

Playbook for Investment in “Quality ICT Infrastructure”

First Edition

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Table of Contents

Foreword	5
Chapter 1 “Quality ICT Infrastructure” and Its Necessity	6
1.1 Characteristics of ICT Infrastructure.....	6
1.2 “Quality” of ICT Infrastructure	8
Chapter 2 Measures to Develop the Quality of ICT Infrastructure	15
2.1 Formulation of Master Plans	16
2.2 ICT Infrastructure Planning	17
2.3 Procurement of Budgets and Funds to Realize the Project	18
2.4 Requirement Definition of ICT Infrastructure	20
2.5 Procurement of ICT Infrastructure.....	21
2.6 Development, Construction, Operation, and Maintenance Management of ICT Infrastructure	22
2.7 Interim and Ex-Post Evaluation	23
2.8 Structure for Project Implementation and Human Resource Development	24
Appendix Example of “Quality”-ensured ICT Infrastructure	26
Contact	40

Foreword

■ Background

ICT (information and communications technology) is an indispensable tool for social and economic activities. Furthermore, it has become indispensable as a foundation for supporting various economic activities, as a tool for solving various social problems related to disaster prevention, medical care, education, and transportation, and as a tool for effectively utilizing other types of infrastructure. From these aspects, ICT is also an infrastructure that pushes people away from poverty by reducing unemployment and regional disparity and promotes sustainable and inclusive economic and social growth.

(Based on this context, ICT in terms of infrastructure will be referred to as “ICT infrastructure” as appropriate hereinafter.)

Various stakeholders are making continuous efforts toward ICT infrastructure improvements so that all people throughout the world will be able to enjoy the benefits of ICT infrastructure. Among them, the idea that it is necessary to consider the quality of ICT infrastructure (in addition to the quantity) is widespread in order to fully benefit from ICT infrastructure.

The quality of ICT infrastructure is essential in order for the ICT infrastructure to contribute to the resolution of the social problems of the nation or region effectively and to lead to the sustainable development of the economy and society.

“Quality ICT Infrastructure” may first appear costly. However, since it is easy to use and durable, “Quality ICT Infrastructure” is indeed cost-effective in the long run, contributing to economic development and social problem solving.

At the G7 ICT Ministers’ Meeting in Takamatsu, Kagawa in April, 2016, it was included in the Opportunities for collaboration that “Japan welcomes collaboration on initiatives to promote quality ICT infrastructure and share information on its development and deployment”. In response to this, the “International symposium on ‘Quality ICT Infrastructure’” was held in March, 2017. In that symposium, the Ministry of Internal Affairs and Communications (MIC), Japan announced that it was formulating a playbook regarding investment in “Quality ICT Infrastructure”.

■ Objective

With consideration of the above background, this playbook seeks to provide the basic concept of “Quality ICT Infrastructure”, useful suggestions, and best practices to develop “Quality ICT Infrastructure” for ICT policy makers, procurement managers, and personnel in charge of ICT infrastructure.

In addition, various stakeholders, such as consulting companies and system development businesses, can refer to and utilize this playbook, and each of them can adopt an effective approach that is appropriate to the circumstances of nations or regions introducing ICT infrastructure.

This playbook is not a regulation or criterion that requires the complete implementation of all the stated items. The playbook may be positioned as a reference that makes it possible to grasp what the overall structure for introducing “Quality ICT Infrastructure” is and where to place emphasis on the overall structure.

We hope this playbook will accelerate various efforts of stakeholders around the world to develop “Quality ICT Infrastructure” which contributes to sustainable and inclusive economic and social growth.

This playbook will be reviewed in the future on a timely basis.

Chapter 1 “Quality ICT Infrastructure” and Its Necessity

1.1 Uniqueness of ICT Infrastructure

ICT infrastructure is roughly divided into two categories.

(1) ICT as Infrastructure (ICT infrastructure itself)

ICT as infrastructure refers to hard infrastructure, which provides physical ICT network functions (e.g. optical submarine cables, terrestrial digital broadcasting facilities, satellites and data centers), as well as soft infrastructure, such as ICT services and platforms (e.g. IoT/AI platforms, cybersecurity related systems and big data related systems), where ICT provides value as infrastructure.

(2) ICT for Infrastructure (Infrastructure utilizing ICT)

ICT for infrastructure refers to each ICT application introduced to public infrastructure, including railroads, aviation facilities, and roads, to improve the demand forecasting and other functions and the durability of such public infrastructure as well as that introduced to social infrastructure, including public administration, agriculture, education, disaster prevention, and health and medical care, to improve the activity content and environment of such social infrastructure. These ICT applications are characterized by their performance to enhance the value of existing infrastructure.

Compared with other types of general infrastructure, these types of ICT infrastructure have the following uniqueness which needs to be taken into account for investment to, development and deployment of them.

(1) Network building

There are some types of ICT infrastructure that connect with other types of ICT infrastructure or systems and form networks. If high-function, high-performance ICT infrastructure is introduced to a part of a network, for example, the remaining functions and performance may become a bottleneck, and it cannot be said that the functions and performance of the entire network will be improved. Therefore, when introducing ICT infrastructure to a network, it will be necessary to pay attention to the entire network.

For example, even if a transmission system of 100 Gbps is introduced in a certain area, if the transmission rate in other areas is 1 Gbps, it is hard to say that the transmission speed of the entire network will increase. Furthermore, even if a cybersecurity-related system is introduced to only a part of the network, it cannot be said that the network is secure.

(2) Value-affecting operation and maintenance

It cannot be said that ICT infrastructure is perfected when it is introduced. It is necessary to operate and maintain it in order to continue providing its value as an infrastructure correctly. Although the introduction and procurement cost of ICT infrastructure tends to be low compared with physical infrastructure, including bridges and roads, it is necessary to keep in mind that operation and maintenance costs that are equivalent to the introduction and procurement costs may occur.

In an ICT infrastructure project, for example, a period of two years and 50% of the project budget were allocated to the initial development, and a period of six years and the remaining 50% of the project budget were allocated to the operation and maintenance.

(3) Shorter life cycle

Compared with the service life of physical infrastructure, the service life of the hardware of ICT infrastructure is relatively short.

Unlike hardware, software has no predetermined expiration date. However, the speed of ICT technological innovation is fast, and the longest support period of basic software, including operating systems and database software, is approximately 10 years. As a result, ICT infrastructure itself will increasingly become obsolete.

As stated above, unlike physical infrastructure, the lifetime of ICT infrastructure tends to be relatively short.

(4) Recurrence of renewal and version upgrading

Software-related arrangements for ICT infrastructure, such as the modification and expansion of application software, will be necessary if the usage of the ICT infrastructure has to be changed as a result of amendments to legal regulations or institutional system changes or a new need is found in the operation of the ICT infrastructure. Furthermore, in order to improve the performance requirement for the ICT infrastructure corresponding to economic growth, it may be necessary to reinforce the hardware. Thus, it is necessary to continue updating and improving the ICT infrastructure.

1.2 Quality of ICT Infrastructure

1.2.1 Principle and Significance of Quality Infrastructure

The idea that “quality infrastructure” is necessary is widespread in the international community.

(1) United Nations

The United Nations Summit in September 2015 adopted the 2030 Agenda for Sustainable Development as an international goal from 2016 through 2030. The agenda set up the Sustainable Development Goals (SDGs), which consist of 17 goals and 169 targets to eradicate poverty and realize a sustainable world. One of the goals is to build strong resilient infrastructure and promote inclusive and sustainable industrialization and innovation. It is clearly stated that the goal is to develop high-quality, reliable, sustainable, and tough infrastructure.

