Expert Group on the Development of Digital Infrastructures (DCs, etc.): Interim Report 3.0 (Summary)

- Along with the advancement of digitization in society and the economy, digital infrastructure is now the "infrastructure of social infrastructure" and works as an essential foundation for Japan to ensure security and safety and the sustainable development of society and the economy of the country.
- Taking into account the previous recommendations and the recent changes in the environment surrounding digital infrastructure, e.g., the rise of generative AI and GX, the Expert Group presents recommendations on basic concepts, basic directions, and specific response measures for the future development of digital infrastructure.
- Concerning the directions shown in the previous recommendations, the interim report says that the public and private sectors have been working together to steadily advance efforts, including the development of DC bases in Hokkaido and Kyushu as a supplement for or alternative to those in the Tokyo and Osaka areas to mitigate the concentration of bases in such areas, and the introduction of multiple routes for international submarine cables.

[Key points of the previous recommendations]

Interim Report 1.0 (January 2022)

- => Organizing the issues to be focused on in promoting the decentralized location of digital infrastructure
 - 1) Enhancing resilience in the event of disasters
 - 2) Efficiently utilizing renewable energy
 - 3) Enhancing the efficiency of communication networks that allows local production for local consumption of data

Interim Report 2.0 (May 2023)

- => Further specifying the blueprint of digital infrastructure development from the viewpoint of strengthening the hub function of international data distribution, bearing in mind changes in the international situation
 - 1) Promoting the development of core bases in Hokkaido and Kyushu as a supplement for or alternative to those in the Tokyo and Osaka areas
 - 2) Further introducing multiple routes for international submarine cables in coordination with the development of the core bases above
 - 3) Promoting the development of decentralized DCs tailored to the situation by region, e.g., progress in introducing 5G and decarbonized power sources

1. Recent environmental changes surrounding digital infrastructure

- (1) Japan is expected to face a further intensification of regional population decline, low birthrate, and aging population. <u>In order to solve the social</u> issues associated with these challenges, it is becoming increasingly important to realize regional DX through digital technology.
- (2) From the viewpoint of strengthening its industrial competitiveness and responding to geopolitical risks, <u>Japan urgently needs to secure domestic</u> <u>large-scale computing resources in line with the introduction and development of Al</u>.
- (3) The advancement of cloud computing has accelerated <u>the further concentration of new investment in DCs to the Tokyo and Osaka areas</u> away from regional areas. In addition, <u>the rise of generative AI has changed the role and use of DCs and led to the expansion of DCs</u>.
- (4) <u>The importance of achieving decarbonization</u> to realize carbon neutrality has been <u>further increasing</u>. There is <u>a growing expectation that</u> <u>DCs</u>, which consume a large amount of electricity, <u>will improve their energy consumption efficiency</u> and <u>contribute to local production for</u> <u>local consumption of electricity</u>.
- (5) In the areas where data center locations are concentrated, some electricity network building has been taking a longer time. Moreover, a shortage of resources in the construction industry has been making the DC construction period longer and causing construction costs to increase.
- (6) As a reliable partner, Japan has been advancing <u>collaboration with Europe, the United States, and Australia in the laying of international</u> <u>submarine cables</u> mainly in the Pacific Ocean, and <u>technological innovation has also progressed</u>.

2. Viewpoints taken in discussions looking to the 2030s (basic approaches and directions involving digital infrastructure development)

It is considered important to: **promote DX and GX, which are indispensable means to solve social issues**, e.g., the concentration of economic activities and population in Tokyo, population decline, low birthrate, and aging population, which cannot be overcome even in accordance with economic rationality, and such means to <u>ensure and strengthen industrial competitiveness</u>; and <u>strengthen resilience and ensure economic autonomy</u>, e.g., against geopolitical risks. To this end, <u>along with keeping a private-sector-led approach</u> as well, Japan should <u>draw up a future vision of digital infrastructure, encourage collaboration between the public and private sectors based on the division of their roles</u>, and respond strategically to the development of digital infrastructure.

