 thousand JPY to several million JPY per year.

5. Proof of Technology / Applicability in Developing Countries, etc.

Our public cloud service is already deployed to around 200 countries. There is no foreseen obstacle in providing the service in developing countries.

6. Reference Information



Establishment of

Smart Seed-Breeding Platform

～New Variety Development by Conserving Crop Genetic Resources and Uncovering Useful Traits～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [uncovering the potential of genetic resources by evaluating the traits monitored in IoT controlled growing environment, through automatic conservation and digital banking of crop genetic resources]

2) Information Analysis and Decision Making (AI, etc.) [analysis and prediction of useful genes and traits which were unable to uncover using existing technology, by using AI to analyze digital data of genetic resources and biological information under growing environment based on scientific know-how]

3) Actions (robots, etc.) [automation, digitization, and energy saving of carrying in/out of stored seeds in a long-term storage facility at －18℃]

(2) Description

- This proposal is to establish a smart seed-breeding platform, which aims at a common global infrastructure. This platform not only conserves and manages crop genetic resources in developing countries, which are rapidly disappearing due to climate change, etc. (corresponds to above 2. (1) 1) information search and collection (IoT, etc.) and 3) actions (robots, etc.)), but also utilizing them (above 2. (1) 2) information analysis and decision making (AI, etc.)).
- This technology has a track record of being introduced in an automatic genetic resource bank in a Japanese research institution (National Agriculture and Food Research Organization, Japan). This seed bank is a state-of-the-art genetic resource conservation facility, which allows not only full automation of carrying in/out of seeds, but also digital storage of seed information. It can save at least 10% energy compared to other similar seed banks, where seeds are carried in/out manually.
- This solution offers decision-making support based on activities proposed by AI using biological information, in addition to measurement, collection and analysis by IoT related to environmental growth information (temperature, relative humidity, ground temperature, water temperature, soil moisture, soil electric conductivity, solar radiation, CO2 concentration, etc.) It allows efficient seed breeding by not only using traits selected based on breeder's experiences and capabilities but also through efficient prediction and interaction between traits using AI, which have not been elucidated so far.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

Automatic genetic resource bank

- Enables conservation of food diversity from the food security and nutrition viewpoint, thus preventing the rapid diminution of native crop genetic resource, that were held in community seed banks as food and as part of food culture in developing countries
- Unified management of domestic genetic resources, through establishing a platform to manage crop genetic resources
- Enables new introduction of technology, regardless of the volume of native crop genetic resources, uncovering useful traits by utilizing digital agriculture technology
- Shortening the breeding cycle at a controlled growth environments
- Creating new business opportunities by developing new varieties (new type of crops to the market)
- Enables use of IoT/AI technology from seed breeding to deployment to farm fields

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other

ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
c) institutional capacity building, d) collaboration with local start-ups

(2) Description on How JICA ODA Support Scheme may be Utilized

We plan to establish a platform and promote digitalization at an international research institution based in developing countries, which already has know-how in conserving seeds and uncovering useful traits. By making the institution as a regional hub for nurturing human resources in developing countries, we plan to introduce the technology to agriculture research institutions and universities in each country.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: d) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

It would cost approximately 500 million to 1 billion JPY if we had to establish a smart seed-breeding platform in international research institution with existing genetic resources.

5. Proof of Technology / Applicability in Developing Countries, etc.

Automatic genetic resource bank

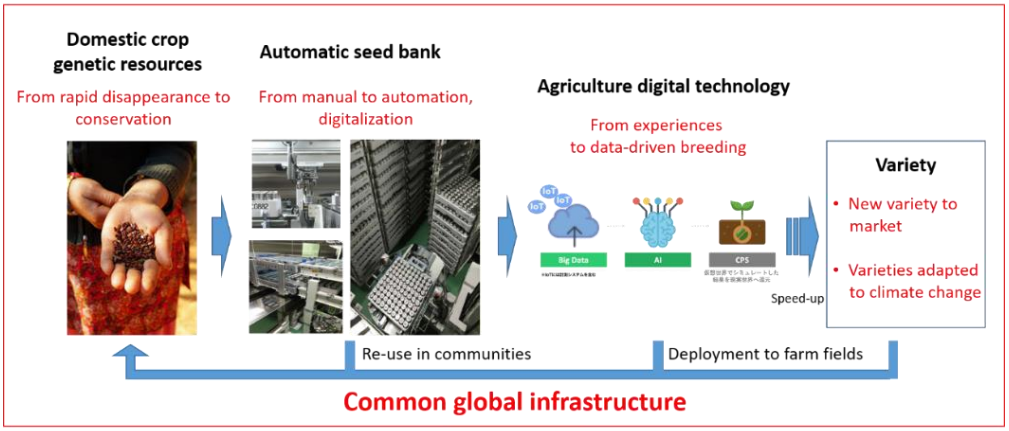
- A similar of facility was established in Japan.
- Outside of Japan, discussions are underway with international research institution to introduce the system.
- The system can be installed in developing countries, as it can be customized to meet the needs of users.

Agriculture information platform

- IoT agriculture tools have been introduced in the Republic of Colombia. Multi-year projects are ongoing since 2017. Therefore, multiple languages including Spanish can be used (Japanese, English, Chinese)
- Equipment operation has been tested (communication function must be verified for different countries)
- Many experiences in awareness-raising activity (workshops) to local extension workers and farmers
- In Latin American countries, multiple inquiries have been received from producer associations, local governments, and private sectors showing interest to introducing this technology. In Colombia, there are local companies that can communicate in Japanese.

6. Reference Information

Conceptual diagram of establishing a smart seed-breeding platform



Export to other countries

Upgrading Civil Services and Industrial Promotion based on Development of Unified Smart City Platform (City OS) at National and Regional Levels

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [Data accumulation through single ID based on the development of a regional portal, etc. for citizens]

2) Information Analysis and Decision Making (AI, etc.) [Provision of civil services through data personalization]

(2) Description

This proposal is to develop a unified smart city platform (City OS) that allows the accumulation and utilization of data at national and regional levels and avoids segregated management by data platform created within each business entity. The unified platform enables the collection and accumulation of cross-functional data using single ID of citizens living and visiting the area, applying it to public and business services in all kinds of areas. By making the data open, it is expected that Plan-Do-Check-Act (PDCA) cycle activities, such as policy and service planning, and impact monitoring, will be strengthened, leading to upgrading civil services and industrial accumulation and promotion.

Advanced services provided in Japan can be extended to meet the needs in developing countries, as numerous services can be included in the City OS. Promotion of sustainable tourism (tourism services), and generation of new economic model from waste management (recycling services such as automobile recycling), are a few of such examples. Data accumulation and utilization will be promoted by deploying applications that provide these services on the unified platform, together with other applications of services in other areas.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

Expected benefits vary depending on which services are provided on the urban platform. Generally, it is expected that the increase in number of residents and conservation of social and environmental services can be expected as a result of job creation through industrial accumulation, economic development through industrial promotion, and upgrading of civil services.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply ODA scheme that is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)

2) Technical Cooperation: c) institutional capacity building,

(2) Description on How JICA ODA Support Scheme may be Utilized

Technical cooperation is for activities related to status quo assessment and proposal for improvement of existing ICT platforms in institutions in developing countries. Financial cooperation is for providing civil services, etc., to develop City OS and digital technologies.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY b) around several billion JPY

2) Technical Cooperation: b) around several 10 million JPY d) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

For technical cooperation, if the status quo assessment and improvement proposal on ICT platform, etc., is limited to the ICT domain only, it is expected that the activities will cost around several 10 million JPY. If the study extends beyond to cross-functional issues, including civil services, it will cost around several 100 million JPY.

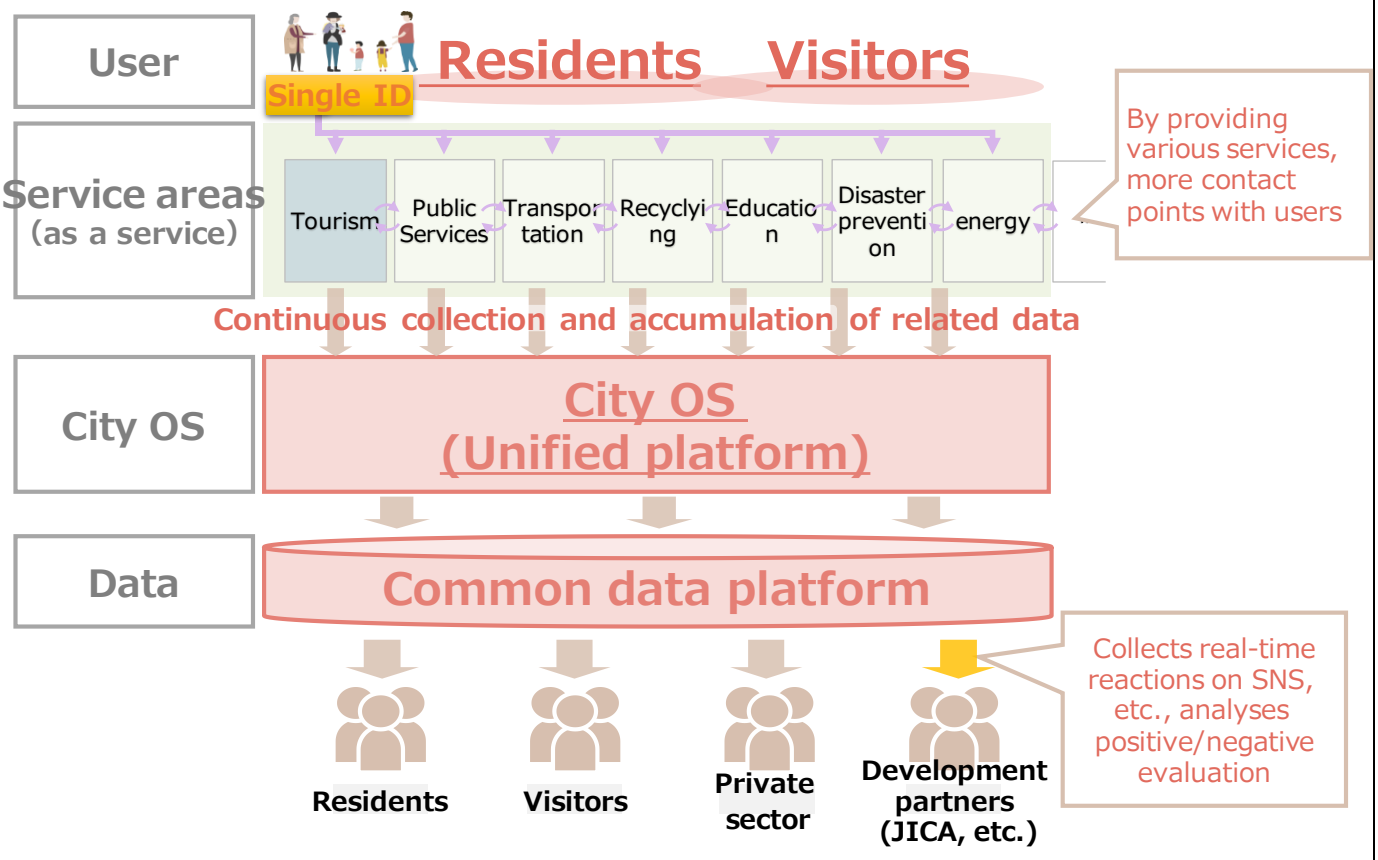
For financial cooperation, if the scope is limited to the simple development of City OS, it will cost around 10 million JPY. If the scope includes provision and operationalization of civil services, etc., on the City OS, necessary activities will cost around several 100 million JPY to several billion JPY.

5. Proof of Technology / Applicability in Developing Countries, etc.

In Japan, several local governments, including the city of Aizu Wakamatsu, are in advanced stages of utilizing City OS. The government of Japan is now in the process of standardization of architecture for expanding areas utilizing City OS, including development in developing countries.

The city of Aizu Wakamatsu is currently developing a regional portal for citizens (Digital Citizen Platform). This platform enables one-stop service for the provision of the necessary information and required procedures to citizens based on their affiliations (such as submission of resident registration, inquiries based on AI Chatbot, linkage of electricity use, and health data). In addition to enhancing the quality of civil services through provision of data contents in the form of videos that match the needs of different groups of citizens, this platform also contributed to the industrial promotion and job creation by accumulating, analyzing and disclosing digital data of users.

6. Reference Information



[image of accumulation and utilization of data by development of City OS]

Recommendation System to Support Road Intersection Traffic Improvement using AI Image Analysis

～Solution for “Transport Safety” and “Traffic Congestion” using Surveillance Camera Images～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [collection of road traffic image through surveillance camera]
2) Information Analysis and Decision Making (AI, etc.) [image analysis, machine learning]

(2) Description

This system recommends the most appropriate improvement measures for road intersections where serious traffic accidents and severe traffic congestions occur, by extracting necessary road traffic information from surveillance camera image to compare with the big data (know-how of situation and measures) accumulated in Japan over the past several decades. This system contributes to the formulation and implementation of comfortable, safe and sustainable economic development and smart urban policy, by combining Japanese knowledge and technology to enhance the quality and coping speed of improvement measures.

[Examples of actual application of this system]

- Road planning agency: Analyzed and evaluated road safety to prepare road network plan for preventing fatal accidents and improving traffic congestion
- Road management agency: Detected anomalies such as road surface deterioration and falling objects to conduct maintenance activities
- Traffic management agency (police): Detected risky drivers and pedestrians to patrol road intersections

[Technological description of image utilization methodology]

- Detects traffic volume using various surveillance camera
- Analyzes detected human behaviors and vehicle movements (going in opposite direction, counting vehicle numbers by direction and type, etc.)
- Detects specific objects other than human and vehicle through machine learning (such as detection of localized vehicles)

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

[Quality enhancement of improvement measures]

- Detection of near-miss accidents: Enables planning of quality improvement plans to prevent serious accidents by analyzing “images prior to accidents”
- Specification of causes of traffic congestion: Enables adoption of appropriate coping measures in road intersections where the causes have been unknown in the past
- Continuous monitoring of transportation infrastructure; Enables preparation of future road network plan at an appropriate timing, by grasping the changes in social conditions of fast growing developing countries

[Reducing time required for preparation of improvement measures]

- Automatic detection of traffic volume by direction and type of vehicles: Enables nearly-real time counting and analysis of vehicles by directions, after incorporating moving images

By utilizing this system, it is expected that all project plans based on traffic situation can now use road traffic data that are continuously monitored from the time of preparatory study to ex-post evaluation and operation. This will connect the “dots” (individual projects for transport safety and traffic congestion at road intersections) and expand them to “zones” (area including multiple road intersections), leading to better planning and management of urban development, such as smart city development. Use of such digital transformation technology will contribute to sustainable development in developing countries through effective development cooperation planning, efficient monitoring during construction and operation, and appropriate evaluation through

Japanese assistance.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
b) indirectly related to financial cooperation (same sector, etc.), c) institutional capacity building,
e) others (improvement of traffic congestion through establishing model traffic control area)

(2) Description on How JICA ODA Support Scheme may be Utilized

The current procurement method prevents continuous and effective use of data, because traffic surveys are conducted independently in different stages of project lifecycle (such as preparatory survey, ex-post evaluation). It is proposed that a new ODA scheme that allows all necessary data for this system to be collected during the project initiation phase (such as masterplan study), and supports the acquisition of the same set of data throughout the lifecycle of the project, all the way to construction completion, ex-post evaluation and operation.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

3) Rough Assumption of Cost

4) Financial Cooperation: a) around several 100 million JPY
5) Technical Cooperation: d) around several 100 million JPY

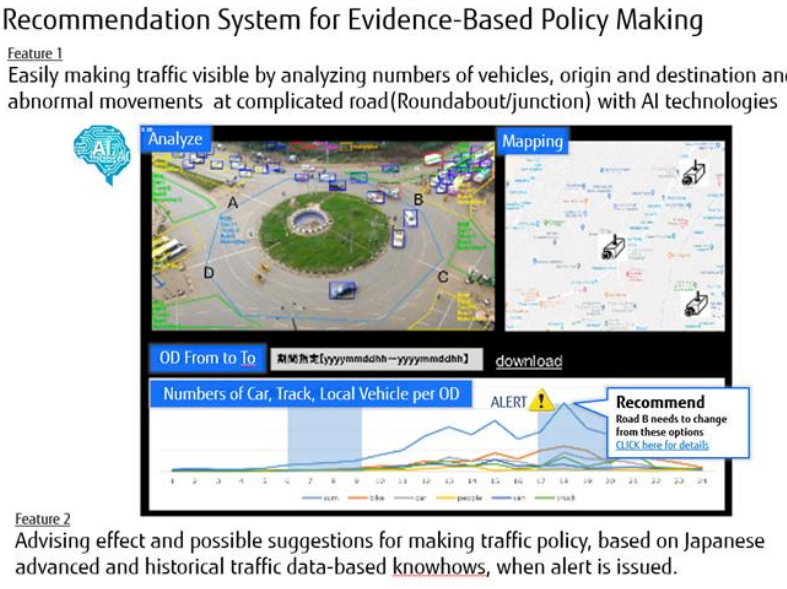
6) Brief Justification of the Above Cost Assumption

- Initial cost: around 100 million JPY (analyzed images for around 100 existing surveillance cameras) – this includes hardware (server for analysis, network equipment, etc.), construction cost for hardware, software (1 year license fee for analysis software), initial setup cost, training fee (system operation, date utilization)
- Maintenance cost: starting from around several million JPY annually – this includes analysis software (annual license fee), maintenance fee for hardware, telecommunication fee, etc.

5. Proof of Technology / Applicability in Developing Countries, etc.

- Technology for detecting human and vehicles was proven for in roundabouts and road intersections in Kenya (Nairobi), Vietnam, Thailand, Philippines and Myanmar.
- In FY 2020, it is expected that proof tests and their evaluations for transportation safety and traffic congestions will be conducted in Thailand and Myanmar.

6. Reference Information



Category F

Digital Frontier Projects

F-2: Single Projects

No.	Primary SDGs	Secondary SDGs	Title of Proposal	Page No.
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Blockchain-based Music Investment System for Improving Livelihood of Refugees and People in Poverty

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

4) Others [blockchain]

(2) Description

- Refugees and people in poverty, who are gifted with talents of creative activities such as music, are deprived of the opportunity to utilize their talents for generating income and thus improving livelihoods. Although supporting creative industries does not only bring economic benefits, but also enhance self-esteem and, in the case of refugees, mitigate conflicts in host countries and communities, development institutions tend to support heavily on traditional industries, such as agriculture and industry, to improve livelihoods of such population.
- The blockchain-based music investment system, which has been developed, is able to help livelihood improvement of refugees and people in poverty through creative industries.
- This proposal is to contribute to livelihood improvement by distributing loyalty from use of copyrights of music, etc., with entitled refugees and people in poverty. This is made possible by recording copyright and right holder information on ledgers and registering the distribution of profit based on smart contracts on this music investment system, as well as linking with music service providers.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

In many developing countries, creating and ensuring job opportunities for people in poverty and young generation, as well as diversification of industry, are challenges. Additionally, there are cases that host countries and communities face social and economic challenges caused by refugee influx. By providing means for refugees and people in poverty to improve livelihood through creative activities such as music, it is expected that developing countries attain a huge benefit. This is made possible through social stability expected as an outcome of solving the challenges such as ensuring the source of revenue, maintaining dignity, recognizing identity, and, in the case of refugees, mitigating conflicts in host countries and communities.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: b) Private Sector Investment Finance (non-sovereign) [equity investment]
2) Technical Cooperation: e) others (technical cooperation projects and studies to support livelihood enhancement for refugees and people in poverty (for public sector), Japanese enterprise proposed program)

(2) Description on How JICA ODA Support Scheme may be Utilized

- Financial Cooperation (Private Sector Investment Finance / equity investment): It is planned to establish a private enterprise established locally with JICA equity investment, which implements livelihood improvement activities for refugees and people in poverty. using blockchain-based music investment system.

- Technical Cooperation (for public sector): It is planned to design, develop and implement blockchain-based music investment system components and pilot projects, under a technical cooperation project or study to support livelihood improvement of refugees and people in poverty.
- Technical Cooperation (Japanese enterprise proposed program): It is planned to propose implementation of studies and projects to improve livelihood of refugees and people in poverty., utilizing the blockchain-based music investment system.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: b) around several 10 million JPY to c) around 100 million JPY

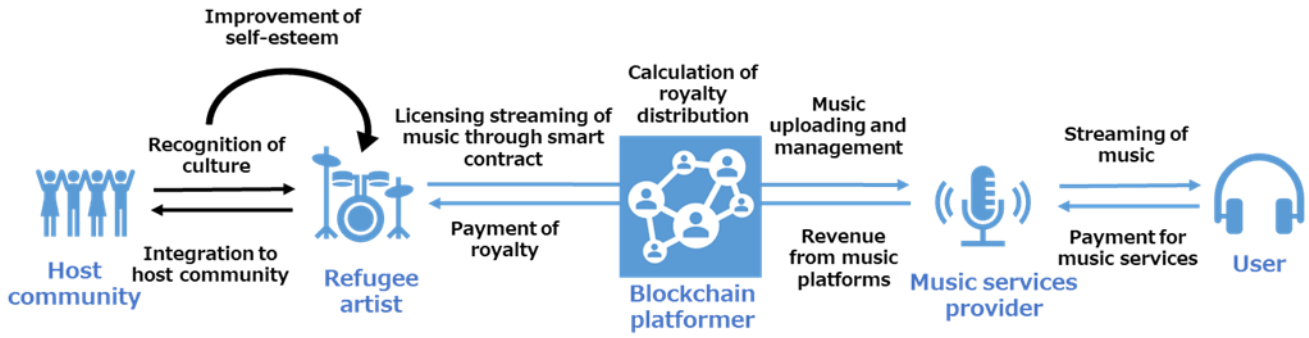
(2) Brief Justification of the Above Cost Assumption

When pilot projects are designed, developed and implemented locally as a technical cooperation project or study, initial cost of roughly around several 10 million JPY to 100 million JPY is required. On the other hand, in order to achieve sustainable livelihood improvement of refugees and people in poverty through blockchain-based music investment system, enterprise activities need to continue on its own economically and this requires establishment of a local private enterprise. Considering its development impact and project risks, etc., around several 100 million JPY of equity investment is needed.

5. Proof of Technology / Applicability in Developing Countries, etc.

- Since 2000, the proposer has been conducting business in music industry in Japan and has know-how of music business, including copyright information. It is also now developing blockchain-based music investment system based on this know-how.
- On the other hand, the proposer has been implementing impact investment to microfinance institutions in Myanmar, Cambodia and Vietnam, and is developing similar activities in Peru since 2019.
- Based on the above, the proposer has accumulated the necessary technology, know-how and experience to implement this project intended for livelihood improvement of for refugees and people in poverty by distribution of profits generated from music services providers, through blockchain-based music investment system in developing countries,.

6. Reference Information



Conceptual model in case of refugee artists

Digital Money Salary Payment System and Job Creation Program through Public Investment funded by Temporary Use of Digitally Paid Salary

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

4) Others [FinTech (salary payment using digital money]

(2) Description

This proposal comprises of the following:

1) Use digital money to pay salary to all workers, including public servants and private sector employees
2) Developing country governments borrow 5% of the digitally paid salary and repay the loan every month to low-income workers after 1 year (developing country governments struggle with shortage of fiscal revenue due to laws and regulations that prevent them from imposing tax on low-income households. The idea is to create fiscal space by borrowing, not tax.)
3) Create job opportunities targeting low-income households and people living in slum areas, by implementing public investment civil works job creation program by the government financed by the borrowed funds
4) Low-income households need to live on less income, but should be satisfied if they are automatically repaid through digital money and feel that they are given job opportunities and unemployment rate is improved

It is expected that such program should bring more dreams and hopes than doing nothing.

Digital salary payment system was first implemented using cloud in Japan in 1999 as “All-in-One HR-Attendance-Payroll-Year-end adjustments” system. This system allowed changing the pay rate depending on the workload (for example, when a worker is handling payments at store (1,000 JPY per hour), doing preparation work in kitchens (1,200 JPY per hour), delivery (500 JPY per time), pealing skins off shrimps at factories (200 JPY per kg), handling customer complaints (double the pay rate)). Low-income workers were particularly satisfied with the system as it showed the amount of salary ready for payment on a day-to-day basis. It earned a good reputation for the company as friendly and fair to the workers, which also helped to increase productivity.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

1) Reliable and simplified tax collection procedure

Digital money enables not only for salary payment, but also for consumption purposes. Therefore, in addition to automatic calculation and collection of various tax and levies (income tax, pension, social security, local tax, etc.), it enables automatic calculation and collection of consumption tax (value added tax).

2) Reduction of crime and related expenditure by digitalization of currencies

A society free of cash using digital money prevents frauds, thefts, robberies, and counterfeit notes, contributing to increased safety. Also, you can save the cost for currency printing, transportation, security and measures to combat counterfeit notes (for example, Saudi Arabia government announced that the saved cost was estimated around 1.3% of GDP in April 2019.)

3) Job creation and public security

In many developing countries, due to increasing population, many people are without stable jobs, often resulting in unemployment rates of more than 20% and the percentage of people paying income tax less than 5%. Additionally, rural people coming to urban areas looking for jobs formulate slum areas, often resulting in serious worsening of public security. By securing sufficient fiscal space for infrastructure development, such as water supply and treatment, road, power generation, waste management, ICT and data center, it expected that many jobs are created, and public security is improved.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), b) Private Sector Investment Finance (on-sovereign), c) Grant Aid (sovereign)

2) Technical Cooperation: e) others (proposal to developing country governments, including heads of states)

(2) Description on How JICA ODA Support Scheme may be Utilized

- In order to implement this proposal, data centers that can store over 5,000 racks and stable power supply to run the racks are required. Investment to install these data centers and power supply facilities usually require a combined investment of around 10 billion JPY. In Africa, South Africa is the only location that satisfies the condition. New investments are needed if the proposal is implemented in other parts of Africa.
- Payments to public servants will be implemented as government projects, so sovereign financing such as ODA loan and Grant Aid is sought.
- Payments to private sector employees will be implemented as private sector projects, so non-sovereign financing such as Private Sector Investment Finance is sought.
- In either case, utilization of digital money and implementation of infrastructure projects financed by 5%, one-year term borrowing will require consent by developing country governments. Therefore, opportunities for policy recommendation is sought.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

3) Rough Assumption of Cost

4) Financial Cooperation: a) around several 100 million JPY (per country)

5) Technical Cooperation: a) around several 10 million JPY (for translation and adjustment to local labor laws and regulations)

6) Brief Justification of the Above Cost Assumption

1) Depending on the size of labor force of each country, the required size and structure of servers vary.

- In countries where the labor force population is under 100 million, it will cost around several 10 million JPY, in countries over 100 million labor force population, it will cost around several 100 million JPY.
  (Note) Above initial cost is for expenditure related to data maintenance server used to safely store and monitor paid tax and income amount by the government. Maintenance fees will be cloud-based and will be correlated to the number of users.

2) The system currently can adjust to multiple languages, including Japanese, English, Chinese, Hindi, Kannada, Kiswahili. If conversion to French, Spanish, Portuguese or other languages are required, and if study on local labor and tax laws and regulations are required, additional cost will be needed.

5. Proof of Technology / Applicability in Developing Countries, etc.

In Japan, the “real-time salary payment” system for blue-collar workers that integrates with human resource, attendance and leave, and payroll management, have a 20-year track record of success. The same system was implemented in Vietnam, partnered with a local bank last year. This year, we are expecting operation in Saudi Arabia, India and the UK.

6. Reference Information

Solution for Visualizing Conditions of Farm and Automatic Farming using AI

～Subscription Services Using Cloud Application to Reduce Initial Investment Cost～ (applicable product is processed tomato only)

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [information collection from IoT (satellites, drones, cameras, sensors, etc.) and weather forecasts, etc.]
2) Information Analysis and Decision Making (AI, etc.) [recommends optimal water sprinkling and use of fertilizers using AI]
3) Actions (Robots, etc.) [automatic irrigation]

(2) Description

This proposal is a service to understand the situation of vast cultivated land through ICT, to analyze by AI, and to provide optimal agricultural operation through auto-irrigation. (Note: applicable crop is processed tomato.)

- Understands crop growth and environment (temperature, humidity, soil moisture, weather/climate) in each cultivated land, by using image information obtained from satellites, drones, remote camera, and environmental information collected from climate and soil moisture sensors.
- Proposes optimal amount and timing of water and fertilizers for growing, by analyzing crop growing situation using AI
- Enables use of proposals automatically through irrigation facilities
- Enables use by farmers and agriculture consultants in making decisions regarding farming, and by processing enterprises in making decisions regarding harvesting, as situation of cultivated land can be easily and remotely obtained in the field (by smart phones) and in the office (by PC)
- Offers functions that support communication among stakeholders and recommend risks and countermeasures against agricultural diseases
- Reduces initial investment as this service is provided in the form of subscription business model of cloud application

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

In Portugal, as a result of automatically applying optimal water and fertilizer using our AI for processed tomato, it led to increase of production by 10% and reduction of nitrogen fertilizer inputs by 40%

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: b) indirectly related to financial cooperation (same sector, etc.)

(2) Description on How JICA ODA Support Scheme may be Utilized

- Case 1: Using leftover funds from ODA Loan (quick contribution)
- Case 2: Implementing technical cooperation and ODA Loan related support to use ODA Loan leftovers
- Case 3: Grant Aid

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

Implementation of automatic farming of processed tomato, following 3 years of field testing
Example: 3 year project for 20Ha (nearly equal to one irrigation unit for control) cost around 120 million JPY
<assumptions>

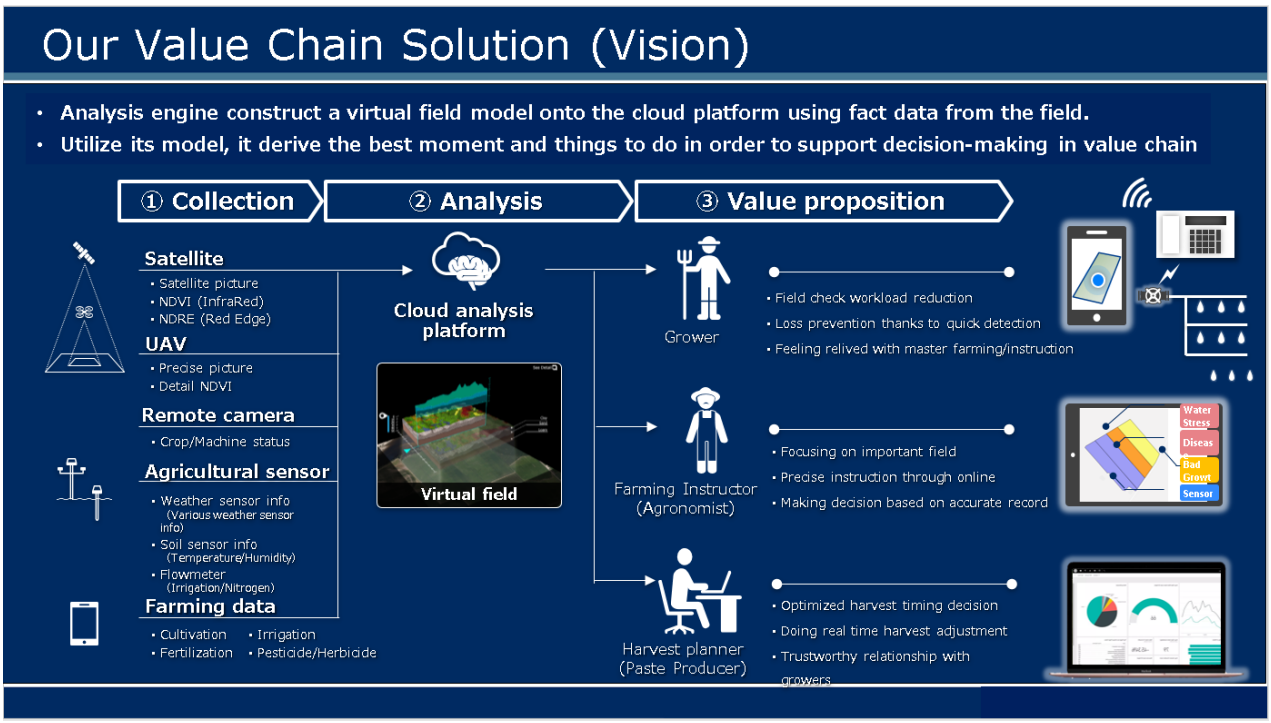
- Cost estimate and installation is by irrigation scheme units (within 20Ha). The estimate given here is on the assumption that the area is 20Ha.
- First year: data collection, Second year: feasibility study for AI analysis, Third year: feasibility study for automatic irrigation: customized development meeting local conditions will follow after feasibility study
- There are local farming instructor (agronomist) who are able to offer trainings and direct support to farmers after installation of the system.
- **Initial investment**
  Cost items that depend on the size of cultivated land (equipment, installation work, soil analysis, transportation, controlling device of irrigation system, etc.): aggregate amount around 35 million JPY
  Cost items that do not depend on the size (first year training only): aggregate amount around 5 million JPY
- **License for subscription (for 3 years)**
  Cost items that depend on the size of cultivated land (solution, maintenance of equipment): aggregate amount around 20 million JPY
- **Development cost (for 3 years)**
  Development cost for localization (engines, user interfaces (UI), second and third year trainings, business trips): aggregate amount around 60 million JPY

Durability of equipment is generally for five years (depends on each equipment)

5. Proof of Technology / Applicability in Developing Countries, etc.

This solution has been implemented in Portugal and Australia in 2019, for integrated management of irrigation schemes covering 2-6.5Ha. There is no foreseen obstacles in installation in developing countries, but require 2G or 3G communication network in the agricultural field. In addition, data collection, feasibility study of AI analysis and feasibility study of automatic irrigation are required before implementation.

6. Reference Information



Agricultural Development Support in Developing Countries utilizing E-Voucher

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [e-money transaction]

2) Information Analysis and Decision Making (AI, etc.) [confirmation of identity for e-money transaction through facial authentication]

(2) Description

This proposal is to distribute IC cards to farmers, after charging subsidy to purchase agricultural materials (seeds, fertilizers, pesticides, agricultural equipment, etc.) Farmers can purchase and make payments by IC card in shops selling agricultural materials and installing IT device (smart phones, tablets, etc.). As the system uses cloud service, IC cards can be used if internet access is secured within the coverage of mobile network operators. In case it is outside the coverage, the service is provided offline. Identity is confirmed through facial authentication.

By adopting this system, subsidy will only be used for intended purposes. The system can also be used to enhance agricultural productivity, increase women participation in agricultural activities, record agricultural material purchases, implement emergency support activities during disasters, etc. We have installed this system and is now in use in Africa, through a project jointly implemented with an international organization.

(Note) Functions of a cloud platform

- Information search and collection: registration and inquiry on user information, registration and inquiry on product information, transactions using e-money, record management of transactions
- Information analysis and decision making: analysis of transactions using e-money, facial authentication

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

In actual cases, we have increased agricultural productivity by more than twice the original figure.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)

(2) Description on How JICA ODA Support Scheme may be Utilized

We would like to formulate projects using this system, together with international organizations if appropriate.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

2) Financial Cooperation: a) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

On the assumption that IC cards are distributed to 5,000 people, the initial set-up cost will be around 50-100 million JPY, and the maintenance field service cost will be around 50-100 million JPY/year. (Details to be discussed)

5. Proof of Technology / Applicability in Developing Countries, etc.

This system has been applied in the past. In Mozambique, we are now providing the services to 24,000 agricultural workers since 2015. We wish to deploy the system in other countries.

6. Reference Information

E-money Solution for Aid Program

This is an electronic payment method (e-money, e-voucher, etc.) service for "BOP layer / small farmer" who wants to secure business funds "safely" and "systematically" from cash.
Compared with traditional paper cash, it can be introduced "safely" and "efficiently".

Target in Aid Program

Expected Effect for the target

Use cases and basic solution menu

Use cases

- Money Transfer for aid
- Payment for Materials
- Savings/Co-payment for subsidy
- Loan (Including VSLA: Village Savings and Loan Association)
- Beneficiary Identification
- Management of Beneficiary Information
- Recoding of Inspection/Training history of Beneficiaries

Basic solution menu

Initial cost

Device/Media	Installation Support
Card (CARD)	Setup cloud server service
Tablet terminal	Face Recognition software license
	Installation /Training

Monthly cost

Basic service

Cloud server basic fee
- Balance management
- User profile management
- Restriction control
- Reporting
- Campaign
- Money Transfer etc.