(2) G7 Ise-Shima Summit

Principles for Promoting Quality Infrastructure Investment with excellent environmental performance and durability were confirmed in the G7 Ise-Shima Summit in May 2016. In the principles, the G7 members declared that they would encourage the relevant stakeholders, namely governments, international organizations, including multilateral development banks (MDBs), and the private sector such as in PPP projects, to introduce and promote a transparent and competitive procurement process by taking full account of the value for money and quality of infrastructure, while also saying that they would make infrastructure investment and provide support in line with the principles.

(3) G-20 Hangzhou Summit

In the G20 Leaders’ Communique at the G20 Hangzhou Summit in September 2016, the participants reaffirmed the commitment to promote investment focusing on infrastructure in terms of both quantity and quality, and the G20 members welcomed the Joint Declaration of Aspirations on Actions to Support Infrastructure Investment by MDBs, including their announcements of quantitative ambitions for high-quality infrastructure projects within their respective institutional mandates. The Joint Declaration also includes the MDBs’ commitment to the maximization of the quality of infrastructure projects, the reinforcement of the flow of project formation, the further collaboration of the existing and new MDBs, environment reinforcement to enable infrastructure investment in developing countries, and the promotion of efforts to induce the introduction of private funds. The Communique stated that the G20 members stressed the importance of quality infrastructure investment, which aimed to ensure economic efficiency in view of life-cycle cost, safety, resilience against natural disasters, job creation, capacity building, and transfer of expertise and know-how on mutually agreed terms and conditions, while addressing social and environmental impacts and aligning with economic and development strategies.

As stated above, a certain social consensus is beginning to be obtained in the international community about the idea of quality infrastructure. It is possible to understand that the world is recognizing the importance of realizing high-quality growth through infrastructural investment and development and distributing the dividend of the growth to all people, including socially vulnerable people, in every corner of each region and society and the necessity for quality infrastructure and investment in order to realize the growth as a goal.

1.2.2 What is “Quality ICT Infrastructure”?

(1) Characteristics of “Quality ICT Infrastructure”

The concept of “quality infrastructure” is extended to the concept of ICT infrastructure. “Quality ICT Infrastructure” is considered to have the following characteristics.

- The initial cost may not always be low, but the infrastructure will be easy to use and it will ensure excellent maintainability and last a long time because of its robustness. Thus, it is greatly expected that the infrastructure will contribute to economic development and resolution of social problems.
- From a long-term perspective, it will be cost effective and inexpensive.
- It will contribute to the achievement of sustainable, inclusive, and economical and social growth.

Taking these characteristics into account, it can be said that high value is expected from “Quality ICT Infrastructure” in return for payment in terms of economy, effectiveness, and efficiency when considering the life cycle cost and quality or suitability of ICT infrastructure.

For example, a certain type of ICT infrastructure may require twice the initial cost of another type, but its life cycle cost can be kept low if its service life is long and it ensures ease of maintenance with a modest maintenance cost. In other words, even though the initial cost is high, this ICT infrastructure can be said to have high economic efficiency. Furthermore, even if the total cost is high but the ICT infrastructure provides a great economic effect and efficiency, it can be said that the ICT infrastructure has high economic performance and efficiency.

	ICT infrastructure A	ICT infrastructure B
Initial cost	High (twice the cost of infrastructure B)	Low
Maintenance cost (yearly)	Low (half the cost of infrastructure B)	High
Life expectancy/lifetime	Long	Short
	↓	↓
Life cycle cost	Low	High

In order to achieve the sustainable growth and inclusive development, it will be effective to invest in and develop “Quality ICT Infrastructure” harmonized with the environment, culture, and people of the region, including socially vulnerable people, which will promote the economic growth of the region as well.

(2) Necessity of “Quality ICT Infrastructure”

If it is difficult to secure a budget due to limited financial circumstances, excessive importance tends to be attached to the initial cost without sufficiently considering the quality at the time of ICT infrastructure planning and procurement. This results in a failure in the use of the ICT infrastructure as planned or scheduled, lack of system operability and long-term durability of the ICT infrastructure, the noncompliance of the infrastructure with international standards, high maintenance and operation costs, and insufficient environmental consideration.

As explained below, there were many problematic cases in which the quality of ICT infrastructure was not taken into account. Considering these cases, although initial and other costs are an important factor, the quality of ICT infrastructure can also be said to be a crucial factor taking into account the long-term perspective and achievement of growth.

By clarifying the real needs for ICT infrastructure and utilizing know-how (e.g. mobilizing finance schemes), it will be possible to procure ICT infrastructure equipped with comparatively high superiority with consideration to its quality. (See the *Appendix* for introduction examples of “Quality ICT Infrastructure”.)

Cases Where Quality Was Not Considered in ICT Infrastructure

A case where too much emphasis was placed on the initial cost

- A country attached importance on the initial cost in procurement of a number of transmitters for terrestrial digital broadcasting. The power supplies failed several years later and they became a mountain of defective products. As a result, a huge repair cost was required, and the government agency in charge got sucked into budget adjustments and a temporary suspension of services. Furthermore, the operator went bankrupt in the end and there were no spare parts available.
- A country decided to order the installation of a telecommunications network from a manufacturer in a project because of its low initial cost. However, as the manufacturer took a strategy to sell the initial introduction block at a low cost and gain a profit from the expansion part, eventually, the total cost including maintenance charges became high. Furthermore, the manufacturer increased the maintenance service cost to a great extent three years later and unilaterally informed the country that the manufacturer would not make level adjustments without a renewal of the contract. As a result, the country had difficulty in making level adjustments and operational problems.

A case where the planning or requirement definition of ICT infrastructure was insufficient

- A country’s policy on the construction of a communications network was not clear in its landline telephone project, and the country easily accepted offers to install equipment for free from a number of manufacturers. As a result, telephone exchanges in a wide variety imported from various countries exist in a mixed state, which adversely affected the efficiency of the project, thus causing trouble in maintenance with increasing costs. Currently, approximately 20 manufacturers’ telephone exchanges are still in operation. Some of them run out of spares; however, and they will not function again if they stop operating.
- A county is planning to introduce a system in a mobile phone project on a loan from another country (hereinafter referred to as “Country X). The object of the loan is only the provision of equipment and a dispatch of a supervisor (SV). According to the contract, the country is responsible for appointing a local contractor at the country’s risk and expense for the actual construction and installation of the equipment under the supervision of the SV dispatched from Country X. The construction work requires considerable experience from the contractor. Although the SV is present, the country is concerned about whether the local contractor can complete the project without fail and whether the country has to purchase expensive parts.

A case where the maintenance or operation of ICT infrastructure was not fully considered

- A public institution of a country introduced a financial system. The manufacturer of the system offered the conclusion of a maintenance contract. The institution decided not to conclude the same from the viewpoint of cost and decided to maintain and operate the system on its own responsibility. A malfunction of the system occurred after a while and the

institution could not handle it. The institution asked the manufacturer for advice. The institution, however, had trouble with the manufacturer because the institution once turned down the offer, and it took a long time to reuse the system.

- A country introduced a surveillance camera system with a finance of several tens of billion yen from another country. Support for the operation method and human resource development, however, was not sufficient and the system was left without being activated.