(1) Roles of DCs as infrastructure that support an Al-based society

- Achieving the driving of multiple AI through integrated operation with an all-optical network
- As AI is expected to rapidly grow in the future, be used in a variety of fields, directly contribute to solving social issues, and ensuring and strengthening industrial competitiveness, Japan should aim to create a <u>society in which people can utilize AI in all fields</u> and, to this end, develop <u>digital infrastructure to support such AI-based society</u>.
- It is important to advance <u>the decentralized location of DCs in accordance with their use and desired scales</u>, e.g., separating the application to learning in which delays are acceptable from the application to inferencing in which low latency is required. In this process, <u>an all-optical network should be used</u> to realize ultra-low latency communication, and this is expected to realize a wide-area distributed Al environment inside and outside Japan and a smoother decentralized processing, increase options for potential areas in which DCs can be located, and <u>contribute to the achievement of decarbonization</u>.

(2) <u>Relationship with electricity and telecommunications infrastructure, and contributions to GX</u>

- Location of DCs taking into account the relationship between information processing and electricity and communications infrastructure
- The cost of telecommunications is lower than that of transporting electricity. Accordingly, importance should be placed on an approach in which data is processed in a DC located near electricity infrastructure and the results are transmitted to the area of demand via a communication network.
- ✓ In this approach, from <u>the perspective of local production for local consumption of electricity, including decarbonized power sources</u>, more importance also should be placed on <u>promoting the decentralized location of DCs</u>.

- 2. Viewpoints taken in discussions looking to the 2030s (basic approaches and directions involving digital infrastructure development) [continued from the previous page]
- (3) <u>Strengthening resilience and ensuring economic autonomy</u>
 - Strengthening measures to deal with possible disasters, e.g., Tokyo Inland Earthquake and Nankai Trough Earthquake, as well as rising geopolitical risks
 - ✓ Japan should strive to correct the structure in which its digital infrastructure is concentrated in the Tokyo and Osaka areas.
 - ✓ In this process, it is important for Japan to promote <u>the decentralized location of landing stations for international submarine cables</u> together with the development of DCs.
 - Establishing and enhancing Japan's international presence
 - Through <u>strengthening the connectivity with Europe, the U.S., and Asia by promoting the introduction of multiple international submarine cables</u> and in light of its initiatives, e.g., the Hiroshima AI Process for its realization of data governance and reliable AI, Japan should place <u>importance on further strengthening its hub function for international data distribution</u>, including strengthening highly-reliable connectivity with countries in the Asia-Pacific region and Western countries.
 - Importance should also be placed on <u>attracting the location of large-scale DCs for Al</u> in Japan and <u>positioning Japan as an international</u> <u>Al factory (i.e., a hub for DCs that companies use for Al to increase their productivity and efficiency</u>). In this process, Japan should further promote <u>the decentralized location of landing stations for international submarine cables outside the Tokyo and Osaka areas</u>, along with the decentralized location of DCs for Al-based learning, which have more flexibility in terms of location, in regional areas.
 - As a reliable partner, Japan has been advancing <u>collaboration</u> with Europe, the U.S., and Australia in <u>the development of international</u> <u>submarine cables mainly in the Pacific Ocean</u>. It should advance related efforts <u>in coordination with this collaboration</u>.
- (4) **Promoting regional DX**
 - **DCs as a solution to social issues working as a foundation that supports regional ecosystems**
 - In line with the advancement of 5G and Beyond 5G, <u>regional DX</u> is expected to be <u>implemented in society</u>. Amid this, Japan should <u>form an</u> <u>ecosystem in regional areas, including efforts by the public sector to stimulate demand</u>.
 - The disparity in digital infrastructure is expected to cause <u>a disparity in DX between the Tokyo and Osaka areas and regional areas</u>. <u>To prevent this problem, the decentralized location of DCs and landing stations for international submarine cables to regional areas is becoming increasingly important</u>.

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The Expert Group presents recommendations on the following specific response measures to develop the digital infrastructure that will support the Albased society in the 2030s.

(1) Further promoting decentralized location of DCs

- Policy support for the decentralized location of DCs in regional areas as a foundation that supports regional ecosystems
 - Japan should <u>achieve Al utilization and the implementation of advanced services</u> in all social activities <u>in regional areas on par with the</u> <u>Tokyo and Osaka areas</u>, thereby contributing to <u>Al utilization and digital implementation in such regional areas</u>. To this end, it should <u>quickly hold deliberations on policy support measures for the decentralized location of DCs</u>.
- Collaboration with the development of data infrastructure that supports a variety of administrative services
 - The digital implementation in regional areas should take into account the need to <u>ensure the economic autonomy</u> across Japan so as to make the regional economy autonomous. With this in mind, Japan should advance the decentralized location of DCs <u>in coordination with the development of data infrastructure that support a variety of administrative services</u>.