Satellite Image Applicability Study for Upgrading Beekeeping Industry

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [IoT, remote sensing utilizing satellites]

2) Information Analysis and Decision Making (AI, etc.) [AI]

(2) Description

- Bees are utilized in the food and health industry, such as pollination of agricultural products and producing honey. The ecosystem of bees is influenced by the environment, including air, heat and soil conditions, but mostly by the vegetation among other factors. We predict that demand for beekeeping industry will increase globally, because it is effective in enhancing food security and agricultural production through pollination. In developing countries, however, the beekeeping industry have not grown due to technological issues, even in cases where there is abundant source of honey. Globally, the production of honey is increasing at a pace of 1% each year. Although production in China, etc. is growing, it is decreasing in Western European countries, and the increasing rate of the past 10 years is low in Africa, which accounts for approximately 10% of the total global production. In Africa, lack of production technologies and lack of understanding on the need to develop surrounding environment for beekeeping are seen as bottlenecks.
- This proposal aims to upgrade the beekeeping industry in developing countries by enabling optimization of predicting honey sources through integrated analysis of flower growing situation near beehives utilizing satellite data and beekeeper data. We believe that deployment of the beekeeping industry in developing countries will lead to strengthening sustainability by increasing revenue of farmers through pollination and honey extraction, which is closely related to other agricultural activities.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

We believe utilization of satellite data brings the following benefits.

- Enables ex-ante consideration of suitable land selection and the amount of honey extracted in developing countries, which are offshore areas (planting areas (source of vegetation) and surface soil moisture, etc. analyzed by data utilization)
  (Note) Local data is also required.
- Prepare tree plant map effective for supporting the livelihoods in developing countries
- Understand the correlation between extracted honey volume and surrounding environment

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

2) Technical Cooperation: e) others (satellite image applicability study for upgrading beekeeping industry)

(2) Description on How JICA ODA Support Scheme may be Utilized

We plan to utilize Japanese enterprise proposal based program.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

2) Technical Cooperation: b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

We assume activities of around 6 months with 2.5 to 3.5 staff.

5. Proof of Technology / Applicability in Developing Countries, etc.

In 2018-2019, we have developed a model to analyze environmental data and plant growing situation in Japan. Since 2015, we have been supporting training to beekeepers and monitoring in Europe.

6. Reference Information

	Maintenance and Site Selection	Honey Extraction	Processing	Sales	Promotion
Activities	Feeding/ Mite control/ Anti-bacteria/ Locating	Extraction/ Relocation of cages	Sorting Filtration Bottling Packaging	Reservation Wholesale Retail	Promotion Marketing Collaboration
Issues	Precision locating	Climate Risk	Manual Work	Prediction	Branding
Stakeholders	Central and Local Governments, Beekeepers	Central and Local Governments, Beekeepers	Beekeepers (Wholesalers)	Processing	Consumers

Satellite Data Utilization Scene	Resource Monitoring (Managing growing conditions and environmental, agricultural risks)	Predicting Production Volume and Ensuring Traceability (Managing markets and quality)
Examples in Other Sectors Utilizing Satellite Data	In forestry and agriculture, satellite data are used for services to understand selection of suitable forest sites, routes, plant extraction volume, risks, etc. ⇒Same technology can be used to check honey source based on similar services	Implements greenery area management and verification of traceability for clients such as enterprises calling for international environmental conservation Upgrades Fintech-based lending program by understanding agricultural production circumstances of individuals in developing countries

Digital and Modern Irrigation Agriculture through Development of Evidence Data based Canal Management System

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [irrigation canal management system (information collection through sensors, mobile devices, cameras, etc.)]
2) Information Analysis and Decision Making (AI, etc.) [irrigation canal management system (supporting decision-making and providing recommendations)]

(2) Description

- In irrigation agriculture, improvement of the rate of irrigated land is one of the important goals from the perspective of enhancing agricultural productivity and income. To achieve this goal, it is important to reduce the loss of supplied water that crops need, through reducing loss during irrigated water distribution. Under such circumstance, civil infrastructure projects such as rehabilitation of water distribution facilities such as canals, and projects with multiple components such as cultivation field development and establishment of irrigation associations, can contribute to the above-mentioned solution for irrigation agriculture in developing countries.
- There could be possibilities of the following difficulties, however, when implementing these projects. These may damage agricultural productivity in the medium to long-term.
  - It is not possible to verify whether water distribution is as planned, or the plan itself was appropriate, due to insufficient understanding of actual volume of distributed water
  - Conventional field practices rely on past experiences and intuition to secure and plan necessary amount of irrigation water for the next year, due to insufficient understanding of actual water distribution and availability of water resources. Additionally, it is hard to make plans for future rehabilitation of irrigation infrastructure, because of the lack of evidence data.
  - Capacity of water distribution may deteriorate faster than panned, as a result of inappropriate maintenance of irrigation facilities without actual data on canal transmission efficiency in hand, caused by insufficient understanding of actual water distribution volume by major water control facilities.
- This proposal is to establish canal management system using ICT. in order to solve the absence of integrated monitoring and analysis based on measured data of water usage.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Enables accurate understanding and prediction of water inflow, outflow and storage of reservoirs, maximizing the supply of irrigated water during the dry season
- Improves water transmission efficiency through inspection of initial water distribution plan, implementation of countermeasures against the cause of transmission loss, and improvement of planning for the next year
- Enhances effect of rehabilitation by being able to plan future infrastructure rehabilitation based on evidence
- Allows effective measures (rehabilitation of canals, sand dredging, etc.) within limited budget, by specifically pinning down the bottleneck which puts severe restriction on water distribution capacity
- Reduces flood risk of dam and canal after heavy rain, based on collected information, during the rainy season

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
b) indirectly related to financial cooperation (same sector, etc.), c) institutional capacity building,

(2) Description on How JICA ODA Support Scheme may be Utilized

- Case 1: introduction of the system and related human resource development using ODA Loan
- Case 2: mix of Grant Aid and Technical Cooperation, such as
  a) introduction of the system using Grant Aid
  b) use Technical Cooperation to implement human resource development for operation and maintenance of the above system a)
- Case 3: a new procurement system that allows both a) and b) above

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: d) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

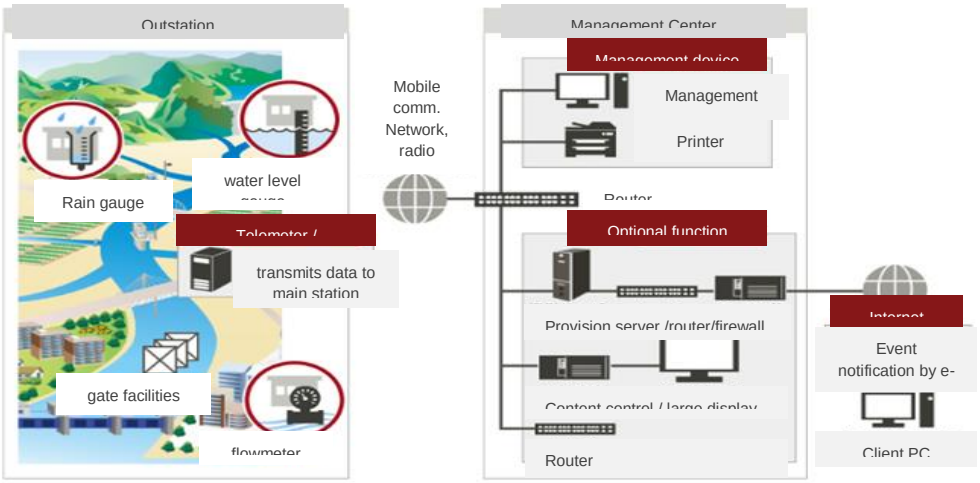
- Typical equipment services required for the system (as outlined in Section 3. (2) above as a) for Cases 1 and 2)
  a) equipment for measurement and communication: from around several million JPY each for measurement of water level, water flow, and rain volume
  (example) 3 equipment for rain volume measurement in upstream area, 1 equipment at reservoir, 1 equipment at water intake of reservoir, 2 equipment at major canals, 5 equipment at tributary canals: a total of 12 equipment each costing from around several million JPY
  b) equipment for data accumulation, integrated monitoring and analysis, plus related software: around several 100 million JPY (varies depending on project scope)
  c) establishment of the system (project management, design, development and testing of the system): included in the cost for b) above
  d) others costs (surveying, logistics, civil works): varies depending on project scope
  e) contract and payments for communication fee, electricity fee, etc.: as a general rule, to be borne by beneficiary government, varies depending on project scope
- Cost for human resource development (as outlined in Section 3. (2) above as b) for Cases 1 and 2)
  a) training for operation (varies depending on the equipment installed): around 10 million JPY

5. Proof of Technology / Applicability in Developing Countries, etc.

We have dozens of actual cases for land improvement areas in Japan. We can introduce the system, customizing based on the circumstances in developing countries (communication, electric power, etc.).

6. Reference Information

Canal management system provides information to support decision-making, through integrated monitoring and analysis of collected and accumulated data in IoT infrastructure. Irrigation facility water utilization data (water level, water flow, rain volume, etc.) is collected by machine sensors, mobile devices, smart phones, cameras, etc. and transmitted through the mobile network.



Farmer e-Learning based on Video Digital Content

～Dissemination Training for Ensuring Quality of Agricultural Products using Smart Phones and Long Distance Wi-Fi Network～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

4) Others [dissemination with video digital content using smart phones and long-distance Wi-Fi network]

(2) Description

Farmers must offer products that match consumer needs in order to increase their income. If crops are exported to foreign countries, especially developed countries, farmers can realize a significant increase in income. Developed countries, however, demand assurance for high quality and traceability for imported agricultural crops, and it is necessary for farmers to assure quality for cultivating, harvesting and shipping crops to meet developed countries' demand.

On the other hand, the agricultural extension service has been conducted for many years with the support of Japan and other countries using paper technical manuals, but after the agricultural extension service period ended, it is difficult for the extension service effect to take root, because the loss or deterioration of the paper technical manuals made it difficult to learn repeatedly.

Therefore, firstly, technical manuals with fun and easy-to-understand video content regarding the fields of deep concern to consumers such as, for example, safe composting, appropriate post-harvest procedure and etc. must be developed by agricultural experts who totally know know-how to meet customer needs in developed countries. Secondly, agricultural extension service based on the technical manuals with video content must be conducted by using "smartphones" which are widely prevalent among farmers. Then, while farmers are farming, they can learn repeatedly with video content and acquire agricultural crop cultivation, harvesting and shipping know-how to meet consume needs.

In addition, the use of mobile network service can be considered to distribute technical manuals with video content to farmers. However, since many farmers cannot afford to pay communication cost of mobile network service to get them, distribution of manuals through "long-distance Wi-Fi network" by using fixed network service is recommended. (Calculation example: Though 2,000 JPY/month on average for communication cost is assumed to get manuals, farmers in developing countries usually cannot afford to pay more than 500 JPY/month. Therefore, if 40 farmers share fixed network service cost of less than 10,000 JPY/month, as estimation, they can afford to pay less than 250 JPY/month.)

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

From 2016 to 2019, in one of the emerging countries in Asia, farmers who participated in a certain pilot project were able to cultivate crops in response to Japanese consumer requirements through know-how acquired by the technical manuals with video content from Japanese agricultural experts. As a result, the farmers increased volume of trade and their income level increased by 10% in average per year.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

2) Technical Cooperation: d) collaboration with local start-ups
e) others (JICA Japanese enterprises proposal based program)

(2) Description on How JICA ODA Support Scheme may be Utilized

- Project planning and implementation consulting (Consultant members include agricultural crop distribution expert, agricultural technical expert and IT expert. TOR include a) planning stage: coordination with government agencies, selection of target consumers, crops and farmers, decision on cultivation, harvest

and shipping schedule, and long-distance Wi-Fi network design suitable for project site, b) implementation stage: support project operation and conduct necessary measures)

- Installation of long-distance Wi-Fi network at project site (a) negotiation with fixed line communication company and installation of network service, b) selection and procurement of communication equipment suitable for project site, c) installation of long-distance Wi-Fi network and hot spots)
- Development of technical manuals with video digital content related to quality assurance of cultivating, harvesting and shipping agricultural products that meet the demands for transactions in international markers

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

2) Technical Cooperation: c) around 100 million JPY

(2) Brief Justification of the Above Cost Assumption

- Project planning and implementation consulting: 80 million JPY
- Installation of long-distance Wi-Fi network at project sites: 20 million JPY
- Development of technical manuals with video digital content that lead to quality assurance of cultivating, harvesting and shipping agricultural products: 50 million JPY

5. Proof of Technology / Applicability in Developing Countries, etc.

From 2013 to 2016, a project for establishing and operating information distribution platform including agricultural video content and Wi-Fi hotspot was implemented in off-grid village in Myanmar. Additionally, partner company in Myanmar have many experiences in installing long-distance Wi-Fi networks. Furthermore, through the smart village survey in Myanmar from January to February in 2020 conducted with agricultural experts, farmers' issues, such as lack of know-how for ensuring quality of agricultural products to meet consumer needs, are understood. The technical manuals with fun and easy-to-understand video content, utilizing the experience of developing agricultural technical manuals with video content in Japan by the above-mentioned agricultural experts, can be developed.

6. Reference Information

Image of video digital content

Solution for Visualizing Conditions of Farm

～Subscription Service Using Cloud Application to Reduce Initial Investment Cost～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [information collection from IoT (satellites, drones, cameras, sensors, etc.) and weather forecasts, etc.]

(2) Description

This proposal is a service to understand the situation of vast cultivated land through ICT quickly and accurately, and to support decision-making.

- High-precision visualization of crop growth and environment (temperature, humidity, soil moisture, weather/climate) as well as agricultural disease and harmful insect risks in each cultivated land, by using image information obtained from satellites, drones, remote camera, and environmental information collected from climate and soil moisture sensors
- Decision-making support to farmers during farming (seed sowing, harvesting, watering, fertilizers, pesticides, countermeasures against agricultural diseases and harmful insects, etc.) and to agriculture product processing enterprises during crop harvesting
- Reduced initial investment as this service is provided in the form of subscription business model of cloud application
- Easy to understand latest information of cultivated land for use in fields (by smart phones), offices (by PC) and remote areas
- Effective information sharing and collaborative work instrument, offering function to communicate among stakeholders

(Note) For tomatoes and several crops, disease risk management functionalities are available.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

1) This solution enabled efficient work in cultivated land, resulting in 2 hours saving in actual cases. Before using this service, farming instructor (agronomist) supported farmers by inspecting farmer fields from 8AM in the morning to 7PM in the evening, providing advice and record keeping.
2) This solution resulted in around 10% decrease of time required for communication. After the service was provided, stakeholders were able to share maps to understand what is happening where on the vast cultivated land, and implement high-precision countermeasures against agricultural diseases, malfunction of equipment, crop abnormalities.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: b) indirectly related to financial cooperation (same sector, etc.)

(2) Description on How JICA ODA Support Scheme may be Utilized

- Case 1: Using leftover funds from ODA Loan (quick contribution)
- Case 2: Implementing technical cooperation and ODA Loan related support to use ODA Loan leftovers
- Case 3: Grant Aid

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

Rough assumption of the size of cultivated land and fees are the following.

Example: 3 year project in 1,000Ha (around 300 farmers and farming instructors): around 150 million JPY (after the fourth year, cost for subscription license and maintenance of equipment only)

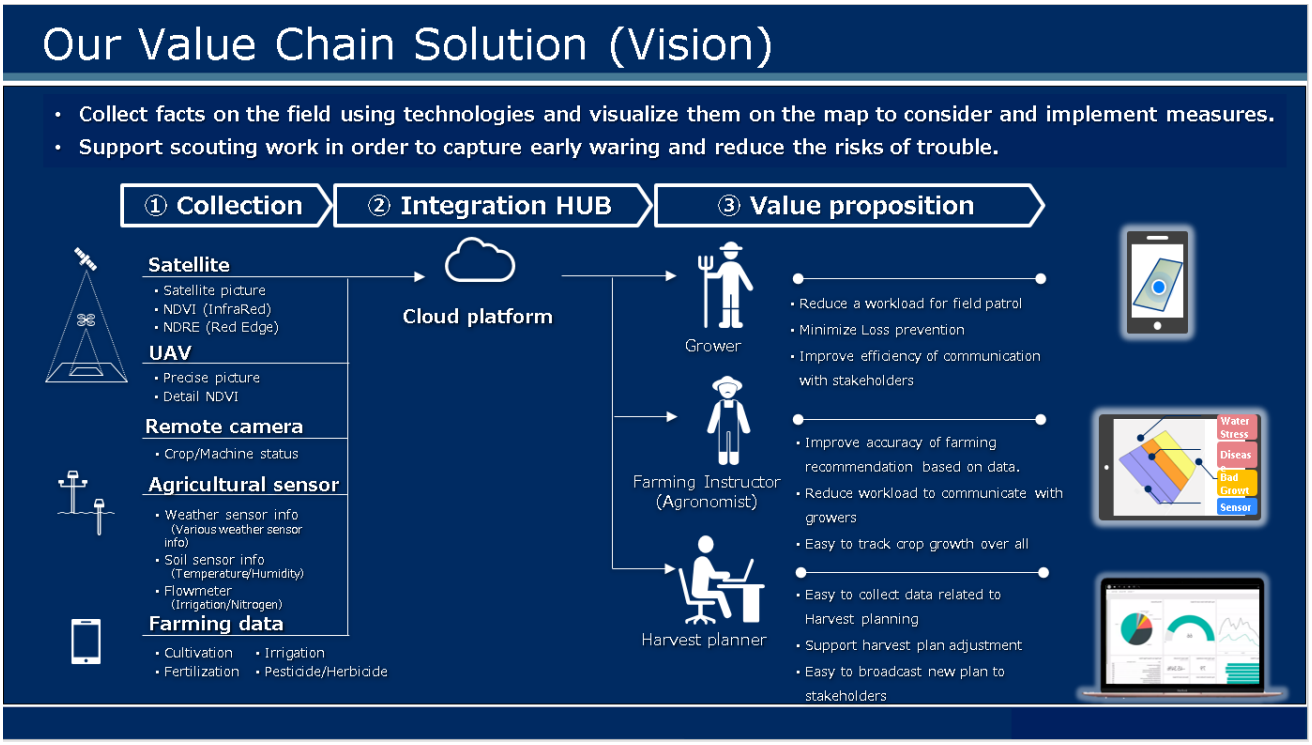
- Initial investment (equipment, installation work, soil analysis, transportation, training etc.): aggregate amount around 100 million JPY
- License for subscription and maintenance for equipment (cost for 3 years): aggregate amount around 50 million JPY

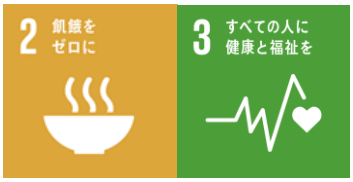
Durability of equipment is generally for five years (depends on each equipment)

5. Proof of Technology / Applicability in Developing Countries, etc.

This solution has been implemented in Portugal, Spain and Australia from 2016 to 2019 (1,000ha in Portugal and Spain in 2019, 600ha in Australia). There is no foreseen obstacles in installation in developing countries, but require 2G or 3G communication network in the agricultural field.

6. Reference Information





Digital Maternal and Child Health Handbook for Improving Developmental Disorders and Mortality Rates of Infants

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [accumulation of health checkup results and growing conditions using smartphone applications]
2) Information Analysis and Decision Making (AI, etc.) [disseminating appropriate information for users' pregnancy cycle and infants' months of age]

(2) Description

Maternal and child health handbook, which was invented in Japan and deployed to several countries in the world including developing countries, has not been used nationwide in these countries, because users must keep them over multiple years in the form of paper. On the other hand, it is a social challenge to educate and raise awareness of parents through maternal and child health handbook, from the viewpoint of improving developmental disorders and mortality rates of under-5 infants. This proposal aims to contribute to solving this social challenge by providing dual functions of "recording" medical information and provision of necessary "information," by replacing paper handbook with digitalized version using smartphone application, in light of the fact that smartphones are now increasing rapidly throughout the world, including developing countries. Parents, who are users of the application, can browse information checked by medical doctors that are appropriate for their pregnancy cycle and infants' months of age (information). Additionally, the application allows recording of body weight of pregnant women, growing conditions of infants, vaccination, etc., enabling visualization of growing conditions and prevention of missing health checkups and vaccination (recording). In the future, this digital handbook could be the foundation of the so-called Personal Health Record (PHR), as personal medical records will be digitalized in general.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Improvement of underdevelopment, malnutrition and mortality rate
  (Note) Measurement of direct impact by introducing digital maternal and child handbook is not easy. Alternatively, the following is reference information on the changes of infant and pregnant women mortality rates before and after JICA Technical Cooperation Project for Enhancing the Quality of Maternal and Child Health Program and the Implementation of Maternal and Child Health Handbook in the Era of Decentralization, Indonesia (from ex-post evaluation report in FY2012).
  - infant mortality rate (per 1,000 births): during planning phase (2005) 42, after project (2008) 37
  - pregnant women mortality rate (per 100,000 births): during planning phase (2005) 270, after project (2008) 240
- Enhancement of percentage in medical examination rate (checkups and vaccination), as well as raising awareness for maintaining health and prevention of diseases, by linking parents and hospitals/medical doctors within smartphone application
- Relief of anxiety by parents: enhancing Quality of Life in developing countries, including Southeast Asia and Africa
- Relief of unnecessary anxiety by women raising infants through this application: this increases available time and contributes to women's participation in social activities
- Contribution to enhancement of public health through visualization of information (by digitalizing medical information recorded in maternal and child handbook), which was not understood before, such as difference among regions.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: b) Private Sector Investment Finance (non-sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
   c) institutional capacity building, d) collaboration with local start-ups,
   e) others (proposal based program for Japanese enterprises)

(2) Description on How JICA ODA Support Scheme may be Utilized

1) Financial Cooperation: private sector investment finance, or other financial cooperation, for development fee of smartphone application that is necessary for implementing agencies in respective countries, and fee for expanding users.

2) Technical Cooperation:

- Support for fee for application development, user expansion, local activities for verification of business models, etc.
- Seminar for introducing actual cases (utilization of digital handbook in Indonesia)
- Deployment Indonesia case to other developing countries (south-south cooperation)
- Strengthening seamless maternal and childcare through introduction of digital handbook in other countries
- Improvement of public health environment by using digitalized medical data based on digital handbook
- (in the future) partnership with local start-ups utilizing PHR accumulated in digital handbook (e.g. utilization for marketing of nutritional supplements, etc.)

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY

2) Technical Cooperation: b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

Cost (the following as a rough estimate subject to variation depending on respective conditions, etc.)

1) Financial Cooperation / Cost of survey for verification of business models

[Total cost] around 120 million JPY annually (targeting 500 thousand people)

- Cost for development and maintenance of smartphone application: around 20 million JPY annually
- Cost for accessing users of smartphone application: around 100 million JPY annually (5 million births annually X 10% share X cost of accessing clients at 200 JPY per client)

[Revenue] around 500 million JPY annually (500 thousand people X 10 companies manufacturing consumer products X unit cost of 100 JPY annually)

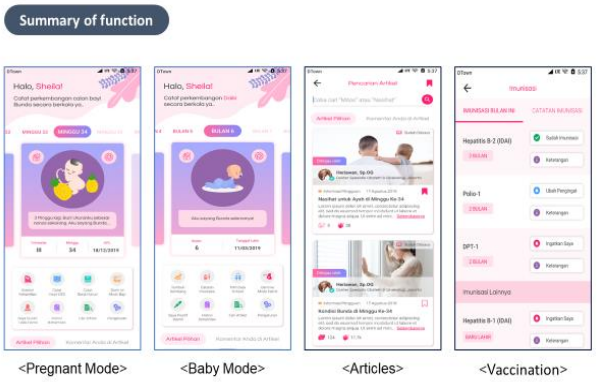
(Note) Above is a rough unit price and cost based on the assumption when the existing maternal and child handbook used in a private hospital in a middle-income country in Southeast Asia (Indonesia) are digitalized

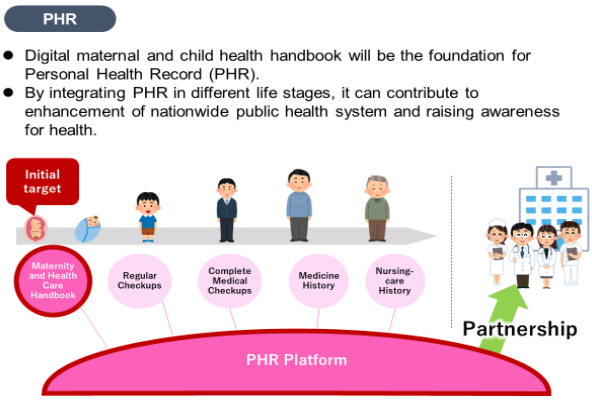
2) Technical Cooperation: around several million JPY to several 10 million JPY (assuming that a seminar is held in collaboration with existing technical cooperation project (maternal and child health))

5. Proof of Technology / Applicability in Developing Countries, etc.

- In end of July, 2019, we have launched smartphone application in Indonesia (currently around 60 thousand downloads). We plan to partner with major local mother and child hospital.
- After the project in Indonesia is started, we can deploy to other countries quickly, through language translation and supervision by medical doctors of each country.
- We can also contribute to enhancement of medical levels and citizen knowledge levels in other countries, by deploying the system together with the Indonesian government (Ministry of Health) and prominent obstetrician-gynecologists and pediatricians, who are contributing to this application already.

6. Reference Information





Medical Communication Networking towards Universal Health Coverage (UHC) in Developing Countries

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

4) Others [mobile application]

(2) Description

In many developing countries, the number of medical workers, such as physicians and nurses who have national qualification, is limited. Under such circumstances, community health workers and other various staffs at different skill levels play a great role in providing medical services. Additionally, many medical institutions in those countries suffer from the lack of digitalized medical images, and in worse cases, imaging equipment itself. This proposal aims to build the collaboration network among the medical professionals to share the accurate medical information and deliver the appropriate medical services in all areas of the country, including rural sides with limited access to medical services. We plan to do so by providing communication application based on smartphones, which are now widely used even by citizens in developing countries. Not only the medical information viewing function, but the voice and video call function and the function for sharing the general information such as photos, videos, voices and documents etc. contribute to improve the quality of the communication among healthcare providers regardless of the physical distance. This application has already been used in medical institutions in 18 countries and regions globally.

[Features of this application]

- Accurate medical information such as medical images and laboratory test results can be shared anywhere, anytime through 1-on-1, or group-chat communication.
- Used as a platform to link medical institutions, internally and externally.
- Integrated with medical information systems such as hospital information systems and third-party Web services in a vendor-neutral manner
  - Adapts to various international standards, such as DICOM (Digital Imaging and Communications in Medicine) and HL7 (Health Level Seven), and allows display of various medical information on the application.
  - Certified by Japan PMDA, USA FDA, Europe CE, etc. as a medical device.
- Implements security measures based on medical information related laws, regulations, and guidelines in various countries

[Use cases of this application]

- Regional medical collaboration for acute diseases: Contributes to optimize the emergency transportation and the preparation for the treatment in a receiving facility, by accelerating communication over a chat-group including emergency medical services, primary care institutions, and specialized medical institutions. By shortening the time of Door to Operation, we aim to enhance success rates, such as saving lives, and realize medical economic efficiency.
- Regional collaboration for COVID-19 infected areas: Enables regional patient management and epidemiology analysis in various departments, by sharing updated case information in a chat-group including medical institutions (primary care facilities and specialized hospitals), public offices, and public health centers, and linking with a web platform for managing infected cases.

Both above collaboration activities can be performed with a single mobile application.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

[Reduction of the time from Door to Operation]

In some clinical researches in Japan and Brazil, it was proved that the application contributed to cutting the time from receiving acute patient to starting treatment and, as a result of it, the improvement of success rates, such as saving lives.

<Case 1> Internal collaboration in a medical institution for stroke: reduced 30 minutes

<Case 2> Regional collaboration for acute aortic diseases: reduced to one-third of the past average

[Avoiding unnecessary and non-emergency patient transportation]

By creating an environment to allow ex-ante consultation with specialized physicians and hospitals, we can

reduce unnecessary transportation of patients between medical facilities (such as re-directing emergency patients to other hospitals, introduction of chronic disease patients from rural areas to urban specialized hospitals). Additionally, it is meaningful for communicable disease response that require avoiding unnecessary transfer of patients.

[Improving work environment of medical staffs]

By being able to understand the details of cases based on medical information remotely, we expect the reduction in receiving unnecessary and non-emergency patients, and overnight, weekend on-site services.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: c) Grant Aid (sovereign)
2) Technical Cooperation: e) others (Japanese enterprise proposal based program)

(2) Description on How JICA ODA Support Scheme may be Utilized

We wish to implement building and operating application network for establishment of a foundation for telemedicine services, as well as training programs to enhance medical technologies and health system in partnership with medical institutions in developed countries including Japan. Additionally, in order to build a sustainable model, we wish to implement the market research to seek the potential collaborations with pharmaceutical and medical device providers, that benefit from increased rate of accurate diagnosis and treatment.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: c) around 100 million JPY

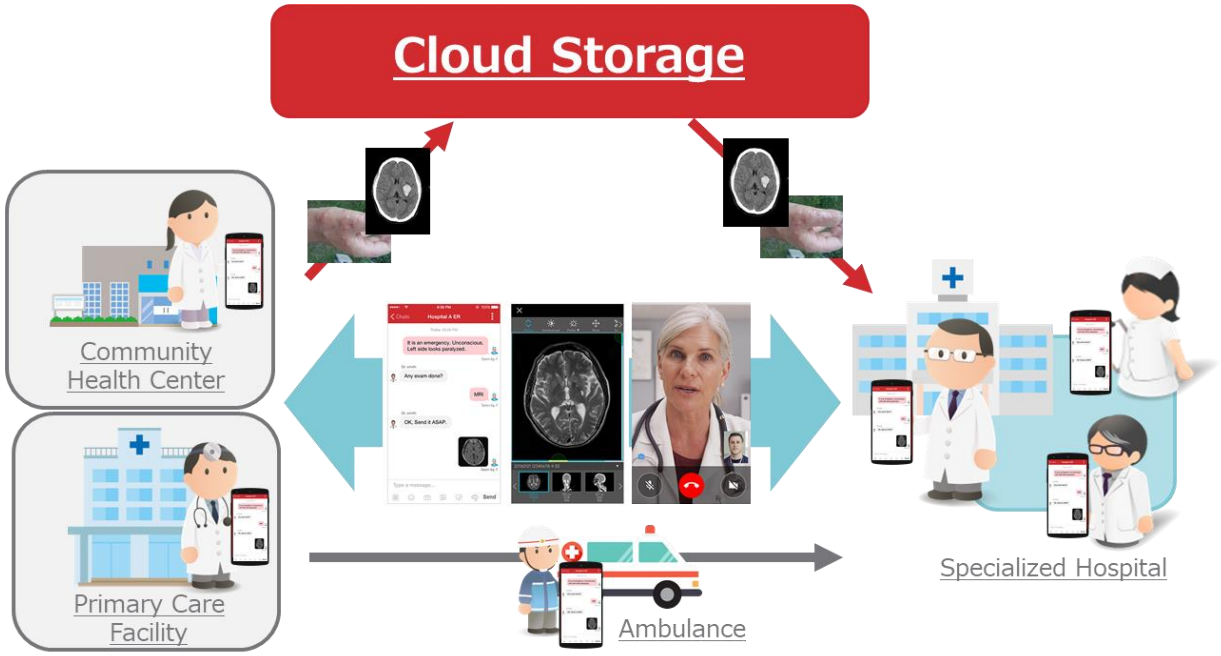
(2) Brief Justification of the Above Cost Assumption

- Initial cost: around 100 million JPY (creating local cloud environment, cost for installation of server for uploading medical information from medical institutions, initial set-up of application, service cost, etc.)
- Maintenance cost: around several million JPY/year (cloud environment management cost, maintenance fee for hardware, communication fee, data monitoring fee, etc.)

5. Proof of Technology / Applicability in Developing Countries, etc.

We have deployed this service in 18 countries and regions already (Japan, Taiwan, Thailand, USA, Mexico, Columbia, Peru, Chile, Brazil, Germany, Spain, Switzerland, Finland, Russia, UAE, Saudi Arabia, South Africa, Rwanda). In FY2020, we plan to implement pilots in Malaysia, Vietnam and Paraguay.

6. Reference Information



Cloud Medical Systems and Applications Supply

(Supplying Picture Archiving and Communication Systems (PACS), Tele-Radiology Systems, Diagnostic Imaging AI, and Personal Healthcare Record (PHR) Applications)

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [cloud picture archiving and communication systems (PACS), tele-radiology systems, personal healthcare record (PHR) applications]

2) Information Analysis and Decision Making (AI, etc.) [diagnostic imaging AI]

(2) Description

Cloud PACS is a system to use dedicated Viewer to browse digital images stored and organized on Cloud for medical facilities. Compared to existing on-premise PACS, the Cloud PACS is more affordable, and enables information sharing between external organizations and medical doctors, in addition to internal use by medical facilities. It could be a solution for uneven regional distribution of medical doctors in specific fields, by enabling medical facilities to utilize tele-radiology systems that request external doctors to conduct diagnosis through a safe network. Additionally, the use of infrastructure on the Cloud enables the use of AI to support image diagnosis by medical doctors in a more efficient and affordable manner. This proposal also supplies PHR application system that allows each patient to manage their own medical information, such as examination results, prescriptions, medical reports, and images, on their smart phones.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- This proposal is expected to upgrade the level of medical services by enabling more efficient and affordable use of various applications on the Cloud, including diagnostic imaging AI, and increased information sharing between external organizations and medical doctors, based on the most advanced Cloud medical system with sufficient amount of security measures for safety.
- This proposal also helps levelling of medical services among different regions, by requesting remote reading of images from medical facilities in rural areas to those in urban areas with doctors in specialized fields.
- This proposal contributes to enhancement of Quality of Life (QOL) through supply of medical services satisfactory for each individual, by disseminating PHR system that enables storage, management and sharing of their own medication information by individuals.
- We also expect creation of new industries in the future, through analysis and secondary use of anonymized medical big data, which is based on the integrated medical information on the Cloud.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: b) Private Sector Investment Finance (non-sovereign)

(2) Description on How JICA ODA Support Scheme may be Utilized

We intend to use financial cooperation mainly targeting 1) establishing the system on the Cloud, 2) utilization of public cloud services, 3) introduction of appliance by medical facilities, 4) integration with the internal system of medical facilities, and 5) maintenance and customer support activities after deploying the services.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type

is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

If we assume that 10 facilities use this service for five years, a rough estimate will be around 500 million JPY.

- Initial cost (supply and installation of equipment, system development, etc.): around 100 million JPY
- Subscription license and equipment maintenance cost, etc: around 400 million JPY

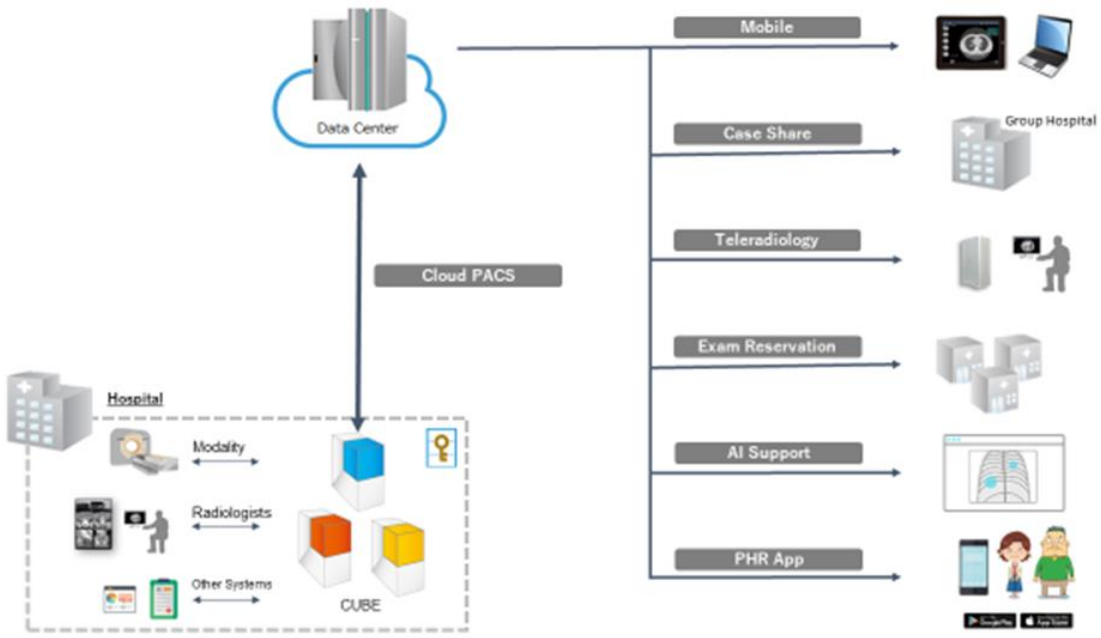
5. Proof of Technology / Applicability in Developing Countries, etc.

