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THE GEOGRAPHICAL DIGITAL DIVIDE IN BROADBAND ACCESS AND GOVERNMENTAL POLICIES IN JAPAN: THREE CASE STUDIES

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Abstract – *Broadband access is indispensable for advanced Internet services, because voluminous data transfers have recently become popular in developed societies. Although broadband access has spread to a certain degree in developed countries/regions, geographical gaps in broadband access (the so-called "geographical digital divide") remain. Based on three case studies in less-favoured areas of Japan (Hokkaido, Nagano Prefecture and Mie Prefecture), we examined how the geographical digital divide is being bridged, and the contributions that national and local government policies make to this process. Several implications were apparent.*

First, integrating communication infrastructures with manifold digital services, such as cable television services and broadband access, is an effective way to extend broadband to less-favoured areas. The Japanese government has promoted the construction of digital cable television networks, and they have played a significant role in the completion of universal broadband services. The challenge of digitizing terrestrial television broadcasting has been behind these policies. Another effective means of extending broadband has been the pressure exerted by local governments (under the national policy scheme) on private cable television companies to bring their services to even the least populated regions. Finally, in those areas where private digital network services are unprofitable, the establishment of a publicly funded cable business (using a budget-transfer scheme, for example) may be an effective option for extending broadband services. In general, the challenge of bridging the geographical digital divide should be tackled with a broad set of regional promotion policies for less-favoured regions.

Key-words – *broadband, cable television, geographical digital divide, less-favoured area, governmental policy.*

Résumé – *De nos jours, l'internet très haut débit est devenu indispensable tant les besoins en bande passante sont énormes. Bien que l'internet à haut débit se soit étendu dans la plupart des pays développés, le fossé numérique persiste encore à l'intérieur du territoire national. Le travail a consisté à comprendre la façon dont les politiques locales et nationales peuvent contribuer à résorber les écarts, en étudiant trois régions parmi les moins favorisées du Japon (Hokkaido, la Préfecture de*

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Nagano et la Préfecture de Mie). Plusieurs enseignements ressortent. En premier lieu, l'idée que le déploiement du haut débit dépend en grande partie de la fourniture simultanée de multiples services numériques.. La télévision numérique joue, parmi ce bouquet de services, un rôle significatif et repose sur un grand programme gouvernemental. Une autre manière efficace d'étendre le haut débit se situe dans la pression exercée par les autorités locales sur les entreprises privées de télévision câblée, susceptibles d'assurer leur diffusion dans les régions les moins peuplées. Enfin, dans les régions où les services privés de réseau numérique ne sont pas rentables, la création d'une entreprise de câble financée par l'argent public semble être une bonne alternative. C'est dans cet ensemble de solutions que les difficultés numériques des régions les moins favorisées peuvent être surmontées.

Mots-clés – *haut débit, télévision câblée, fracture numérique, zones défavorisées, politique gouvernementale.*

INTRODUCTION

Difficulties in providing basic information and communication technologies (ICT) to geographically isolated regions have largely been reduced in developed countries. Dial-up access to the Internet through analog telecommunication lines was available in most areas of developed countries early on in the expansion of the Internet, because fixed public switched networks were in place. Low-speed Integrated Services Digital Networks (ISDN) using digital telecommunication lines were also in use. E-mailing and basic Internet browsing using primitive Internet access was widespread in developed societies. In addition, mobile Internet use via cellular phones has been rapidly growing in these societies. However, broadband access is indispensable for advanced Internet services, because of the large data transfers required to download software or multimedia content such as pictures, sound, and videos.

Broadband access spread in developed countries in the early 2000s, following the development of cable modem technologies using cable television networks and digital subscriber line (DSL) technologies using the copper cables in public switched telephone networks. OECD statistics reveal that the number of broadband subscribers per 100 inhabitants grew from 7.2 in 2003 to 22.6 in 2008 (Figure 1).