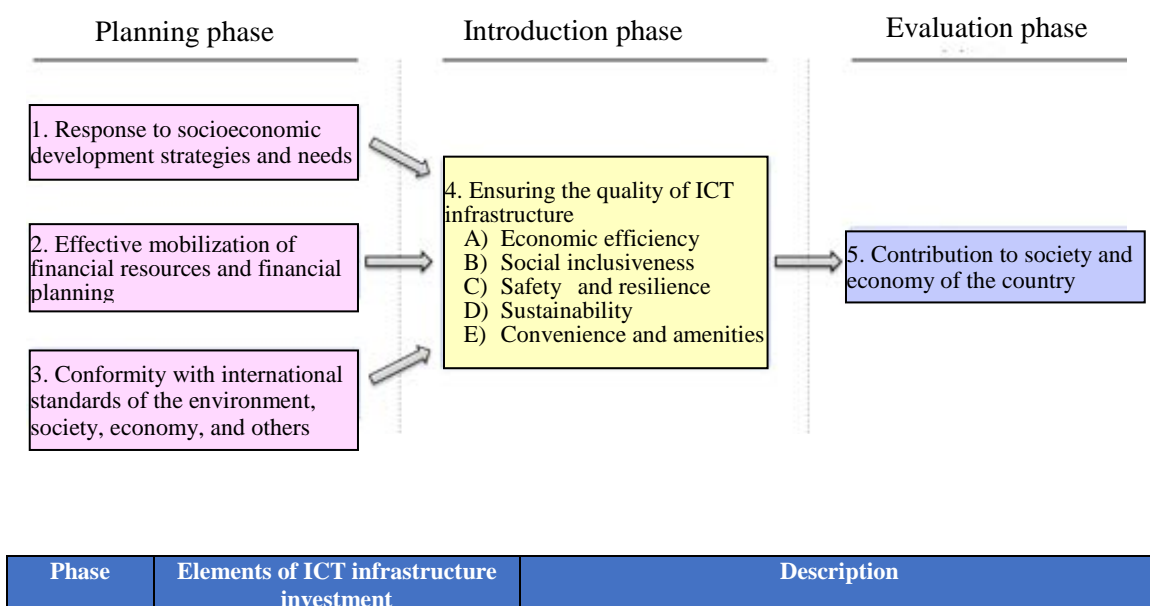
A case where a master plan on the introduction of ICT infrastructure was not formulated

- A country agreed to receive support from a developed country for improvements in a logistics-related business project, but the operator of the business did not specify a master plan or ideal image specifically and had to work on measures that could produce results in a short term. The project differed from the content of the planned long-term support of the developed country, and it became difficult to obtain continuous support and investment.

1.2.3 Elements of “Quality ICT Infrastructure” Investment

In order to enable a country or region to achieve high-quality growth, it is desirable to conduct “Quality ICT Infrastructure” investment in response to the ICT infrastructural demand of the country or region. There are items to be noted in carrying out “Quality ICT Infrastructure” investment. These items include the response of the ICT infrastructure to the country or region’s socioeconomic development strategies and needs, effective mobilization of financial resources and financial planning, the conformity of the ICT infrastructure with international standards of the environment, society, and economy in the planning phase and the development of the quality of the ICT infrastructure in the introduction phase. The contribution of the ICT infrastructure to society and economy (including the creation of job opportunities and the training of ICT human resources for the operation of the infrastructure) will be achieved in the evaluation phase and the ICT infrastructure is expected contribute greatly to the high-quality growth of the country or region and the resolution of social problems.

Fig. 1 Element Examples of “Quality ICT Infrastructure” Investment and Corresponding Phase



Planning	1. Response to socioeconomic development strategies and needs	Formulating the ICT master plan or long-term plan and designing the project consistent with people's needs and requests for the resolution of problems along with dialogues and cooperation with other governments and international development financial institutions for the plan
	2. Effective mobilization of financial resources and financial planning	Securing budgets for "Quality ICT Infrastructure" investment and utilizing investments and loans from overseas.
	3. Conformity with international standards of the environment, society, economy, and others	Reducing impacts on the environment and society and planning and designing of ICT infrastructure in accordance with international standards and not with their own standards.
Introduction	4. Ensuring the quality of ICT infrastructure	Features of ICT infrastructure itself
Evaluation	5. Contribution to the society and economy of the country	Effects and achievements brought about by "Quality ICT Infrastructure". * Job opportunity creation and ICT human resource training and capacity building are included.

1.2.4 Content of Quality of ICT Infrastructure

The quality of ICT infrastructure to be maintained in the elements shown in 1.2.3 is considered to include the following elements (i.e., economic efficiency, social inclusiveness, safety and resilience, sustainability, and convenience and amenities). Depending on the type of ICT infrastructure, not all of these elements are applicable.

Each quality element of ICT infrastructure is directly included in the development, introduction, and operation of the ICT infrastructure itself, but they will evolve into matters related to 5. *Contribution to society and economy of the country*. Chapter 2 describes 1. *Response to socioeconomic development strategies and needs*, 2. *Effective fund introduction and financial planning*, and 3. *Conformity with international standards of the environment, society, economy, and others*.

Fig. 2 “Quality” of ICT Infrastructure

Quality elements of ICT infrastructure	Description	Elements of ICT infrastructure investment Developmental connection with contribution to society and economy of the country
A) Economic efficiency	<ul style="list-style-type: none"> ■ High economic value from a long-term perspective on ICT infrastructure · Low total cost (life cycle cost) of the development, operation, maintenance from a long-term perspective. · Suppression of the lifecycle cost of social infrastructure using ICT. 	<p><Solution of social issues by “Quality ICT Infrastructure” and contribution to economic growth></p>
B) Social inclusiveness	<ul style="list-style-type: none"> ■ Development of ICT infrastructure (with high social inclusion) that will include socially disadvantaged regions and people or improvements in social inclusion by using ICT. · ICT infrastructure will be provided across urban areas or it can be used without distinction, such as differences in social and economic strata. (covering distant, non-profitable, low population density areas) · By using ICT, social infrastructure services can be used across urban areas. 	<ul style="list-style-type: none"> ■ Securing financial resources for economic development · Making it possible to improve or alter the mechanism of revenue of the country or region, and as a result, the procurement of new financial sources with new profits will be obtained from an increase in revenue and the suppression of expenditure. (*1 and *2) ■ Ensuring social inclusiveness · Making it possible to create a society that can withstand social structure changes and accept all people equally by bridging the digital divide.
C) Safety and resilience	<ul style="list-style-type: none"> ■ Improvements in the safety and resilience of ICT infrastructure or improvements in safety and resilience of social infrastructure · Achievement of a stable communication environment with less malfunctions · High durability against natural disasters such as typhoons, floods, earthquakes, and human disasters, including cyberattacks. · Utilizing ICT can increase the durability of infrastructure. 	<ul style="list-style-type: none"> ■ Improvements in social resilience · Making it possible to realize the protection of people’s lives and assets, and as a result, a strong society that can withstand changes in social structure will be made.
D) Sustainability	<ul style="list-style-type: none"> ■ Reduction of the burden on the global (or regional) environment by the development and operation of ICT infrastructure or utilization of ICT infrastructure with improvements in the sustainable harmonization of ICT infrastructure with the environment · Reduction of greenhouse gas emissions and realization of energy saving. ■ Contribution of ICT infrastructure to sustainable development of the social and economic environment · In line with the development and change of the socio-economic environment, the feasibility of the gradual introduction of infrastructure and the continuity and expandability of business related to ICT infrastructure will be highly expected. (*3) 	<ul style="list-style-type: none"> ■ Development of job opportunities and human resources · Creating job opportunities for the development of ICT human resources and for the operation of ICT infrastructure, and the creation of domestic job opportunities and the progress of ICT human resource development will contribute to society and the economy.

E) Convenience and amenities	■ Ease of the operation, maintenance, and management of ICT infrastructure or high-quality services provided by social infrastructure through the use of ICT.	
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*1: It is an idea to convert the introduction effect of ICT infrastructure into monetary value and deducting it from the cost. Even if a high-cost ICT infrastructure is introduced, if it produces even a high profit to cover the cost, it will be economical as a result.

*2: In order to improve economic efficiency by introducing ICT infrastructure, it is an idea to newly establish or amend the legal institution that governs the income and expenditure mechanisms of the country or region for the introduction of an ICT infrastructure system package, including the allocation of personnel as a means of operating the system, to maximize the effect of the ICT infrastructure.

