

Broadband policies for limited Internet access areas by local governments:
An analysis based on the questionnaire survey in Japan

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Abstract

Although broadband services have diffused to a certain degree in developed countries/regions, limited service areas in broadband access remain mainly in less-favored regions, where the services are unprofitable for a private telecom-carrier. In Japan, many local governments carry out manifold projects to improve broadband access subsidized by the Japanese Government. Broadband policies by local governments are examined based on the questionnaire survey of municipalities throughout the country except for large metropolitan regions.

Broadband services have rapidly improved in most of local municipalities in the first decade of the 2000's backed by the promotion policies by the national government. The major method of broadband access has shifted from DSL to optical-cables in this period. The improvement policies on broadband access by local governments subsidized by the national government contribute to eliminate the areas with no broadband access.

The number of the joint business based on the Indefeasible Right of User (IRU) contract between a private telecom-carrier and a local government has considerably grown in recent years. Even a local government with no technical know-how to operate broadband business can introduce a broadband services to its territory using the IR business model.

1. Introduction

The limited Internet access in less-favored areas was not so apparent in the days when narrowband access using the existing telephone networks was popular, because the “universal telephone services” are substantially obligatory for telecom-carriers. However, the geographical gaps in the Internet access grew after the deep penetration of broadband services into advanced countries in the 2000s. Broadband services in a less-favored area such as a mountainous region or a small remote island are unprofitable for a private telecom-carrier due to the scarce population. The major difficulty for the complete diffusion of broadband services in less-favored areas is caused by the inefficiency of the connection between a subscriber and an access-point. This is so called the “Last Mile” issue (Downes and Greenstein, 2007; Lorentzon, 2010; Wood, 2007).

The Japanese Government has been active to promote the complete diffusion of broadband services in the entire country since 2000. In the “ubiquitous-Japan (u-Japan) Plan”, the government

sets the goal that all people can access the broadband Internet services no later than 2010. The government adopts manifold promotion programs to achieve this goal. The subsidies aiming to improve broadband access are typical of these programs. Many local governments with limited broadband access areas carry out the projects to improve the broadband access utilizing the national subsidies.

We reported the case studies in the selected less-favored areas in Japan (Arai and Naganuma, 2010). After these reports, we conducted a questionnaire survey on the projects for the improvement of broadband access by local governments with less-favored areas throughout the country. In this paper, we will analyze the broadband policies for limited Internet access areas by national/local governments based on the results of this questionnaire survey.

2. Background and the method

2-1 Recent diffusion of broadband services in Japan

Firstly we will briefly summarize the recent diffusion of broadband services in Japan. The subscribers of broadband services per 100 inhabitants for the whole of Japan rises to 26.3% in 2010 from 23.6% in 2008. It is slightly higher than the average of OECD countries (Fig. 1).

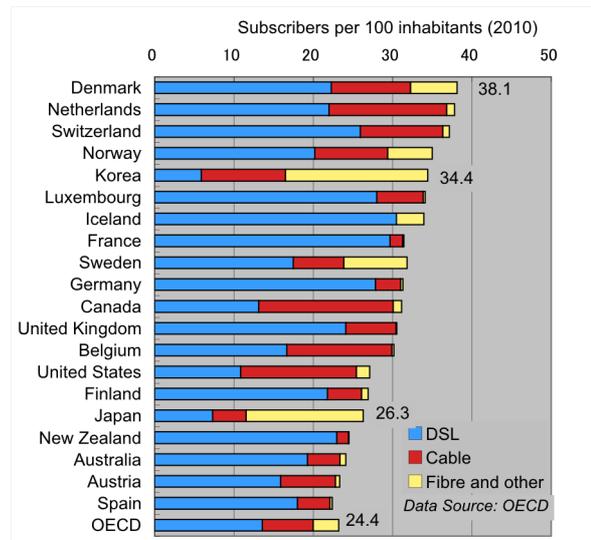


Figure 1 Broadband subscribers in selected countries of OECD (2010)
Data source: OECD

The subscribers of the fiber-to-the-home (FTTH) broadband services are increasing and ones of the data-signal-line (DSL) services are decreasing after the peak in 2006. The FTTH overtook the DSL in 2009. The subscribers of the data transmission service using cable television networks (cable modem) are relatively few but gradually grow (Fig. 2).

From the regional perspective, the penetration rate of broadband services in the peripheral regions of the country is lower than the core region. The high areas are found in the central parts of two major metropolitan regions (Tokyo and Osaka) (Fig. 3).