- We have been providing PACS system for over 20 years in Japan, and started sales of Cloud based PACS in 2012. Currently, the system is being used in over 1,000 facilities in Japan, and the share of our products in the Cloud PACS market in Japan is over 70%. We currently store over 180 million medical examination data for more than 30 million people.
- As for tele-radiology IT infrstructure, we have a market share of 50% in Japan, being used by over 1,300 radiologists in Japan.
- Regarding diagnostic imaging AI, we are now promoting joint development with AI companies in Japan and abroad. We plan to start the sale of diagnostic imaging AI which obtained Japanese certification regarding medical equipment ahead of other companies.
- We have started supply of PHR application system in 2019 in Japan, currently being used by 20 facilities and by 3,000 people. We are now implementing a pilot in one medical facility in Pune, India for deployment of PHR services

[feasibility in developing countries]

We require conducting pilot activities to assess the feasibility, taking into account information such as the internet environment (communication line speed of over 50mbps), local partners, internal system in medical facilities, rate of smart phone use, etc.

6. Reference Information



IoT for Optimal Operation of Elimination Type Microorganism Organic Matter Disposal Machine for Food Residue and Garbage

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [remote monitoring of operation]

(2) Description

- This proposal enables stable operation, early detection of malfunctions, and reduction of maintenance staff, for garbage disposal machines that contribute to improvement of the environment through elimination of food waste, manure, urine, and carcasses, etc. using the effect of microorganisms. Built-in sensors and measurement device enable remote monitoring of operation. There is no need to remove the remains, nor waste water from the machine, because the garbage will be eliminated: non existent in the machine.
- Operation of the machine results in accumulation of huge amount of data, allowing big data analysis to find out optimal ways to control microorganisms.
- Today, similar machines can process the garbage only up to 80% and remains must be discharged into the wastewater system. However, this disposal machine can offer a solution that enables elimination of the garbage by more than 99.9%.
- Thus, with this solution supported by fungus activities, people can sustainably enjoy hygienic daily life and consideration to global environment.
- Bio lavatory which uses the same technology requires no basic infrastructure such as water, gas, etc., no need of removal of pumped manure, and therefore is suitable to apply in isolated areas, refugee camps, conserved environment, etc.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Environmental protection:
  - ✓ no emission of dioxin because incineration is not used,
  - ✓ enables reduction of CO2 emission by more than 92%,
  - ✓ no water pollution because it requires no flush and drainage.
- Safety:
  - ✓ high level of safety because microorganisms are harmless to human being
- Cost reduction:
  - ✓ enables reduction of transportation cost and CO2 emission because garbage disappears on site

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

2) Technical Cooperation: e) others (proposal based program for Japanese enterprises)

(2) Description on How JICA ODA Support Scheme may be Utilized

Pilot activities are proposed to test the feasibility of this solution as public service by local governments in isolated or distant locations such as remote islands, mountains, etc. where waste management and processing are of potential issue.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

2) Technical Cooperation: b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

- Model price for elimination type microorganism machine:
  Main disposal machine for 1 ton: around 40 million JPY (including standard cost for installation work)
- equipment for cloud monitoring: around 4 million JPY
- annual operation and maintenance cost: around 3 million JPY
- cost for study of local situation: around 3 million JPY

5. Proof of Technology / Applicability in Developing Countries, etc.

Matter disposal machine are in use in Japan.

- 2014: In Tokyo Tsukiji market, 500kg processor was installed, has operated over four and a half years.
- 2018: In Tokyo Toyosu market, 300kg processor was installed, has been operating to date

6. Reference Information

Elimination type microorganism organic matter disposal machine>

- Uses microorganisms to treat and decompose organic wastes.
  - No spills, because waste will be extinct.
  - No waste water discharge, because water is not used.
  - Microorganisms are harmless to human being.
  - 1 ton garbage can be processed per day.

Rotten vegetable | Rotten fruit | Sludge | Garbage from fish
Dewatered sludge | Human waste | PKS
Animal faces | Carcasses of livestock | POME
EFB | Mesocarp fiber

IN

- ✓ After 24 hours, more than 99% of the waste becomes extinct, no need of removal.
  - ✓ or, remains can be used as fertilizers.
- ✓ No emission of dioxin, and CO2 will be reduced by more than 90%.

Universal Health and Civil Services Coverage in Developing Countries utilizing Child (1-5 years old) Fingerprint Technology

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [collection of child fingerprint]

2) Information Analysis and Decision Making (AI, etc.) [authentication of child fingerprint]

(2) Description

Confirmation of identity is required to accurately record and provide health and civil services. This proposal is to promote universal coverage by collecting and authenticating child (1 to 5 years old) fingerprints, providing high-precision authentication, which is not commonly available globally.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Example of health services: provides access to around 19.9 million children without appropriate vaccination. According to WHO/UNICEF, there are around 19.9 million children globally, mostly in developing countries, who do not have access to appropriate vaccination. This service is intended to solve the problem by enabling universal access to appropriate vaccination, thereby realizing health and growth opportunities for all children.
- Example of civil services: leaves no-one behind in providing civil services by issuing ID while citizens are still children. This service can be used by issuing and using national ID cards (which can be used as electronic mother and child health handbook, drivers' license, pension, election, medical services, tax payment, etc)

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: c) Grant Aid (sovereign)

(2) Description on How JICA ODA Support Scheme may be Utilized

We would like to use the service to formulate project with developing country governments.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

- Health services: unit price of AFIS system is around 500 million JPY (for 5 million IDs)
- Civil services (national ID): unit price of AFIS system is around 2 billion JPY (for 20 million IDs)

(Note)

AFIS stands for Automated Fingerprint Identification System (includes fingerprint authentication for both children and adults)

(Breakdown)

1) Hard-ware (fingerprint reading device, server storage, etc.)

2) Software (operating system, data base, AFIS application, etc.)

3) System integration (development, testing and training of system, etc.)
4) Maintenance services

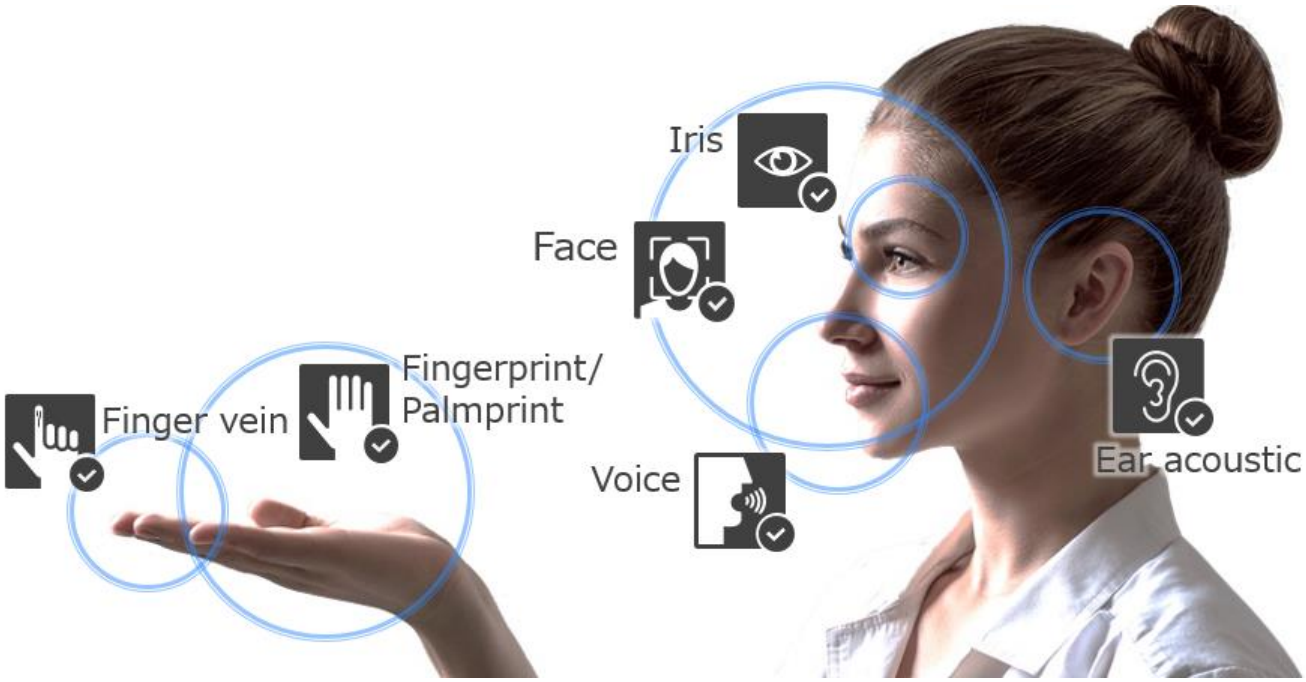
- Health services AFIS system unit price: around 500 million JPY (1) 200 million JPY, 2) 150 million JPY, 3) 50 million JPY, 4) 100 million JPY/year)
- Civil services AFIS system unit price: around 2 billion JPY (1) 800 million JPY, 2) 600 million JPY, 3) 200 million JPY, 4) 400 million JPY/year)

(Note)
Number of IDs refers to the number for registration and authentication. Cost varies by the number of IDs.

5. Proof of Technology / Applicability in Developing Countries, etc.

We are expecting technological pilots in Tanzania and Bangladesh in 2020. We have obtained world's No.1 assessment in a technological benchmark of US NIST (National Institute of Standard and Technology)

6. Reference Information



Harnessing Visual Media for Education and Raising Public Awareness

Building a "Learning Society" to Provide Universal Access to Education

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information searches and collection (IoT, etc.) (Using television, IP television, online streaming, and social media for education and raising public awareness)

(2) Description

This proposal aims to use multimedia to provide education and raise public awareness in the recipient countries, thereby contributing to their human and social development. Multimedia can be harnessed by developing educational videos and educational media archives.

Information ministries and public/national TV broadcasters would be the implementing agencies of this project. The objective is to develop a "Learning Society" that can provide universal access to education and continuous access to other information that is useful for human and social development. The expected outputs would include:

- Drafting strategies to harness educational media for social development
- Capacity building for counterparts engaged in the production of educational videos
- Production of educational videos of 3-10 minutes' duration harnessing information from a range of existing social development projects
- Educational videos through telecasts, online streaming, and public screenings
- Evaluation of these activities for fostering education and raising public awareness

Educational videos in this project could be produced in collaboration with various existing social development projects. Public/national broadcasters could be used to air such videos. They could also be streamed online via video-sharing sites and social media, which offer free access, and which attract large numbers of users.

2. Quantitative and Qualitative Benefits for Developing Countries

(1) Transforming the experiences and knowhow of various existing social development projects into visual resources, which will deliver education and other useful information to people who did not have access to it before

(2) Providing educational videos about healthcare, disaster prevention, environmental conservation, agriculture, learning, etc., on a constant basis via television and online streaming, which will change the way people think and act

(3) Transforming school content into videos that will improve the quality of education and learning

(4) Harnessing low-orbit satellite internet services, etc. to deliver high-quality education and learning opportunities in hard-to-reach areas, such as refugee camps, slums, and regions affected by conflict

(5) Educational videos that will provide people with knowledge, inspiration and confidence to improve their lives, and thereby foster greater social consensus and autonomous development

(6) Fostering human resources for producing, harnessing and evaluating educational videos for television and online streaming, thereby encouraging various media agencies to produce videos for social development

(7) Airing and streaming educational videos at very little cost

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

2) Technical cooperation: a) directly related to impact and efficiency of financial cooperation.
c) institutional capacity building.

(2) Description on How JICA ODA Support Scheme may be Utilised

(i) Conduct a development study or technical co-operation project with the implementing agencies, e.g.

information ministries, TV broadcasters.
(ii) Contribute to education and raising public awareness by collaboration with ODA projects in various fields (ODA loans, grant aid, technical co-operation).
(iii) Implement follow-up co-operation in terrestrial digital TV projects (ODA loans, grant aid).

4. Scale of the Project Type (Note: for reference purposes only. not a commitment that the proposed project type is implemented at this scale.)

(1) Rough Assumption of Cost

2) Technical Cooperation: d) around several 100 million JPY

(2) **Brief Justification of the Above Cost Assumption**

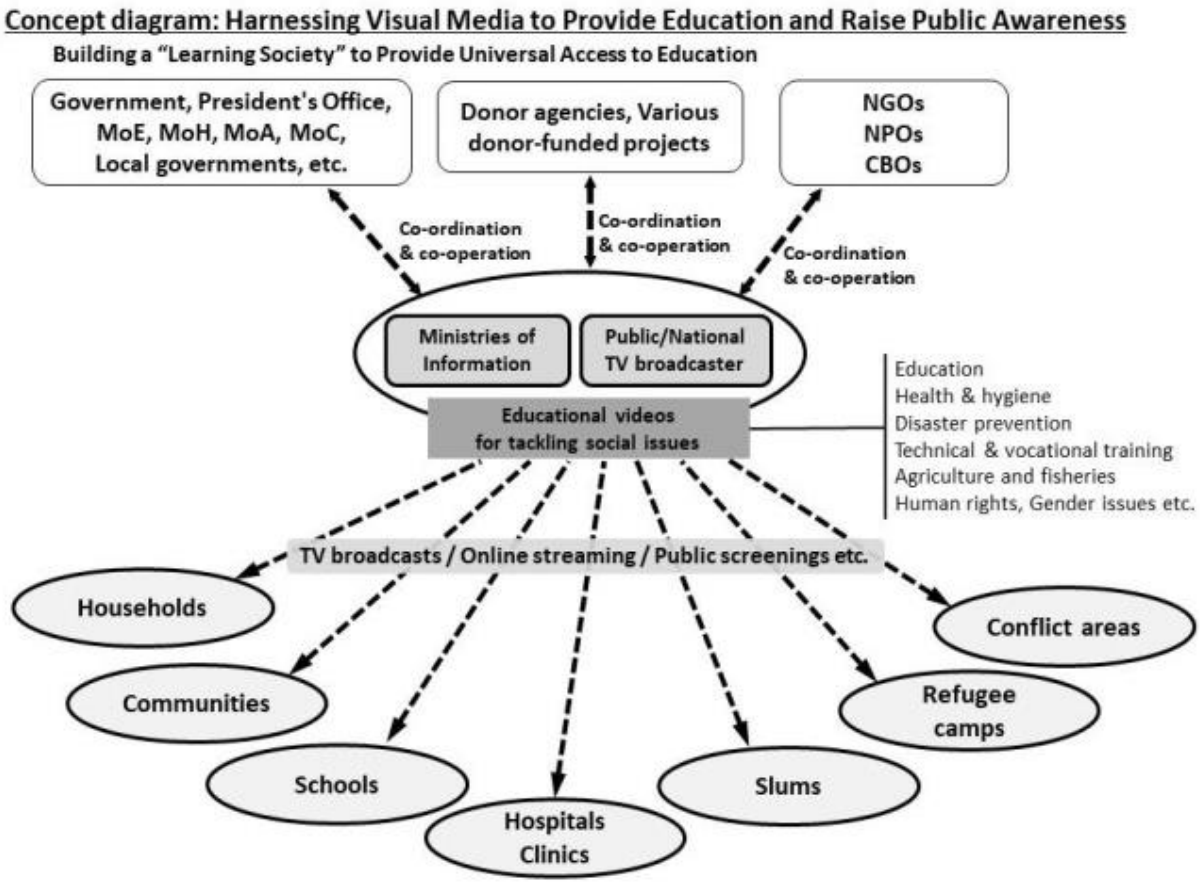
The cost of producing 15 to 30 educational videos and activities targeting all citizens to promote education and greater public awareness would total around 100 million JPY per year. If this project were to be implemented for three years, the total cost would be around 300 million JPY.

5. Proof of Technology/Applicability in Developing Countries, etc.

A similar project has already been implemented in Bangladesh, *viz.* Project for Support the Establishment of an Educational Television Channel (2015-2019). Surveys revealed that this project has contributed greatly to the nation's social development by the broadcasting, online streaming, and public screenings of educational videos about disaster prevention, healthcare, education and vocational training, agriculture, human rights, and gender issues, etc.

Low-orbit satellite internet services, which are due to be become available around 2021, will be able to provide broadband to every place around the globe. This project could provide small-sized antennas for satellite internet, Wi-Fi routers, personal computers, large-sized monitors, power generators, etc. according to the needs of each area.

6. Reference Information



Capacity Building Activities utilizing Digital Agriculture Platform

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [Storing and visualizing crop growing environmental data on a cloud collected by high-precision sensors]2) Information Analysis and Decision Making (AI, etc.) [realizing advanced agricultural education and early acquisition of technology and knowledge by utilizing AI analysis of acquired data and information based on scientific know-how]

(2) Description

This proposal is to a) conduct a human resource development workshop by utilizing obtained environmental data, crop information, and work record, together with plant science, b) contribute the systematization of Japanese cutting-edge smart agriculture practices, as well as autonomous operation and establishment in the local practices through the education, and c) promote human resources for the smart agriculture development with the capability of creating new jobs and employment, and play a part in preventive diplomacy to prevent low-income farmers from joining guerrillas for life in conflict areas. The main features are the following four points.

1) Development of an agriculture information platform using cutting-edge technologies (IoT, BIG Data, AI, etc.): The agriculture information system enables provision that can store systematically vast amount of information, such as environmental data, crop information, and cultivation information, utilizing the latest technologies.
2) Capacity building workshop and human resource development: Experts in agricultural science will offer workshops in IoT tools and applications used in local practices. This will lead to the development of skilled personals who can provide smart agriculture consulting services through data analysis and integration by AI, sophisticated cultivating techniques, learning visualized difference of crop environment, and understanding experience and intuition using scientific knowledge and scientific evidences.
3) Implementing solutions for sophisticated smart agriculture: This solution provides functions as “cultivation recipe” and “navigation to implement based on the recipe,” through provision of threshold value for various type of crops and different growth stages, in addition to algorithms to predict growing situation. The navigation presents “useful” information” provided by AI, such as “detailed cultivation procedures,” “harvest prediction,” “what to do now (or next)” based on expert knowledge and scientific evidence of plant science.
4) Transforming experience and intuition into “Documented Knowledge”: tacit knowledge, such as experiences and intuitions of experienced farmers can be formalized based on scientific evidence, which will be an essential data asset for the country and the region, because it will not only facilitate the use of know-how by experienced farmers easily, but also allows the transformation of scientific cultivation management into information.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

Improvements in productivity, technology transfer, sustainable production, and environmental protection are common global issues. However, by utilizing the above-mentioned advanced technologies and capacity building schemes based on plant science will enable a) quick learning of technological know-how and financial independence of farmers, b) stable and high-quality production, and c) nurturing human resource capable of providing smart agriculture consulting services, which are essential for digital transformation in the primary industry. This initiative also contributes to preventing low-income farmers from participating in anti-social activities for economic reasons by supporting them to be financially independent utilizing smart agriculture.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial Cooperation
   c) institutional capacity building, d) collaboration with local start-ups

(2) Description on How JICA ODA Support Scheme will be Utilized

- Capacity building as a part of financial cooperation project

- Local human resource development by training program under financial cooperation project, independent training program, or activities in collaboration with local start-ups

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumptionof Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: d) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

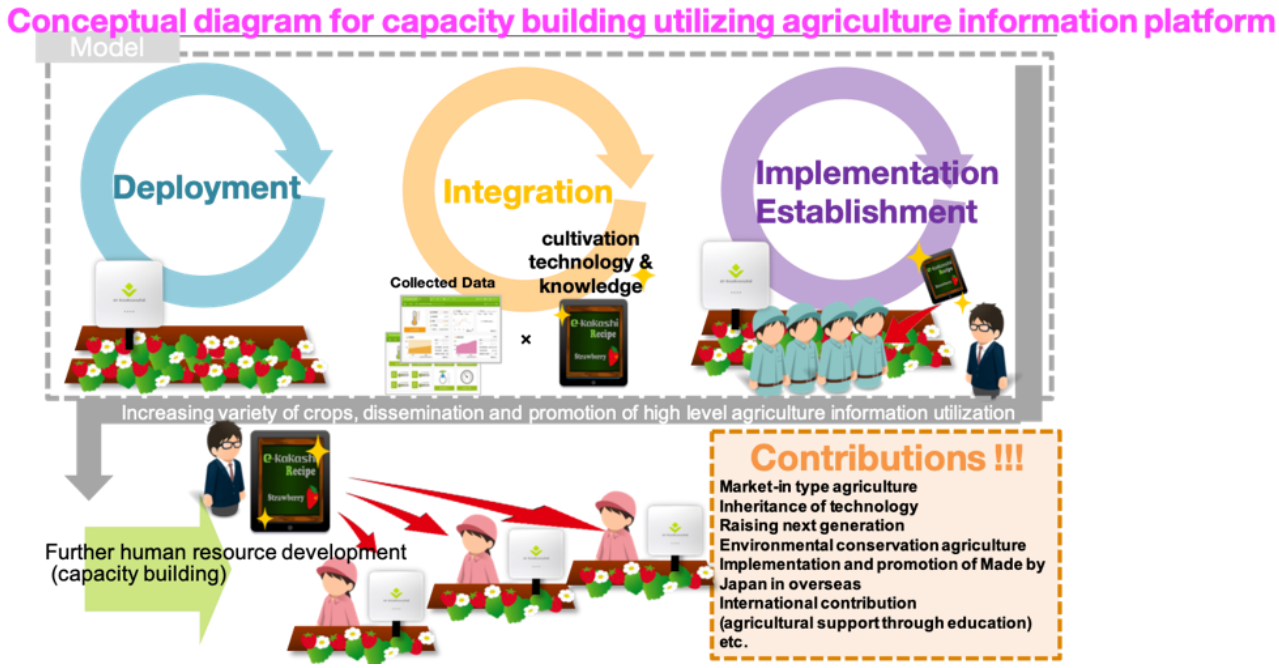
- It costs around 300 million JPY for the dissemination of technology to about 50 farms.
- It costs around 300 million JPY for human resource development activities targeting about 500 people annually at pilot implementation farms to create high added-value chain using agricultural information platform (after the second year, we aim to make profits based on the established high added-value chain)

5. Proof of Technology / Applicability in Developing Countries, etc.

In Japan, we have many domestic cases, including Munakata City, Fukuoka Prefecture. More than 90% of the projects and solutions introduced have been used beyond the project implementation period, for multiple years. In the Republic of Colombia, there are cases of introducing this solution, and multiple-year projects are ongoing since 2017.

- Equipment operation has been tested (communication function need to be verified for different countries)
- Multiple languages can be used (Japanese, English, Spanish, Chinese)
- Many experiences in awareness-raising activity (workshops) to local extension workers and farmers
- Experience in cooperating with international organization in agricultural research
- In Latin American countries, we have received multiple inquiries from producer associations, local governments and private sector interested in introducing this technology. In Colombia, there are local companies that can communicate in Japanese, and are nurturing local extension workers who can extend this solution in other Latin American countries.

6. Reference Information



AI Technology for Strengthening Security in Public Facilities (Airports, Railways, etc.)

～High-speed, efficient search and tracking of individuals based on big data from surveillance camera video, using non-facial features～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [high-speed people search using non-facial feature values]

2) Information Analysis and Decision Making (AI, etc.) [analysis of people's feature in collected video data]

(2) Description

This system enables high-speed search of individuals with similar features from video data filmed by street cameras, etc., using features of the target based on eyewitness information, etc. We can track the behavior of a particular individual by analyzing and searching video of multiple cameras (for example, identification of lost children, narrowing-down of suspicious persons, showing trace). This will support improving efficiency of operation to track down particular individuals, such as security companies.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Enhancement of safety in public facilities (airports, railways, etc.): We expect avoiding loss caused by closure and evacuation of leaving suspicious objects, etc. at airports, estimated at around 140 million JPY/year (assuming a middle-sized airport (number of users about 400 million/year, loss reduction of approximately 20%)
- Upgrading and improving efficiency of searching suspects by police, etc.: We expect earlier detection of criminals and restraining effect of terrorism activities, as a result of upgrading suspect searching operation by the police using this system

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)

2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
b) indirectly related to financial cooperation (same sector, etc.)

(2) Description on How JICA ODA Support Scheme may be Utilized

- We plan to provide the solution system as a package, in the form of a relatively small-sized project with an objective to strengthen physical security.
- We also would like to consider selling this solution as a component which upgrades and adds value to relatively large-sized project, such as introduction of rolling stock and signal system for railways.
- By implementing technical cooperation etc, we can conduct a survey and give consideration to how this solution might be utilized, eventually leading to relatively small-sized financial cooperation projects.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY

2) Technical Cooperation: b) around several 10 million JPY

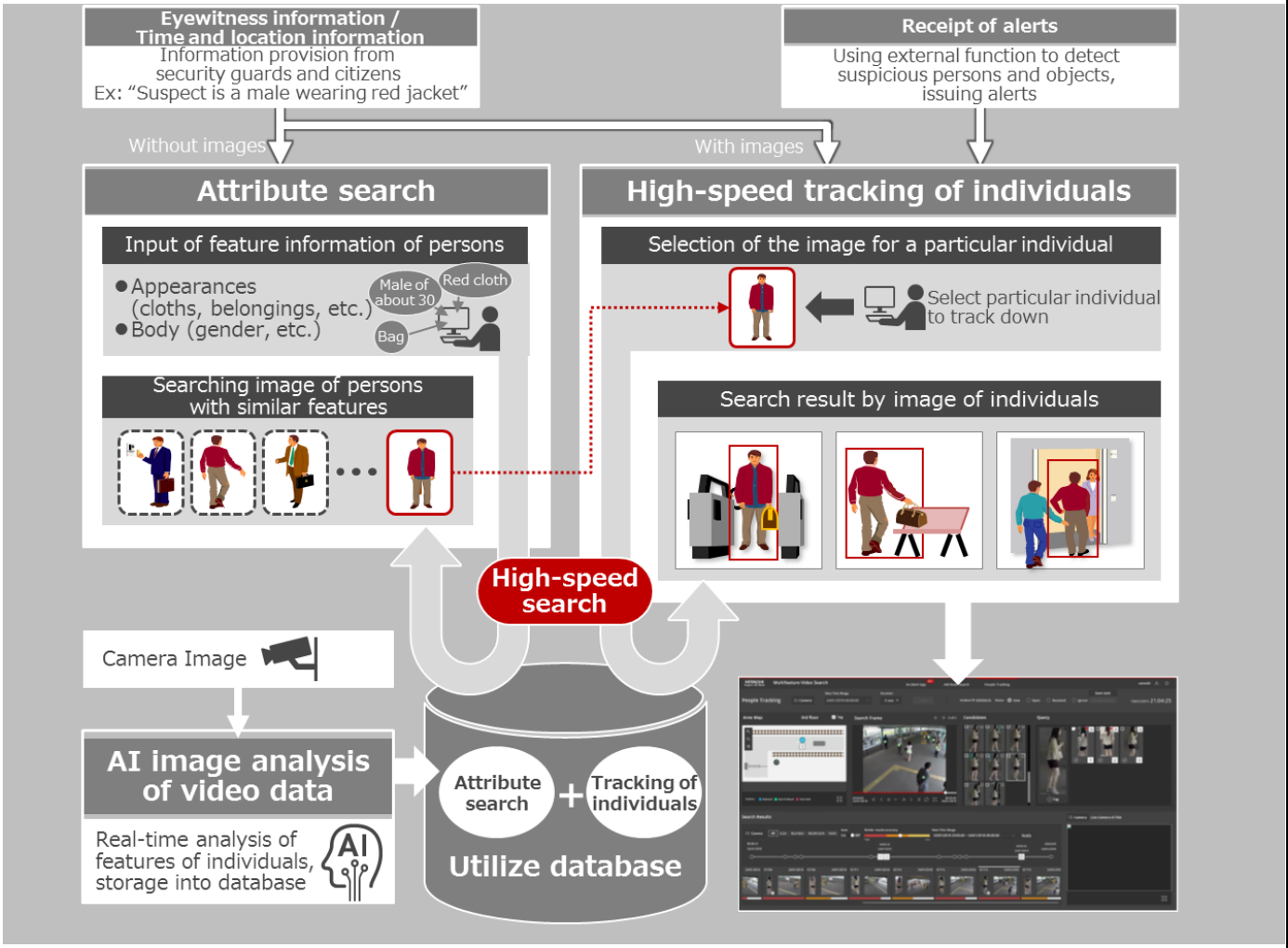
(2) Brief Justification of the Above Cost Assumption

Roughly speaking, it costs around billion JPY to several billion JPY, if incorporated into a railway project.

5, Proof of Technology / Applicability in Developing Countries, etc.

We have actual case under operation at commercial basis at an airport in Europe. We are now implementing multiple Proof of Concepts (PoCs) in multiple projects in ASEAN, Europe, etc.

6. Reference Information



Hybrid Renewable Power Storage System for Mobile Network Operators and Off-Grid Areas / Mini-Grids

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [collection of meteorological data (past several decades)]

2) Information Analysis and Decision Making (AI, etc.) [proposal for future use of predicted optimal power load based on past power load data]

(2) Description

This is a proposal on Hybrid Renewable Power Storage System, mainly for use by Base Tower Stations of Mobile Network Operators. The system can also be utilized as Hybrid Renewable Power Storage System for off-grid areas and mini-grids for community in rural area. It enables integrated operation and management by controlling output power, remaining charged power capacity of battery storage, generated power by solar panel, power supply from grid, generated power from diesel generators, remaining amount of fuel for generators, etc., all necessary calculated power load. The system can propose optimal use of power load by predicting a) future required power load based on actual used power load in the past, and b) generated power from solar panel based on meteorological data of past several decades.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Before and after comparison of diesel fuel consumption reduced 30 to 40 % in actual cases (depending on actual use of power load by clients).
- This system can be used in hybrid by combination with conventional and newly installed generators, solar panels, grids and power storage battery system. We will offer control equipment with full turn-key condition.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), b) Private Sector Investment Finance (non-sovereign), c) Grant Aid (sovereign)

(2) Description on How JICA ODA Support Scheme may be Utilized

In areas with low rates in electrification, the demands for this solution is very huge, although many clients face lack of funds. This system is technologically proven and already in use in developing countries. Therefore, this system is not in the stage for technical cooperation, but financial cooperation to implement concrete measures and projects.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: b) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

In the case of Base Tower Station of Mobile Network Operator, we expect a cost of around 10 million USD per operator, based on the assumption that cost for each Base Tower Station is roughly 60 to 100 thousand USD, and that each operator has about 100 Base Tower Stations, although these assumptions depend on the size of the operator.

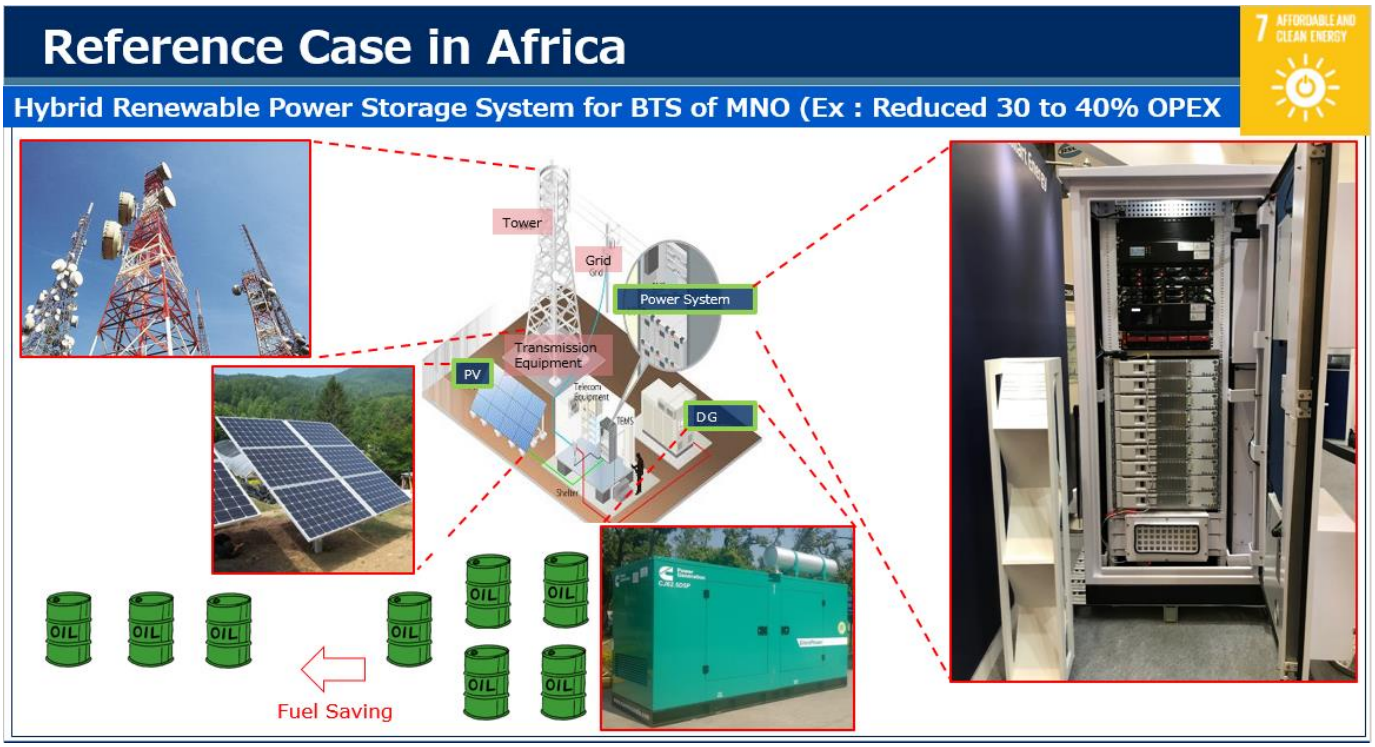
The above is cost for equipment only. The cost of installation work and training is roughly 10 to15% of the equipment cost, variable depending on the country, location, whether there is solar panel / diesel generator or not, etc.

Regarding the cost of operation, it totally depends on the services required by each client, and therefore to be quoted on a case-by-case basis.

5. Proof of Technology / Applicability in Developing Countries, etc.

- Already conducted trial of 770 Ah Hybrid Renewable Power Storage System in Kenya, from June 13, 2019 to October 30, 2019. Reduced more than 50% of cost after installation of Hybrid Renewable Power Storage System, including diesel fuel and transportation cost
- This system was installed and in operation for clients in Nigeria since 2017, and in South Africa since 2018

6. Reference Information



Emergency Warning Broadcast System (EWBS) using Digital Broadcasting Technology

～Technical Support for Development of Low-cost and Resilient "Local Inclusive Disaster Prevention Information Dissemination System"～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

4) Others [digital broadcasting technology ("One-segment" digital TV broadcasting and FM multiplex broadcasting ("visible" radio)]

(2) Description

This proposal is to build a mechanism to utilize digital broadcasting technology deployed in Japan ("One-segment" digital TV broadcasting and FM multiplex broadcasting ("visible" radio) (Note)) to send emergency disaster related information (text data) in unused spaces of television and radio broadcasting radio waves, and to transmit those emergency information by automatically activating receivers. This is made possible by embedding dedicated chips to constantly detect broadcasting radio waves in all kinds of communication device, including signage, siren, Wi-Fi headend, and in-house audio broadcasting. This method allows broadcasting radio waves to be used as public information transmission instrument during emergency, without being limited to existing contents of broadcasters that use receivers for television and radio services. Broadcasting radio waves have technical advantage compared to other device from the viewpoint of stable transmission of information during emergency, such as 1) no congestion, 2) robustness, and 3) wide service area. Additionally, information can be distributed from each relay station (roughly speaking, each relay station covers one prefecture in Japan), meaning that information for limited local areas can be handled. By specializing in text data, the structure is at low-cost and simple.