*3: If it is not possible to secure a sufficient budget for the introduction of ICT infrastructure or the effect of ICT infrastructure needs to be verified, it is not always necessary to develop and construct all functions extensively, and it is also an idea to adopt a “small start” form. Even if ICT infrastructure is introduced with a small start, it will be good if the ICT infrastructure has functions, while being scalable and extensible, because it will be possible to expand the functions and scope at the stage of securing a new budget and verifying the effect. As a result, the sustainability of society can be secured.

Chapter 2 Measures to Develop the “Quality ICT Infrastructure”

In order to develop the “Quality ICT infrastructure”, it is necessary to implement appropriate approaches at each stage of the formulation of a national plan and policy on the development of the ICT infrastructure, ICT infrastructure planning, requirement definitions of the ICT infrastructure, development, construction, operation, and maintenance management of the ICT infrastructure.

The overall way to promote an ICT infrastructure project with emphasis on the quality of the ICT infrastructure is shown below. The playbook is organized according to the implementation of a typical project.

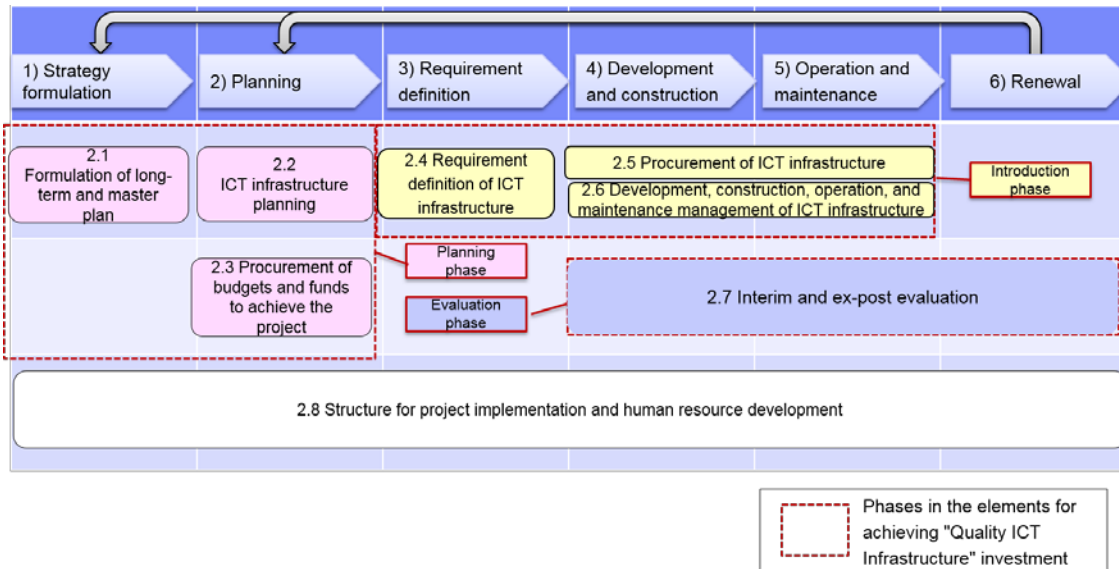
Fig. 3 Each Stage of ICT Infrastructure Project

Stage	Explanation
1) Strategy formulation	Clarifying the position of the ICT infrastructure in the national plan and policy and making a development plan to contribute to the creation of employment opportunities and the development of human resources according to the needs of the country.
2) Planning	Making an appropriate plan by conducting a feasibility study, if required, in order to clarify the quality of the ICT infrastructure and consider an introduction method. Furthermore, making an appropriate investment plan to realize the introduction of the ICT infrastructure according to the plan.
3) Requirement definition	Defining the requirements of the ICT infrastructure for the level of the quality with consideration of the balance between the content of the plan and its budget with required funds.
4) Development and construction	Clarifying the detailed requirement level and qualification requirements of the ICT infrastructure along with the evaluation criteria for the screening of proposals in order to make an appeal for competitive proposals for the selection of business operators engaged in the development and construction of the ICT infrastructure.
5) Operation and maintenance	Monitoring and controlling the implementation status of the selected business operators or government-related organizations’ maintenance management and operation of the ICT infrastructure.
6) Renewal	Clarifying the successful points of the project and required improvements based on the mid-term evaluation and ex-post evaluation of the project, modifying the project, if necessary, and making new strategies and additional

	plans and designs. Furthermore, organizing lessons for similar projects in the future.
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The chart below shows how to proceed with each step. The bottom part of the chart shows parts related to this Chapter.

Fig. 4 Implementation Process of ICT Infrastructure Project



In order to develop the “Quality ICT infrastructure”, 2.1 through 2.3 are important from the viewpoint of clarifying the purpose of the ICT infrastructure to be introduced and 2.4 through 2.7 are important from the viewpoint of acquiring and maintaining the necessary and sufficient performance and functions of the ICT infrastructure. With consideration of the uniqueness of ICT infrastructure, the value of ICT infrastructure tends to be greatly influenced by the contents of 2.4 through 2.7. Furthermore, the establishment of a framework and the development of human resources are very important items to support the implementation of 2.1 through 2.7, while 2.8 is also a very important item from the viewpoint of realizing the high-quality growth of a country or region by securing the medium to long-term quality of ICT infrastructure.

2.1 Formulation of Long-term and Master plans

(1) Clarification of ICT infrastructure development and implementation plan according to the purpose

First of all, it is important to establish a master plan for the introduction of “Quality ICT Infrastructure” in order to clarify the role that the ICT infrastructure should fulfill and the scope of the usage of the ICT infrastructure.

The master plan shows a basic, comprehensive, and long-term plan for the clarification and reinforcement of the goal sharing and coordination of a number of related plans. Furthermore, the master plan serves as a base for requesting each organization for cooperation at the time of implementing the plan.

As long as the master plan is established, it will be possible for concerned parties to recognize the same idea of what to introduce the ICT infrastructure for, what to solve in the ICT infrastructure, and so on. If the master plan is appropriately formulated, the purpose of introducing the ICT infrastructure will be clear. In the work at the later stages, the quality of the ICT infrastructure should be emphasized naturally.

(2) Sharing information and exchanging opinions with stakeholders

ICT infrastructure is used for people in various positions in countries and regions. Furthermore, the development and construction of ICT infrastructure may be conducted across a number of countries or local governments. At the time of formulating a master plan, it is important to properly reflect the local needs and characteristics of the areas where ICT infrastructure is introduced.

For that purpose, it is necessary to share information with related ministries and agencies in the country, municipalities, and private enterprises. Furthermore, if necessary, it is also effective to utilize the knowledge of other countries that have similar ICT infrastructure development experience.

The innovation speed of some types of ICT infrastructure is high. Furthermore, they may have diversity. It is an idea to request cooperation from domestic and overseas consultants, vendors, etc. in order to gather the latest information and the best information for problem solutions. Considering that the innovation speed of ICT infrastructure is particularly fast, it is necessary to increase the collection speed of information. It is also an idea to organize counselors such as consultants and vendors beforehand on a field-by-field or system-by-system basis.

In order to make ICT infrastructure function more effectively, not only introducing the ICT infrastructure itself but also institutional development may be appropriate.

Example) In the case of developing a broadband network in a mountainous area or on an island

First of all, it is necessary to hear the detailed local needs and characteristics of the mountainous area or the island from the local government. With consideration of the needs and characteristics, it may be possible to request vendors to offer the use of satellite or wireless technology to the local government if it is difficult to lay a wired network.

Example) In the case of introducing a tax-related system

By implementing and reforming tax-related laws, it will be possible to further increase the effect of introducing ICT infrastructure.