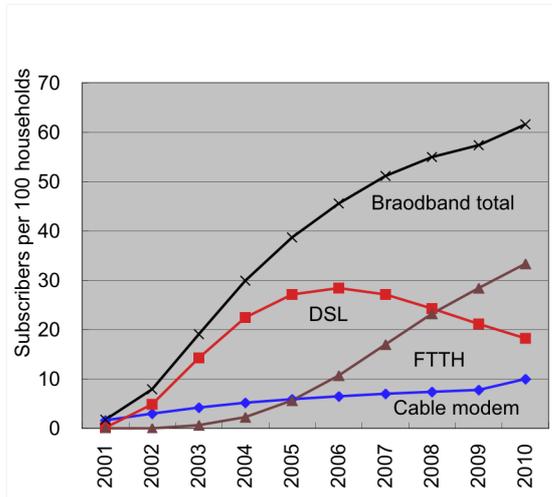


Figure 2 Penetration of broadband services in Japan

Data source: Ministry of Internal Affairs and Communications

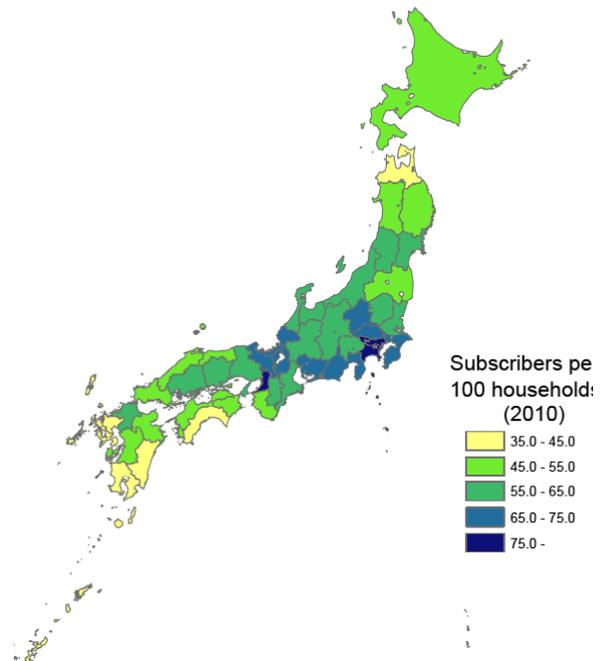


Figure 3 Geographical difference of broadband services

Data source: Ministry of Internal Affairs and Communications

2-2 The questionnaire survey

The questionnaire survey aims to gather the detailed information about the conditions of broadband access and the improvement policies by the local governments with less-favored areas. The questionnaires were distributed to all municipalities (*Shi-Cho-Son* or cities, towns and villages) throughout the country except the three large metropolitan regions (Tokyo, Osaka and Nagoya) and the designated cities. The questionnaires were sent by postal mail in November 2009 and in June 2010. Total number of the target municipalities is 1,326. 453 responses were collected by postal mail or e-mail. Then response rate is 34.2%.

3. The conditions of broadband access

The Japanese Government sets the goal of “u-Japan Plan” that the areas with no broadband access will be dispelled no later than 2010. Has the area with no broadband access already disappeared actually? In the responses to the questionnaire, more than a half of the municipalities report that some broadband services are provided access in their entire territories. For more than 70% of the municipalities, the percentage of residents with no broadband access is less than 1%. Generally speaking, broadband access has been already improved in most municipalities in Japan.

However, more than a quarter of the municipalities state that more than 10% of residents cannot access any broadband service. 3% of the municipalities report that the residents with broadband

access are less than a half of the whole residents. Actually, a number of areas with no broadband access remain (Fig. 4a).

A distribution map of the areas limited broadband access reveals that many areas with limited broadband access remain in the peripheral regions, e.g. Hokkaido, the east-part of Tohoku, the south-part of Shikoku and the south-part of Kyushu. This fact coincides with the geographical difference of broadband penetration mentioned above (Fig. 4b).

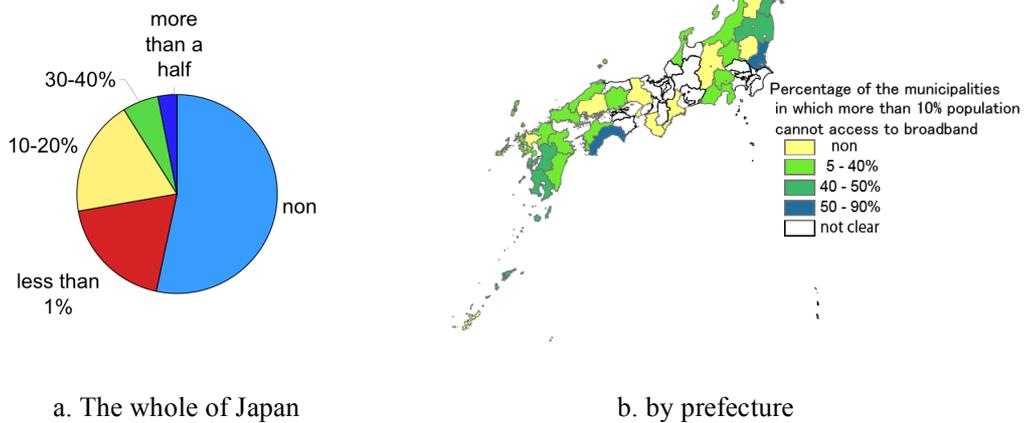


Figure 4 Percentage of residents with no broadband access by municipality
Data source: *The Questionnaire Survey*

A comparison of the conditions of broadband access by the size of municipality shows that the access conditions tend to be the less improved in the smaller municipalities. Although the percentage of the residents with no broadband access is less than 1% in around 90% of the municipalities with more than 100,000 residents, the corresponding municipalities are around 60% of the municipalities with less than 5000 residents. This fact suggests that small demand for the broadband services in a small municipality hinders the improvement of the services (Fig. 5).