(Note) Latin American countries that adopted the Japanese system deploy "One-segment" TV system. FM multiplex system can be used after study of local regulatory conditions and technological development.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

Many developing countries require huge investment to upgrade telecommunication infrastructure, such as mobile phones, which often covers only a limited area and very fragile. On the other hand, broadcasting infrastructure exists in most countries as publicly used system, and its technical characteristics are similar across countries (robustness, wide service area). This proposal leads to huge reduction in investment cost for transmission (less than 10% of mobile network), as existing broadcasting network can be used by embedding EWBS multiplex device in the system. Operation of the system is very simple. Operational knowhow obtained through EWBS in Latin American countries can be easily shared with other countries, such as type of disaster prevention information (early warning, follow-up information after disaster, etc.), target areas (nationwide, regional, local), mode (actual disaster, training, testing of equipment, etc.), and diversity of receiving instrument (personal television, signage in public areas, etc.). Therefore, it is expected that this system can be developed in a short time-frame and deployed inclusively.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

2) Technical Cooperation: c) institutional capacity building,
e) others (technical cooperation project to introduce and implement EWBS)

(2) Description on How JICA ODA Support Scheme may be Utilized

Technical support for providing transmitting multiplex instruments and receiver instruments (chip, signage, etc.), and knowhow to utilize these instruments in the initial stages, plus additional support to help developing countries learn operating the instruments and expand coverage of receivers. After developing countries are

trained to operate the system on their own, they can contract with the private sector to purchase and install further instruments (expanding coverage of EWBS multiplex instruments and receiver chips, etc.).

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

2) Technical Cooperation: 5-50 Million JPY

(2) Brief Justification of the Above Cost Assumption

a) Study of local conditions for FM multiplex requirements (includes study on competing European technology) , technological development (multiplex instruments and receiver chips), and installation pilot experiments require around 50 million JPY

b) Continuation of technical support to countries that have supported Japanese terrestrial digital broadcasting technology cost around 5 million JPY per country

c) EWBS introduction support in countries which are new to Japanese terrestrial digital broadcasting technology cost around 20 million JPY per country (including technical support for dissemination, piloting and follow-up of operation by providing around 10 units of EWBS multiplex instruments and receivers)

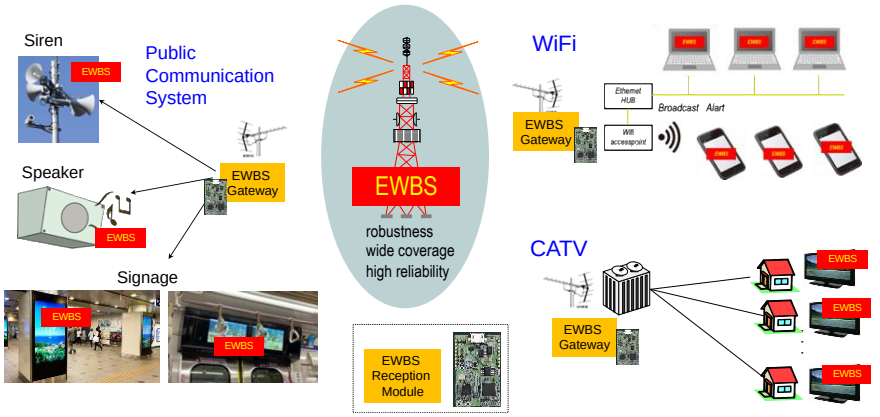
d) EWBS introduction support in countries which are new to Japanese FM multiplex system cost around 20 million JPY per country (including technical support for dissemination, piloting and follow-up of operation by providing around 10 units of EWBS multiplex instruments and receivers)

5. Proof of Technology / Applicability in Developing Countries, etc.

Pilot experiments for EWBS utilizing “One-segment digital TV broadcasting technology have been implemented in Latin American countries (such as Peru and Costa Rica) that adopted Japanese system (ISDB-T), by using funds from Ministry of Internal Affairs and Communication, Japan. In Peru, government agency in charge of disaster prevention decided to purchase 400 units of signage receivers from Japan. It is expected that receivers such as chip-embedded sirens and set-top-boxes will be installed by the Peruvian authorities, through purchase of instruments from the local market.

Regarding EWBS using FM multiplex broadcasting, it is expected that feasibility studies will be conducted in 2020 to understand the local conditions in Southeast Asia and the Pacific Islands, with an aim to implement early technological development of instruments. It is expected that knowhow for EWBS under digital TV broadcasting system will be utilized for this technological development. After successful technological development, we plan to conduct dissemination pilot projects in developing countries throughout the world.

6. Reference Information



Disseminating emergency information through existing communication system by utilizing technological advantage of broadcasting radio waves

EWBS system of “One-segment” digital TV broadcasting demonstrated in a broadcasting exhibition event in Brazil (August 2019)

Preliminary Study for Designing Smart Buildings

～Digital Technology Driven Low-Carbon, Energy-Saving Type Building Management～

1. Summary of Applicable Digital Technology and Method
(1) Type of Digital Technology and Method 1) Information Search and Collection (IoT, etc.) [IoT] 2) Information Analysis and Decision Making (AI, etc.) [AI] **(2) Description** In developing countries, we assume that the importance of improving efficiency through integration of maintenance work and facility management, in addition to prediction of malfunctions, will increase in order to achieve efficient use of resources and energy. Additionally, functions of user authentication and service related to building management, and data control and data analysis, would be the foundation to support the comfort, workstyle, and work efficiency of people who use the building. Utilization of digital technology, such as IoT, AI and data management, will be the key in this context. This proposal is to support designing plans in view of achieving industrialization and innovation of user-friendly buildings, by enabling shortening the time required for building the infrastructure development and making sure that the intended impact is delivered. Preparation of a reference architecture (such as security, authentication, data collection and management function) comprised of proven technologies before starting the design work will help to achieve these targets.
2. Quantitative and Qualitative Benefits for Recipient Developing Countries
➢ Enables to design highly effective and feasible plans by incorporating a reference architecture, which is a collection of proven technologies being used mainly by private enterprises over 5 years. ➢ Offers an effective measure against global warming solution by maximizing energy optimization while maintaining optimal environment of buildings, through linking the BEMS “Building Energy Management System”, which is a system to manage the entire building by utilizing IoT, with various facilities inside the building. Reference of private enterprise that applied a reference architecture have reduced their energy consumption by about 20%. This indicates that similar impacts can be expected by applying this architecture. ➢ Realizes a high-level security by enabling detection of intrusion by suspicious persons, by linking with surveillance cameras, various sensors and entry and exit management information. ➢ Expects increased productivity of building maintenance and space utilization by efficient detection and assessment of equipment malfunctions, prevention of malfunctions, equipment lifecycle management of equipment, and real-time monitoring, which are made possible with introduction of BEMS.
3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)
(1) Type of JICA ODA Support Scheme 2) Technical support and research: e) others (Preliminary study for designing smart buildings) **(2) Brief Description on How JICA ODA Support Scheme may be Utilized** Assumed to be carried out either a basic study or project research.
4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)
(1) Rough Assumption of Cost

2) Technical support and research: b) around tens of millions of JPY

(2) Brief Justification of the Above Cost Assumption

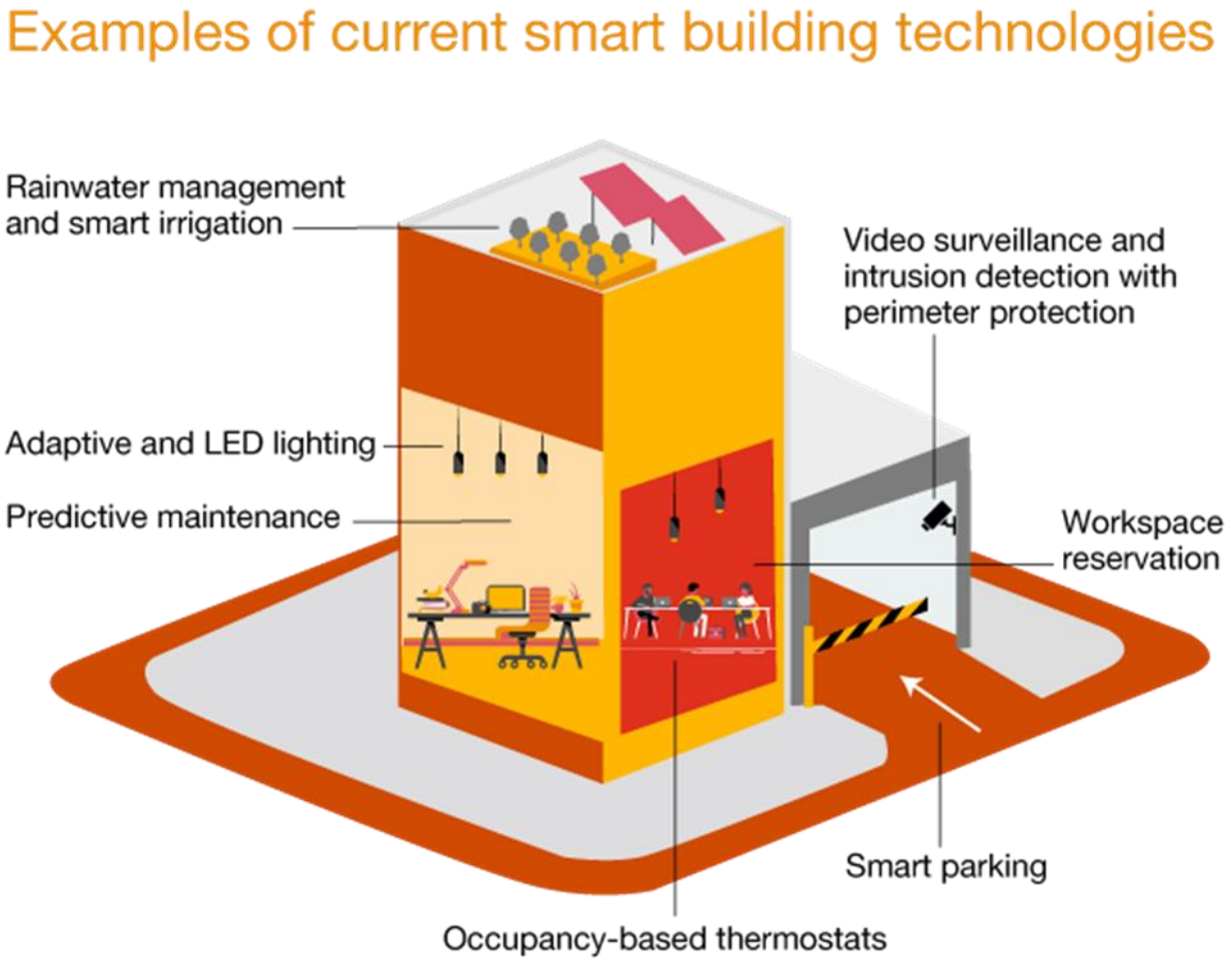
We assume 2.5 to 3.5 members to work around 6 months.

5. Proof of Technology / Applicability in Developing Countries, etc.

The reference architecture has practical experience and case studies for private enterprises around the world including Japan.

- For private companies in the United States: Preventive maintenance and energy management by analyzing equipment data for over 160 buildings
- For private enterprises in Japan: Preventive maintenance and energy management by analyzing equipment data of over 60 buildings.

7. Reference Information



Air Traffic Control and Navigation System

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [sensor, data processing, user-friendly human machine interface]

2) Information Analysis and Decision Making (AI, etc.) [various safety net functions]

(2) Description

This proposal provides various airport surveillance solutions in full turnkey condition.

1) ASR/SSR (Airport Surveillance Radar / Secondary Surveillance Radar): airport surveillance radar equipment using latest technology that provides stable and clear radar information regarding enroute and approach control airspace for air traffic controllers after a) obtaining necessary information for air traffic control (such as information on range, azimuth, elevation, and aircraft identification) based on reflected wave from aircrafts to primary radar and response signals from aircrafts responding to inquiry signals from secondary radar, and b) signal processing such as reduction of clutters and interferences. Research is underway to develop and add next-generation function to detect signs of malfunction using AI, in order to enhance availability and efficient supply of spare parts, etc.
2) ARTS (Automated Radar Terminal System): data processing system to manage and display integrated information necessary for use by air traffic controller. It connects with various sensors (such as ASR/SSR, ADS-B (Automatic Dependent Surveillance - Broadcast)), flight plan management system, meteorological system, etc.
3) ILS (Instrument Landing System): high-quality instrument landing system that directs accurate runway approach course to aircrafts for safe landing. It enables safe landing even during poor visibility.
4) TRCS (Transportable Radar Control System): backup system when airport radar system cannot be used due to emergency disaster and replacement. It has detection ability equivalent to fixed radar equipment at airports, but portable and transportable using middle-sized trucks, transport aircrafts and helicopters, installing ASR/SSR and ARTS in small-scale shelters.
5) DVOR/DME (Doppler VHF Omni-directional Range / Distance Measuring Equipment): highly reliable navigation radar equipment that stably provides accurate location information to aircrafts. It comprises of DVOR equipment that provides azimuth information to aircrafts, and aviation signs made up of DME equipment that provides distance information.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

1) Reducing aircraft accidents through enhancing safety
2) Reducing work load of air traffic controller
3) Increasing flight traffic volume (such as flight in rainy weather, creating space for new airlines)
4) Increasing income of airports
5) Increasing tourism inbound

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation

(2) Description on How JICA ODA Support Scheme may be Utilized

To implement supply of equipment and technical transfer regarding operation and maintenance methodologies using ODA Loan and Grant Aid

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY to b) around several billion JPY
2) Technical Cooperation: a) around several million JPY

(2) Brief Justification of the Above Cost Assumption

1) Financial Cooperation: assumes turnkey contract (including training) for a set of necessary equipment (individual equipment can be provided separately on demand). Cost will depend on the required composition of the system, ranging from around several 100 million JPY to around several billion JPY
2) Technical Cooperation: assumes on-site training, dispatching 2 experts for about 1 month

5. Proof of Technology / Applicability in Developing Countries, etc.

Recent contracts implemented: 2013 (Nepal, Laos), 2014 (Myanmar), 2015 (Bangladesh), 2016 (Malawi, Philippines, Kirgyz), 2017 (Nepal), 2019 (Myanmar)

6. Reference Information

Development of Digital Agriculture Cooperatives in Developing Countries

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [digital bank for farmers, e-commerce of agricultural products]

2) Information Analysis and Decision Making (AI, etc.) [AI credit using agricultural product as guarantee, dynamic pricing, share-drive of agricultural product]

(2) Description

- Banks find it difficult to meet constant financial needs in the agriculture sector using existing business model (establishing branches and bank clerks near the clients) due to high cost, particularly in developing countries. This makes it difficult to end poverty for farmers who are forced to procure seeds before cultivation using finance provided by regional middleman at a very high interest rate. Farmers also have no access to financing for purchase of agricultural machines, resulting in manual cultivation at low productivity. Middleman also use their bargaining power to buy agricultural products at a very low price.
- In order to solve these problems, we propose to introduce a) digital bank for farmers, which meets financial needs by farmers in developing countries through FinTech using AI etc., providing unmanned banking service without large-scale infrastructure. We also propose increasing sales price of farmers and provision of opportunities to easily purchase safe and fresh agricultural products to consumers at a reasonable rate, by b) newly implementing online matching (e-commerce of agricultural products) based on the bargaining power gained from institutionalizing group of farmers. Additionally, we propose to make logistics more efficient by c) introduction of share-drive of agricultural products, and d) purchase price guarantee mechanism for farmers using dynamic pricing.
- We aim to formulate online community to connect farmers through dedicated SNS, by developing and providing smart phone applications installing a) through d) above.
- Our goal is to realize leap-frogging in empowerment of farmers, by efficiently and instantly increasing income of farmers in Southeast Asia at once. We further aim to establish cold-chain at localized price levels, by using traceability function of agricultural share-drive to realize repeated use and recycle of low-cost cooling materials. In 10 years, we hope to raise income of farmers in Southeast Asia to a level equivalent to developed countries, by introducing agriculture cooperative service, and obtaining around 10% of the market share using this platform. We then plan to utilize the system to other regions including Africa.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- There are financial institutions providing agriculture finance, other than regional middleman offering the same at a very high interest rate. In many cases, these institutions require cashable collateral such as land, making it difficult for most farmers to access. This solution proposes to use crops as collaterals, by managing the credit risk by utilizing AI, and thereby providing a service accessible by many farmers.
- Agriculture share-drive has function to enable unified shipping of products from multiple farmers, in addition to combining multiple transportation means to meet single shipping needs. This allows shortening of transportation and idling time, reduction of transportation cost, and increasing income for drivers by providing additional opportunities of transportation services. By distributing economical cooling material to drivers and managing/recycling the distributed materials based on agriculture share-drive, it may be possible to establish cold-chain at localized price level. If we combine dynamic pricing of consumption price prediction with this agriculture share-drive, farmers can sell directly to retail stores and consumers as transportation means will be provided through agriculture share-drive. Similarly, by combining dynamic pricing with

agriculture share-drive, we can offer purchase price guarantee to farmers. These elements will enable development of digital agriculture cooperatives.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: b) Private Sector Investment Finance (non-sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation b) indirectly related to financial cooperation (same sector, etc.), c) institutional capacity building, d) collaboration with local start-ups

(2) Description on How JICA ODA Support Scheme may be Utilized

1) We aim to offer lower interest rate to farmers by using JICA funds as source for finance to farmers.
2) We plan to utilize technical cooperation to cover the cost for development of technologies, such as applications, farmer awareness raising activities, agriculture technical training, etc.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: d) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

1) Financial Cooperation: We assume lending to several 10 million people, with a total loan amount of around several billion JPY in several years. In 3 years time, we aim to achieve outstanding loan and annual transaction amount of around 300 million to 1 billion JPY for a) digital banking for farmers, and b) e-commerce of agricultural products, respectively. Additionally, we assume a total development fee of around 60 million JPY as smart phone application equipped with the function of d) dynamic pricing and c) agriculture share-drive, in addition to a) and b) above.
2) Technical Cooperation: We aim to operationalize and upgrade agriculture share-drive and dynamic pricing, at a development cost of around 60 million JPY in 3 years.

5. Proof of Technology / Applicability in Developing Countries, etc.

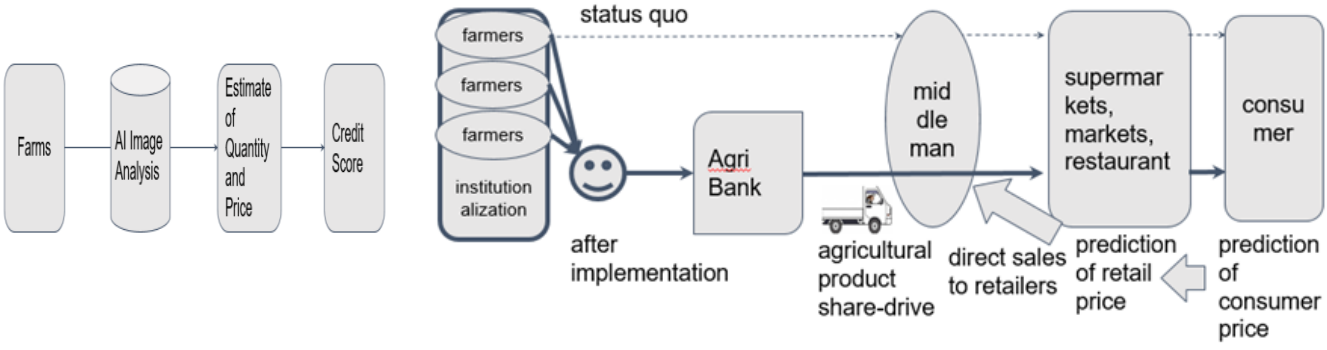
Methodology to quantify quality and quantity of agricultural products, using AI analyis of crop images, is being utilized by national agriculture insurance company in India for assessment of insurance payment and risk management. We have no experience in actual application, and are planning to start a pilot in the Philippines from early part of 2020.

6. Reference Information

Conceptual diagram

a) digital bank for farmers

b) agriculture share-drive and d) dynamic pricing, and combination of b) e-commerce of agricultural product



Telematics Dash Camera for Establishment of Comfortable and Safe Road Transportation System

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [collection of information regarding vehicle location, speed, driving behavior, etc. using on-board dash cameras with telematics]

2) Information Analysis and Decision Making (AI, etc.) [detection of reckless driving behavior, preparation of daily report on each driver]

(2) Description

This proposal is a solution to support vehicles and drivers regarding the following aspects, by obtaining various real-time data on reckless driving, occurring of accidents, driving situation etc. by installing telematics-enabled dash cameras on board vehicles (automobiles including commercial vehicles such as buses and taxis).

1) Inspection of irregular activities by confirming the driving route
2) Improvement of response to accidents by confirming reckless driving and details of accidents
3) Reduction of accidents through supporting training for safe driving, based on confirmed driving skills

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Enhanced operational efficiency: better utilize unused vehicles, inspect driver truancy
- Reduced vehicle cost: prevent accidents by enhancing the driving skills of drivers and prevent thefts of car accessories etc. of enterprise-owned vehicles.
- Enhanced fuel efficiency: promote eco-friendly driving by enhancing the driving skills of drivers, inspect non-compliant use of enterprise-owned vehicles
- Enhance value-add of enterprises providing transportation services such as trucking: differentiate from competing companies by offering more “comfort and safety” by reducing accidents

(Actual case) In the case of a client in Japan who introduced the system in 50 enterprise-owned vehicles, the number of accidents decreased by 75%, leading to insurance payment reduction of 2 million JPY/year and fuel payment reduction of 1.9 million JPY/year.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA schemes are not applicable)

(1) Type of JICA ODA Support Scheme

2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation

(2) Description on How JICA ODA Support Scheme may be Utilized

This system may be utilized in a technical cooperation or financial cooperation related support. For example, contribution to the establishment of a comfortable and safe system can be demonstrated by pursuing pilot activities to install the system on board commercial vehicles such as buses, taxis and enterprise-owned vehicles, under road construction projects (financial cooperation) or the preparation of an urban transportation masterplan (technical cooperation).

4. Scale of the Project Type (Note: for reference only. Not a commitment that the proposed project type will be implemented at this scale)

(1) Rough Assumption of Cost

2) Technical Cooperation: around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

- Breakdown of sales price image to an enterprise owning vehicles: rough project size for service to 10,000 vehicles is several 100 million JPY for the cost of dash camera with telematics, and several 100 million

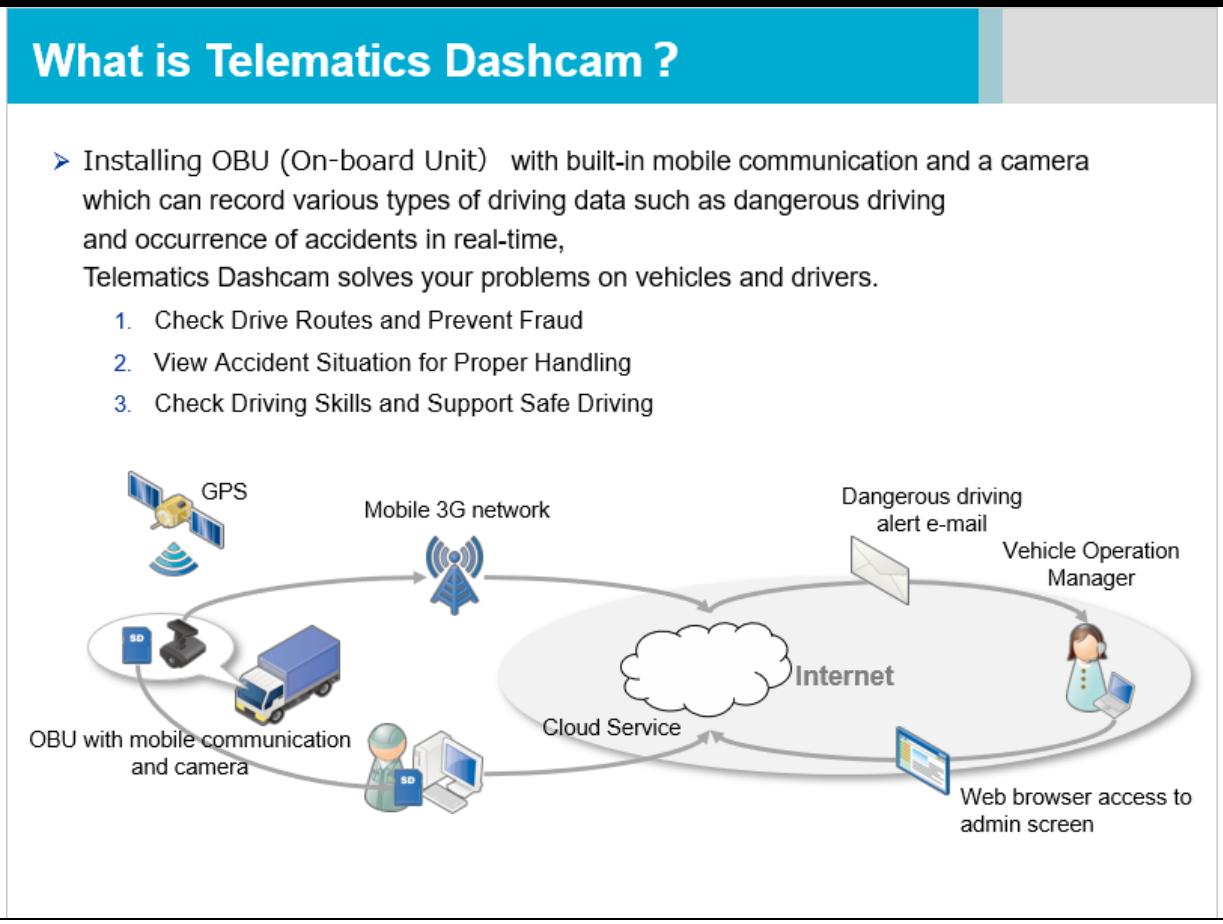
JPY/year for providing related services

- Assumptions
  - A local service provider will be required in the country where the service is provided. We will sell re-licensing rights regarding the solution to the local service provider.
  - The local service provider must operate and maintain its IT infrastructure (we can provide the required know-how)
  - The local service provider must procure the dash camera on its own (we will disclose the specifications)
  - The beneficiary country needs to have a mobile network of 3G or higher.
- Breakdown of initial investment
  - Localization of application (if necessary)
  - Installation of IT infrastructure (server, middleware, application and network) and environmental setup
  - Upgrading to new versions of the application program in order to meet the requirements of the version of operating system (OS) and middleware
  - Procurement of dash cameras
  - Following activities to procure dash cameras locally:
    a) Signing contracts with the local roaming operator, and securing the communication network through internet VPN between the roaming operator and the IT infrastructure
    b) Obtaining a certificate of conformity to local laws and regulations for radio, with regards to the dash camera

5. Proof of Technology / Applicability in Developing Countries, etc.

We have an actual case of supporting the safe operation of a pick-up service for an Indonesian enterprise in the tourism sector. We have also conducted a technical pilot for a long-distance bus company in the Philippines.

6. Reference Information



Traffic Control System during the era of CASE

（Connected, Autonomous, Shared/Service, Electric）

～Traffic Situation Prediction done by AI through Fusion of Vehicle Probe Data and Infrastructure Sensor Information （Currently under R&D）～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

2) Information Analysis and Decision Making (AI, etc.) [Alleviation of traffic congestion through traffic control system using AI]

(2) Description

Rapid increase in the number of vehicles due to economic development are observed in many developing countries and a large scale traffic jam is becoming a big social challenges to those countries, especially in urban areas. One solution to this challenge is Traffic control system. The traffic control system contributes to the alleviation of traffic congestion by optimally controlling the traffic signals installed at each intersection based on the analysis of traffic information collected from various vehicle detectors installed on the road. It has actually been effective in urban areas of developed countries and some developing countries. On the other hand, in order to maximize the effect of the traffic control system, it is important to accurately grasp and predict the current traffic situation and outlook. Therefore, in this proposal, we'd like to introduce technology, currently under R&D, of AI learning the correlation between the information of the vehicle detector and the probe data. When this traffic control system is introduced at a certain area, AI will estimate traffic congestion length of the covering areas without using detectors and realize the effect of reducing traffic congestion by achieving signal control which is greater than or equal to the case where sensors are installed. Following activities are specifically planned.

① AI learns the correlation between vehicle probe data (≒Information about vehicle position and its' travel path) and infrastructure sensor data near intersection.
② By applying AI (through 1)), traffic situation of the area where infrastructure sensors are not installed can be predicted using the real-time vehicle probe data and infrastructure sensor data.
③ Through a traffic control system which utilizes the AI forecast information, it is able to alleviate large-scale traffic congestion in urban areas of developing countries.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

① Regarding the effect of reducing traffic congestion in urban areas which is expected through the introduction of a traffic control system, for example, in the system which was introduced at Phnom Penh, Cambodia, the effect of "average travel speed of 12.5 km / h → 14.2 km / h" was expected at the pre-evaluation stage.
② Since the technology to be adopted in this proposal is under R&D, there is no content of quantitative effects which can be explained to the public at the moment, but it is expected to enhance the effect of the conventional traffic control system.
③ Depending on the amount of probe data and budget, there is possibility that signal control system with close control level as that of general system in Japan (control based on vehicle detectors) could be developed.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation

(2) Description on How JICA ODA Support Scheme may be Utilized

1) Procurement of the Equipment and related Traffic Control System (including AI forecasting equipment) to urban areas of developing countries through realization of Grant Aid Project is recommended. Afterwards, if ODA Loan project and/or commercial-based business would be realized, it can lead not only to solving social issues, but also to establishing a Japanese-style traffic control system widely in related countries.
2) Conduction of a trial experiment of AI forecasting at the preliminary survey stage is recommended and

expected. However, it is necessary to decide concrete experiment content through discussions amongst relevant parties, by taking into account of content of the probe data which is actually available in the relevant country.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: b) around several billion JPY
2) Technical Cooperation: c) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

1) 1 to couple of billion JPY scale of Grant Aid or ODA Loan projects are ideal for an installation of traffic signal lights (Note 1) at 50-200 major intersections, traffic control center equipment, probe data relate equipment (Note 2), equipment necessary to make forecasts through AI, and provision of related training,
   (Note 1) If there is a lack of probe data, installation of vehicle detector for complement is recommended.
   (Note 2) A device which converts the data obtained from the probe data provider into contents that can be used by the traffic control system.
2) Experiment with traffic signal lights and a simple signal control server installed at several intersections (up to around 200 million JPY).

5. Proof of Technology / Applicability in Developing Countries, etc.

① In Japan, the system has been installed to all prefectural police departments, one of which is the world's largest Metropolitan Police Department traffic control center. Furthermore in overseas, installation of traffic signals to 115 intersections and traffic control center in Phnom Penh, Cambodia, was completed in 2018 and they are under operation now.

② A trial experiment of public bus priority control by traffic control system using probe data is on-going in Phnom Penh.

③ Japanese traffic signals were also installed in Yangon, Myanmar as a pilot project.

6. Reference Information

System for Non-contact Debris Flow Detection utilizing Visual Image Analysis Technology

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [visual image obtained from CCTV camera]
2) Information Analysis and Decision Making (AI, etc.) [debris flow detection system utilizing visual image analysis]

(2) Description

Globally used debris flow detection technologies include wire-type and shock sensors, but there are some difficulties for their maintenances and accuracies: wire-type sensors need re-construction after being cut, and detection by shock sensors are often not reliable against falling rocks, etc. Additionally, contact-type sensors could be deteriorated as a result of damage and burial by debris.

Further enhancement of debris flow surveillance is possible by automatic analysis and effective utilization of visual images from CCTV cameras installed in mountain streams and check dams. This proposal is to provide a system contributing to strengthening of emergency management through development and establishment of a non-contact mechanism to instantly and accurately detect debris flow from visual image analysis utilizing CCTV cameras, etc.

This system enables accurate and real-time debris flow detection by using PIV (Particle Image Velocimetry) method to identify locations where continuous down-flow vectors are detected.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Quick installation of the system, if there are suitable locations to set the cameras.
  Monitoring camera and router for communication: from around 800 thousand JPY / set
  Cost for system designing and development: from around 15 million JPY (varies depending on the size of the facility)
- Repeated detection once equipment is installed on site, because of its non-contact nature. Detection by this system is at high accuracy compared to other technologies, because it judges debris flow based on detection of debris volume over a certain criteria within a predetermined timeframe.
- In a pilot experiment, image subtraction method, which is one of the processing method using visual images, made 73 errors in a 100 minute video caused by rain drops, etc., while detecting debris flow intermittently, not continuously. This PIV method only made 2 errors in a 100 minute video prior to the occurring of debris flow, ad accurately detected debris flow without interruption.
  (Note) Image subtraction method: a method to detect objects by comparing and taking the difference between original visual image and newly imported image.
- Monitoring of the site situation is possible anytime, anywhere, because the moment of detection is recorded visually.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
   b) indirectly related to financial cooperation (same sector, etc.), c) institutional capacity building,

(2) Description on How JICA ODA Support Scheme may be Utilized

- ODA Loan: introduction of the system and implementation of related human resource development
- Utilizing technical cooperation project strengthen capacity of river basin disaster management through pilots and trainings, and subsequently deploying on-site permanent surveillance system in mountain streams where debris flow may occur frequently under grant aid project.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: d) around several 100 million JPY

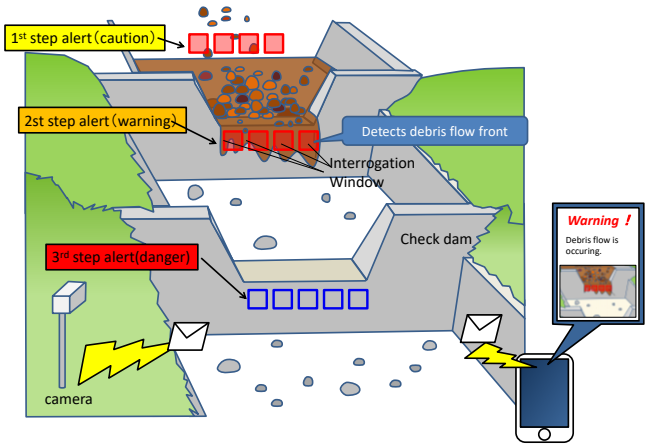
(2) Brief Justification of the Above Cost Assumption

a) Cost for equipment (camera, router for communication, etc.): from around 800 thousand yen / set (cost will increase at the same rate as the number of sets)
b) Cost for system installation (design and development): from around 15 million JPY (varies depending on the size of facility)
c) Other costs (logistics, measurement, environment for supply of equipment): around several 10 million JPY (depends on the scope of project)
d) Cost for technical and operational training: around several 10 million JPY (depends on the scope of project)

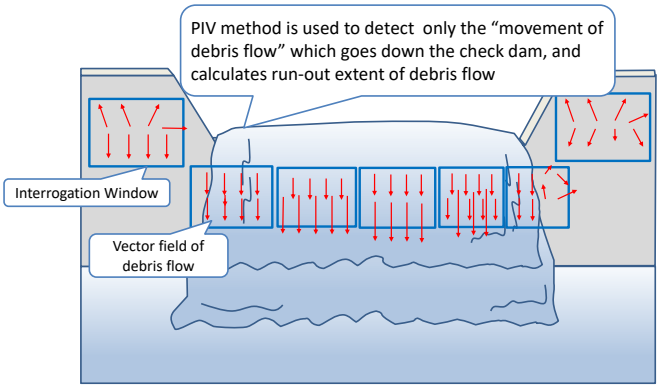
5. Proof of Technology / Applicability in Developing Countries, etc.

We have experienced of actual cases in Japan. This system can be deployed anywhere in the world, if there is suitable environment, such as space to install camera equipment, power supply, night-time lightings, mobile network radio waves, etc.

6. Reference Information



<Example of step-wise alert issuance>



<Detection method of debris flow>

<Example of system display>

Utilizing AI to Transfer Skilled Expert Knowledge for Material Processing Industry Operation

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [collect sensing data to instruct optimal production condition by combining with AI utilized skilled expert knowledge]
2) Information Analysis and Decision Making (AI, etc.) [inheriting knowledge and thinking process of skilled experts to next generation utilizing AI]
3) Actions (Robots, etc.) [sorting robot based on combination of image analysis technology and skilled expert knowledge AI]

(2) Description

We have developed a technology to transfer skilled expert knowledge utilizing AI, based on our experience of "technology and skill inheritance consulting services" for the manufacturing industry. These services were intended to enhance productivity by digitalizing production activities, utilizing AI to inherit the skilled expert techniques in manufacturing and material processing industry, which Japan has excelled in over many years. Unlike big data type AI which uses massive amount of data, the advantage of this AI is to present solutions with only a limited amount of data, because skilled expert thinking is used as supervised data.