2.2 ICT Infrastructure Planning

(1) Achievement of necessary ICT infrastructure performance, functions etc

It is necessary to define the purpose of the development of ICT infrastructure, required performance and functions of the ICT infrastructure, methods of developing and constructing the performance and functions, and methods of operating and maintaining the ICT infrastructure at the planning stage of the ICT infrastructure.

Furthermore, it is necessary to decide what should appear as a result of the use of its performance and functions and how the ICT infrastructure will contribute to society and the economy.

At this stage, it is important to conduct a feasibility study (FS), demonstration experiments, and small-scale tests and examine and verify whether it will be possible to realize the required performance and functions and obtain the assumed effects and results of the ICT infrastructure and how to introduce the ICT infrastructure.

(2) Performance of ICT infrastructure and dialogues with cooperating organizations with cooperation requests

A way to clarify what kinds of performance and functions are required for the ICT infrastructure is to refer to other countries' initiatives that have the same track records on the introduction and operation of similar types of ICT infrastructure. The reason is that the budget can be used more effectively even if the budget is limited.

In order to obtain information on the initiatives, it is also an idea to collect information from consultants and vendors who have knowledge of the introduction and operation of the ICT infrastructure, as well as research institutes, such as universities, or through dialogues with the competent authorities of the countries.

2.3 Procurement of Budgets and Funds to Realize the Project

It is also necessary to consider how to develop and introduce the ICT infrastructure planned in 2.2.

(1) Study on appropriate budget and fund acquisition at the planning step

In the planning of the ICT infrastructure, it is important to clarify the performance and functions of the ICT infrastructure and the methods of developing, constructing, operating, and maintaining the ICT infrastructure along with the methods of appropriate budget and fund acquisition for the realization of the ICT infrastructure.

The required performance and functions or the development, construction, operation, and maintenance of the ICT infrastructure will be inappropriate or insufficient unless the methods of budget and fund acquisition are proper. As a result, the purpose of introducing the ICT infrastructure may not be attained. It is necessary to pay attention because there is a possibility of introducing useless things and waste may be generated, and additional funds may be required after all.

(2) Procurement of budget and funds by domestic and foreign investments and loans

There are various means of budget and fund acquisition. As a matter of course, it is desirable to secure the budget for the home country, but it is also possible to utilize domestic and foreign investments and aids.

Domestic and foreign investments and aids include the following ones, and one idea would be to apply them as follows.

- Private Finance Initiative (PFI) as a type of Public Private Partnership (PPP) for social infrastructure development utilizing private funds ; Those with high business potential from the early development stage and are expected to benefit with the involvement of non-governmental business operators
- Official Development Assistance (ODA)
- Introduction support through investments and loans by international development financial institutions and the establishment of domestic entities in cooperation with foreign governments and the private sector : Though high effects can be expected from

them, they need to be introduced in a brief period of time.

With regard to the application of such investments and loans, one idea is to hold dialogues with and request cooperation from countries that have already introduced similar ICT infrastructure or ODA implementing organizations of developed countries, international development financial institutions, domestic and foreign consultants, vendors, etc., with proven track records on their involvement in the utilization of the ICT infrastructure and supplement necessary information.

In order to obtain these investments and loans, it is desirable for the ICT infrastructure to attract investors to be involved with the planning of ICT infrastructure, for example. As described in 2.1 and 2.2, it is important to clarify the following items.

- How will the target ICT infrastructure be introduced?
- What function will achieve its purpose and how?
- What kind of organizational structure will undertake the project?
- Under what kind of legal framework will the project be developed?

After this, it is considered that the possibility of attracting private investments will increase on the basis of public investments as the project seed money (starting capital).

2.4 Requirement Definition of ICT Infrastructure

ICT infrastructure requirements need to be defined with consideration of the mechanism of budgets and funds to be secured to plan ICT infrastructure and realize the plan as described in 2.2 and 2.3.

It is necessary to keep in mind that the following points are included with respect to the quality of ICT infrastructure in the definitions of ICT infrastructure requirements.

- Ease of operation and visibility at the time of operating and maintaining ICT infrastructure (e.g., clarifying the accessibility requirements of the user interface of the ICT infrastructure so that users of various ages and physical characteristics can operate the ICT infrastructure without problem).
- A low frequency of parts replacement with high response performance, including the high suppression of service interruption at the time of parts replacement (e.g., specifying that the frequency of major parts replacement is less than twice a year and the system operation rate (i.e., $\text{Operable time} \div (\text{Operable time} + \text{Inoperable time to } 99.9999\%)$) is 99.9999% (i.e., the inoperable period is 32 seconds).
- Less trouble, a low cost of operation and maintenance, and high cost-effectiveness from a long-term perspective (e.g., evaluating the system based on the average failure time of less than 4,380 hours (i.e., $\text{System operating time} \div \text{the number of failures}$), which is the average time of the system in continuous stable operation (allowing failure stoppages twice a year) and the life cycle cost calculated from the initial cost added to the running cost for five years).
- The system and equipment constituting ICT infrastructure are robust and can ensure high security against disasters (e.g., digitizing the tolerance to earthquakes, i.e., major natural disasters in the country, and explicitly indicating functions such as access control and encryption).
- The system and equipment constituting ICT infrastructure must comply with international standards that have been formulated for improving social inclusion and ensuring environmental sustainability (e.g., indexing the improvement rate of bridging the digital divide by introducing the ICT infrastructure with a concrete figure, for example 10%, and clearly indicating the numerical values of the environmental management and elements of the information system, for example greenhouse gas emissions).
- The construction and installation technology and management techniques must ensure the performance and functions, cost effectiveness, safety construction, and environmental consideration of the ICT infrastructure at prominent level (e.g., clarifying the health, safety, and environment (HSE) policies and elements of the ICT infrastructure and clarifying the numerical values of the environmental management system and its elements of the ICT infrastructure).

Note: The values shown here are examples and are not commonly applied to all ICT infrastructures and systems.

Depending on the type of ICT infrastructure, technologies requiring high expertise are included, and it may take a long time and exorbitant cost to grasp the technology and to evaluate the assumed effect and ease of the operation and management of the ICT infrastructure. In this case, it would be possible to define the requirements with the height of the quality kept in mind, by hiring a consultant who has knowledge in the ICT infrastructure if necessary.

Defining requirements appropriately will ensure the transparency of procurement. In the case

of choosing the lowest bid price with no technical proposal required, in particular, it should be kept in mind that the definitions of requirements will become a key factor in securing the quality of ICT infrastructure.

2.5 Procurement of ICT Infrastructure

In order to ensure the quality of ICT infrastructure, it is necessary to use an appropriate method and select a business entity capable of reliably developing and constructing the ICT infrastructure meeting the required specifications defined in 2.4.

Typical procurement methods include the following ones:

- Lowest price bidding method: A method of requiring quotation proposals only for the specifications indicated by the ordering party and deciding on the bidder.
- Overall evaluation bidding method: A method of making an appeal for technical proposals for designing and construction methods, having bidders apply with their construction and performance price quotations, and deciding on the bidder with consideration of their offers comprehensively.
- Technical proposal and negotiation method: A method of making an appeal for technical proposals, negotiating the quotation and construction method with the applicant making the best proposal, and deciding on the contractor.

In the procurement of ICT infrastructure, it is necessary to select and apply an appropriate method from the above according to the characteristics of the ICT infrastructure to be procured. Specifically, one idea would be to apply the method as explained below.

- Requesting a better technical proposal for detailed specifications through fair competition
=> Overall evaluation bidding method or technical proposal and negotiation method
- Desired to balance the appropriate technical proposal and price proposal corresponding to it
=> Overall evaluation bidding method or technical proposal and negotiation method
- Technical specifications are clear and no competition is anticipated
=> Lowest price bidding method

In any case, it is necessary to pay attention to the following items in order to properly enforce procurement.