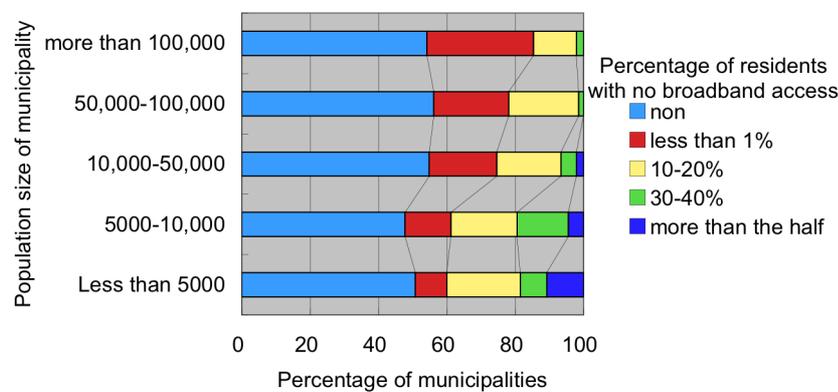


Figure 5 Percentage of residents with no broadband access by population size of municipality
Data source: *The Questionnaire Survey*

A clear evidence for the difficulty caused by the small demand is found in the limited access condition in the “scarcely-populated municipalities”. The scarcely-populated municipality is designated by law as the municipality with severe decrease of population. Needless to say, most of the scarcely-populated municipalities are small villages in mountainous areas or in small islands. The percentage of residents with no broadband access in the scarcely-populated municipalities is significantly higher than the other municipalities. The percentage of the municipalities where more than 10% of residents cannot use any broadband services is around 40% of the scarcely-populated municipalities comparing with less than 20% of the other municipalities (Fig. 6).

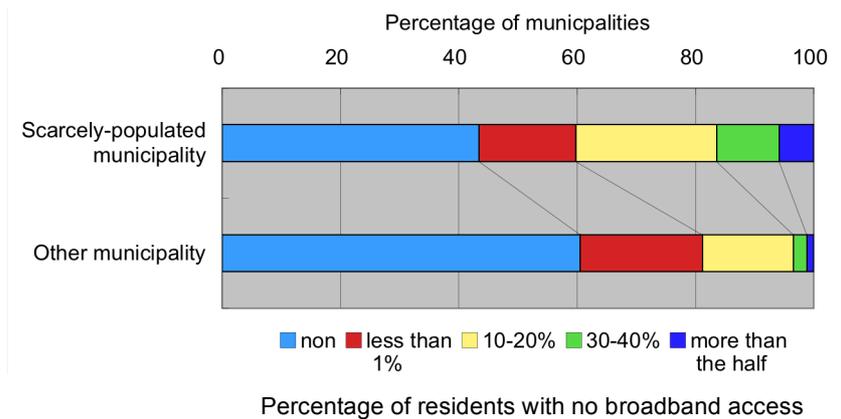


Figure 6 Broadband access in the scarcely-populated municipalities

Data source: *The Questionnaire Survey*

As we reported earlier, limited broadband access is typically found in mountainous areas (Arai and Naganuma, 2010). The responses to the questionnaire reveal that 80% of the areas with no broadband access are mountainous. Dispersed settlements along winding roads in mountainous areas need longer communication lines compared with in plain areas. The small population of a mountainous area lowers the profitability of a communication business.

Islands are another typical areas of the limited broadband access. 6% of the areas with no broadband access are islands. In the case of islands, the difficulties of the telecom-connection to the mainland in technical and economical reasons add to the shortage of broadband demand (Fig. 7).

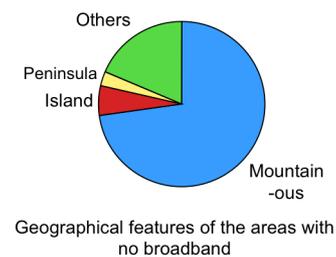


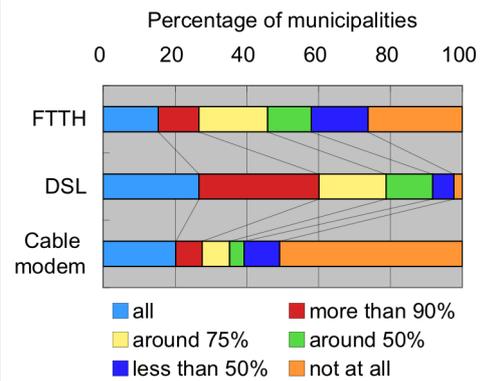
Figure 7 Geographical features of the areas with no broadband

Data source: *The Questionnaire Survey*

The conditions of broadband access are not even among broadband methods. DSL services are widely diffused in most municipalities. More than 90% of residents can use DSL services in 60% of all the municipalities and more than 75% of residents can in almost 80% of all the municipalities. Percentages of the residents with FTTH access vary among the municipalities. Because of the high

construction cost for FTTH networks, private telecom-carriers are prone to hesitate at the expansion of FTTH services in dispersed population areas. A halfhearted attitude of private telecom-carriers prevents the improvement of FTTH access in many municipalities (Fig. 8).