1) We can provide applications that recommend solutions by developing IoT "brain" resin mold based on the viewpoint of skilled experts and linked to IoT platform, and by verbalizing real-time sensing data from the perspective of skilled experts. They can be used to remotely instruct production activities in overseas factories.
2) We provide useful knowledge derived from the experiences of skilled experts, by entering key words into the AI we have developed. By substituting AI for skilled experts, we enable inheritance of technologies and skills to the next generation, which required years of human resource development in the past. Additionally, starting from this fiscal year, we plan to start digital webcasting to distribute general industrial knowledge. We aim to contribute to nurturing technology professionals in developing countries, through provision of a wide variety of contents.
3) We also contribute to productivity enhancement in manufacturing, by combining image analysis technology. For example, by using AI based on the ability of skilled experts to check the degree of wear of metal processing tools, we have started provision of "automatic detection system of processing tool wear" that allows robots to automatically ship and sort processing tools. This will not only allow reduction of human labor for tool sorting exercise, but also level the result of tool sorting activities and contribute to reduction in the total number of tools required.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- We can contribute to nurturing next generation of technology professional by incorporating the knowledge of skilled experts and technical workers into AI, using our consulting know-how and system development technology using AI, which we have many experiences in Japan.
- We can contribute to improving efficiency in the manufacturing industry and sustainable growth, by combining skilled worker based AI and IoT technology. The "automatic detection system of processing tool wear" has achieved a matching rate of 90% against the decisions made by skilled experts. This contributed to better utilization of processing tools and reduction of defective products, resulting in cost reduction of around 4.8 million JPY annually in a factory producing resin molds with 58 workers (as of March 2020) under one of our group companies.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: b) Private Sector Investment Finance (non-sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation b) indirectly related to financial cooperation (same sector, etc.), c) institutional capacity building, e) others (study on partnership between developing countries in material processing industry, and study on nurturing local technology

professionals in material processing industry)

(2) Description on How JICA ODA Support Scheme may be Utilized

Starting from this fiscal year, we plan to start business activities overseas. For example, we wish to utilize ODA support to upgrade the level of component industries in developing countries that benefit Japanese manufacturers, together with metal industry associations and local governments. As initial cost, we expect around several 10 million JPY, which cover local office establishment, hardware (PC, server, network equipment), local recruitment, training cost (preparation of database based on skilled expert knowledge, system operation), in addition to operating cost of around several million to several 10 million JPY, including labor cost, office cost, public relations cost, hardware maintenance cost, telecommunication cost, etc. We hope to utilize financial cooperation to cover the cost.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 10 million JPY several 100 million JPY
2) Technical Cooperation: b) around several 10 million JPY

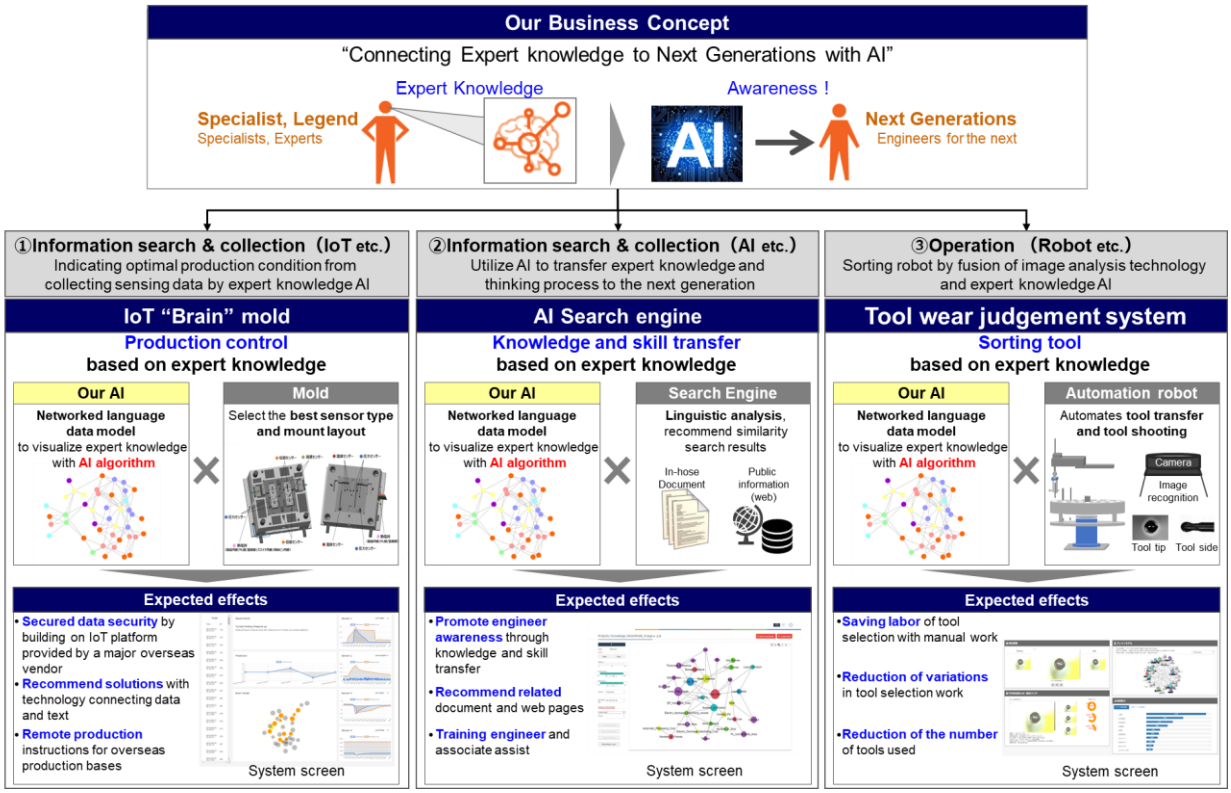
(2) Brief Justification of the Above Cost Assumption

We hope to utilize financial cooperation for the initial cost and operating cost described above. For technical cooperation, we estimate around several million JPY for local study. We expect around several 10 million JPY that cover Proof of Concept (PoC) before introducing the system, as well as various coordination for business operation of locally established enterprise and training for human resource development, if the number of target manufacturers were around 5 companies.

5. Proof of Technology / Applicability in Developing Countries, etc.

- Since the founding of our company in 2016 to 2019, we have developed AI to incorporate skilled expert knowledge for development departments and factories in automobile component, chemistry, game toys, and general electric, electronic, and machine industries in Japan.
- At this moment, we have no actual experience working overseas, including developing countries, we believe that we can deploy our digital technologies overseas, because we can not only meet the needs in developing countries, but also the needs in Japan, through such activities as human resource development for technology professionals in developing countries, and supporting the transfer of domestic knowledge to overseas production sites when Japanese manufacturers expand their business overseas.

6. Reference Information



Blockchain System Development

～Human Resource Management System linking Japan and Developing Countries, and National ID System in Developing Countries～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [blockchain technology]

(2) Description

This proposal is to develop decentralized, self-sovereign identity exchange platform that enables management and exchange of authenticated personal information at each participant's consent. It uses blockchain technology, that prevents falsification of information, and other technologies such as encryption. This platform enables the following activities.

- Promote physical exchange of talented human resources between Japan and other developing countries where national ID system is already in place. This will increase attractive employment opportunities globally for individuals, by reducing the burden for authentication of human resource information.
- In countries where national ID system is yet to be developed, the same technology can be used to support development of necessary platforms.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Activates physical exchange of talented human resources between Japan and developing countries, both in the private and the public sectors, through safe, accurate and comprehensive management of information on professional and academic experiences. For example, in Japan, it is projected that there will be a chronic shortage of talented human resources. Around 800 thousand IT engineers will be in demand by 2030. This proposal can provide employment opportunities for talented human resources in developing countries, enabling close connection between Japan and other developing countries in the future.
- Ensures universal delivery of various public services to rural population without bank accounts, by promoting population data management through national ID platform development.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
   c) institutional capacity building

(2) Description on How JICA ODA Support Scheme may be Utilized

There is a possibility that analysis of the on-going PoC result and further pilot activities in planned project areas may be required before system development.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY

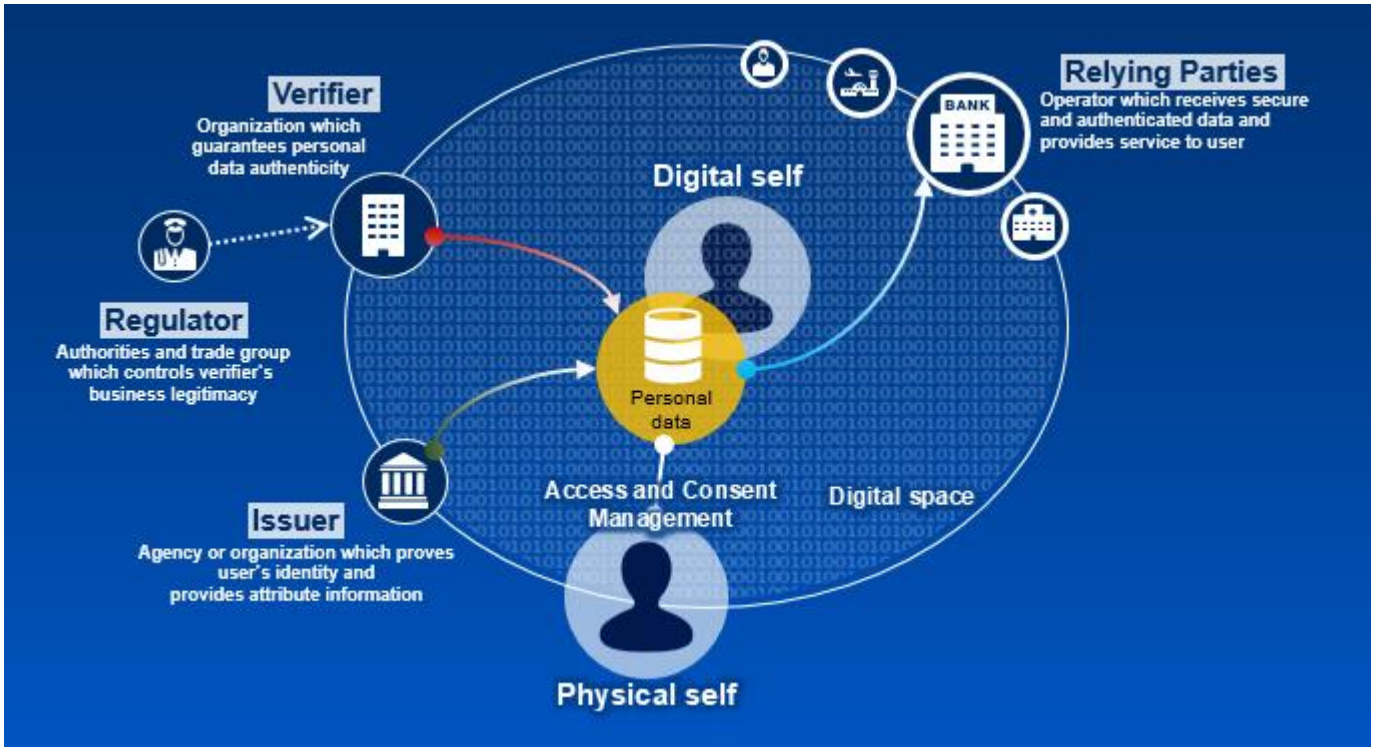
(2) Brief Justification of the Above Cost Assumption

Marketing cost for registration of local human resources and local system maintenance cost

5. Proof of Technology / Applicability in Developing Countries, etc.

- From April 2020 to September 2020: Proof of concept stage for the system targeting IT experts in India
- After October 2020: Planning to start services in India based on the result of proof of concept

6. Reference Information



Enhanced Video Analytics Solution

～Strengthening Security by Behavior Detection, etc.～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

2) Information Analysis and Decision Making (AI, etc.) [behavior detection]

(2) Description

This proposal provides various video analysis technology (behavior detection, crowd behavior analysis, etc.) using camera and Integrated Monitoring Function. With processing video from cameras in various places such as airports, sport stadium, it enables to detect abnormal behavior automatically, to enhance the level of security and increase efficiency, further leading to various predictions based on analyzed information.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

Enhances security and efficiency within and around facilities using highly advanced video analysis triggered by automatic detection, which enables daily monitoring works to be more efficient and sophisticated.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
   b) indirectly related to financial cooperation (same sector, etc.)

(2) Description on How JICA ODA Support Scheme may be Utilized

- Case 1: Grant Aid
- Case 2: Using leftover funds from ODA Loan (quick contribution)

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: a) around several million JPY

(2) Brief Justification of the Above Cost Assumption

Roughly speaking, it will cost around several 10 million JPY to several 100 million JPY per site.

5. Proof of Technology / Applicability in Developing Countries, etc.

This solution has been utilized in many cases, in Japan and globally, including airports, sport stadiums, important infrastructure facilities, commercial facilities, etc.

Enhanced Video Analytics Solution

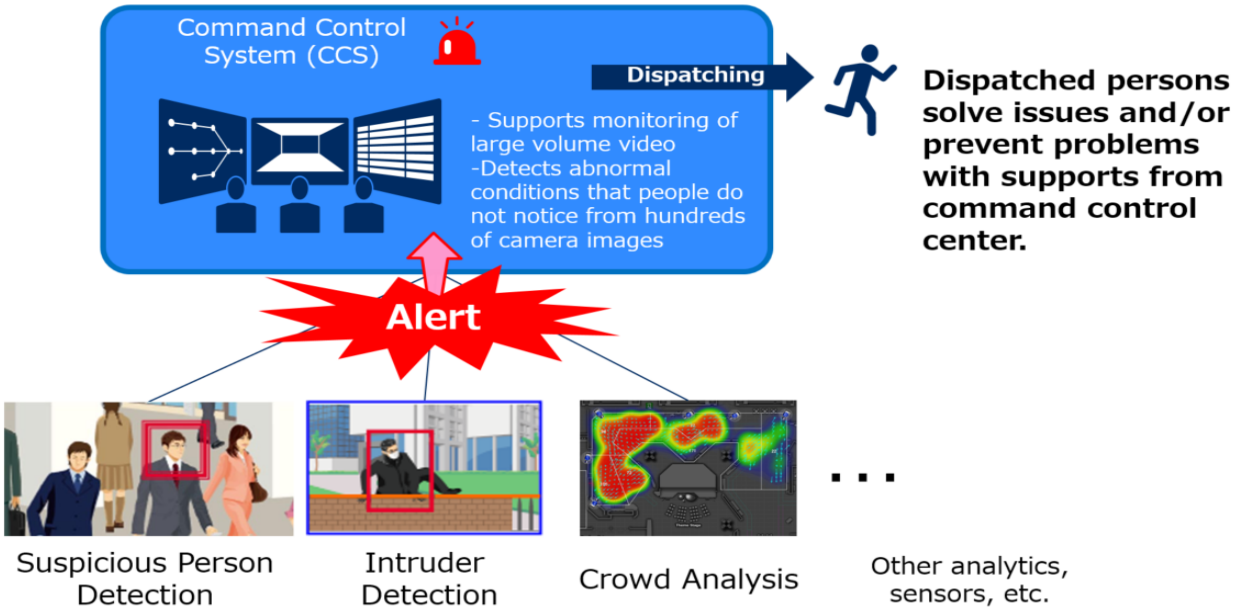
～Strengthening Security by Behavior Detection, etc.～

This proposal provides various video analysis technology (behavior detection, crowd behavior analysis, etc.) using camera. Processing camera video in airports and other important infrastructure facilities, it is possible to automatically detect intrusion, etc., to enhance the level of security and increase efficiency, further leading to various predictions based on analyzed information. This will contribute to enhancing security and ensuring safety, which are important for political stability and economic development.

Image of Analytics

Enhanced Video Analytics Solution

Alert is informed to Integrated Monitoring Function which enables efficient security operation.



Dispatched persons solve issues and/or prevent problems with supports from command control center.

Digital and Modern River Disaster Management through Development of Evidence Data based River Information System

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [river information system (information collection through sensors, mobile devices, cameras, etc.)]

2) Information Analysis and Decision Making (AI, etc.) [river information system (supporting decision-making and providing recommendations)]

(2) Description

- In river disaster management, reduction of flood damage is one of the important goals from the perspective of safe livelihood and economic development for cities and regions with high risk of floods. To achieve this goal, it is necessary to decrease flood risk by improving the capacity of rivers at key areas and reduce the damage when inundation of flood water occurs. Under such circumstance, civil infrastructure projects such as rehabilitation of river embankment, river widening, dredging of riverbed sands, and projects with multiple components such as elevating buildings and restricting the area for residents, can contribute to the above-mentioned solution for river disaster management in developing countries.
- There could be possibilities of the following difficulties, however, when implementing these projects. These may harm comfortable and safe livelihood, as well as economic activities in the medium to long-term.
  - It is difficult to verify whether the original river plan was appropriate, due to insufficient understanding of actual hydrological information
  - Damage may worsen if accurate and timely information is not provided to residents in high flood risk areas who require immediate evacuation, due to insufficient understanding of river situation
- This proposal is to establish river information system using ICT. in order to solve the absence of integrated monitoring and analysis based on measured data of river situation.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Reduces flood risk in the medium to long-term, based on verification of the appropriateness of river planning and rehabilitation work
- Enhances effect of rehabilitation by being able to plan future infrastructure rehabilitation based on evidence
- Enables enhancement of precision in prediction of flood and inundation based on accumulated information
- Allows effective measures (rehabilitation of embankments, sand dredging, etc.) within limited budget, by specifically pinning down the bottleneck which puts severe restriction on water management capacity

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)

2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
b) indirectly related to financial cooperation (same sector, etc.), c) institutional capacity building,

(2) Description on How JICA ODA Support Scheme may be Utilized

- Case 1: introduction of the system and related human resource development using ODA Loan
- Case 2: mix of Grant Aid and Technical Cooperation, such as

1) introduction of the system using Grant Aid

2) use Technical Cooperation to implement human resource development for operation and maintenance of the above system a)

- Case 3: a new procurement system that allows both a) and b) above

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: d) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

➢ Typical equipment services required for the system (as outlined in Section 3. (2) above as a) for Cases 1 and 2)

(1) equipment for measurement and communication: from around several million JPY each for measurement of water level, water flow, and rain volume
(example) 3 equipment for river basin rain volume measurement, 5 equipment for river gauging: a total of 8 equipment each costing from around several million JPY

(2) equipment for data accumulation, integrated monitoring and analysis, plus related software: around several 100 million JPY (varies depending on project scope)

(3) establishment of the system (project management, design, development and testing of the system): included in the cost for b) above

(4) others costs (surveying, logistics, civil works): varies depending on project scope

(5) contract and payments for communication fee, electricity fee, etc.: as a general rule, to be borne by beneficiary government, varies depending on project scope

➢ Cost for human resource development (as outlined in Section 3. (2) above as b) for Cases 1 and 2)

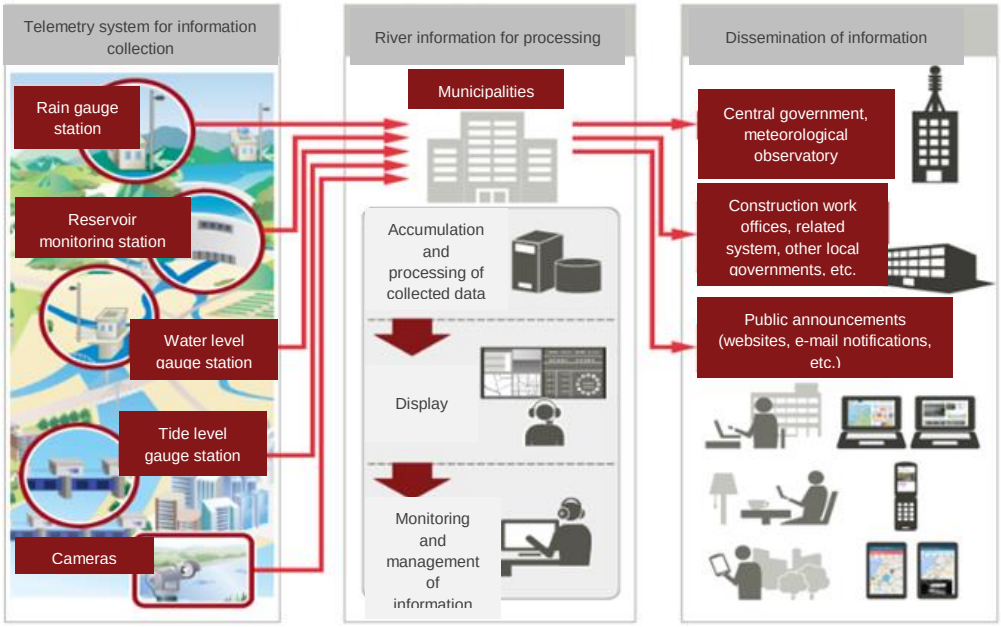
a) training for operation (varies depending on the equipment installed): around 10 million JPY

5. Proof of Technology / Applicability in Developing Countries, etc.

We have dozens of actual cases for rivers in Japan. We can introduce the system, customizing based on the circumstances in developing countries (communication, electric power, etc.).

6. Reference Information

River information system provides information to support decision-making, through integrated monitoring and analysis of collected and accumulated data in IoT infrastructure. River situation data (water level, water flow, rain volume, etc.) is collected by machine sensors, mobile devices, smart phones, cameras, etc. and transmitted through the mobile network.



Solution for Public Safety using LTE (PS-LTE)

(Developing Safer Cities utilizing LTE Network)

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [LTE]

(2) Description

PS-LTE solution (Developing safer cities utilizing LTE network)

In the past, wireless network used by emergency response officials during accidents and disasters depended mainly on voice messages. This system based on LTE technology allows high-speed data transmission and enables provision of various applications utilizing the data. Possible applications include those that can detect suspicious individuals using biometrics and video analysis technology. Therefore, we can expect contribution to the safety of nations and cities through strengthening of crime prevention by enabling early arrest of suspects. Additionally, during disasters, we can enable immediate and quick rescue operation by planning emergency activities based on video analysis of disaster areas. It will be possible to identify the exact location of victims and evacuees, by accurately understanding the local situation using video analysis of disaster areas. Moreover, we can further contribute to disaster rescue and medical services by augmenting the lack of medical staff at disaster sites by providing remote medical support to reduce the casualties and respond to mental care needs. Overall, we aim to contribute to safe and secure nation building by providing PS-LTE, a reliable and safe communication infrastructure that is robust to disasters. (This proposal is for introduction of PS-LTE communication system only. Above mentioned applications are to be installed separately.)

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

1) Reducing the number of victims and the rate of crimes (early identification and arrest of criminals)
2) Reducing the number of casualties during disaster (early detection and rescue of victims)
3) Reducing secondary disaster risks of the rescue teams (firefighters, disaster relief teams, medical teams, police) (identification of rescue activities using safe routes)

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: b) indirectly related to financial cooperation (same sector, etc.)

(2) Description on How JICA ODA Support Scheme may be Utilized

- Case 1: Installation of highly reliable communication infrastructure in major cities (crime prevention and response to disasters)
- Case 2: Installation of highly reliable communication infrastructure for public transport networks (railway, airport, highway) (crime prevention and response to disasters)
- Case 3: Installation of highly reliable communication infrastructure in important government facilities (crime prevention and response to disasters)

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: b) around several billion JPY
2) Technical Cooperation: b) around several 10 million JPY to c) around 100 million JPY

(2) Brief Justification of the Above Cost Assumption

1) It will cost around several billion JPY if designated LTE network covering a city area (100-200 km2) is installed, plus maintenance cost for five years. Maintenance cost per year (OPEX) will be around 5-8% of total project cost.
2) It will cost around 10-20 million JPY to conduct feasibility study to check local conditions.
3) It will cost around 100 million JPY to conduct trials. (cost to be estimated later if clients have certain scale in mind)

5. Proof of Technology / Applicability in Developing Countries, etc.

This is a newly developed solution. There is no actual case of installation at this moment. In the future, we plan to use this solution in Japan and overseas, including in developing countries.

6.Reference Information

Personal Authentication System for Immigration using Biometrics

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

2) Information Analysis and Decision Making (AI, etc.) [personal authentication system for immigration using biometrics]

(2) Description

This proposal is to provide personal authentication system using biometrics to identify whether a passenger is on the watch list during immigration at airports, seaports, etc.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Facilitating immigration work by using high-speed personal authentication system
- Enhancing safety and security through identification and prevention of entry by suspicious characters at immigration

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: b) indirectly related to financial cooperation (same sector, etc.)

(2) Description on How JICA ODA Support Scheme may be Utilized

- Case 1: Using leftover funds from ODA Loan (quick contribution)
- Case 2: Implementing technical cooperation and ODA Loan related support to use ODA Loan leftovers
- Case 3: Grant Aid

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY to b) around several billion JPY

(2) Brief Justification of the Above Cost Assumption

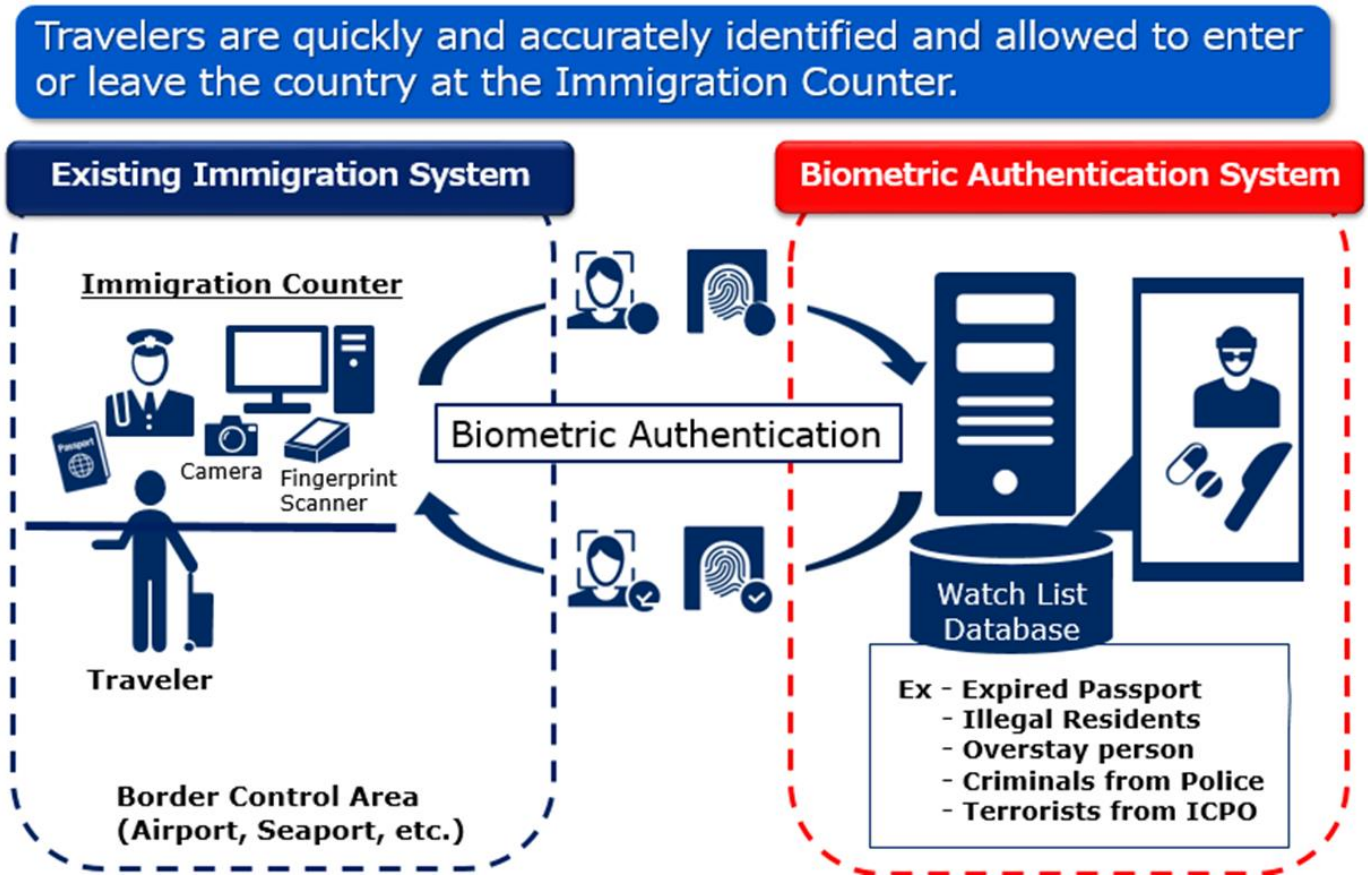
It costs around several 100 million JPY to around several billion JPY to establish personal authentication system and database storing biometrics (fingerprints, faces). The amount varies depending on the number and target group of biometrics required, as well as detailed specifications (such as use of existing system).

5. Proof of Technology / Applicability in Developing Countries, etc.

The system has been used by all international airports in Japan, in addition to many other places outside of Japan. The system can be customized to link with existing system depending on the conditions of interface, etc.

The system can be operated by locals on condition that a training be conducted during installation and with support during operation.

6. Reference Information



ID Management System using Biometrics to Prevent Injustice Receipt of National ID Cards and Social Security

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

2) Information Analysis and Decision Making (AI, etc.) [detection to prevent double issuance of national ID using biometrics, and identity confirmation using national ID]

(2) Description

This proposal is to provide reliable, biometric based system to prevent double registration and confirm identity. Many developing countries do not have basic ledgers and therefore development of a national ID system is required. By using biometrics such as fingerprints and faces, this system enables equitable provision of medical services and payment of social security (such as pension) to the citizens in the country. The system makes it possible by preventing double issuance of national ID cards and passport cards by the government, and by allowing secure ways to confirm identity using these cards. This system can be utilized not only for public services, but also for identity confirmation of other purposes, such as opening bank accounts at financial institutions.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

This system enables identity confirmation for public services, such as health insurance and pension, and prevents injustice receipt and impersonation. This will not only lead to reduced expenditures as a result of injustice receipt, but also enables equitable provision of social security universally to all citizens by using ID cards based on biometrics.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: b) indirectly related to financial cooperation (same sector, etc.)

(2) Description on How JICA ODA Support Scheme may be Utilized

- Case 1: financial proposal based on left over funds from ODA Loan
- Case 2: small scale national ID project using Grant Aid
- Case 3: utilization in market survey of national ID by recipient governments (understanding which institutions are involved, what is the current issue for ID system, what is the masterplan for the future, etc.)

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY, b) around several billion JPY
2) Technical Cooperation: a) around several million JPY, b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

1) Financial Cooperation: Costs around several 100 million JPY to several billion JPY for establishing

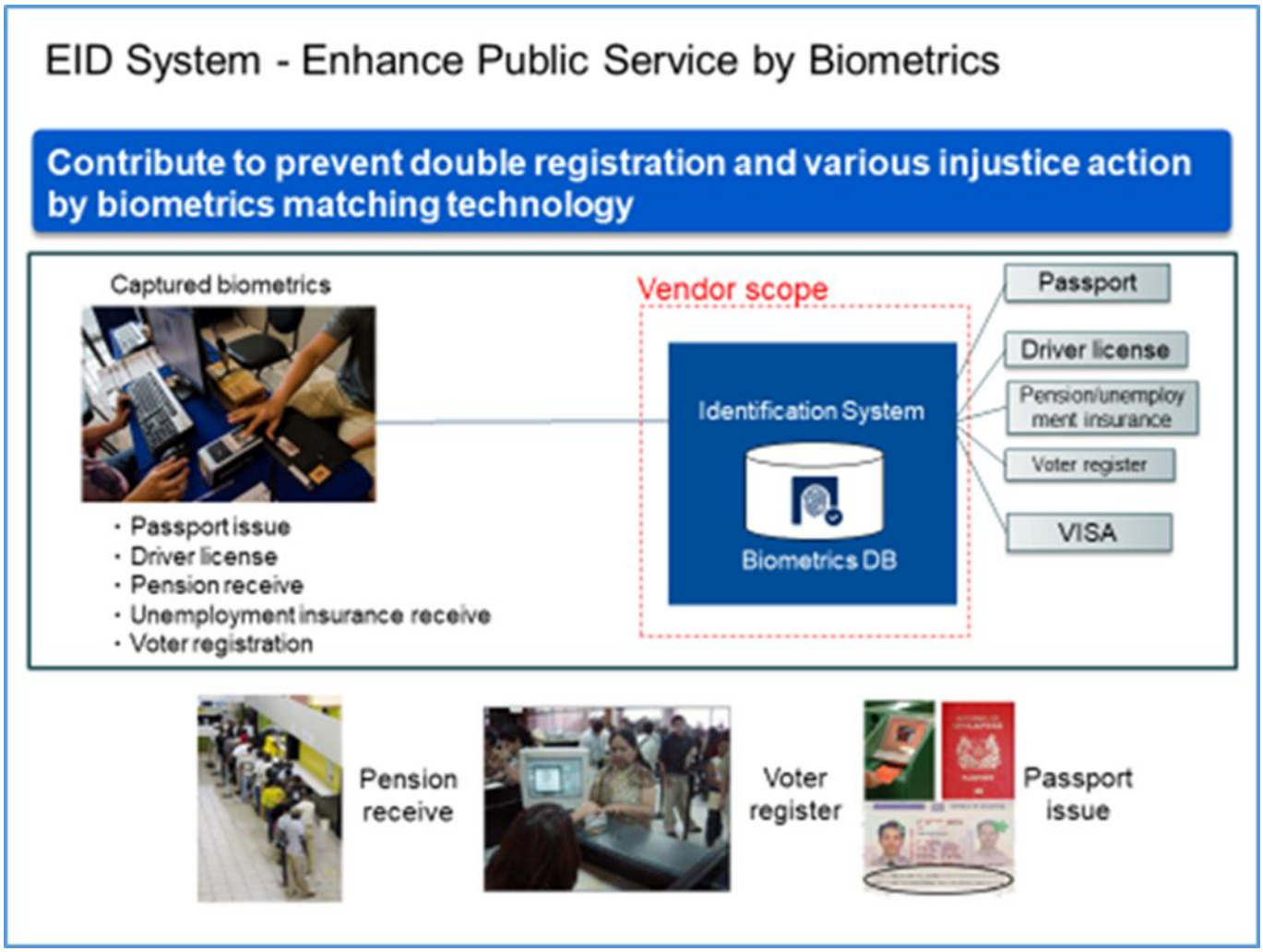
biometrics matching system for national ID system

2) Technical Cooperation: Costs around several million JPY to several 10 million JPY for conducting market survey in recipient country (about a few months)

5. Proof of Technology / Applicability in Developing Countries, etc.

Biometrics matching system has been provided and utilized in Middle East and African countries. If it is necessary to provide the national ID system as a whole, we need to collaborate with system integrators that have experience in providing ID system.

6. Reference Information



Next Generation Weather Forecast Service powered by Microsatellites

～Precision Forecast based on AI Analysis utilizing Unique Earth Observation Data～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [obtaining Global Navigation Satellite System (GNSS) occultation earth observation data from microsatellites]

2) Information Analysis and Decision Making (AI, etc.) [weather forecasting utilizing AI and Global Spectral Model (GSM)]

(2) Description

We obtain massive amount of atmospheric condition data above the ocean, desert and in polar regions, which are hard to access by national meteorological agencies, collecting utilizing 80 microsatellites by a method called GNSS. This proposal is to provide weather forecast that is more precise and detailed than any other services in the past, by assimilating these GNSS data with other observed data to execute forecasting models. Although we are a private company, we own a global model that enables us to provide weather forecast up to 7 days in the future, anywhere in the world.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

[Avoiding economic loss caused by meteorological disaster]

- Even in developing countries where national meteorological agencies are not yet developed, we can indirectly support economic activities in the target country through provision of weather forecast services at a higher precision than those in developed countries. We aim to contribute to sustainable development in developing countries through measures such as accurately understanding storm paths and precipitation volume, coordinating the timing of harvesting agricultural products, and response measures against flood.