(2) Promoting research and development of cutting-edge technology and its implementation in society

- Strengthening industrial competitiveness and improving energy consumption efficiency by using cutting-edge technology
 - From the perspective of strengthening the competitiveness of the entire industry and improving energy consumption efficiency thereof, Japan should promote research and development and social implementation of cutting-edge technology, e.g., next-generation optical technology, advanced semiconductor technology, and AI chip designing technology. In the process of the social implementation, these technologies should be developed and deployed as an internal system operable in society, and also the technology for management and operation and the development of an environment therefor is necessary.
- Next-generation optical technology, e.g., all-optical network technology
 - Japan should promote research and development of all-optical networks, which have the potential to contribute to the decarbonization of DCs due to their low latency and low power consumption.
 - > It should attract the development of DC bases in coordination with efforts to implement and develop all-optical networks in society.
- Computing infrastructure technology looking to the social implementation of AI
 - Looking to a future increase in the social implementation of AI and aiming at the realization of decentralized AI infrastructure, Japan should promote <u>research and development to optimize and efficiently utilize computing infrastructure and to enhance the sophistication of such infrastructure</u>.

The Expert Group presents recommendations on the following specific response measures to develop digital infrastructure that will support the Albased society in the 2030s.

(3) Decentralization of landing stations for international submarine cables and establishing and enhancing Japan's international presence

- Promoting the decentralized location of landing stations for international submarine cables
 - Looking to the decentralized location of DCs and international collaboration in all-optical networks, Japan should promote <u>the decentralized</u> <u>location of landing stations for international submarine cables, which are currently concentrated on the Boso and Shima Peninsulas</u>.

Establishing and enhancing Japan's international presence

- Through further promoting the introduction of <u>multiple international submarine cables</u> and in light of its initiatives, e.g., the Hiroshima Al Process for its realization of data governance and reliable AI, Japan should <u>strengthen its hub function for international data distribution</u> by strengthening the connectivity with Asian countries and Western countries.
- Japan should encourage the domestic location of large-scale DCs for AI and establish its presence as an AI factory. In this process, it should also promote the decentralized location of landing stations for international submarine cables.

(4) Collaboration with GX policies

■ Location of DCs taking into account electricity infrastructure

Concerning large-scale DCs for AI, which require a large amount of electricity, Japan should <u>collaborate this effort with GX policies</u> since it is considered <u>effective to attract the location of DCs to the areas in which existing power infrastructure can be available</u> or to <u>the areas near the sites in which power infrastructure is expected to be located in the future</u>, while <u>further securing decarbonized power sources</u>.

Promoting energy saving of DCs

Japan should promote <u>research and development and implementation of cutting-edge technologies, including those for improving energy consumption efficiency</u>. It should first set efficiency targets to be met, then promote the visualization of the current state of efforts for improving energy consumption efficiency and future efforts therefor as well as <u>facilitate the improvement of efficiency, e.g., of the implementation of the outcomes from research and development</u>. While taking into account the efforts of other countries, it should hold deliberations on <u>a system to stimulate the improvement of energy consumption efficiency of DCs per se as an effort coupled with support measures</u>.

4. Approaches to future deliberations

Digital infrastructure is the "infrastructure of social infrastructure" and works as <u>an essential foundation for Japan</u>. The Government of Japan should place importance on <u>quickly holding deliberations on measures in response to the recommendations</u> and <u>working out the specifics of measures</u> as an approach to developing digital infrastructure.

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- With such technologies as AI, semiconductors, all-optical networks, and quantum computers at the core, it is significant for Japan to <u>ensure</u> <u>flexibility, bearing in mind that a major paradigm shift</u> following the AI revolution <u>may occur within a few years</u>.
- Going forward, the Expert Group should place importance on focusing on the utilization of AI, human resource development, and research and development, too.
- While paying close attention to trends in the frameworks of and deliberations on other related policies, the Expert Group needs to conduct follow-up efforts on the progress made in related efforts and to work with related ministries, agencies, and businesses to further consider strategies and make timely revisions to them as necessary.