The diffusion pattern of Internet access through cable modem and cable TV networks is peculiar compared with the other broadband methods. On the one side, more than a half of the municipalities have no cable modem service. On the other side, all residents can access cable modem services in 20% of all the municipalities. As discussed later, a number of local governments carry the construction projects for cable TV network. In these projects, the local government strive that the cable TV network covers the entire territory. Then broadband services are provided in the entire municipalities. Exactly for the same reason, cable TV services are partially provided in few municipalities.



Percentage of residents with broadband access

Figure 8 Access Conditions by Broadband Method
Data source: *The Questionnaire Survey*

The timing of the introduction also varies among the broadband methods. DSL services were introduced earlier than the other methods. 2003 is the peak of the introduction of DSL services. The introduction of FTTH services lags behind the other services. The introduction of cable modem services has a twin-peak pattern. One peak is found in 2003 and the other in 2009. This peculiar pattern affected by the evolution of the national broadband policies as discussed later (Fig. 9).

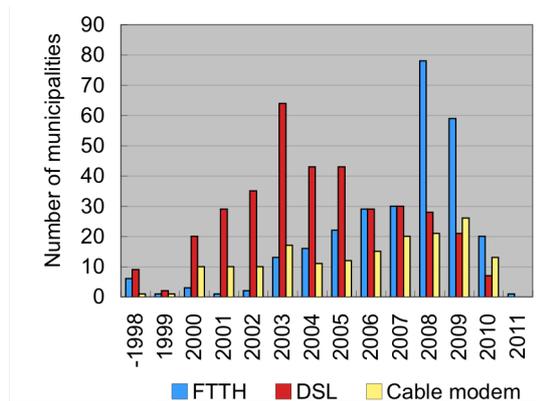


Figure 9 Timing of the introduction by broadband method
Data source: *The Questionnaire Survey*

In the responses to the questionnaire, 16.7% of the broadband construction programs by the local governments were subsidized by the New CATV Program and 36.6% by RTICP. Although there are many other subsidy programs by the Japanese Government, The New CATV Program and the RTICP are the most popular subsidies and contribute to the rapid expansion of broadband services throughout the country (Fig. 11).

Around a half of cable TV networks are constructed utilizing the New CATV Program. These projects are conducted from the later half of the 1990s to the early half of the 2000s. Cable TV systems constructed by the New CATV Program contributed considerably to the early diffusion of broadband in Japan. On the other hand, more than 60% of FTTH networks construction utilized the RTICP. The fact that the projects subsidized by the RTICP are greatly increasing in a few last years suggests the RTICP boosts the recent expansion of FTTH services mentioned earlier.

Contrary to cable TV systems and FTTH networks, few DSL facilities are constructed by these programs. Around a half of DSL facilities are constructed using the subsidies by prefectures or municipalities. Most of these DSL facilities aim to expand the DSL services areas of private telecom-carriers in scarcely-populated areas, where the DSL business is unprofitable. Because the budget needed for the improvement of DSL services is relatively small compared with cable TV system and with FTTH networks, many prefectures and municipalities set the own promotion programs.

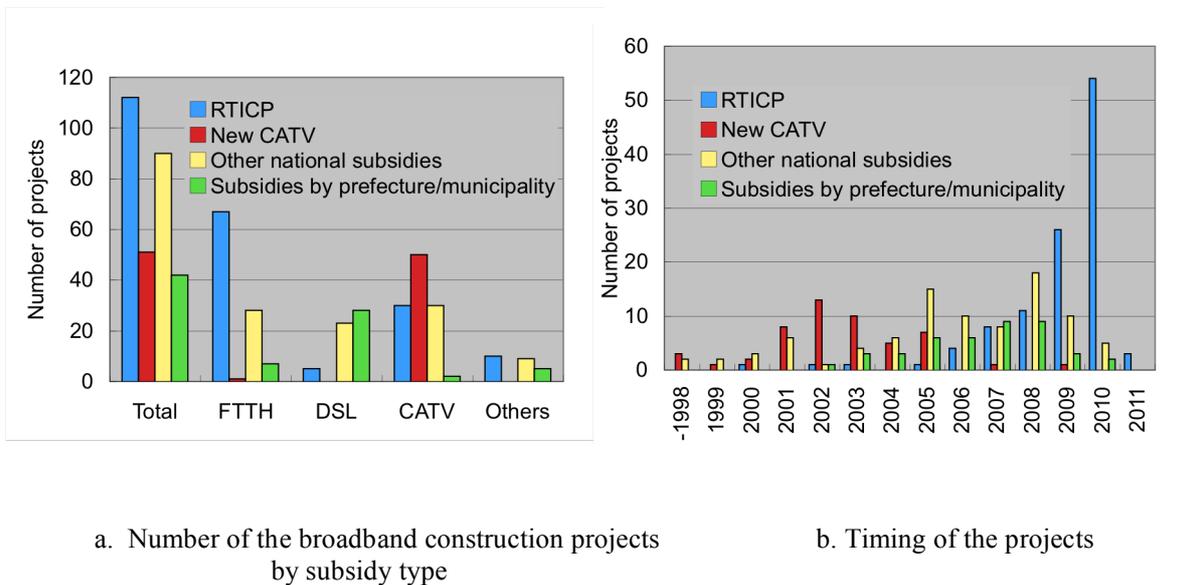


Figure 11 Subsidies for broadband construction projects
Data source: The Questionnaire Survey