[Supporting smooth operation in industrial activities]

- We can minimize economic loss caused by landing restriction and flight ban during bad weather, by facilitating smooth airport operation and aircraft departure and landing activities through accurate understanding of weather forecast above the airports owned by developing countries. Similarly, in sea shipping industry, by being able to obtain accurate sea and weather forecast, one shipping company achieved reduction of approximately 6 tons of fuel in just one week, simultaneously achieving 18 tons of CO2 emission reduction.
- Additionally, we can contribute to avoiding unnecessary expenditure by securing alternative electricity power source on spot, only when power supply is expected to be short of the planned output. This is made possible by accurate forecasting of solar radiation and wind power for renewable energy plants, which will be constructed more in developing countries in the future.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: b) Private Sector Investment Finance (non-sovereign)

(2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation

d) collaboration with local start-ups

(2) Description on How JICA ODA Support Scheme may be Utilized

We expect to use technical cooperation to identify the needs of the local governments, partner with system companies that provide services to calculate optimal aerial and maritime routes, and conduct pilots to test the impact by enhancing precision of weather forecasting. If we find there is sufficient amount of benefits by fully implementing the proposal, we wish to use financial cooperation to set up an enterprise together with local partners, and prepare for service provision.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: b) around several 10 million JPY

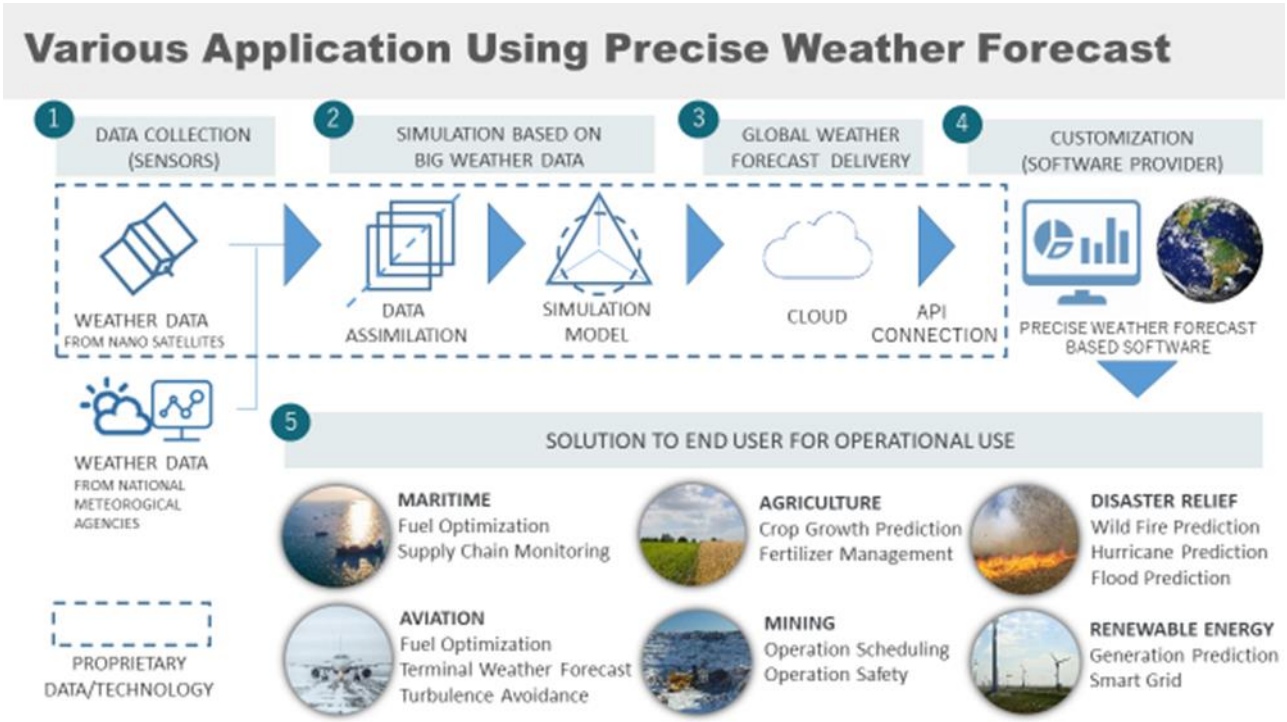
(2) Brief Justification of the Above Cost Assumption

The cost for weather forecasting services vary depending on the area covered and the number of users. Regarding the area covered, we provide a 12km/12km grid at a monthly price of 10 thousand JPY anywhere in the world during the Proof of Concept (PoC) stage. Actual operation will be determined and agreed after pilot activities, including items such as the number of users, frequency of information to be provided, area covered, details of the weather forecast information to be provided.

5. Proof of Technology / Applicability in Developing Countries, etc.

We have proven that a forecast service with an enhanced precision can be provided in a pilot activity targeting a mining field overseas. This service has not been utilized in developing countries yet, but we are planning to start a project in South Africa. As weather forecast is delivered real-time via cloud, or for periodical downloads for offline use, we need to secure internet connectivity.

6. Reference Information



IoT / AI Solution and Recirculating Aquaculture System (RAS) for Stable Production of Farmed Salmon throughout the year

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [real-time measurement of fish and environment under aquaculture using image analysis and water quality sensor, etc.]
2) Information Analysis and judgement (AI, etc.) [automatic growing by AI]
3) Operations (robots, etc.) [utilize robotics technology for feeding and water quality control to automate]
4) Others [enables planned production using application software which integrates information for production and sales]

(2) Description

1) IoT: stress-free measurement of salmon growth state using image analysis by AI, measurement for maintaining suitable environment using water quality sensor, and utilization of big data accumulated through automatic and real-time collection of measured data through IoT
2) AI: enables highly efficient and high quality aquaculture with automatic aquaculture based on decision by AI, even though no enough know-how.
3) Robotics: robot that automatically controls feeding and growing environment based on instructions from AI
4) Application: collect integrated information on raw materials (water, feed, oxygen, etc.), sales and demand and constructs and manages optimal, efficient value chain

Stable supply of good quality protein sources to match food diversity, as well as safe and comfortable food is a global agenda, it is, however, very difficult to realize particularly in many emerging countries. This proposal enables aquaculture project that contributes to stable and safe production of fresh and clean salmon even without experience in aquaculture. This is made possible by combining the aforementioned IoT/AI technology with the benefits of RAS (unaffected by meteorological condition, does not use fish disease medicine, provides stable and clean growing environment) which takes water from the well. This system will contribute to not only stable food supply, but also expansion of new regional economic opportunities through production and distribution of salmons.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Shortening of time required for aquaculture (from 1 and a half years to 8 months)
- Increase of production volume per unit by more than 5 times
- Enables shipment throughout the year (it used to be only once a year)
- No fish disease medicine is necessary, because well water is used
- Stabilization of regional food supply by providing high-quality and safe protein source, as well as cultivation of culture for food diversification
- Fostering of local industry through creation of new value chain (expansion of employment opportunities, procurement of raw materials, sales of salmon, etc.)
- Does not require special know-how (in general cases, it takes around 10 years to be an expert in aquaculture)
- Salmon has great potential with high demand around the globe without religious restrictions
- Responds to growing demand for food diversity, and ;eads to creation of new food culture

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: b) Private Sector Investment Finance (non-sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation

(2) Description on How JICA ODA Support Scheme may be Utilized

1) Financial Cooperation: establishing fish farm after study of RAS project (see next section)
2) Technical Cooperation: feasibility study for commercialization, covering the following issues
a) study on well water: literature survey, geography survey, hydrogeological survey, geophysical (electrical, electromagnetic) exploration, boring survey
b) study on value chain: raw materials procurement survey, marketing of sales network

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: b) around several billion JPY to c) around several 10 billion JPY
2) Technical Cooperation: a) around several million JPY to b) around several 10 million JPY

(1) Brief Justification of the Above Cost Assumption

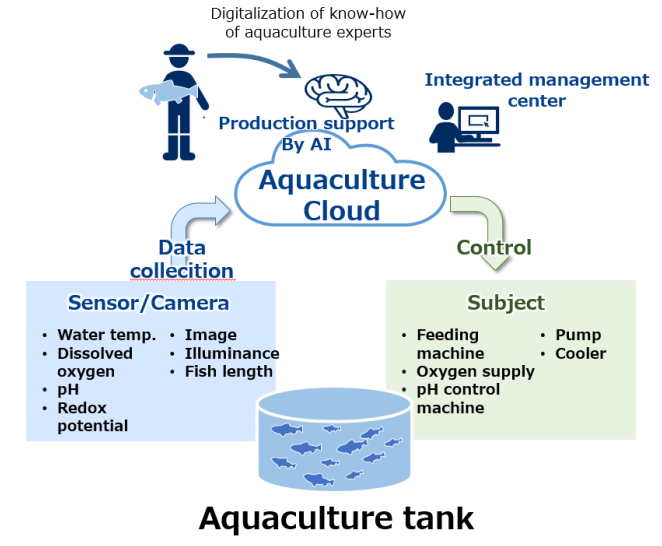
1) In case fish farm is to be established using RAS: depends on annual production volume of salmons, rough cost estimate is the following.
   - annual production volume 500t: around several billion JPY (approximately half of this cost is for procurement of equipment, the other half is for installation work)
   - annual production volume 10,000t: around several 10 billion JPY (approximately half of this cost is for procurement of equipment, the other half is for installation work)

   (Note) Reference information: annual supply of salmon and trout in Japan is 600,000 t per year.
2) In case feasibility study for commercialization is conducted, rough cost estimate is the following.
   - well water survey: around several 10 million JPY
   - value chain survey: around several million JPY

5. Proof of Technology / Applicability in Developing Countries, etc.

- We have experience of over 80 years of aquaculture of salmon and trout. We have a total of 3 successful cases in Japan (Tohoku, Chubu and Chugoku regions) for using RAS.
- Users do not have to have special localized knowhow as automatic, remote and integrated ICT aquaculture system is available.
- If it is possible to stably prepare well water at a temperature of around 15 degree Celsius and raw materials (seed, feed, liquid oxygen, pH regulator, electric power), this system can be used.

6. Reference Information



Category C

Digital Components

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Robotic Conveyor Service Fit for Logistic Locations

(for Seaports, Land Border/Immigration Facilities, Freight Railway Terminals, Freight Truck Terminals, Agricultural Warehouses, etc.)

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [understands the surrounding situation within the facility using externally placed sensors]

3) Actions (Robots, etc.) [small-sized robots convey existing and various type of carts without attachments]

(2) Description

Features of the function are the following.

1) The Robots hold a cart to convey goods, which means that replacement of existing equipment and operation is not necessary as robots will simply substitute the work.
2) Small-sized robots are used, which means that large-scale refurbishment of facilities, such as expansion of aisles, are not necessary.
3) The Robots can operate safely in the same space as human workers, and instructions to robots are simple.
4) The Robots can perform in logistic locations where the layout changes over time (for example, arrival of goods in the morning, sorting of goods during daytime, and shipment of goods in the evening)

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

Sensors and brains, which used to be built-in the robots, are now placed outside of robots using remote control technology. This enables collaborative work with human workers in locations where the layout changes over time, by controlling multiple robots at the same time and by understanding the surrounding situation in real-time within the facility using externally placed sensors.

1) Reduction of unit cost (compared to existing robotic conveyors, smaller and cheaper)
2) Reduction of management cost (remote control allows simplification of managing individual robots)
3) Simplification (large-scale refurbishment of facilities, such as expansion of aisles, are not necessary, as robots are small-sized)

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: b) indirectly related to financial cooperation (same sector, etc.)

(2) Description on How JICA ODA Support Scheme may be Utilized

- Installation or additional installation as related equipment in ODA Loan airport and seaport projects
- We may need to consider the result of the ongoing pilot activity, and additional pilots in project where this service is planned for use.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: a) around several million JPY

(2) Brief Justification of the Above Cost Assumption

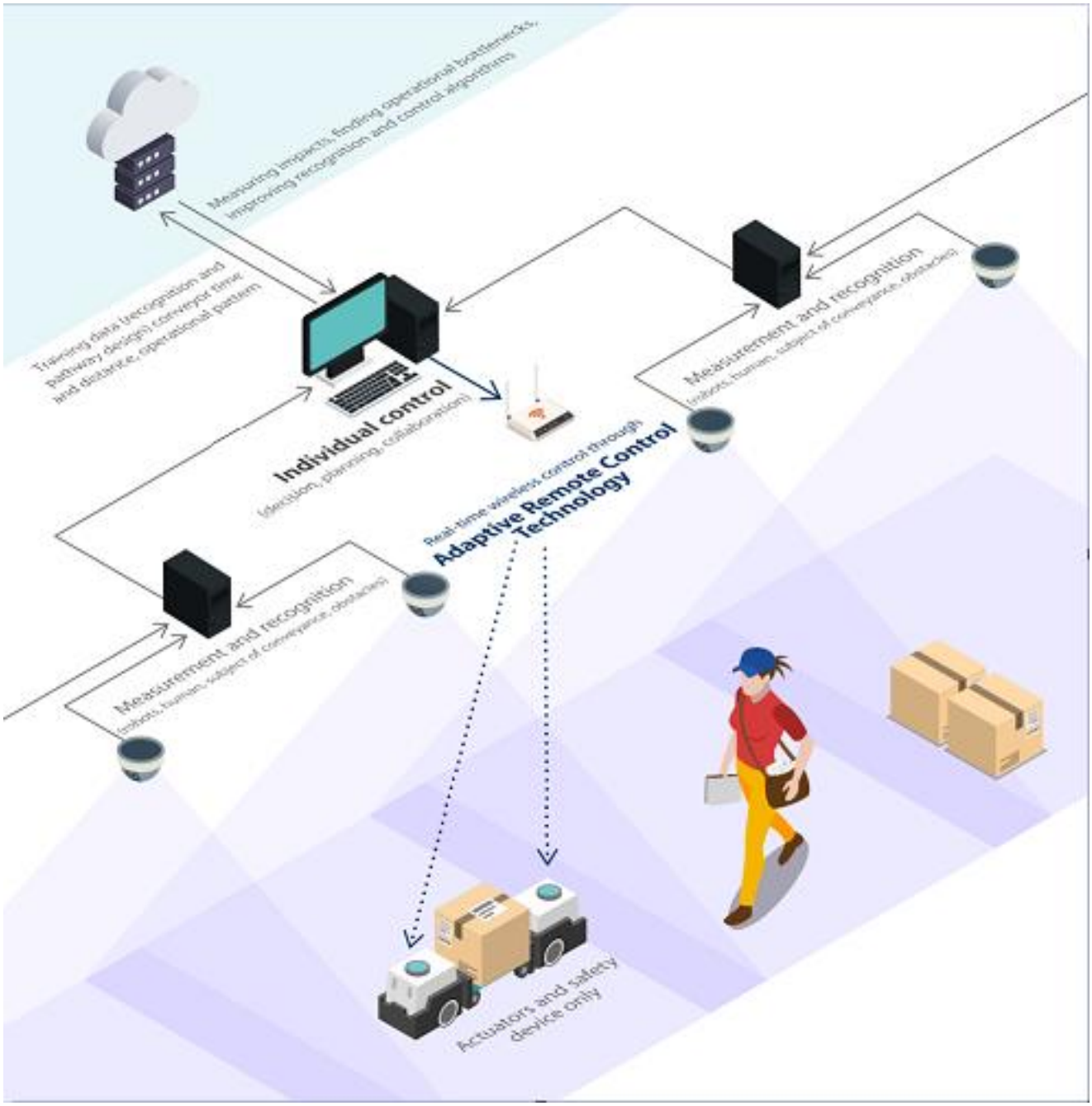
Service model

- Initial installation cost (design and development of system, sensor camera, edge device): from around 10 million JPY (depends on the size of the facility)
- Monthly charge (lease payment for robotic conveyor, license fee for software): from around 200 thousand JPY (correlates with the number of robots)
- At least 5 years of service contract

5. Proof of Technology / Applicability in Developing Countries, etc.

Currently being tested with a logistic company in Japan

6. Reference Information



Preventing Lifestyle Diseases (such as Diabetes) using Rural Health Checkup Data

～Solution for Social Issues in Emerging Countries, such as Poverty, Gender Equality and Health～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [Accumulating health checkup data in multiple demographics such as rural areas by utilizing IoT enabled devices such as smartphones]

2) Information Analysis and Decision Making (AI, etc.) [Data-driven strategies based on regional characteristics and personal health risk assessment]

(2) Description

In emerging countries, with advancement in lifestyle, lifestyle related diseases such as Type-2 diabetes are increasing rapidly.

Despite of technological and lifestyle advances, health education and preventive health care mentality is still in infancy, therefore, citizen only access medical facilities after getting ill and developing severe symptoms. This hinders in efficient operation of large-scale medical facilities as most of these severe cases were preventable with simple preventive health care but now requires special health care provisions.

With an aim of prevention of lifestyle-related diseases in emerging countries by monitoring health conditions, we will provide inexpensive or free of cost on-site health checkup services which will improve significant health literacy. Citizen living in rural areas will be provided with basic services such as medical examinations, root-cause explanations with preventive steps, consultations etc. via Health Consultants (HC). HC who have vocational education will visit household to offer their services and will be equipped with diagnostic kit, containing medical device and IoT enabled equipment with dedicated application, which will aid their day-to-day operations. In addition, collected health data will be analyzed to understand individual as well as demographic health status and thus, can be utilized to frame and deploy appropriate health policies.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Provide free or low-cost health checkup services to low and middle income population by visiting households or offices.
- Support financial independency of rural residents through skill training as health consultant.
- Enables realization of preventive medicine by raising awareness and enhancing knowledge of local citizens, and by persuading more citizens to visit hospitals at early stages of illness.
- According to existing study in Japan, intervention through health checkups is proven effective in improving health conditions and reducing health expenditure.
  - Example of improving health condition: Overweight reduction is effective in lowering blood-sugar level and prevention of diabetes (reduction of weight by more than 5% leads to effectively reducing fasting blood sugar level by 4% and HbA1c by 0.15%, etc.)
  - Example of reducing health expenditure: Increase of BMI index by 10% leads to 3.56% increase in health spending

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)

(2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation

(2) Description on How JICA ODA Support Scheme may be Utilized

ODA Loan and affiliated technical cooperation (particularly effective when introduced together with construction of new, large-scale hospitals)

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

Service model (includes salary for health consultants, lease payments for health checkup device, consumables such as medical needles, license fee for application software)

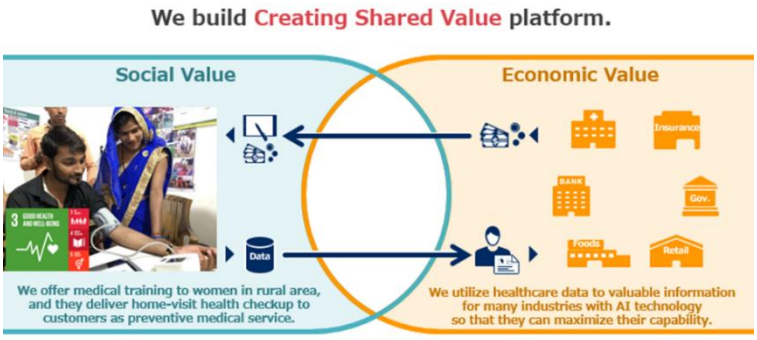
- Cost per hospital with 30 health consultants (to conduct checkups for cumulative 6,000 citizens) is around 20 million JPY annually.
- At least 5-year service contract is required.

5. Proof of Technology / Applicability in Developing Countries, etc.

- We successfully performed pilot activities completed in Varanasi, State of Uttar Pradesh, India (May 2019, 6 health consultants conducted checkups for 2,000 citizens).
- We started preventive health checkup project with Bihar government and government social workers. In this project, social workers provided health checkup to more than 4,200 citizens as of 31st March 2020.
- Further activities in state of Maharashtra are planned.
- It is confirmed that under the laws and regulations of India, utilization of the collected heath data is legally permitted, if prior consent is obtained from the medical examinee.
- Our tablet application supports English as well as Hindi. We'll add local languages gradually.

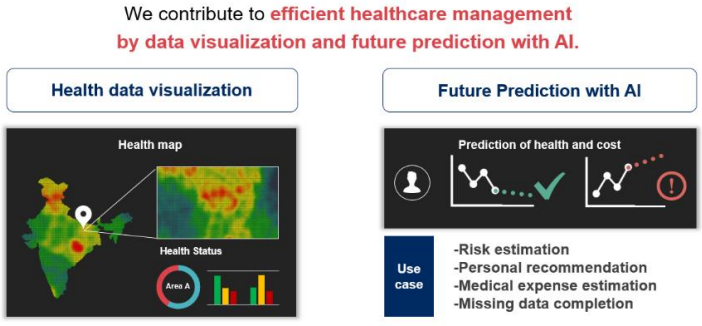
6. Reference Information

Our Scope



Our Service

Future Plan



Digital Communication System to Inter Connect amongst Multiple Distant Locations

～Video Communication System for Government Offices, and for Remote Medical care and Education service～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [real-time information sharing among users in distant locations]

4) Others [system to connect distant locations lively by delivering audio, visual and digital data using projection mapping technology through IP network]

(2) Description

- This solution can, using projection mapping technology, seamlessly inter connect multiple users located in distance in a lively manner.
- Easy -to-operate. Users are connected via IP network sharing audio, image, video and file data.
- Field proven generally available hardware only are required; no proprietary equipment and/or development are necessary. No relay servers are necessary.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Help set up easy real communication regardless of time and place as long as the users are connected to IP network.
- Zero-distance: users mutually feel as if who he/she communicates with is just in front wherever the location is; even hundred km away.
- Reduces physical move of business persons; help reduce time and cost of travel and even contribute to reduce greenhouse gas emissions.
- Boost collaborative works amongst teams and optimize decision-making process (effectively, faster).
- Improvement of management quality: help better implement daily job through unification of team spirit amongst many participants.
- Active communication, accurate understanding: by mutually noticing facial expression and attitudes amongst many participants.
- Reduction of capex and opex; unlike conventional dedicated communication line, this IP based communication solution can support simultaneous connection of up to 49 users using generally available laptops and smart phones; no proprietary devices, no development.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)

2) Technical Cooperation: c) institutional capacity building,

(2) Description on How JICA ODA Support Scheme may be Utilized

Contingency budget of on-going or completed ODA projects is assumed;

- Connecting government agencies in developing countries which spread across in many locations
- Remote education services (remote classes, interaction between distant schools)
- Remote medical services

It can also be a suitable solution to improve quality and service features of communication of companies.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type

is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: a) around several million JPY to b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

As a model case, we assume "1 central location, with 2 x 86-inch screen" and "4 satellite locations, with 2 x 50-inch screen." It generally costs around several million JPY to several 10 million JPY, to use the system depending on the size.

- Supply of equipment: around 16 million JPY
- Transportation and installation of equipment: 7 million JPY or above
- Operation and maintenance fee: 320 million JPY/year (excludes user fee for broadband lines)

5. Proof of Technology / Applicability in Developing Countries, etc.

- Numerous operating references in Japan for remote educational class solution (connecting remote classrooms in islands and deep in the mountains to realize a lively interaction as if participants were in a single location) and for remote conference solution (building an environment to activate communication over distant offices).
- Intra-enterprise connectivity services for over 34 countries.
- Performance of the system depends on the communication and operating environment in target areas (need to be connected to the internet, and each site is recommended to have access to lines with a speed of 4.0Mbps/10.0Mbps (upstream and downstream rates).

✓ For 2 x 50-inch display models, an electric power plug of around 1,200W per location is recommended.

✓ For 2 x 86-inch display models, around 1,800W per location is recommended.

- Reliable local maintenance and support service partners are recommended.

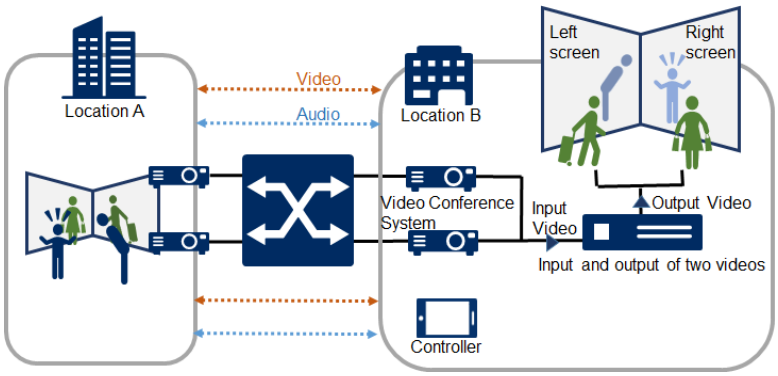
6. Reference Information



Participants even located in a distance mutually notice as if he/she communicates in a same space.

Effects

- Communication with no feel of distance; Enables lively communication regardless of geographical location
- Sensing small changes: By always being able to recognize the situation at distant office, communication opportunity loss can be avoided, thus even change management thoughts.
- Improve office space productivity: Can transform an office corner which used to be a dead space to communication space which can generate a value.



Service in regards to Improvement of Power Plant Operation utilizing Digital Technology (Proof of Concept)

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

2) Information Analysis and Decision Making (AI, etc.) [improvement and/or optimization of power plant operation efficiency by utilizing various digital technologies, including anomaly detection technology]

(2) Description

We are currently introducing and operating (Proof of Concept, “POC”) various digital solutions including AI based anomaly detection technology, in one of our power plants. The objectives of POC is to add value to the power plant assets, with improving the availability by reducing unplanned outage risk (anomaly detection) and optimizing maintenance plan (automation of work flow process). Although this proposal is still in the POC phase prior to commercialization, we are trying to establish a profitable business model in the future.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

We expect that this solution may contribute to affordable electricity supply through reduction of operation and maintenance cost of power plants (optimization). On the other hand, since if this solution can be applied or not will be largely depends upon the conditions of digital infrastructure on each country and/or power plant, detail study must be required beforehand.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: b) Private Sector Investment Finance (non-sovereign)

(2) Description on How JICA ODA Support Scheme may be Utilized

We are not considering utilization of ODA Loan, Technical Cooperation in this phase, but we may consider to apply it in future, if there are any Private Sector Investment Finance which has more flexibility on country where we can apply.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

(2) Brief Justification of the Above Cost Assumption

As this solution is still in the POC phase, we are unable to specify the project cost (POC is to specify the conditions for cost assumption). Just for reference purpose, the accumulate cost for POC as of today was under several 100 million JPY, which was the combination of various type of solutions.

5. Proof of Technology / Applicability in Developing Countries, etc.

Although such POC our power plants in Mexico has been conducted, feasibility study must be required if the same or similar solution will be applicable in each country (if conditions of digital infrastructure is not in the expected level, this solution may not be applicable.)

6. Reference Information

-

3D Digitalization for Design and Construction of Underground Distribution Power Facilities

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [digitalization of underground information, power distribution line design using 3D]

3) Actions (Robots, etc.) [underground exploration equipment]

(2) Description

This proposal is to a) identify buried objects during upstream stage of design through underground exploration, b) prepare 3D digital data based on the identified information, and c) use the data for design of underground power distribution line, etc. We aim to share the information with contractors to improve construction efficiency and safety, as well as accelerating the process for consensus building. From the viewpoint of power utility companies, this allows integrated management of not only existing underground buried objects, but also information on newly installed objects, facilitating management and maintenance of equipment.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- In developing countries, due to congestion of objects buried underground, there is a lack of understanding of underground situation in many cases. This could make design and construction inefficient, when laying down underground power distribution lines for removing power poles and building facilities resilient to disasters.
- By identifying buried objects underground and sharing digitalized information in 3D with project owners and contractors, we aim to not only achieve efficiency in design and construction work, but also prevention of accidents caused by drilling errors.
- We can also simplify work for estimating quantity of soil volume to be excavated and number of equipment needed.
- This solution is expected to shorten construction duration, or prevention of delay.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)

2) Technical Cooperation: b) indirectly related to financial cooperation (same sector, etc.), c) institutional capacity building

(2) Description on How JICA ODA Support Scheme may be Utilized

We intend to utilize this proposal in underground power distribution facility construction projects.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation / 2) Technical Cooperation: a) from around several million JPY (depending on site

conditions, scale, etc.)

(2) Brief Justification of the Above Cost Assumption

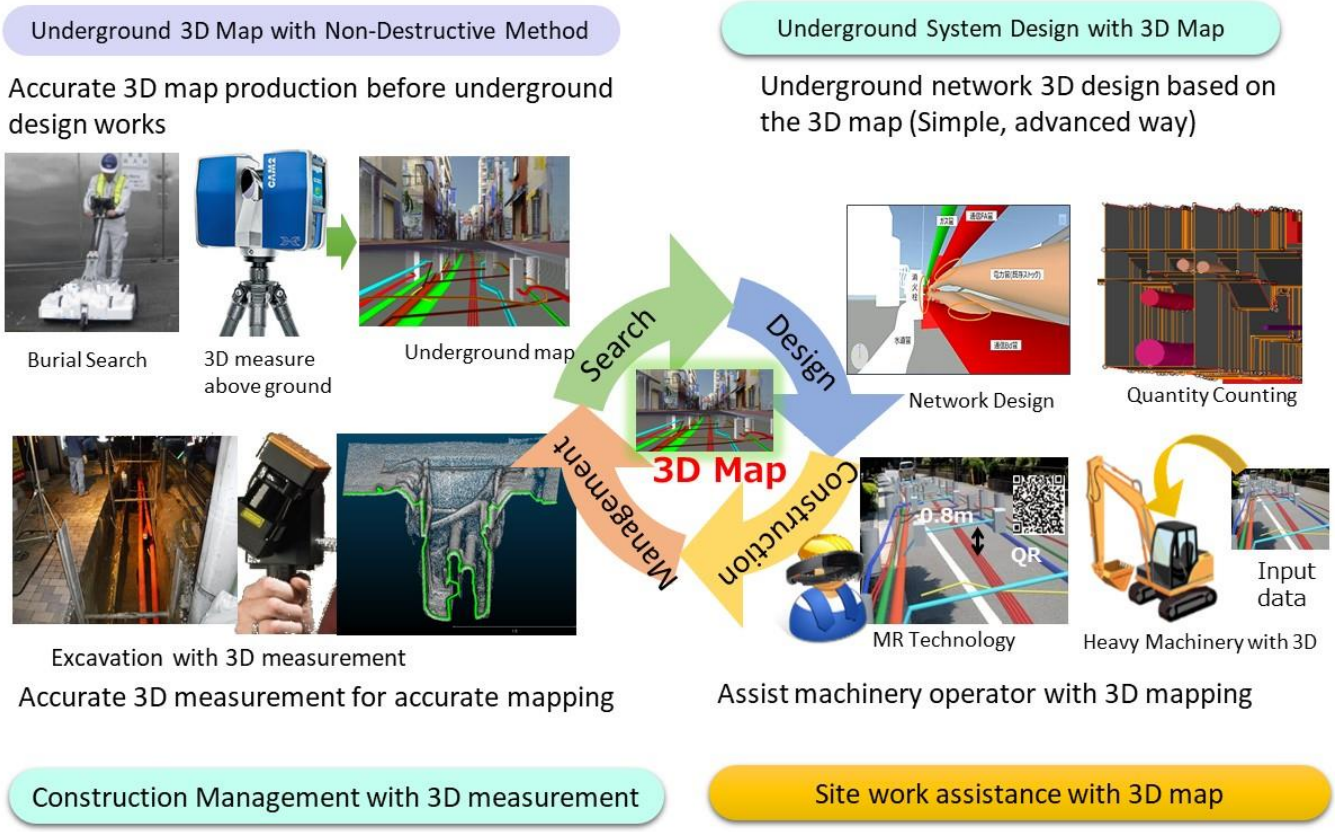
Rough composition of this proposal is the following.

- Underground exploration and data digitalization
- Power distribution design engineering
- Creating databases

5. Proof of Technology / Applicability in Developing Countries, etc.

- There are many actual cases in Japan, working with local governments.
- There are some actual cases in developing countries.
- Japanese enterprises have exploration technology with high precision.

6. Reference Information



Digital Twin and 3D Technology for Asset Management of Electric Power Facilities (Generation, Transmission, Substation, Distribution)

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [digitalization of power generation, transmission, substation, distribution facilities, etc., and searching of device information]
2) Information Analysis and Decision Making (AI, etc.) [digitalization of power generation, transmission, substation, distribution facilities, etc., and 3D equipment design]

(2) Description

We define digital power generation and substation facility as 3D technology build digital-twin (creating a "twin" in cyberspace identical to a physical object). This proposal is to contribute to efficient work in project cycle (planning, construction designing, operation and maintenance) for power plants and substations through digital-twin. This technology can be applied to transmission and distribution facilities as well, but the generation facilities and substations are likely to benefit first as these facilities are about management of a cluster of equipment.

To be more exact, we aim to improve efficiency in all stages of operation, by visually managing the entire process. This is made possible by making a 3D model (point groups, 3D-CAD (BIM)) of the structure of equipment in generation and substation facilities. We will then link information of all equipment (such as manufacturer specification, local condition, equipment monitoring data) to 3D model data for each equipment unit. Expected benefits are described as follows.

[Planning and design stage]

- Reducing construction work volume calculation using 3D, Increasing efficiency of comparison analysis of cost in different cases, and increasing efficiency in planning safety measures during carrying in of equipment
- Contributes to front-loading by drastically reducing on-site survey and the risk of reworking due to difference in plan and actual layout. This is made possible by sharing of information at site and in office, allowing necessary check for availability of space and influence of other equipment during future additional and renewal work.
- Avoids inter-sectional confirmation of various drawings by integrated management of 3D data, even if there are different construction companies involved.

[Operation and maintenance stage]

- Enables searching of drawings, specifications, past records, operation manuals, etc. on site, by clicking 3D data through tablets and xR equipment, when malfunction is found during physical inspection
- Accessible to relevant information by clicking the image of what was visually confirmed, even if maintenance workers lack experience and does not have thorough understanding of equipment (can also be utilized for visual-based technical training)
- Allows quick identification of troubles at control centers and offices, without physically visiting sites showing malfunction alert signals. This is made possible by using sensing technology, such as adoption of IoT equipment, to specify which a part of equipment is not working properly. Additionally, quick implementation of recovery work is possible if inspection robots and industrial television is placed on site to send images to offices.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Leads to drastic reduction of on-site survey and prevention of design rework, through sharing of local situation on the desk (ensures sharing of design philosophy to construction stage)
- Enables efficient operation by digitization of various documents and unified management
- Allows quick consensus building of construction method through visualization of construction work using 3D (shortening construction period and preventing delays)
- Facilitates inspection by technical staff with less experience, through lectures of operation and maintenance of generation and substation facilities
- Mobilizes spare parts quickly, as identification of replacement equipment in the case of malfunction is immediately possible (particularly effective in narrow spaces and complex sites requiring special attention in delivering goods, such as underground substations)

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: b) indirectly related to financial cooperation (same sector, etc.), c) institutional capacity building

(2) Description on How JICA ODA Support Scheme may be Utilized

We plan to utilize above mentioned scheme for implementation in power generation and substation construction projects.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation / 2) Technical Cooperation: a) around several million JPY (depends on its scale and condition)

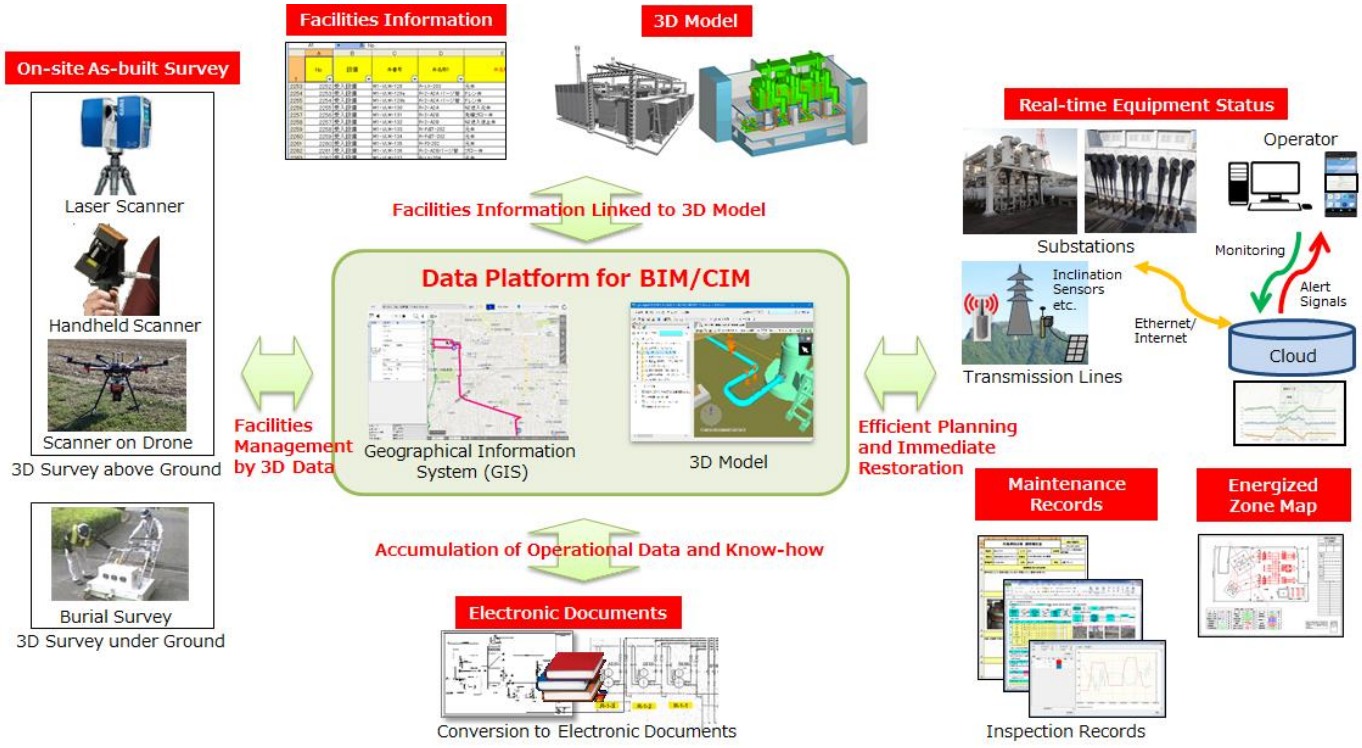
(2) Brief Justification of the Above Cost Assumption

- For new construction projects, we can utilize the system from design drawing stage. There will be additional cost to cover a creation of 3D, but there is a possibility that this will lead to overall cost reduction through increasing efficiency and shortening of consideration period.
- For existing facilities, we can create 3D data using as-built drawings, or using scanned data from camera images, etc. If the client does not wish to pursue very high precision, we may be able to implement 3D at relatively low cost.