- 1) Matters kept in mind for the overall evaluation bidding method and technical proposal and negotiation method

The overall evaluation bidding method and the technical proposal and negotiation method have the following characteristics.

- Seeking technical proposals, thus increasing the possibility of acquiring the latest and optimum “Quality ICT Infrastructure”.
- The ordering party is required to have the ability to legitimately evaluate technical proposals.

Regarding the procurement of the evaluation ability, for example, the following measures are also effective.

- Inviting a third party, such as a consultant with knowledge, to support technical reviews

- and ensure the transparency of the ICT infrastructure.
- Utilizing human resource development programs and personnel support programs prepared by countries that have already introduced the same ICT infrastructure, ODA implementing organizations of developed countries, international development financial institutions, etc. (as described in 2.8 below).

2) Matters kept in mind for lowest price bidding method

The lowest price bidding method has the following characteristics.

- If many business operators participate in the bidding, the possibility of a truly appropriate business operator's bidding for the procurement will increase.
- It is expected to push down the winning bid price as a result of competitive bidding.

On the other hand, the participation of many business operators will increase the possibility that a business operator who cannot ensure the quality of the ICT infrastructure will offer an excessively low quotation. Therefore, it will be important to examine the qualification of each bidder. Specifically, it is an idea to confirm that each business operator who makes a bid can satisfy the requirement specifications and guarantee the business operator's compliance with the required delivery date, construction period, etc. It may be an idea to confirm whether the business operator has track records on the introduction of similar ICT infrastructure on the same scale in the past.

Furthermore, in many cases, pre-qualified (PQ) and technical examinations are conducted in accordance with the definitions of requirements as specified in 2.4 when the lowest-price bidding method is applied. The details of the definitions of the requirements will be an essential element for ensuring the quality of the ICT infrastructure.

Therefore, one idea would be to include technical items in the content of the definitions of requirements as examination standards to the extent that it does not result in an extreme reduction in the number of bidders.

2.6 Development, Construction, Operation, and Maintenance Management of ICT Infrastructure

After selecting a business operator engaged in the development, construction, operation, and maintenance of ICT infrastructure (hereinafter referred to as "the practical work") in accordance with 2.5, it will be necessary to manage and grasp the practices of the workers in an appropriate manner and to adequately execute the work.

It is common for the operator of a project to perform the detailed management of the project (i.e., the progress management, personnel management, article management, and project management including budget execution management). Therefore, it is an idea for each country or region to establish and operate a department, such as a project management office (PMO), to provide the operator with project management support, technical support, administration of the secretariat, and the coordination of matters common to a number of projects.

In some cases, ICT infrastructure is not available when it is really necessary. This occurs if the procured, developed, and constructed ICT infrastructure is not maintained properly at the operation. Operation and maintenance management, in particular, is important.

A PMO is not a temporary or short-term office but established as a regular and long-term office.

It is common for a PMO to standardize management methods for the entire project and continuously develop human resources for project management. With regard to the establishment of a department like a PMO, one idea would be to make use of human development programs or human support programs prepared by leading countries of ICT infrastructure, ODA implementing organizations of advanced countries, international development financial institutions, etc. (to be described in 2.8).

2.7 Interim and Ex-Post Evaluation

At the end of each project phase, it is important to ascertain the purpose of master plans, etc. specified in 2.1 and to evaluate the degree of achievement of requirement specifications specified in 2.4. Specifically, quantitative evaluations of the performance and functional requirements, lifecycle costs, matters on the sustainability of the environment, etc. are effective.

Furthermore, it is necessary to confirm the progress and validity of the plans, grasp improvement points, if any, and modify the project by appropriately monitoring the implementation schedule of the project as well as the state of compliance of the project with laws and regulations and evaluating the actual results of the project in comparison with plans. It is also desirable to make use of all information as lessons learned in planning so that the lessons can be applied to similar projects in the future.

If a PMO described in 2.6 has been established, one idea would be to have the PMO evaluate them. It is also an idea to commission an external consulting agency to evaluate the project in order to obtain proper evaluation results.

2.8 Structure for Project Implementation and Human Resource Development

(1) Human resource development and system development

As shown in 2.1 through 2.7, it is necessary to develop and maintain a system properly stationed with personnel to formulate strategies that will make ICT infrastructure play expected roles, while also formulating a master plan for the introduction of the ICT infrastructure, making plans for introducing the ICT infrastructure, securing budgets and funds, and developing, constructing, operating, and maintaining the ICT infrastructure under proper requirement definitions.

Necessary human resources vary in nature at each stage of project implementation.

- At stages of Formulation of Long-Term and Master plans (2.1) and ICT Infrastructure Planning (2.2)
 - => Policy makers and concept makers, in particular, as well as human resources who have broad knowledge of ICT infrastructure, are needed
- Procurement of Budgets and Funds to Achieve the Project (2.3)
 - => Human resources well informed of domestic and overseas investment and loan policies that can be applied to the development and construction of targeted ICT infrastructure
- Requirement Definition of ICT Infrastructure (2.4), Procurement of ICT Infrastructure (2.5), and Development, Construction, Operation, and Maintenance Management of ICT Infrastructure (2.6)
 - => Human resources with detailed knowledge and experience of ICT infrastructure technology and the operation and maintenance of ICT infrastructure are needed
 - => Human resources with knowledge and experience to operate a PMO that manages across multiple projects are necessary (the establishment of the PMO may be considered from the planning stage)
- Interim and Ex-Post Evaluation (2.7)
 - => Human resources with detailed knowledge of ICT infrastructure technology and the operation and maintenance of ICT infrastructure with experience in addition to complex skills to make use of the results in various measures for the future.

If the above human resources are secured, it will be possible to incorporate the concept of the quality level necessary and adequate for the introduction of ICT infrastructure and to operate the ICT infrastructure continuously and develop society and the economy.

(2) Utilization of overseas programs for effective human resource development

It is basically desirable to secure human resources domestically with consideration of the contribution of ICT infrastructure to the economic and social development of the country. However, there are many types of ICT infrastructure that require specialty and expertise, and it is considered to be difficult to prepare appropriate human resources with ease depending on the situation of the country. In such a case, the following countermeasures are also proposed.

- Training domestic human resources by utilizing the human resource development programs of countries including developed countries that already introduced the target ICT infrastructure.
- Securing short-term human resources by ordering domestic and foreign consultants and development vendors and implementing technology transfer to domestic human resources

It is also possible to improve the skills of domestic human resources through the establishment of domestic entities as shown in 2.3.

Appendix Example of “Quality”-ensured ICT Infrastructure

(1) Submarine Cable

Points

- The government of a country led the construction of a submarine cable for the purpose of improvements in the telecommunications environment, expansion of the future use of large-volume data, and an increase in economic merits.
- The finance scheme of an international development financial institution was utilized to quickly secure the huge amount of funds necessary for laying the cable.



Features of the “Quality ICT Infrastructure” project

“Quality” element of the project	Basis
Effective mobilization of financial resources and financial planning	<ul style="list-style-type: none"> • The finance scheme of an international development financial institution was utilized to quickly secure the funds.
Quality of ICT infrastructure	
<ul style="list-style-type: none"> • Economic efficiency • Social inclusiveness • Convenience and amenities 	<ul style="list-style-type: none"> • The operation of the submarine cable is for the purpose of improvements in the telecommunications environment. • Attracting data centers by securing high-capacity communications performance and aiming for economic development as a result of revenues from the data centers and telecommunications hubs.

Features of the “Quality ICT Infrastructure” technology

- Possible to secure inexpensive and highly reliable high-capacity lines with ease.
- Expandable and has a long life.
- Short propagation time.