4-2 The effect of the construction projects on broadband access

Did the construction projects by local governments improve the broadband access? The percentage of residents with no broadband access in the municipalities with the construction projects

is lower than ones with no projects. This fact reveals that the construction programs contribute significantly the improvement of the broadband access.

For the municipalities with the construction projects, the percentage of municipalities where less than 1% of the residents cannot access any broadband services is 75% against 65% for the ones with no projects. Contrary, the percentage of municipalities where more than 10% of residents cannot access any broadband services is 25% for the municipalities with the construction projects against 35% for the ones with no projects. The percentage of no broadband access by subsidy type shows that every program affects positively to improvement of broadband services (Fig. 12).

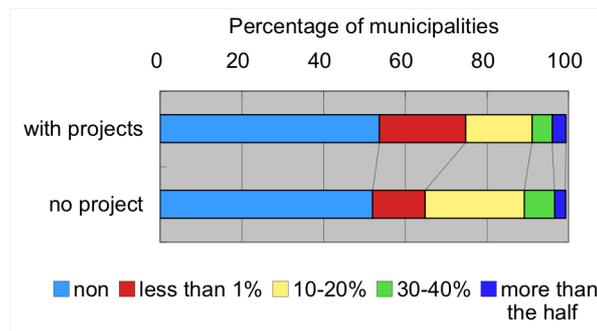


Figure 12 Percentage of residents with no broadband access in the municipalities with the broadband construction projects
Data source: The Questionnaire Survey

The improvements of broadband access by construction projects utilizing the subsidy programs facilitate the regional promotions using Internet. For the municipalities with broadband construction projects, the percentages of municipalities in which some organizations/individuals open regional promotion websites are obviously higher than for ones without the construction projects. The promotions are active both for the provision of tourist information and for selling goods. Selling agricultural and marine products by agricultural/fisherman's cooperatives are particularly prosperous comparing with the other activities. Because many of the municipalities with the broadband construction projects were located in less-favored and agricultural/fishery oriented regions, Internet retailing of agricultural/marine products is very suitable for the advancements of the regional economies after the enhancement of the Internet access. In addition, the broadband construction projects trigger the opening of regional SNS and blog services (Fig. 13).

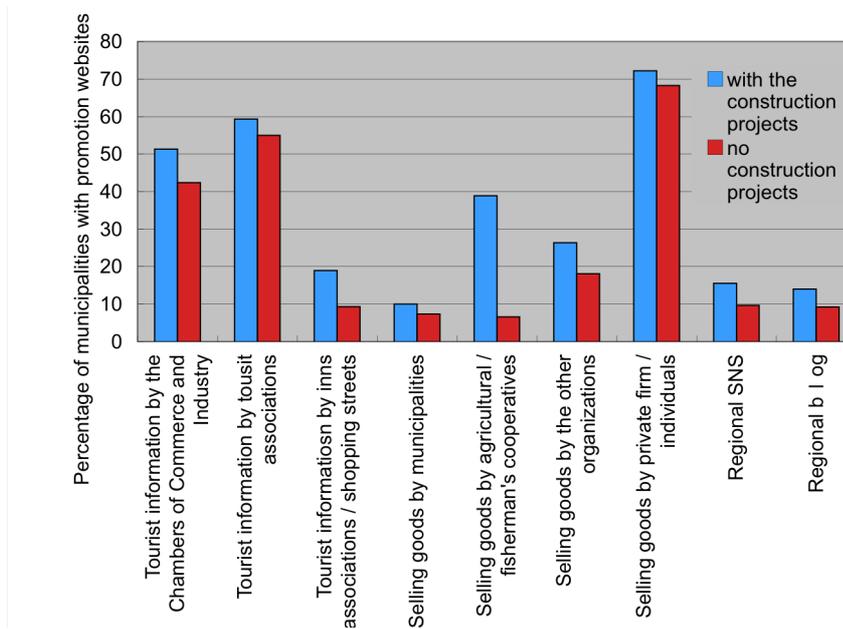


Figure 13 Effect of broadband construction projects on regional promotion websites
 Data source: The Questionnaire Survey

5. The establishments of broadband services utilizing IRU Contracts

5-1 The IRU business model in broadband services

The broadband service utilizing IRU contracts attracts the attention of the ICT staff of many municipalities as a new business model of telecommunication in less-favored regions. The Japanese Government regulates the participation of a firm without its proper facilities in telecom-business by the Telecommunication Business Law (*Denki Tsushin Jigyo Ho*). However, the law permits the telecommunication business without the proper facilities based on the “Indefeasible Right of User (IRU)” contracts when the proprietor of telecom-facilities and the operator of a telecom-service have signed a ten-year or longer lease contract. Broadband services can be provided utilizing the IRU contracts even in the area where broadband business is unprofitable solely by a private telecom-carrier. Under the IRU business model, a municipality or a public organization in a less-favored region can construct a broadband network and lease it to a private telecom-carrier. In many case, optical fiber is selected as the telecom-method in spite of the great expense for the construction.