5. Proof of Technology / Applicability in Developing Countries, etc.

We have experience in substations in Japan to check whether carried-in equipment can fit in after considering cables and distribution pipes (design of renewal construction work by power companies). We also have experience in utilizing 3D scanner and creating 3D model data for Japanese generation and substation facilities. We also have experience in linking each device in plant equipment with document information (as part of fuel plant management).

6. Reference Information



Digital Twin and 3D Technology for Asset Management of Electric Power Facilities

Enhancing Productivity of FPSO (Floating Production Storage and Offloading System) utilizing IoT and AI

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [data collection from sensors attached to device on FPSO]
2) Information Analysis and Decision Making (AI, etc.) [predictive maintenance of equipment based on AI data analysis, digital-twin]

(2) Description

This proposal is to implement digital transformation project for enhancing productivity in FPSO charter projects. We aim to reduce the downtime using data analysis for predictive maintenance, digital twin of oil and gas production equipment, and unique data platform.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

We have actual cases in which downtime was reduced by around 65%, using analysis for predictive maintenance, digital twin of oil and gas production equipment, and unique data platform. Increase in oil production leads to tax revenue and loyalties received by government, further contributing to economic growth of the entire country.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: c) Private Sector Investment Finance (non-sovereign)

(2) Description on How JICA ODA Support Scheme may be Utilized

This technology has been utilized and proven. We aim to utilize JICA's financial cooperation necessary for further development of data platform and application, in addition to deployment to clients in other countries.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: b) around several billion JPY

(2) Brief Justification of the Above Cost Assumption

The cost is for employment of data scientists, data engineers, etc. who will develop the data platform and application.

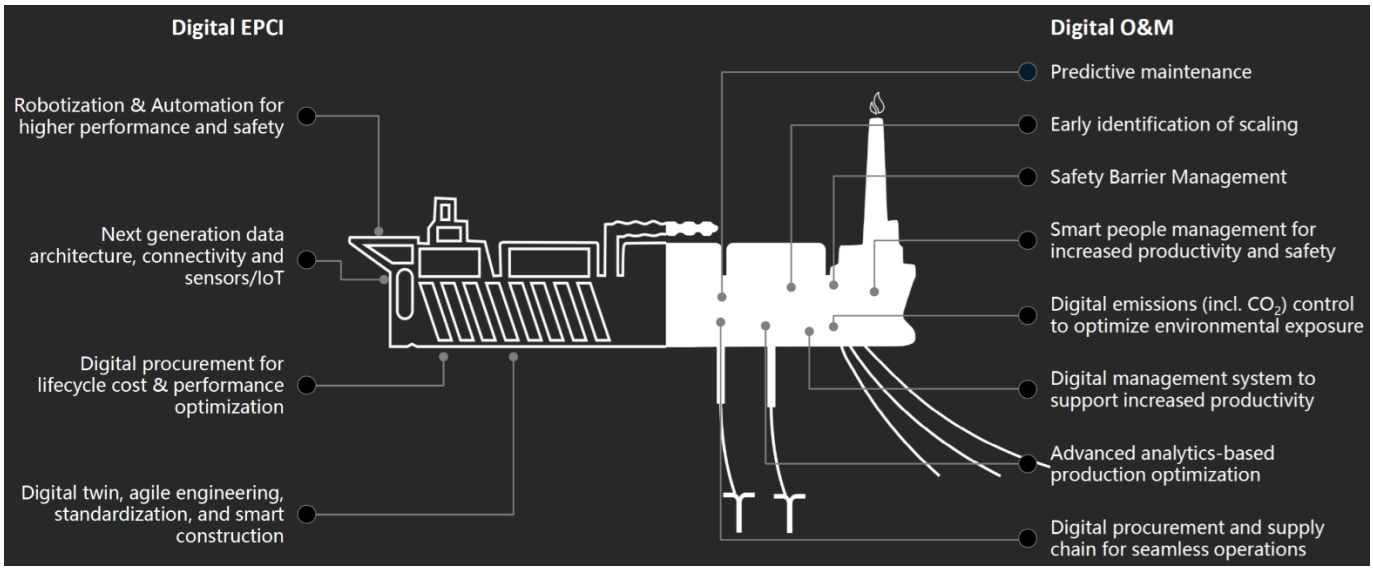
5. Proof of Technology / Applicability in Developing Countries, etc.

In Brazil, we have succeeded in reducing downtime by around 65%, using analysis for predictive maintenance, digital twin of oil and gas production equipment, and unique data platform. In January 2020, this Brazilian plant was selected by the World Economic Forum as the "lighthouse," awarded to most advanced factories in the world leading the fourth industrial revolution, as the first selected factory in Latin America and owned by a Japanese company, and the only selected facility among upstream oil and gas sector. We are now considering

implementation in Ghana and Senegal.

6. Reference Information

Image diagram of Use Cases (application)



Preliminary Survey and Proof of Concept for Utilization of Drone in the Energy Sector

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

2) Data Analytics and Recognition (AI, etc.) [AI]

3) Actions (Robots, etc.) [drone]

(2) Description

We think that the importance of stable supply of electricity without loss of opportunity caused by malfunction of transmission and distribution network, while reducing the operation cost of equipment, is increasing as a global trend in the energy sector. Additionally, we predict that the necessity to secure human safety will be emphasized during inspection work and response to malfunctions in hard-to-reach and dangerous areas. By obtaining data in hard-to-reach, dangerous areas through drones, and by analyzing the data based on artificial intelligence (AI), we are convinced that maintenance and inspection work can be done without relying on human interventions. This proposal is to identify the hardware, software and the cost for realizing the idea, by conducting desk and field studies based on hypothesis constructed from case studies and survey on latest technologies fit for this scenario.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

In many developing countries such as India, Southeast Asia and Africa, maintenance of electric power infrastructure is insufficient, leading to serious problems such as profit reduction from frequent blackouts caused by vulnerable system and power thefts. It is therefore necessary to conduct safe, sophisticated and efficient inspection and surveillance by utilizing drones. Introduction of drones is expected to bring the following benefitts.

- Enhancement of safety: Enables selection of equipment to avoid cases that cause workers to step into dangerous areas and serious situations, by remote survey in areas where scaffold is needed in view of the location, and hard-to-reach areas due to safety and other reasons
- Upgrading of analysis: Enables information collection at closer distance and higher precision than human activities, by not only utilizing quickly and highly improved sensors and cameras, but also by selecting the most appropriate technology based on previous cases from among the many functions available
- Improvement of work efficiency: Enables shortening of inspection activities, decreasing the time required from days to hours
- Reduction of cost: Enables reduction of cost by not using scaffolds, cranes, and manned helicopters, in addition to decreasing lost profit from power thefts. In a previous case, we achieved around 66% cost reduction.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

2) Technical Cooperation: e) others (preliminary survey and proof of concept for utilization of drone)

(2) Description on How JICA ODA Support Scheme may be Utilized

We plan to utilize Japanese enterprise proposal based program.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

2) Technical Cooperation: b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

We assume activities of around 6 months with 2.5 to 3.5 staff.

5. Proof of Technology / Applicability in Developing Countries, etc.

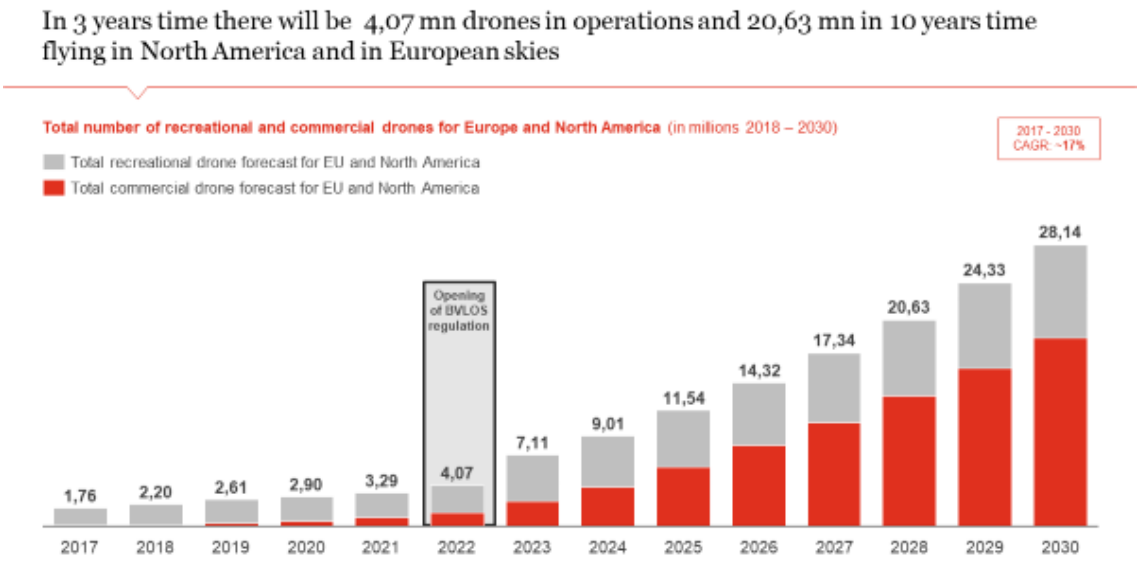
In Japan, we have multiple cases of actual deployment for the private sector.

- Major power company in Japan: support for formulating strategy for unmanned aerial logistic service
- Major power company in Japan: support for survey of global situation regarding inspection of transmission

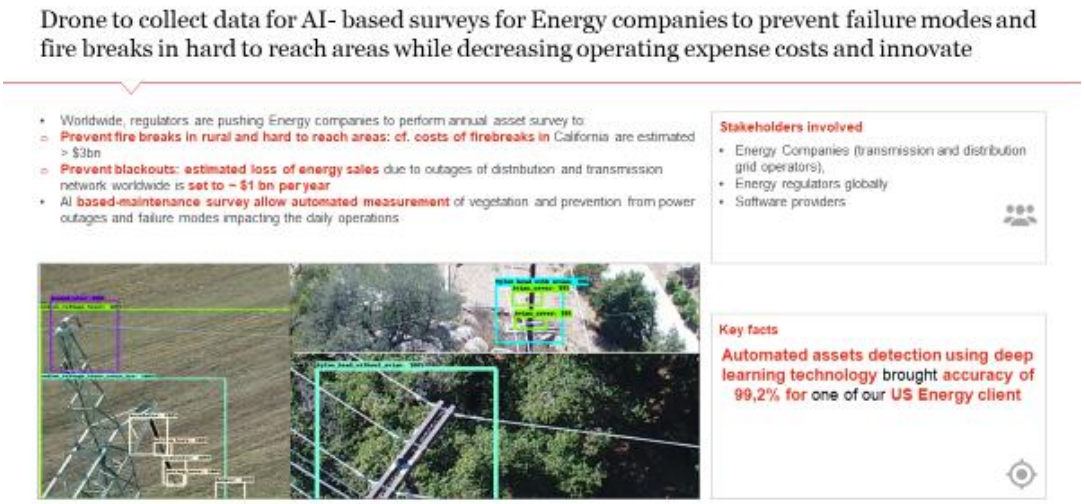
lines using unmanned equipment

- Major telecommunication company in Japan: concept for a new project related to the use of unmanned aerial equipment
- Major service provider in Japan: design of surveillance and inspection operation utilizing unmanned aerial equipment
- Major manufacturer in Japan: formulation of concept for a new project related to unmanned aerial equipment
- Major trading company in Japan: study on regulations related to large-scale unmanned aerial equipment

6. Reference Information



We predict that in 2 years time, there will be 400 million drones flying just in North America and Europe, and 2 billion in 10 years time.



Drones collect data for utilization by AI to prevent malfunctions and fire in hard-to-reach area, while reducing the operation cost of the energy sector in an unprecedented manner.

[Drone x AI Utilization]

Inspection Service for Solar Cell Modules (Panels)

(Service for Mega Solar Power Plants)

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [image shooting using thermo camera on board drones]
2) Information Analysis and Decision Making (AI, etc.) [image analysis by AI and reporting of malfunction]
3) Actions (robots, etc.) [using drones (robotics) for inspection of infrastructure]
4) Others [optimization of resources (man-hours, costs) and efficient maintenance]

(2) Description

This proposal is to detect malfunctions and visualize the need for preventive measures, by using cutting-edge AI technology (rapid machine learning) to analyze large number of solar panel images shot in the air from thermo (infrared) camera on board drones, and is believed to be effective for solving the following issues for solar power generators.

- Optimization of man-hours and cost through efficient maintenance work
- Maximization of power generation efficiency (reduces lowering of efficiency) through early detection of malfunctions (cells, clusters, modules, strings)
- Standardization of detection quality through AI analysis
- Reduction of work load on inspection staff

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Reduced man-hour of maintenance staff by more than 60%, in an actual case of 38MW solar power plant with 170,000 panels
- Reduction of labor safety risk by avoiding work at high elevation and in extremely hot weather
- Reduction of fire risk caused by malfunction of solar panels

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation/Survey: b) indirectly related to financial cooperation (same sector, etc.)

(2) Description on How JICA ODA Support Scheme may be Utilized

- As one of sub-projects to solar power generation project to be financed by Yen Credit or Grand Aid. Proposal based program for Japanese enterprises for related study.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation/Survey: b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

Reference price (initial investment, image shooting from drones, AI analysis, and report submission) of services provided in Japan are the following.

- Initial investment (purchase of drones, training of staff to shoot images from air): around 20 million JPY
- Cost for shooting images from drones and data analysis
  - 2MW class (equivalent to coverage of around 450 households estimated using average annual electricity consumption in Japan, around site area of about 40,000 m2): around 1 million JPY/round
  - 10MW class (equivalent to coverage of around 2,250 households, requiring an area of 200,000 m2); around 2 million JPY/round

Details will be subject to individual situation, such as area covered (number of modules) and working hours, etc.

5. Proof Technology / Applicability in Developing Countries, etc.

Service started in July, 2019 in 10 locations including pilots.

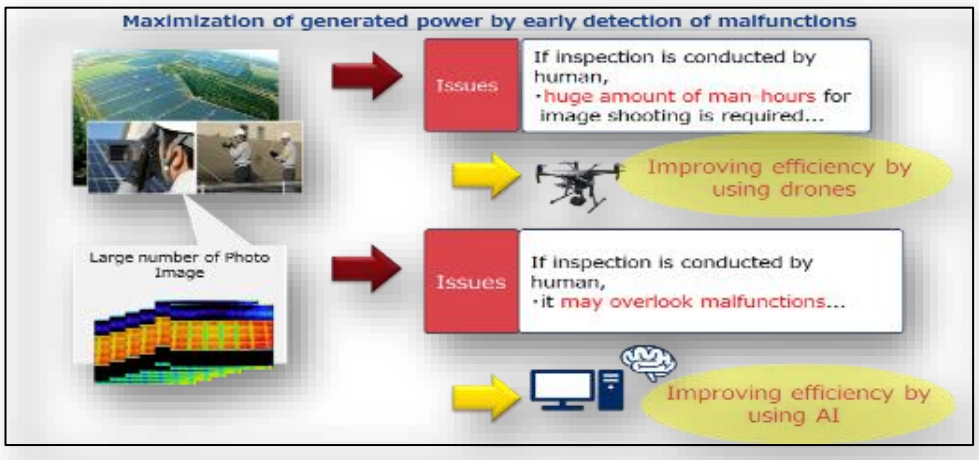
No reference yet in overseas market. Following research shall be necessary before proposing to overseas prospects:

(1) relevant laws and regulations for flying drones (aviation law, road traffic law, other permissions required, etc.), and

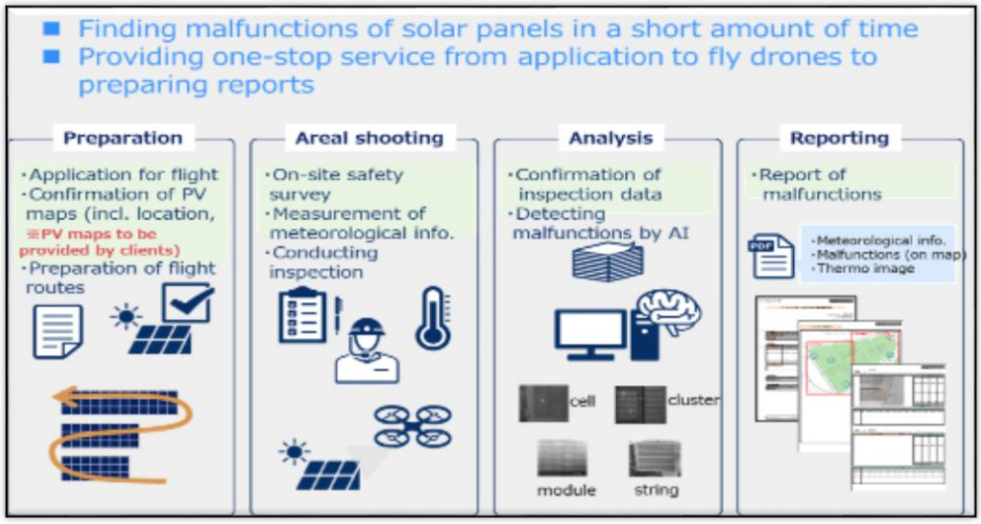
(2) restrictions regarding taking the shot image data for uploading and transmitting on the cloud.

6. Reference Information

Issues with Mega Solar Plant



Summary of Service



Walkie-talkie like Communication at Anywhere using Ordinary Smartphones

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

4) Others [IP wireless application]

(2) Description

In many countries, users engaged in operation and/or maintenance of critical infrastructure face poor quality professional telecommunication services due to under-developed relevant network, and such unavailability of quality communication to connect amongst not only internal users but also external public service institution may endanger stable social activities. Construction of new communication facilities to solve this problem is not easy because of limited resources, financially in particular. However, this application installed on the ordinary smartphones enables users to enjoy equivalent services to those provided by walkie-talkie as long as the devices are in the coverage of the existing 3GPP standard mobile IP communication (3G/LTE) or Wi-Fi service.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- Ready to start: Cost and time barriers are low.
  - ✓ Requires only devices of industry standard (3G and LTE; Android/iOS), no need of dedicated handset nor new software development,
  - ✓ No need for investment to build network, no need to obtain spectrum license,
  - ✓ Service areas extend as far as the existing network (nationwide),
  - ✓ Used in many scenes: “Push to talk” (see below *(Note)), one on one simultaneous communication, text chats, recordings, transmitting location of sender, etc.,
    *(Note) a type of conversation function, which allows users to speak alternately by pressing a button
  - ✓ Security is ensured by using encryption
- Possible use cases of this application can be:
  - ✓ Disaster prevention purpose for local governments (distribution to many officers),
  - ✓ Railway operation (communication between operation centre and trains, simultaneous broadcast call is available),
  - ✓ Airport (communication among staff of airline companies),
  - ✓ Nursing facility (communication among staff in different buildings and floors),
  - ✓ Security company (group communication covering a wide area),
  - ✓ Factories, etc.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grand Aid (sovereign)

(2) Description on How JICA ODA Support Scheme may be Utilized

The proposed solution can help realise efficient and stable operation of infrastructure, services and quality enhancement amongst institutions and staffs engaged in the operation of various social infrastructure and public services.

It can be addressed as one of sub-projects of planned, on-going and completed ODA Loan and/or Grand Aid projects.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: around several 100 million JPY + other costs (subscription model)

(2) Brief Justification of the Above Cost Assumption

Below subscription model cost in Japan can be a reference (1 contract, maximum 500 users, up to 100 channels)

- ✓ Initial registration fee (around 4,000 JPY per user)
- ✓ Basic monthly fee (around 1,500 JPY per user)

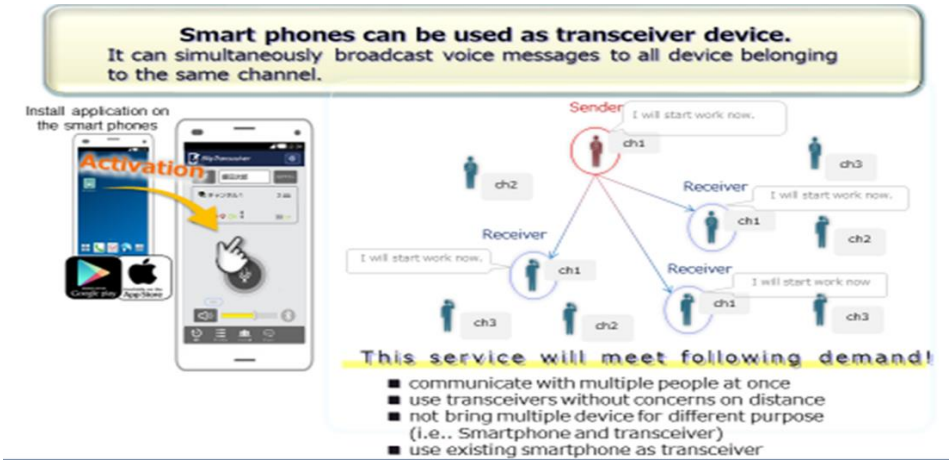
(Note) Price level for service outside of Japan needs to determine on a case-by-case basis

5. Proof of Technology / Applicability in Developing Countries, etc.

This service has been used by more than 10,000 users in Japan, including central and local governments, private enterprises, etc. Outside of Japan, this service has been used mainly for communication means amongst staffs of airline companies

Success of this service in developing countries appears promising. Since it operates in global standard communication network environment, result of analysis from various perspectives such as introduction cost, time for deployment, operational efficiency and usability are highly positive. However, before launching the service, advanced investigation of local environment like network inter-operability, regulations and restrictions, local partnership is advisable.

6. Reference Information



Economic Data Network for IoT Device to Support Wide Area Coverage, Low Power Consumption, High-speed Moving Communication, and Data Transmission (LPWA: Low Power Wide Area)

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [wireless network technology to transmit small amount of data from IoT device/sensor (LPWA)]
2) Others [accumulation, visualization, linkage of collected data]
[multi-functional platform linking voice message service, AI analysis and map system]

(2) Description

This proposal is to install infrastructure platform for data network, with features to cover wide area, with low power consumption, and respond to high-speed moving communication. Major use cases are the followings;

- Remote surveillance of dangerous areas: slope collapse, change in river surface level and landslide
- Live monitoring of outdoor facilities: lamps, ancillary equipment, etc.
- Prevention of thefts and tracking of heavy machinery
- Monitoring of environmental information/status of equipment in locations without other means of communication, such as deep in the mountains and in the middle of the sea

Data accumulated in the cloud can be utilized by using WebAPI. The system provides a platform which makes it easy to incorporate various functions, such as SMS/phone messages and AI. The system is provided at low initial cost. It complies with international standards, The developed terminals and IoT solutions can be deployed worldwide. It not only supports local IoT, but also helps local startup companies create IoT business.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

1) Ready for use with limited initial cost and without skills for development: a) users can easily introduce IoT services, because service providers establish base stations and operate the network, b) suitable for small start without large-scale investment, as the system uses cloud and no payments for infrastructure is required
2) Operation cost is less than a quarter of the cost for existing LTE: in Japan, the service can be used starting from only around 70 JPY per month (around USD 70 cents)
3) Enables remote monitoring in wide service area: a) drastically reduce annual cost required for physical measurement and inspection activities, as the service can be used for IoT outside LTE communication coverage area, b) strengthen local crime prevention, as the service can be used for “Child Watching Service and “Prevent of Thefts of Assets” and so on

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
b) Indirectly related to financial cooperation (same sector, etc.)

(2) Description on How JICA ODA Support Scheme may be Utilized

- Possibility as a sub-project of planned major project or an extension to a completed project when aiming to install IoT features.
- Additionally, depending on the various industrial structure and the aim of data use, this system can function as fundamental infrastructure for data utilization business.
- A chance is expected to conduct studies to explore the market potential and create projects using technical cooperation schemes related to financial cooperation.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

As reference costs in Japan:
2 million JPY for a base station including materials, and 1,500 JPY/device for monthly communication and cloud usage fees.

5. Proof of Technology / Applicability in Developing Countries, etc.

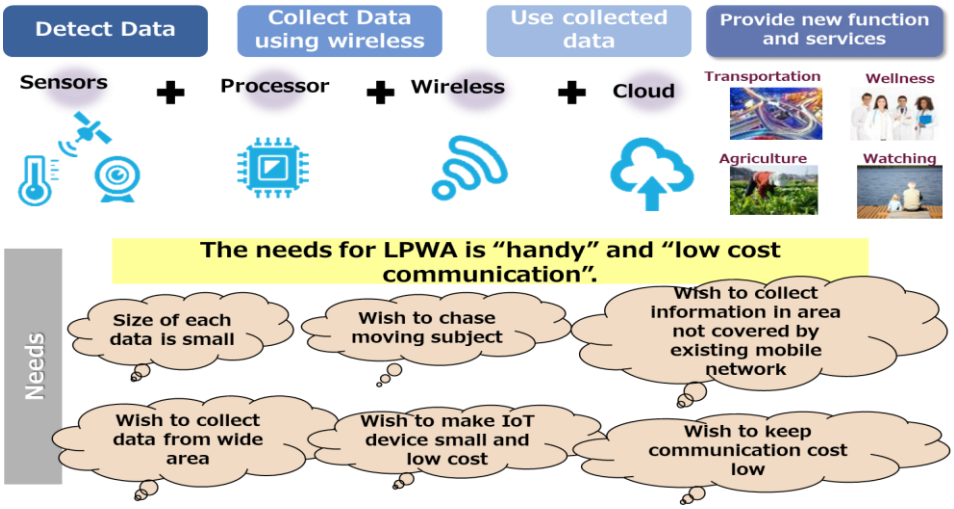
- The following are actual use cases and pilot cases in Japan.

- ✓ Real estate company for keeping watch on employees during earthquake disaster (January 2020): enables monitoring of employee activities, even when LTE and Wi-Fi are not available due to large-scale disaster
- ✓ Alert surveillance of aircraft warning lights (January 2020): contributed to dramatic saving of staff cost and time by substituting physical maintenance inspection with this service
- ✓ Local government for remote monitoring of water level to cope with water related disasters (June to November 2019): enables remote confirmation of water levels in bad weather and outside the office, using PC and smart phones

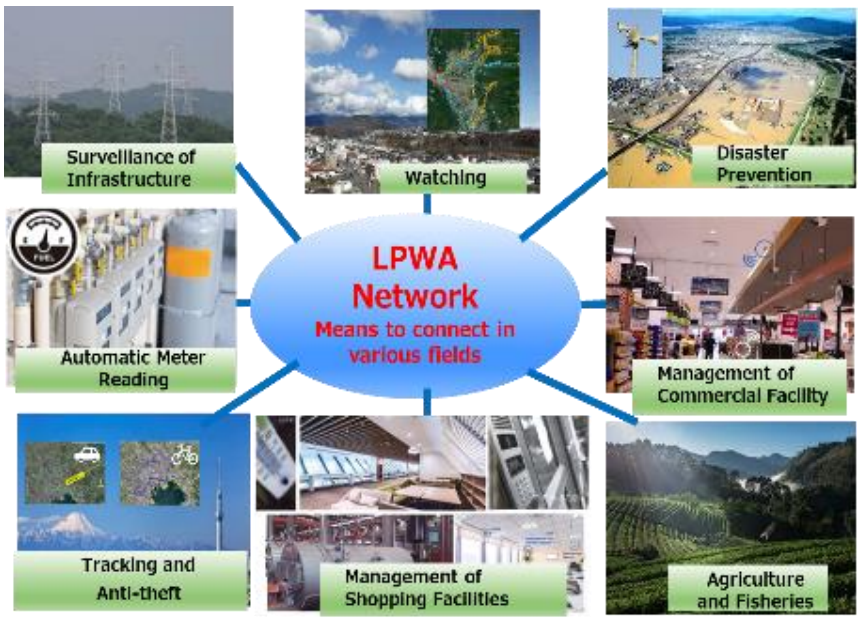
- This service is highly promising in developing countries,
  - ✓ because there is no need to implement large-scale construction work for wireless network, making it easy and quick to establish base stations in wide area.
- Compare to other IoT networks, this service is easier to develop because of the following reasons.
  - ✓ Users do not need to develop network, nor maintain the network.
  - ✓ Initial cost is low as subscription model enables users to pay as the service is provided.
  - ✓ A wide variety of services, including keeping child watching service, prevention of thefts, monitoring of facilities, monitoring of the environment, monitoring of soil condition, monitoring of water level, etc., is possible within the wider area.

6. Reference Information

Basic Structure of IoT and Expectations to LPWA



LPWA Wireless System - Major Deployment Area



Regional Monitoring of Infrastructure (Energy, Transport, etc.) utilizing Synthetic Aperture Radar (SAR)

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

2) Information Analysis and Decision Making (AI, etc.) [visualization of surface movement using SAR image analysis, and factor analysis and prediction by AI in the near future]

(2) Description

This proposal is to offer visualized data for any region of the world with high-accuracy (up to units in mm), detecting changes over time of man-made structure covering wide area, using analysis of images from Synthetic Aperture Radar (SAR) on board the satellite. In the near future, by combining with special AI, it is expected that estimate of the causes for changes over time, as well as future prediction, will become possible. This proposal also includes interpretation of SAR images, and detection and analysis of changes by matching SAR images at different points in time.

This system is used for infrastructure management and disaster prevention/mitigation at local government and enterprises for business continuity plan. Frequently utilized areas are the following.

1) Monitoring of wide-area lifeline management and chemical plants for energy companies
2) Monitoring of ground transformation during road/subway shield construction
3) Monitoring of sea ports for management authorities

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

Major benefit of this system is reduction of infrastructure management cost for monitoring and inspection (monitoring fee, labor cost). In Japan, by utilizing this service line, there are cases in which annual monitoring cost has been cut by 40 – 60% as a result of concentrated monitoring. In other cases, annual labor cost has been cut to just 20% of the original as a result of reducing site inspection activities. Other benefits are the following.

1) Reduction of construction cost: provides comfort and safety to lives of citizens through evaluation of the ground situation, surveillance of ground deformation before, during and after construction, and detection of ground deformation at a higher accuracy and a wider coverage than before. This is especially required in urban development projects in developing countries, particularly those involving underground shield construction such as subways and highways.
2) Preventive measures: enables extension of lifetime of infrastructure and reduction of fiscal expenditure by allowing decision on judging priority in conducting maintenance of facilities, based on detection of change over time at sea ports, particularly seawall and reclaiming facilities.
3) National security measures: contributes to comfort and safety of citizens by enabling surveillance of suspicious ships, etc.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
   d) collaboration with local start-ups

(2) Description on How JICA ODA Support Scheme may be Utilized

- Using leftover funds from ODA Loan (quick contribution)
- Utilizing ODA Loan and Grant Aid by linking the proposal with social infrastructure projects
- Disclosing time series data of changes in infrastructure facilities (such as energy, transport) on GIS, in collaboration with local start-ups that provide internet services, particularly those related to the use of cloud. By combining the data with various other open source data (geological data, meteorological data, transport flow data, hazard map, etc.), and by processing them with artificial intelligence, we can offer factor analysis of change in infrastructure over time, as well as future prediction service.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

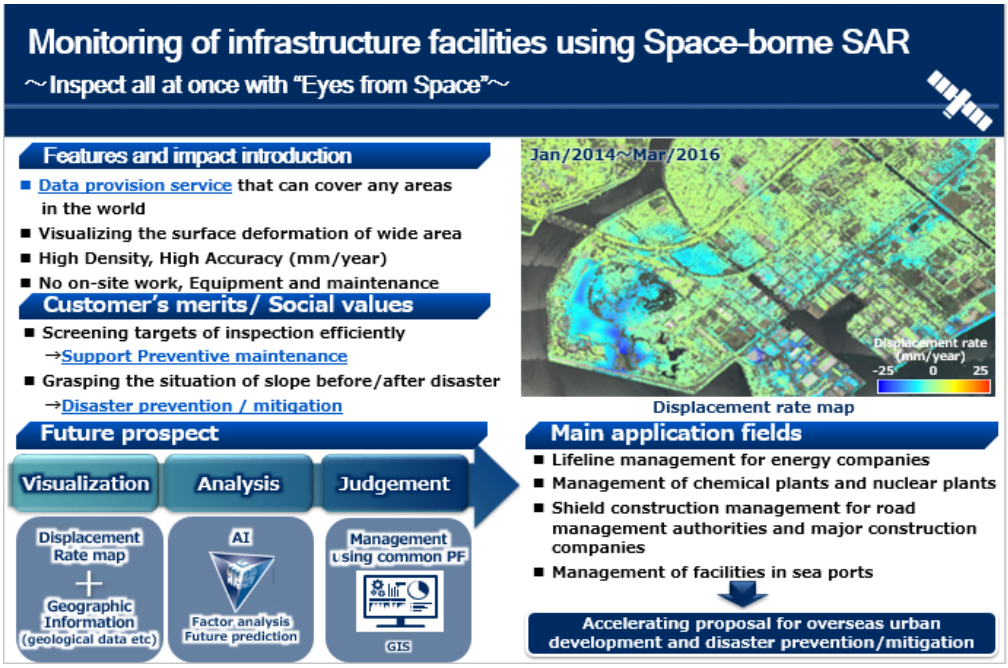
This proposal is data provision service, and does not involve purchase of equipment, construction and maintenance. Breakdown of the cost is the following.

- Around 10 million JPY per year (fees for creating and analyzing images to visualize change in time of man-made infrastructure within an area as large as 100 km2)
- Man-made structure that can be monitored: bridges, river embankments, roads, housing/buildings, electric power facilities, sea port facilities, etc.

5. Proof of Technology / Applicability in Developing Countries, etc.

1) In Japan, many kinds of infrastructure facilities (man-made structure on surface) as shown below used this system for monitoring.
   [ground deformation of shield construction area, thermal power plants, bridges, dams, ports (large-scale demonstration facilities, wharfs, airports, etc.), ground subsidence/liquefaction, river basins (embankments, riverbeds)]
2) In other countries, we are now proposing utilization of this system to a consulting company for subway construction in an Asian country (JICA supported project). We have also made a proposal in a developing country in Africa.