Background

- There will be a great increase in the communications demand of emerging countries in the future.
- Video content, such as YouTube, is utilized for entertainment and education, and the necessity of a communication environment for satisfyingly watching such high-capacity content is increasing.

Progress

Step	Efforts
2) Planning and designing	<ul style="list-style-type: none"> • The government of the country focused on securing high-capacity telecommunications, from which <u>improvements in the telecommunications environments of the country and neighboring countries</u> would be expected along with <u>the economic development of the country as the result revenue from attracting data centers and telecommunications hubs.</u> Accordingly, the country decided to construct a submarine cable. (<u>Ensuring the quality of ICT infrastructure (economic efficiency, social inclusiveness, and convenience and amenities)</u>) • However, when the country decided to build a submarine cable, another country in the same region decided to lay a different submarine cable. The economic merits could have been lost if the other country had started the operation of the submarine cable. Therefore, the country had to select a contractor promptly and secure the funds. • A huge amount of money was urgently needed for the submarine cable, but the country thought that it was difficult to cover the entire project with only its own funds. Therefore, the country <u>promptly procured the funds for the construction from a financing scheme provided by an international development financial institution of a developed country.</u> Specifically, the development bank of the country received a loan from the international development financial institution.

	The development bank financed a contract-oriented enterprise of the country, and the country concluded a contract with a submarine cable laying company. (<u>Effective money mobilization and financing planning</u>)
3) Requirement definition	<ul style="list-style-type: none"> At the time of laying the long-distance line, the country decided the required specifications by referring to other submarine cable projects already implemented.
4) Procurement, development, construction, and maintenance	<ul style="list-style-type: none"> The country selected the contractor as a result of appropriate technical screening and started the construction of the submarine cable.
5) Operation and maintenance	<ul style="list-style-type: none"> (No operation or maintenance has been conducted yet because the project is still in the construction phase.)
6) Renewal	<ul style="list-style-type: none"> (The contract has not been renewed yet because the project is still in the construction phase.)

Result

- Currently, the contractor is continuing the construction of the submarine cable.

(2) Construction of Optical Fiber Network

Points

- A country realized a high-capacity and high-speed telecommunications environment with the procurement of optical fiber cable.
- With consideration of past failure experiences, the country procured a product of high quality, the operation of which was not dependent on workers' skills, and planned to conduct quality construction work to ensure the stable operation of the submarine cable for a long term. Furthermore, the country expected labor and cost reduction after the operation of the submarine cable.
- The country planned to accumulate its know-how in the country and operate it only with the country's own talented personnel by receiving educational support from a company with laying know-how.



Features of the “Quality ICT Infrastructure” project

“Quality” element of the project	Basis
Quality of ICT infrastructure	
<ul style="list-style-type: none"> • Economic efficiency • Safety and resilience • Convenience and amenities 	<ul style="list-style-type: none"> • Achievement of a high-speed and stable communications environment by introducing optical fiber • High-quality products and construction work will ensure the stable operation of the facilities for an extended period of time. As a result, the project will reduce the labor and time of replacing products after they come into operation and save the operation cost of the cable.
Contribution to society and economy of the country	<ul style="list-style-type: none"> • The country is receiving educational support from a company with laying know-how to improve the quality of construction

Features of the “Quality ICT Infrastructure” technology

- Transmission loss is low and signals can be transmitted over long distances.
- Easy to secure high-capacity communications performance because a broadband is available.
- Resistant to obstacles because electromagnetic noise hardly affects the cable.

Background

- The country anticipated a telecommunications demand expansion in the future and felt the necessity of environment improvements that would allow high-capacity, high-speed telecommunications performance.
- Issues, such as improper work, poor connections, and the early deterioration of products occurred to the country in the past because it ordered products and installation work at low introduction costs when it developed its telecommunications network. As a result, a stable telecommunications environment had not been realized, and a situation with no re-procurement or reconstruction of products continued.
- Therefore, the country planned to develop a high-capacity, high-speed, stable communications environment by referring to opinions from a business operator that the country had a relationship with.

Progress

Step	Efforts
2) Planning and designing	<ul style="list-style-type: none"> • In order to <u>secure high-capacity, high-speed telecommunications performance</u>, the country planned to lay out an optical fiber network with overhead lines. <u>(Ensuring the quality of ICT infrastructure (convenience and amenities))</u> • <u>In order to maintain an environment that ensures stable telecommunications performance</u>, the country considered the procurement of quality products and ordered quality construction work by reflecting its past failure experiences. This made it possible to operate the optical fiber network <u>stably for a long time</u>. Furthermore, the country <u>expected a total cost reduction by reducing the trouble of exchanging products and labor at the time of installation</u>. <u>(Ensuring the quality of ICT infrastructure (economic efficiency, safety and resilience))</u> • Specifically, the country introduced products with preset cables and connectors so that everyone could connect them with ease with no connection skills of experienced workers required. The country planned development of the optical fiber network by

	<p>setting up a construction management company with the know-how to properly carry out the construction of the network.</p> <ul style="list-style-type: none"> Quality construction was not always performed in the country, where construction procedures were sometimes ignored and protective equipment was left in an exposed state. Therefore, the country <u>planned technical instructions from the contracting company in order to conduct high-quality installation work with only domestic human resources. (Contribution to the society and economy of the country)</u>
3) Requirement definition	<ul style="list-style-type: none"> The country defined the requirements in consultation with the contractor in order to select a company with the rich know-how to handle reliable products and supervise the installation work. The country selected a suitable contractor and is currently advancing the work.
4) Procurement, development, construction, and maintenance	<ul style="list-style-type: none"> The country selected an appropriate business operator to carry out the construction work.
5) Operation and maintenance	<ul style="list-style-type: none"> (No operation or maintenance has been conducted yet because the project is still in the construction phase.)
6) Renewal	<ul style="list-style-type: none"> (The contract has not been renewed yet because the project is still in the construction phase.)

Result

- Currently, the contractor is continuing the construction of the optical fiber network.

(3) Telecommunications Network Deployment

Points

- A country entered a joint operation agreement with a private company that has know-how in order to have the country’s human resources accumulate maintenance know-how while securing maintenance funds.
- The development of the network has been successfully bridging the digital divide. Furthermore, the improved availability of base stations has realized a comfortable telecommunications environment.



Features of the “Quality ICT Infrastructure” project

“Quality” element of the project	Basis
Quality of ICT infrastructure	
<ul style="list-style-type: none"> • Social inclusiveness • Convenience and amenities 	<ul style="list-style-type: none"> • The development of the network has been successfully bridging the digital divide. • The improved availability of base stations has realized a comfortable telecommunications environment.
Contribution to society and economy of the country	<ul style="list-style-type: none"> • The country aims at accumulating telecommunications development know-how and utilizing the funds of foreign companies.

Features of the “Quality ICT Infrastructure” technology

- The enhancement of communications infrastructure will improve people’s information access through the Internet and mobile communications.

Background

- The country had no efficiently developed telecommunications network. Therefore, the country formulated a plan under the cooperation of a foreign country through the development of an efficient network to improve the penetration rate of telephones including fixed lines and mobile phones.
- The country thought that it was difficult for the country’s telecommunications companies to

develop the same by themselves, so the country planned the development of the telecommunications network in cooperation with a foreign company.