5-2 Diffusion of the IRU business model

Among the broadband construction projects from 1998 to 2010 reported in the questionnaire survey, the percentage of the projects with IRU contracts is 36% for the whole period (Fig.14a). Before the mid 2000's, the support for the broadband construction projects by national/local governments was carried mainly in the two types. One type is the direct subsidy to a private/semi-private telecom-carrier. Many of these telecom-carriers received the equity investments by the related local governments. In the other type, a local government operates the telecom business by itself. Although most governmental businesses are cable TV services, they can provide broadband

services using cable modem as well as digital television services.

However, the percentage of the projects with IRU contracts has rapidly grown in the later half of the 2000's. Almost of all projects use the IRU business model in the two last years. The IRU business model becomes obviously to the standard for the broadband construction.

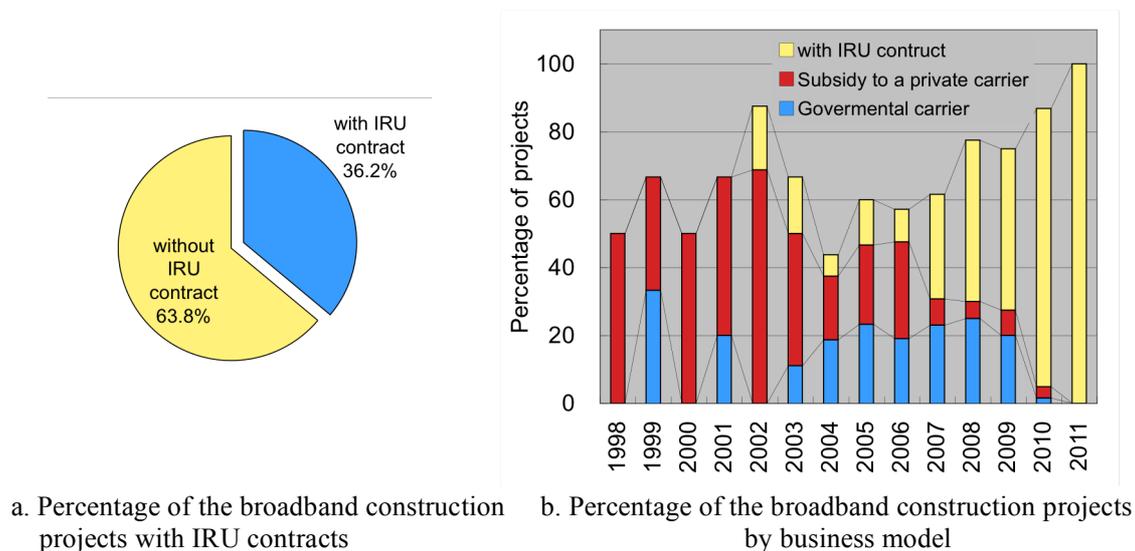
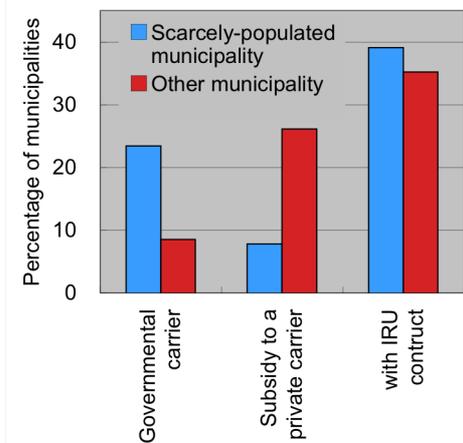


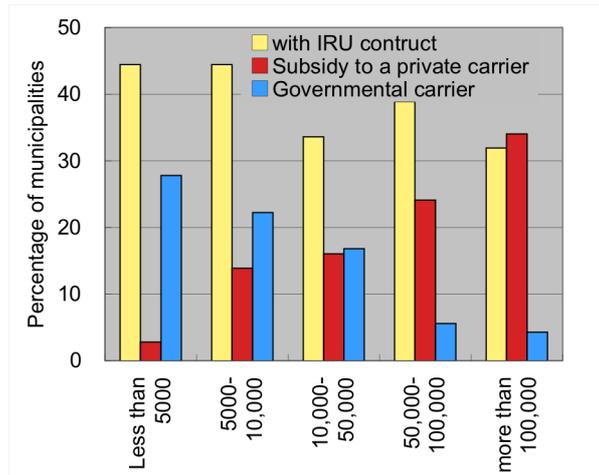
Figure 14 IRU contracts for broadband construction projects (1998-2010)
 Data source: *The Questionnaire Survey*

Why do the projects with IRU contracts increase greatly in these years? An analysis of the relationship between the geographical conditions of the municipalities and the business model of broadband construction projects offers useful suggestions for this question.