6. Reference Information



Overseas Deployment of ICT-based Construction (I-Construction) for Efficient and Refined On-site Practices

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [digitalization of high-precision measurement, construction drawings and planning]
2) Information Analysis and Decision Making (AI, etc.) [semi-automation of construction machineries, support to operators]

(2) Description

In developed countries including Japan and Australia, we have enabled digitalization of location information by obtaining high-precision measurement data using GPS-based control station, which function as the receiving point of GPS satellites. As a result, it is now possible to a) efficiently conduct pre-construction survey and completion inspection using digital measurement device, b) semi-automation of construction machineries with cm level accuracy (automation of blades and buckets), and c) remote monitoring of construction sites using applications. We propose to deploy ICT Construction using these technologies.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

It is reported that aggregate working hours from pre-construction survey to construction completion were reduced by 26.2% on average, as a result of introducing ICT construction in civil works contracted by the Ministry of Land, Infrastructure, Transportation and Tourism, Japan (MLIT), in FY 2018. By providing assistance from development of infrastructure like electronic reference points, to utilization of high-precision information by the industry, developing countries can benefit from a) supporting construction machinery operators and measurement surveyors who lack sufficient experience and technical capability, and b) shortening the construction period, which tends to become very long. This is in contrast with developed countries like Japan, where lack of labor force for civil works was the major reason for broad use of ICT-based construction. We now see actual use in various sectors, covering not only urban civil works and agriculture, but also mining, telematics, maintenance of plants, etc.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
   e) others (needs assessment through information collection survery)

(2) Description on How JICA ODA Support Scheme may be Utilized

We hope to utilize ODA to conduct pilot project using high-precision measurement data in countries where electronic reference points are available, and adoption in civil works projects (such as infrastructure development, river flood mitigation, dredging of seaports).

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

The cost varies by a great extent, depending on the volume of construction work, as well as percentage of ICT-based construction in the work. Below is scale of preceding case as a reference.

- ICT utilization for civil works in road construction project of Australia: measurement equipment cost around 10 million JPY, device for semi-automation of construction machineries cost around 15 million JPY,

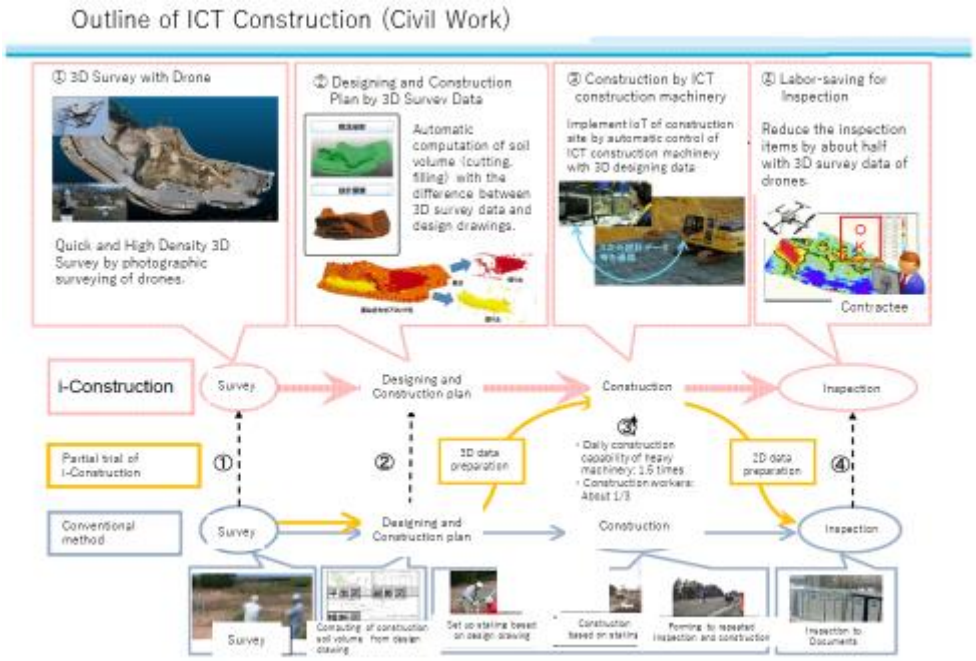
consulting fee for technical support cost around 5 million JPY, etc.

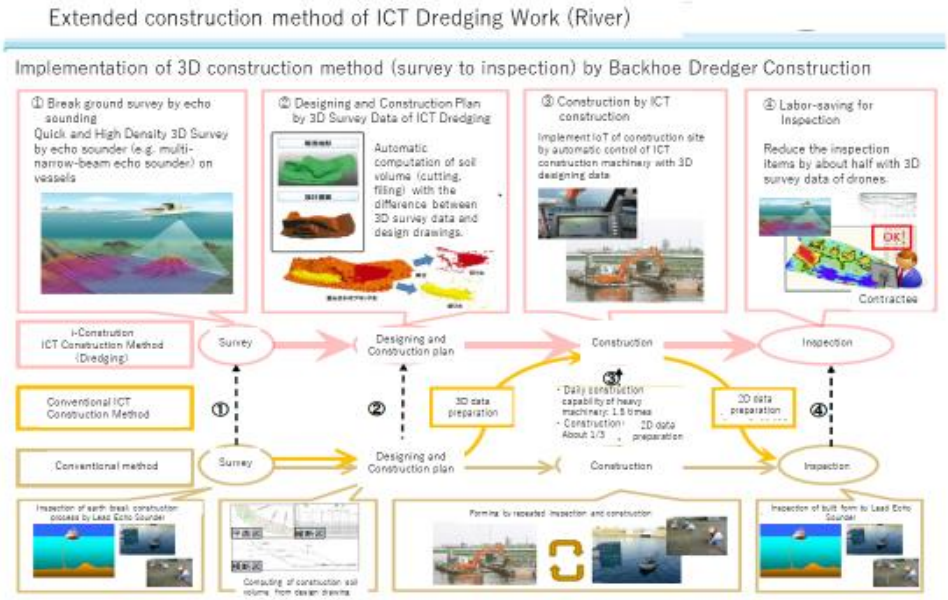
- ICT utilization for airport construction project in Southeast Asia: measurement equipment cost around 15 million JPY, device for semi-automation of construction machineries cost around 30 million JPY, consulting fee for technical support cost around 10 million JPY, etc.

5. Proof of Technology / Applicability in Developing Countries, etc.

This solution has been used in Japan and other major developed countries (we have invested in an Australian enterprise working on related business, as mentioned above), and some areas in developing countries as well. There is no foreseen difficulties in deploying the solution to developing countries, but it is desirable that the target area is accessible to high-precision measurement information economically and stably.

6. Reference Information





Global Digital 3D Map prepared from Satellite Images

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [global digital 3D map prepared from satellite images]

(2) Description

AW3D is the world's first digital 3D map illustrating the topography of the entire globe at 5m resolution (further improved to 2.5m resolution). In urban areas, 3D maps at maximum resolution at 50cm resolution can be provided, which is fully available for the entire country of Japan. Expression of micro-topography at 50cm resolution enabled increased use by business areas, which was not possible at 5m resolution. In development cooperation activities supported by Japan, it is used not only for topography maps in developing countries and disaster management (analysis of flood and landslide risks), but also for basic design (route selection and soil volume estimation for new roads and railways) and various simulation (such as obstacle analysis of radio waves, fluid analysis of winds). Recently, its usage has expanded to areas such as simulation of operating drones and self-driving cars. It is now being used in over 130 countries, and over 1,300 projects in various sectors around the world. AW3D enables collection of information, free of flight restrictions and safety issues. This allows significant enhancement in "precision, speed, and cost" compared to conventional methods available in the past, expanding the possibility by use in various projects around the world.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

In developing countries, aerial surveys and drone surveys are necessary before construction and simulation, due to absence of reliable topography maps. In some cases, airplanes and drones could not be flown into target areas, or could only be flown after a long time (or unpredictable), due to national border issues, flight restrictions due to nature of airports, weather problems, etc. AW3D enables collection of information, free of flight restrictions and safety issues. Additionally, it often uses massive archive images stocked since 1999, facilitating relatively manageable scheduling.

Generally speaking, AW3D can provide 3D maps at only 20 to 25% of the cost required for conventional aerial survey methods, because there is no need to shoot images in many cases.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), b) Private Sector Investment Finance (non-sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation b) indirectly related to financial cooperation (same sector, etc.),

(2) Description on How JICA ODA Support Scheme may be Utilized

AW3D enables accurate simulation and analytical work for urban planning and damage prediction after naturel disasters, for any place on the planet. Standard topographic data at 5m and 2.5m resolution has an accuracy equivalent to map scale of 1/25,000, optimal for use as national level, base map information. High-resolution topographic data at maximum 0.5m resolution enables understanding more detailed undulation. This makes it possible for use in calculation of quantity and slope (level of inclination), and various simulations. Examples of

AW3D use cases are the following.

Climate change ➢ Inundation damage simulation and hazard map preparation of flood, high tide, etc. ➢ Impact assessment of sea level rise ➢ Hazard map preparation of landslide disaster	Urban issues ➢ Preparation of national level topography map ➢ Preparation of urban masterplan ➢ Planning of construction area and route for large-scale infrastructure
Health, water and sanitation ➢ River basin analysis ➢ Underground water survey and selection of well digging location by topographic analysis ➢ Identification of virus infecting route by understanding the flow	Innovation ➢ Flight plan for airplane, helicopter, and drone ➢ Upgrading of automatic navigation ➢ Simulation of wireless network design ➢ Adjustment of remote sensing data, such as satellite image and aerial photo
Sea and land resources ➢ Selection of prospective mine development area ➢ Survey for geothermal energy	Energy ➢ Simulation for suitable location for wind and solar power generation
Education ➢ Production of visual image, such as computer graphics ➢ Production of teaching material for geography and disaster prevention	Map ➢ Understanding earth covering and land use ➢ Understanding change feature for updating map
Constriction and civil work ➢ Selection of suitable land and basic design ➢ Preparation of urban development plan	Understanding of disaster risk areas and reflection onto disaster management plan ➢ Supporting decision-making and nurturing common understanding by 3D visualization of disaster prevention information

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

3) Rough Assumption of Cost

4) Financial Cooperation / 2) Technical Cooperation

a) around several million JPY, b) around several 10 million JPY, c) around 100 million JPY

5) Brief Justification of the Above Cost Assumption

The cost varies by the project, covered area, scope of license, etc. Below are standard unit prices for AW3D.

- Standard topography data (level 2 DSM): from 500 JPY/kms (minimum purchase area: 400 km2)
- High-resolution topography data (level 2 DSM): from 9,800 JPY/km2 (minimum purchase area: 25km2)
- Ortho image (in color): from 3,600 JPY/km2 (minimum purchase area 25km2)
- 3D image of buildings (available images): from 10,000 JPY/km2 (minimum purchase area 25km2)

5. Proof Technology / Applicability in Developing Countries, etc.

AW3D has been used in over 130 countries, and over 1,300 projects, including many cases in developing countries. Owing to its wide coverage and high resolution, it is increasingly being used in regions without maps at fine scale, and updated to reflect latest information. We are contributing to increased efficiency and upgrading in numerous areas including disaster management, resource management, urban planning, electric power, and communication services, both in Japan and abroad.

6. Reference Information

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Detecting Dangerous Objects Using Invisible Sensing for Overseas Transport Projects (Railways, Buses, etc.)

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

2) Information Analysis and Decision Making (AI, etc.) [high-speed scanning and real-time imaging technology]

(2) Description

This system detects concealed dangerous objects (such as firearms, knives, among others) by using penetration characteristics of radio waves, and make a distinction from accepted items (such as smart phones, keys, wallets, and etc).It enables security screening in walk-through manner, as opposed to current body scanners which require a person to stand still. The system achieves the world's fastest frame rate for human-body size measurement and reconstruction of microwave radar images (as of January 2020). It can also detect small knives by using AI dangerous object detection technology.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

Quantitative and qualitative benefits are to be evaluated through Proof of Concept (PoC) and other pilot trials in future, as this technology is under research and has not been ready for commercialisation. Expected benefits, for example, include contribution to increased comfort and safety for infrastructure mass transportation, by preventing weapon crimes in railway stations and passenger coaches through installation of the system.

In not a few developing countries, there are metal detectors placed at the entry gate of train stations, which causes long queues during morning and evening rush hours. This system could contribute to mitigate such congestion, reduce waiting time for passengers through efficient security screening.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), b) Private Sector Investment Finance (non-sovereign), c) Grant Aid (sovereign)

(2) Description on How JICA ODA Support Scheme may be Utilized

a) Use of ODA Loan is expected in the future.

b) Private sectors may rarely promote such infrastructure investment, but in case they do.

c) As this solution is still being developed, we would like to use Grant Aid for on-site tests or PoCs to check the impact and opportunities for commercialisation with clients, toward start-up and establishing business models.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY

(2) Brief Justification of the Above Cost Assumption

This technology is still in research phase, and requires a PoC before commercialisation. Cost estimate is not ready.

5. Proof of Technology / Applicability in Developing Countries, etc.

- It is expected that this technology could be applied for the railway sector.
- Feasibility, however, will be evaluated through PoC, etc. as this technology is still in research phase.

6. Reference Information

The following is supplementary information and images.

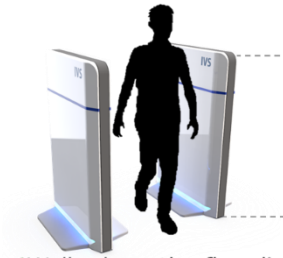
Invisible Sensing (IVS): Enhancing security without causing inconvenience to users

- Detecting concealed weapons (guns, knives, etc) and make a distinction from good items (smartphones, etc)

Body Scanner
in use today

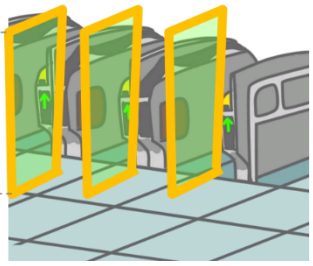
✗Stop & one-by-one (congestion)
✗Forced screening posture
✗Obtrusive screening

Invisible Sensing (IVS)
Walk-through Gate



✓Walk along the flow-line (no congestion)
✓No forced posture and conspicuous screening

Example scenario:
for ticket inspection gate at train stations



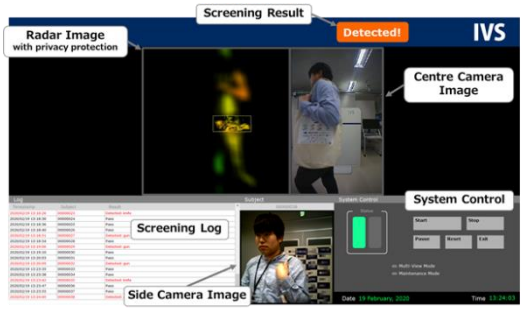
Detect dangerous objects by sensors embedded in a gate-side wall

Invisible Sensing (IVS) features

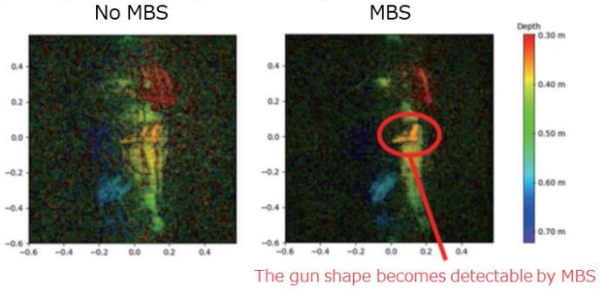
- An IVS prototype has been developed which achieves **the world's fastest** (as of January 2020) for human-body size measurement and reconstruction of those radar images, enabling **real-time walk-through operation**
- **Motion compensation technology** suppresses motion blur in radar images, which contributes to walk-through operation
- **Machine learning technology** as well as **3D radar imaging** enables:
  - detection of metallic and non-metallic weapons concealed inside bags and/or body worn
  - detection of smaller weapons in distinction from good items (smartphone, keys, etc)
- Certified to radio emission regulation in Japan (7.28 – 10.22 GHz)

Prototype Operation: Radar Imaging and Weapons Detection in 10fps

Demonstration Interface



Effect of Motion Blur Suppression (MBS)



The gun shape becomes detectable by MBS

Harbor Monitoring Solution

～Security Solution to Comprehensively Monitor Important Coastline Social Infrastructure, Sea Port Facilities, Vessels, etc. from Air, Water Surface and Underwater～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [information collection through various sensors such as radar, camera and sonar]
2) Information Analysis and Decision Making (AI, etc.) [display of integrated images, automatic detection, automatic tracking, reverberation reduction using AI]

(2) Description

Security solution to comprehensively monitor important coastline social infrastructure, sea port facilities, vessels, etc. from air, water surface and underwater

Around 80% of the global population live near the sea, and around 90% of global logistic is by sea. It is necessary to protect important coastline infrastructure supporting the lives of many (electric power, gas, mining, transportation, etc.), seaport facilities where many vessels are harbored, and vessels harboring in seaports (passenger vessels, oil tankers, etc.) from suspicious intruders. Recently, international regulations are inclined to strengthen underwater surveillance, in addition to surveillance from air and water surface using radar and camera. This solution enables comprehensive monitoring by offering underwater surveillance using sonar, plus radar and camera monitoring from air and water surface. Moreover, the solution increases efficiency and reduced efforts for surveillance, through functions that support operators such as display of integrated images, automatic detection, automatic tracking, warning by sound and light, and reverberation reduction using AI. What sets this solution apart from others is underwater surveillance. Underwater has been regarded as security hole in existing surveillance system using radar and camera.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

1) Provides comfort and safety to livelihood of citizens in developing countries by protecting important coastline facilities (electric power, gas, mining, transportation, etc.) that function as social infrastructure invested for development of the country
2) Similar benefits for seaport facilities and vessels harboring at seaports (passenger vessels, oil tankers, etc.)
3) Increases efficiency and reduced efforts for surveillance, through functions that support operators such as display of integrated images, automatic detection, automatic tracking, warning through sound and light, and reverberation reduction using AI, reducing the chance of overlooking due to inexperience
4) Enables implementation of high-probability, efficient countermeasures by predicting the location and remaining time before suspicious intruders reach certain location

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign)
2) Technical Cooperation: b) indirectly related to financial cooperation (same sector, etc.),

(2) Description on How JICA ODA Support Scheme may be Utilized

- Case 1: Using leftover funds from ODA Loan (quick contribution)
- Case 2: Utilizing ODA Loan by linking the proposal with social infrastructure projects

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

It costs around 300 million JPY for procurement of 1 radar, 3 cameras and 1 sonar, around 30 million JPY for installation works, and 20 million JPY per year for maintenance.

5. Proof of Technology / Applicability in Developing Countries, etc.

Since 2014, we have conducted annual demonstration activities for Japanese electric power companies, National Police Agency of Japan, Japan Coast Guard, etc., actually testing detection by sending divers into the sea. Recent activities include demonstration off the coast of Tokyo Olympic/Paralympic villages in November 2019. Outside of Japan, we have conducted demonstration activity at a canal in front of an exhibition hall in UAE, during the IDEX/NAVDEX in February 2017, which is one of the three major defense exhibition events receiving around 10 thousand visitors from around the globe.

We can install sonars only, to add the function of underwater surveillance to an existing air and water surface surveillance using radar and camera.

6. Reference Information

Mobile Solar Camera Solution

～Cloud Surveillance System, possible to be used even in Areas without Wired Network and Power Supply～

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [viewing live and recorded videos in distant locations]

(2) Description

- Combining “independent power source by solar panel power generation + batteries” and “4G (LTE) / 3G mobile communication accessibility” with mobile camera, this solution can be useful in environment where no communication lines and power suppliesare available.
- Ideal for construction sites, seaports, fishery harbor, power transmission lines and towers, remote disaster damagedareas, surveillance system along highways and railways, etc.
- Operation can start operation in a short lead time with low initial investment as complicated equipment installation, heavy tower foundation work, administration procedure are not necessary, depending on placement plan and installation method.
- From information security perspective, video shall be watched via cloud server where viewers’ right management are monitored and controlled.
- Video can be also viewed by mobile device (smartphones and tablets using dedicated application), in addition to watching video through dedicated viewer / Web browsers on PC.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- This solution can realise viewing surveillance video at distant areas/location that require immediate service, wherer basic infrastructure like wired network and power supply are not available, such as disaster areas and early stage construction sites in much shorter lead time as long as such areas are covered by 4G (LTE) / 3G mobile communication network, for no time and cost are necessary for fixed communication infrastructures/facilities..
- This solution offers easy viewing of videos remotely and at all times. The service is available through mobile device (using dedicated application). Camera modes and function can be remotely managed from distance.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: a) ODA Loan (sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: b) indirectly related to financial cooperation (same sector, etc.)

(2) Description on How JICA ODA Support Scheme may be Utilized

1) As a component of financial cooperation projects through screening of project scope. Examples are the following.

- Disaster prone areas: dam and river water level, eruption signs of volcanoes, etc.
- Critical infrastructure: damages due to bird nest and abnormal vibration of power transmission lines and steel towers
- Seaports and fishing areas: surveillance for poaching and safety, etc.
- Highways and railway crossing: surveillance for surrounding roads, facilities and flooding
- Construction site: monitoring of safety and work progress, etc.
- Event halls: monitoring of congestion and safety, etc.

2) Proposal based programs for Japanese enterprises

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation: a) around several 100 million JPY
2) Technical Cooperation: b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

1) Cost for model case of financial cooperation project

- Mobile solar camera (100 cameras as 1 lot, purchase of equipment): around 100 million JPY (does not include cost for poles, construction work materials and installation work)
- Pre-investigation and assessment of operational environment from technical and regulation perspectives such as SIM card operability, system performance, etc.: around 2 million JPY (travel and accommodation fee, cost for materials, cost for testing, etc.)
- Annual operation cost for 1 lot of cameras (100): around 3 million JPY
- Additional cost for locally procured materials and services, fees for using communication lines and facilities (dependent upon local situation and market price levels)
  a) cost related to installation of mobile solar camera (poles for installation, construction work materials, land acquisition cost, foundation work, etc.)
  b) cost for installation work
  c) initial and operation cost for mobile communication SIM

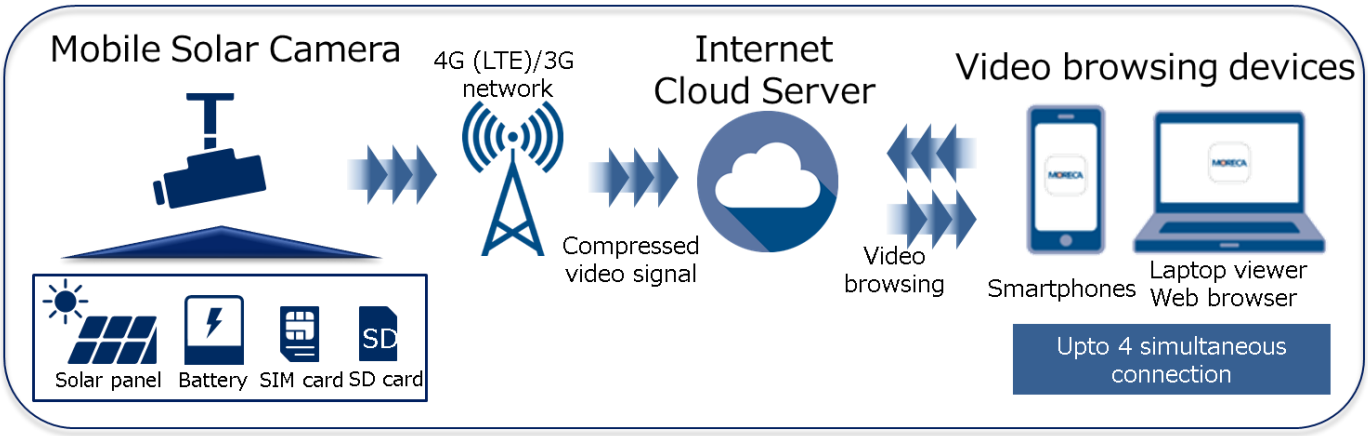
  (Note) local cloud system is required to use this solution

2) Cost for studies will depend on requests from clients to customize the needs.

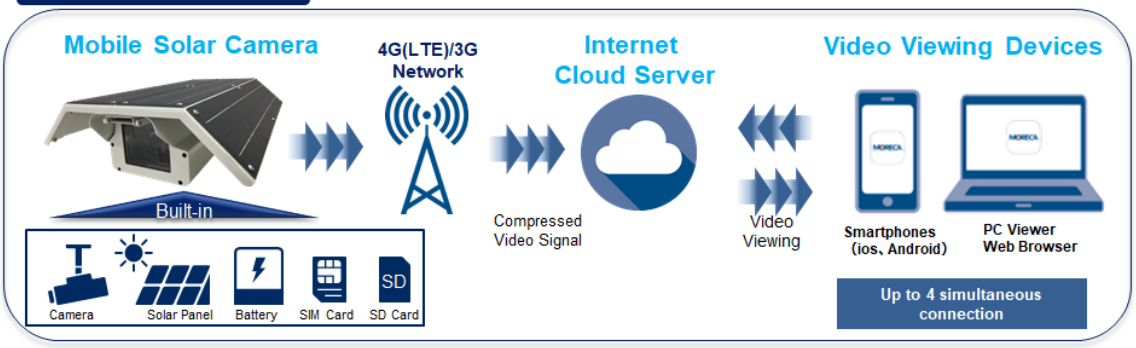
5. Proof of Technology / Applicability in Developing Countries, etc.

- 3 systems are in operation in Japan since July 2019.
- Currently, dozens of companies are interested in using this solution (particularly with regards to strengthening surveillance towards 2020 Tokyo Olympics/Paralympics, road surveillance, construction site surveillance).
- As of end/2019, no supply record to overseas market. Opportunities of providing the service are expected in Myanmar, Thailand and the Philippines.

6. Reference Information



Service Image



Characteristics

Own Power Source/Solar Panel	4G(LTE) / 3G	Easy Use/Operation
■ Solar Power Generation (Built-in) ■ Battery (Built-in) ■ Can continuously run up to 3 days with fully charged battery	■ Ordinary Mobile Network can be used ■ No Network equipment / Video Recorder required.	■ No cabling of LAN / Power required ■ Equipment assembly and Civil Work is not required

3D Modeling Solution with a Smartphone for Quick Disaster Investigations

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

1) Information Search and Collection (IoT, etc.) [Generating 3D modeling (point cloud) using videos recorded with a smartphone]
2) Information Analysis and Decision Making (AI, etc.) [Measuring volume of soil easily by recording videos with a smartphone

(2) Description

This technology, as solution, enables an easy measurement of soil volume with a smartphone, generating 3D modeling (point cloud) from recorded videos. Current conditions can effectively be grasped by utilizing the generated 3D modeling (point cloud). Before this solution was introduced, expensive equipment including Unmanned Aerial Vehicle (UAV) and Laser Scanner (LS) was necessary. This solution, in contrast, can generate point cloud with a smartphone connected to a Global Navigation Satellite System (GNSS) antenna. Anyone can easily record videos for the solution in a way they do in their daily life.

Geographically-tagged photos are generated from recorded videos, then the photos allow us to grasp actual conditions too. Some tools can locate photos on a map, which can be utilized as evidence.

At the sites of restoration construction after natural disasters occur, we need to establish job plans immediately, grasping actual conditions of the disaster, and calculating what job must be done and how much. In many cases, however, we face challenges where it costs us huge amount of time and money to collect enough information to plan reconstruction because only limited people have access to sites after disasters occur. In the worst cases, little information can be collected. This technology can be the solution for those cases.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

➢ Improvement of productivity：

	New solution	Conventional way (Survey by poles)
Required time	1 hour	2 hours
Number of people required	1 person	4 people

At disaster investigation, we saw a case where the solution can reduce time greatly from 8 man-hour to 1 man-hour.

➢ Improvement of safety：

A mere use of smartphone improves safety of investigators at disaster investigation in comparison with conventional survey. Only recording a video allows them to collect enough data.

➢ Decrease of life-cycle cost：

At disaster investigation, anyone can easily obtain data with a smartphone. When landslides block roads and investigators do not have access to sites, even local people, who do not know how to conduct survey, can tell current conditions clearly and immediately with a use of smartphone.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

2) Technical Cooperation: d) others (local support for introducing this solution to overseas as ODA in the future)

(2) Description on How JICA ODA Support Scheme may be Utilized

JICA's local support is requested at the time of introducing this solution to overseas as ODA in the future.

1) Support in introducing the solution

2) Support in procuring equipment locally such as smartphones, SIM cards, GNSS antennas

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

2) Technical Cooperation: b) around several 10 million JPY

(2) Brief Justification of the Above Cost Assumption

Ten plus several million Japanese Yen is estimated as cost.

Based on an assumption that 10 sets of equipment are set up at 100 locations,

- Initial (equipment) purchase：approx. ￥200,000 (per one set) X 10 set = approx. ￥2 million
- 3D modeling (point cloud) generation：approx. ￥5,000 per location X 100 locations = approx. ￥500,000
- Local introduction support costs：2 people X 3 months = approx. ￥6 million
- Translating the solution into local languages: approx. ￥6 million

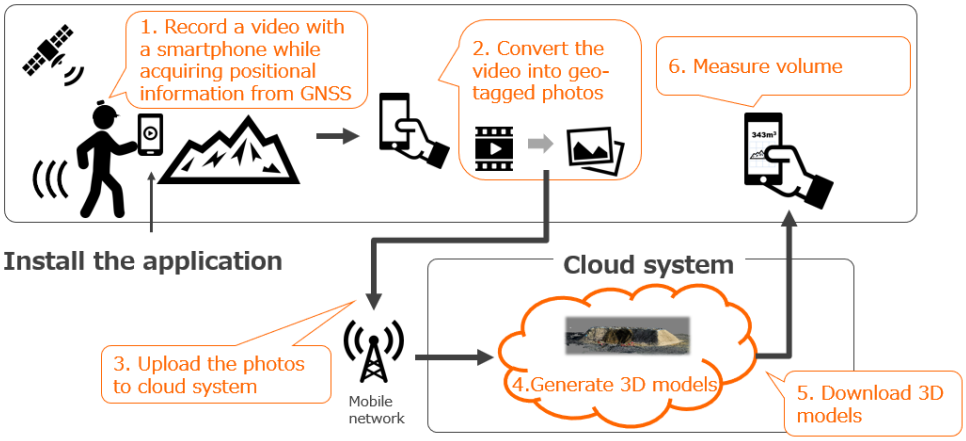
＊The version of smartphone needs to be Android OS8 or OS9.

5. Proof of Technology / Applicability in Developing Countries, etc.

- The solution was provided to a case in Japan.
  An application investigation was carried out at ten plus several locations in a disaster assessment investigation of Higashi-Hiroshima that sustained damage from the heavy rain in July 2018.
- The solution has not been provided to the foreign countries yet.
  In order to introduce the solution to overseas, it is necessary to deal with translating the app into local languages, establishing a proper route to procure local equipment, and setting up network for local support.

6. Reference Information

1. Illustration of the service



2. Example case

AI Assessment for Deterioration of Existing Solar Power Plant

1. Summary of Applicable Digital Technology and Method

(1) Type of Digital Technology and Method

2) Information Analysis and Decision Making (AI etc.) [assessment technology for deterioration of existing solar power plant using AI]

(2) Description

- It is possible to detect malfunction of solar power plants through alerts and inspections, but it is not to specify the cause (weather, deterioration, etc.) of lowering of generation capacity, from gradual changes in daily generation results.
- This proposal is to provide a system to detect a deterioration of the entire system by “visualizing (digitization)” lowering of generation capacity. This is made possible by comparing and verifying actual generation against estimated value during assessment period. Estimated value is calculated through AI learning of actual generation data at ordinary times (such as when the equipment has just been installed), using unique algorithm to create models of generation capacity.
- Solar power business operator can use this system to assess soundness of the facility.
- We can provide this service at economical price, because the analysis is just made by obtaining actual generation data (generation, temperature, sunlight, etc.) over approximately past several months to 1 year, and additional equipment and construction is unnecessary.

2. Quantitative and Qualitative Benefits for Recipient Developing Countries

- This solution enables selection of countermeasures (cleaning, replacing, additional construction work, etc. of panels) with consideration to the trends and cost based on the assessed result of capacity of the solar generation facility.
- This is an instrument to understand medium to long-term state of solar power plant (overall, in units of Power Conditioning System (PCS), in units of strings). For real-time assessment and understanding of malfunctions, we can utilize existing warning system.
- This solution can be used for due diligence before selling or transferring power plants.

3. Possible JICA ODA Support Scheme Applicable for this Project Type (Note: does not imply that other ODA scheme is not applicable)

(1) Type of JICA ODA Support Scheme

1) Financial Cooperation: b) Private Sector Investment Finance (non-sovereign), c) Grant Aid (sovereign)
2) Technical Cooperation: a) directly related to impact and efficiency of financial cooperation
d) collaboration with local start-ups

(2) Description on How JICA ODA Support Scheme may be Utilized

We plan to utilize the schemes for 1) deterioration assessment service of mega-solar power plant facilities (on-grid and off-grid, monthly reporting), 2) due diligence for buyers when power plants are sold, and 3) utilization as negotiation material on compensation for panel deterioration with manufacturers, from the viewpoint of owners.

4. Scale of the Project Type (Note: for reference only. not a commitment that the proposed project type is implemented at this scale)

(1) Rough Assumption of Cost

1) Financial Cooperation / 2) Technical Cooperation: a) around several million JPY (for multiple sites)

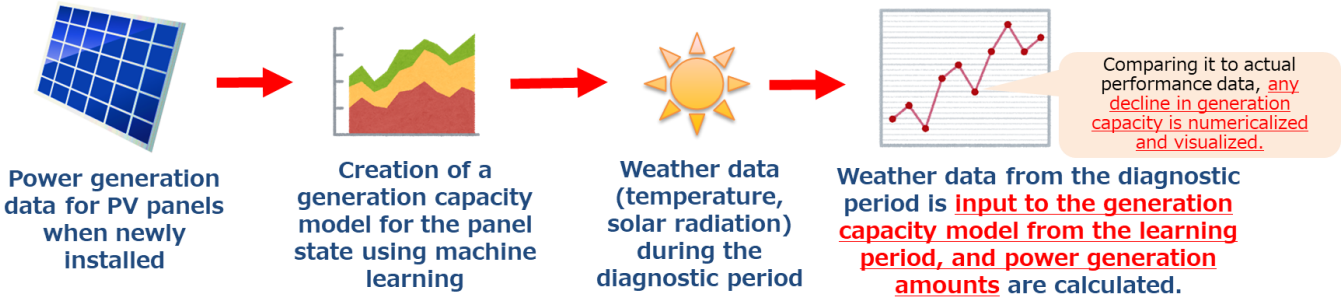
(2) Brief Justification of the Above Cost Assumption

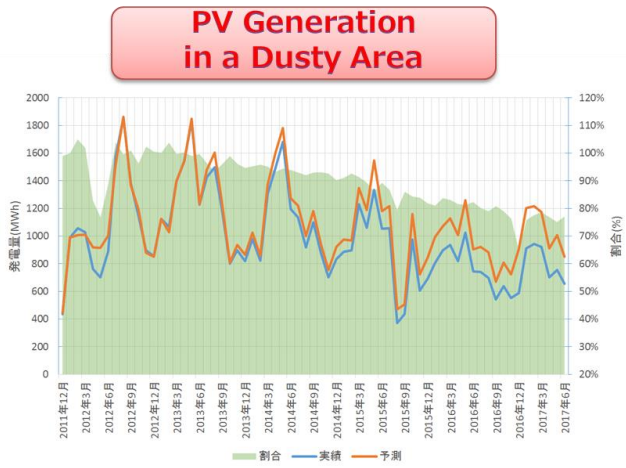
We can submit assessment report in around 1 month, for a site of 10 MW class plant (20 PCS).

5. Proof of Technology / Applicability in Developing Countries, etc.

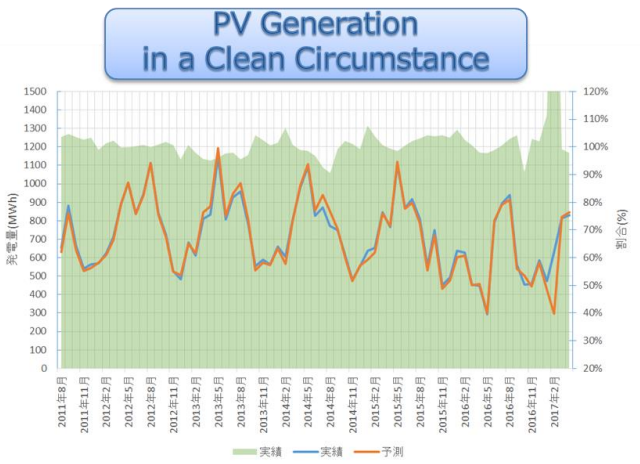
We have experience of using this technology for a number of mega solar power plants in Japan.

6. Reference Information





Case which the Solar Power Plant has been deteriorated



Case which the Solar Power Plant has kept initial soundness