Progress

Step	Efforts
2) Planning and designing	<ul style="list-style-type: none"> For improvements in the communications network, the country decided to liberalize the telecommunications sector and allowed the participation of foreign telecommunications companies. With the aim of <u>accumulating telecommunications development know-how and utilizing the funds of foreign companies</u>, the country planned to conclude a joint operation agreement. (<u>Effective mobilization of financial resources, financial planning, and contribution to the society and economy of the country</u>)
3) Requirement definition	<ul style="list-style-type: none"> The country utilized the know-how of the investment company that signed a joint operation contract and defined the requirements.
4) Procurement, development, construction, and maintenance	<ul style="list-style-type: none"> Utilizing the know-how of the investment company, <u>the country's human resources have been developing the telecommunications services</u>. (<u>Contribution to the society and economy of the country</u>)
5) Operation and maintenance	<ul style="list-style-type: none"> <u>The country has been training human resources</u> so that they can operate and maintain the services without overseas assistance. (<u>Contribution to the society and economy of the country</u>)
6) Renewal	<ul style="list-style-type: none"> (The contract has not been renewed yet because the project is still in the construction phase.)

Result

- The telecommunications services covering 97% of the population have achieved a base station availability rate of 99% or more**, thus realizing a comfortable telecommunications environment. The development of the telecommunications services is ongoing. (**Ensuring the quality of ICT infrastructure. (Social inclusiveness, safety and resilience, sustainability)**)

(4) Biometric Authentication System

Points

- The country decided to procure a biometric authentication system with high authentication accuracy ensured by state-of-the-art technology for the purpose of replacing the existing biometric authentication system with low authentication accuracy and promoting the utilization and application of ICT. By doing so, the country is planning to secure the safety of people and improve their convenience.
- The country requested technical support for a year and established the system that the country's human resources could operate without overseas assistance.



Features of the “Quality ICT Infrastructure” project

“Quality” element of the project	Basis
Response to socioeconomic development strategies, needs, etc.	<ul style="list-style-type: none"> • The project meets the country's need for a biometric authentication system with high authentication accuracy to link with an existing database in which individual biological information was recorded.
Quality of ICT infrastructure	
<ul style="list-style-type: none"> • Safety and resilience • Convenience and amenities 	<ul style="list-style-type: none"> • The country secured public safety and improving people's convenience by introducing the system with high authentication accuracy.
Contribution to the society and economy of the country	<ul style="list-style-type: none"> • The system can be operated with domestic human resources through one year of technical support. • The country expects the utilization of the highly accurate biometric authentication system for various fields, such as citizen ID management and criminal investigation.

Features of the “Quality ICT Infrastructure” technology

- The biometric authentication system is an essential information communications base for recognizing people.
- By improving the accuracy of biometric authentication, it can be used for solutions, such as people's IDs, passports, and driver's licenses to be issued, receipt of pension and unemployment

insurance, voter registration, immigration control, crime investigation, and counter-terrorism measures.

Background

- The accuracy of the existing biometrics authentication system of the country was low and the country felt the necessity for introducing a highly accurate biometric authentication system. That was the reason the country planned the introduction of the system.
- By introducing a highly accurate biometric authentication system, **the country thought that it could utilize the system in many ways, including the country's citizen ID management and criminal investigation and expected to secure the safety of people and improvement of their convenience.**

Progress

Step	Efforts
2) Planning and designing	<ul style="list-style-type: none"> • The country demanded a biometric authentication system with high authentication accuracy to link with an existing database in which individual biological information was recorded. • In introducing a highly accurate biometric authentication system, the country collected information on biometrics systems from vendors from around the world and conducted a study on the installation of the system. • As a result of the study, the country found that the biometric authentication system provided by a vendor of a developed country matched country's needs. Therefore, the country <u>invited the vendor to explain the biometric authentication system and confirmed the conformance of the system with the actual needs. (Response to socioeconomic development strategies and needs)</u> • The country requested <u>technical support for a year and established the system</u> so that the country's human resources could operate without overseas assistance. (<u>Contribution to the society and economy of the country</u>)
3) Requirement definitions	<ul style="list-style-type: none"> • In cooperation with the contractor of the developed country, the country defined necessary requirements in order to procure the biometric authentication system according to the needs.

5) Operation and maintenance	<ul style="list-style-type: none"> (No operation or maintenance has been conducted yet because the project is still in the construction phase.)
6) Renewal	<ul style="list-style-type: none"> (The contract has not been renewed yet because the project is still in the construction phase.)

Result

- The country has been preparing to introduce the highly accurate biometrics authentication system with this contractor and to operate it to link with the existing database.

(5) Solid-state Weather Radar System

Points

- Introducing, in a planned manner, the solid-state weather radar systems that are more accurate, more economical, easier to maintain and have less environmental impact than conventional electron tube radar systems.
- The solid-state weather radar system ensures the safety and resilience of society and contributes to the sustainability of the country by effectively utilizing frequency resources.



Features of the “Quality ICT Infrastructure” project

“Quality” element of the project	Basis
Quality of ICT infrastructure	
<ul style="list-style-type: none"> • Economic efficiency • Safety and resilience • Sustainability • Convenience and amenities 	<ul style="list-style-type: none"> • Compared to conventional electron tube radar systems, it is possible to reduce the life cycle cost because parts replacement is less likely to occur • Possible to acquire accurate information. • Parts which are environment-friendly and non-harmful for human body are used.
Contribution to the society and economy of the country	<ul style="list-style-type: none"> • Achieving effective use of frequency bands and operation cost reduction. • The country expects to ensure the safety of people such as reducing flood damage and utilize the system in many ways.

Features of the “Quality ICT Infrastructure” technology

- Meteorological and precipitation observation information can be acquired quickly.
- Periodic parts replacement (every two years) is not necessary as needed in a conventional weather radar system.
- The system consists of a number of modules. Even if a failure occurs in one of the modules, the system can continue to operate using other modules without suspending the entire system.
- The system ensures space-saving performance, thus saving the running cost.
- In some cases, conventional electron tube radars use lead for shielding electromagnetic waves. New solid-state weather radar do not use lead. Therefore, it does not burden the surrounding environment or the human body.

Background

- To reduce repeated flood damage, it is important to provide accurate weather forecast and quick evacuation information. For this purpose, deploying weather radar all over the country is indispensable.
- Considering the demand of frequency usage such as the beginning of IoT age and high increase in the capacity of wireless LAN and communication device such as smartphones, interference between weather radar and wireless LAN is concerned.
- Taking the above-mentioned into account, well-planned deployment of the new solid-state weather radars which can achieve efficient use of frequency is desired.

Progress

Step	Efforts
2) Planning and designing	<ul style="list-style-type: none"> • <u>The country planned to introduce the solid-state weather radar system ensuring the efficient use of frequency, the rapid and accurate acquisition of observation information, while providing ease of operation at a reduced running cost with the mitigation of environmental impact. (Ensuring the quality of ICT infrastructure (in terms of economic efficiency, safety and resilience, sustainability, convenience, and amenities))</u>
3) Requirement definitions	<ul style="list-style-type: none"> • The country changed the procurement specifications to cover the solid-state weather radar systems as well as conventional weather radar systems.
4) Procurement, development, construction, and maintenance	<ul style="list-style-type: none"> • The country selected the contractor through an appropriate technical examination.
5) Operation and maintenance	<ul style="list-style-type: none"> • In order to use the outstanding function continuously and stably, the country need to inspect the radar system regularly. On the other hand, the failure rate is quite low.
6) Renewal	<ul style="list-style-type: none"> • The country confirmed the advantages such as the efficient use of frequency, the highly accurate observation, low operation cost, and high availability of the radar system. • The country is proceeding the planned transition from conventional electron tube radar systems to the solid-state radar systems. (<u>Contribution to the society and economy of the</u>

	<u>country</u>)
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Results

- Currently, the solid-state weather radars are being deployed nationwide in a planned manner, and the advantages, such as the efficient use of frequency resources and a reduction in running costs are being proved. (**Contribution to the society and economy of the country**)

Contact

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* In order to avoid spam, “@” is shown as “_atmark_”. Replace “_atmark_” with “@” to send an email.

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