Governmental carrier is typical for the scarcely-populated municipalities. Contrary, the direct subsidy to a private carrier is typical for the other municipalities. The reason for this difference is clear. The conditions of a broadband business are severe in the scarcely-populated municipality because of the limited demand for the broadband services. For a private carrier (even though for a semi-private carrier), the business is unprofitable often in the scarcely-populated municipality (Fig. 15a). The fact that the percentage of the projects by the subsidized private carriers is the lower for the smaller municipality supports this understanding (Fig. 15b). The characteristics of the projects with IRU contracts are nearer to the ones of governmental carrier than to the ones of the subsidized private carriers. The IRU business model is obviously effective for the broadband construction in less-favored regions.



a. The scarcely-populated municipality



b. by the population size of municipality

Figure 15 The relation between the geographical conditions and the business model of broadband construction projects

Data source: *The Questionnaire Survey*

In the early stage of the broadband construction in less-favored regions, the local governments have no option but to start up their own telecom business to improve the broadband access in their territories. After the IRU business model was developed, many local governments in less-favored regions can construct the broadband networks without their own technical know-how. Because the IRU business model has naturally some advantages for the broadband construction by the municipalities not only in less-favored region but also in non less-favored regions, the almost of all broadband constructions are carried on the IRU business model in these years.

For the IRU business model, a private carrier which agrees the IRU contract with the municipalities is needed. In many cases, NTT East-Japan and NTT West-Japan, which are the descendants of the former NTT, a monopolized telecom carrier in Japan, participate in the IRU business. NTTs participate to around 70% of the projects with IRU contracts. NTTs set the corporate policy that they would not invest the broadband networks in less-favored regions but participate as an operator when the network is constructed based on the public expenditures (Fig. 16).

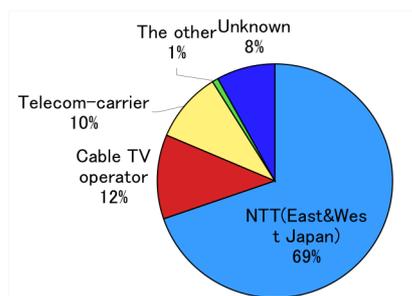


Figure 16 Percentage of construction projects by broadband operator

Data source: *The Questionnaire Survey*

5-3 A case study

Here, we would like to introduce a case of the construction of optical-fiber networks based on the IRU business model to indicate the characteristics of NTTs' IRU business policy. *Ohsaki-Kamishima* Town is an island located in *Setonai-Kai*, the largest inland sea of Japan and has around nine thousand residents. The town constructed an optical-fiber network from 2002 to 2005. The total expenses were around 1,600 million Yen (ca. 13 million Euro) and around 80% of the expenses were substantially borne by the Japanese Government. Total length of the fiber-cables is 37km and more than 1000 families subscribe (Fig. 17).

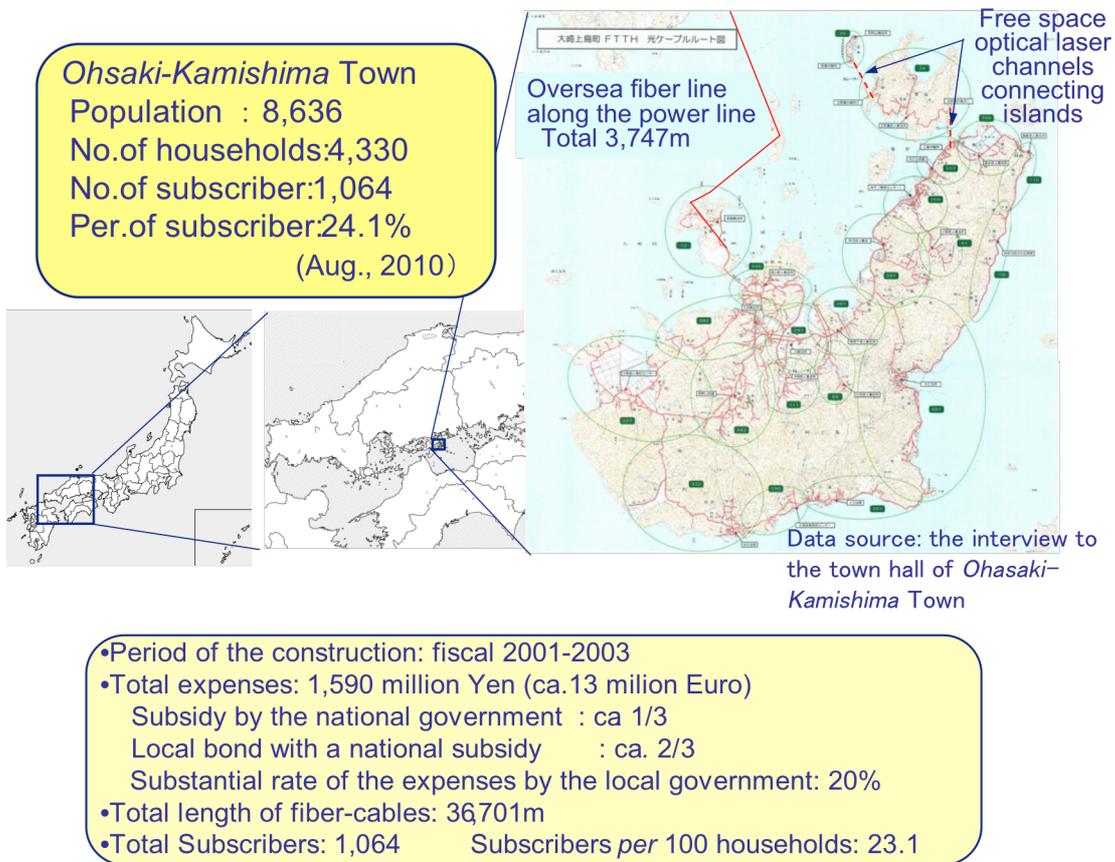


Figure 17 A case of the construction of an optical-fiber network utilizing the IRU contract:
Ohsaki-Kamishima Town, *Hiroshima* Prefecture

Data source: the interview to the town hall

The beginning of the project planning, the town requested to NTT West-Japan to participate into the project. However, NTT West-Japan refused the participation for the reason that the needed expenses would be too large. Generally for an island, a new overseas communication line connecting the network in the island with the mainland Internet-backbone is needed. The cost of the overseas communication line, submarine fiber-cables in most cases, often becomes a bottleneck in the network construction. NTT West-Japan hesitated to invest the expensive submarine cables. Fortunately for the town, *Energia Communications Inc.*, a subsidiary of the *Chugoku Electric Power*

Co., Inc., the monopolized electric power company of the region, agreed to participate the project. *Energia Communications* can utilize the existing overseas fiber-line along the power line from the power plant located in the island (Fig.18).

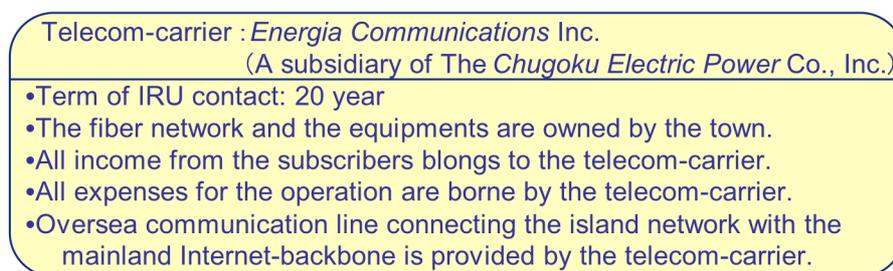


Figure 18 IRU contract for the optical-fiber network in *Ohsaki-Kamishima* Town
Data source: the interview to the town hall

The case of *Ohsaki-Kamishima* Town shows the limitation of the IRU business model. The large investment outside of the national subsidy scheme hampers the participation of a private telecom operator. The IRU business model cannot overcome this difficulty so far as a participant with special advantages like *Energia Communications*. The IRU business model is not the perfect solution for the improvement of broadband services in less-favored regions.

6. Conclusion

In this paper, we examined the broadband policies for the areas of limited Internet access by national/local governments based on the data collected from the questionnaire survey. The results of the analysis can be summarized as follows.

Broadband access in Japan has been rapidly improved in the 2000s supported by the promotion policies of the Japanese Government e.g. “u-Japan” Plan. The major broadband method has been shifted from DSL to optical-fiber in this period.

However, the areas with no broadband has not been disappeared. Many areas with no broadband remain in Hokkaido, the east-part of Tohoku, the south-part of Shikoku and the south-part of Kyushu. There are many non-broadband areas in the small scarcely-populated municipalities.

The national subsidies for the broadband construction projects played key roles of the improvement of broadband access. “The New Age Cable Television System Construction Program” in the first half of 2000s and “the Regional Telecommunication Infrastructure Construction Program” have been typical of the national subsidy schemes. The broadband construction projects by local governments subsidized by the national government affect positively to the elimination of the areas with no broadband.

The improvements of broadband access supported by the construction projects facilitate the regional promotions using the Internet in the fields of tourist information and goods selling. The effect of the broadband improvements on the regional promotions is particularly significant in the

selling agricultural and marine products in less-favored regions.

The entry of private telecom-carriers utilizing IRU contracts rapidly increased in a few last years. The IRU business model becomes the standard for the broadband construction in these years. IRU business model eases the improvement of broadband access in less-favored regions where private broadband business is unprofitable and the local government has no ability to operate its own broadband business.

In Japan, the governmental policy to dissolve the geographical digital divide is coming to the final stage at the present day. Almost of all mountainous areas and remote islands are linked by fiber-cables or wireless access channels. Improved broadband access seems to vitalize partially the social-economic activities in less-favored regions. However, there are a number of challenges for the full utilization of the Internet potentials. Some of these challenges are caused by the social structure of less-favored regions. Internet use by the elderly is one of the typical challenges. Further research is expected.

Acknowledgement

This investigation was funded by the Grant-in-Aid for Scientific Research of Japan Society for the promotion of Science (No. 21520790).

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