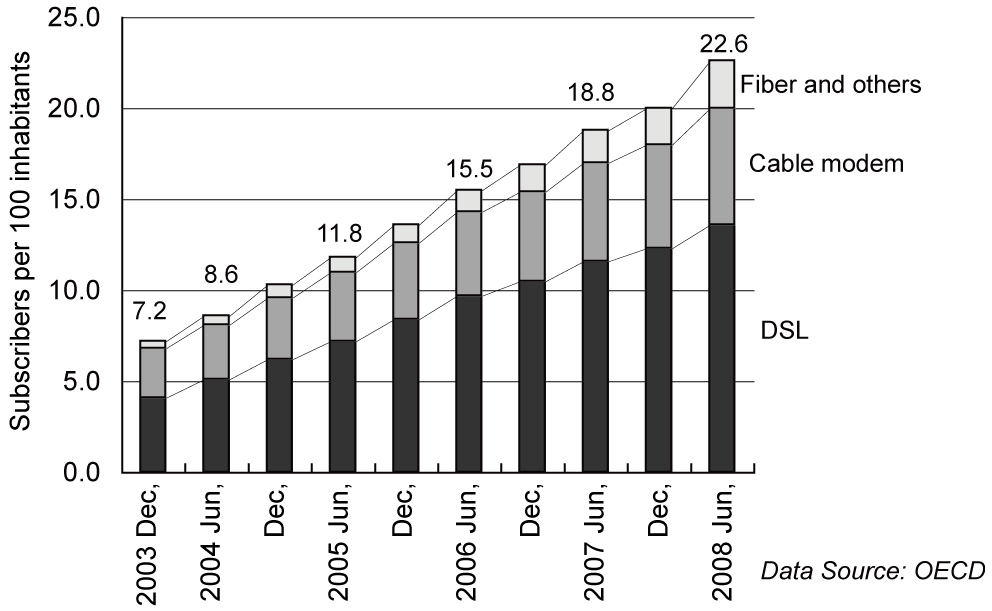

Figure 1. Broadband subscribers in OECD countries

Although broadband availability has increased, differences in access, the so-called "geographical digital divide," remain. Several studies of the geographical digital divide have been published, and as Greenstein and Prince (2007) suggest, many of these studies focus on the gaps in Internet access between urban and rural areas. One severe challenge facing universal broadband access is a problem known as the "Last Mile," which refers to making the connection between a subscriber and the nearest Internet access point. It is far more difficult to resolve this issue in sparsely populated rural areas than in densely populated urban areas. From the early days of broadband diffusion, this issue has attracted the interest of scholars as well as businesspersons. As Downes and Greenstein (2007) have pointed out, providing universal broadband is more difficult than providing dial-up access, because the former requires a larger investment. Gillett and Lehr (1999) analysed the nationwide diffusion of broadband services using cable modem and DSL technologies in the U.S., and Gabel and Kwan (2000) analysed these same services in North America. Detailed case studies in selected areas have been also carried out. In the United States, for example, Gillett and Lehr (1999) studied a county in Massachusetts, and Grubesic and Murray (2002) examined the state of Ohio. The Last Mile should be identified as a new issue in the geographical digital divide of the broadband age.

The limited availability of broadband access in rural areas can be reduced, as Wood (2007) suggested based on a detailed empirical analysis in Pennsylvania, U.S. For both technological and economic reasons, mountainous areas and small remote islands are however difficult to reach with broadband services relative to other rural areas. We cannot judge the severity of a region's geographical digital divide based on

regional averages of broadband access. Japan, for instance, which has more mountainous areas than most of the other developed nations (and therefore might be expected to have a large digital divide), actually has an average rate of broadband access. Regional and nationwide averages are deceiving because less-favoured regions have a small proportion of the national population. Thus, we are more likely to get a better understanding of the geographical digital divide by closely examining specific less-favoured areas rather than by focusing on broad regional averages.

Previous research on broadband policies has concentrated on deregulation and competition in telecommunications (Crandall and Alleman, 2003). However, ICT promotion policies, including the narrowing of the geographical digital divide, should be based on a general framework of regional policies that target less-favoured regions. Lorentzon (2009) used a survey to examine the geographical digital divide in a selected area of Sweden. He pointed out that the real availability of broadband access is often obscured by technical difficulties on the providers' side and poor equipment on the users' side of telecommunications, even if the area is officially identified as having broadband service. The realities of the geographical digital divide can be discovered only by closely examining local conditions.

In this paper, we use selected case studies of less-favoured areas in Japan to examine the contributions that national and local governmental policies can make to the dissolution of the geographical digital divide. As described below, the geographical digital divide as a supply-side issue has already been resolved in many of the less-favoured regions. However, many questions have not been answered, such as who was involved in the dissolution process, what roles the national and local governments played, and what challenges remain.

Understanding the details of how the geographical digital divide was reduced in Japan would yield useful insights and policy strategies for other countries and regions confronted by similar challenges.

1. DIFFUSION OF BROADBAND SERVICES IN JAPAN

1.1. Regional differences in the expansion of broadband services

OECD statistics on broadband access show that the access rates of Northern European countries are the highest among developed countries, with the exception of very small countries/regions. In Japan, the number of broadband subscribers per 100 inhabitants is 23.6, which is slightly higher than the average of OECD member countries (Figure 2). In Japan (47.9%) and Korea (43.1%), a large proportion of users have "Fiber to the Home" (FTTH) broadband connections, whereas only 9.7% of users in OECD member countries, on average, have FTTH connections.

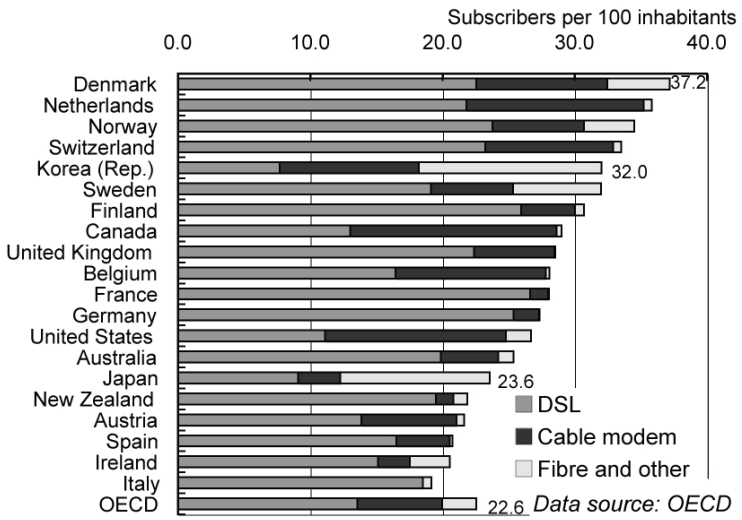

Figure 2. Broadband subscribers in selected countries of OECD (2008)

In Japan, Internet access via cable television networks and cable modem technologies was launched in 1998, and DSL was introduced around 2000. Figure 3 shows the diffusion curves for broadband service by type in Japan from 2001 to 2008. DSL was the most popular service since 2002. However, since 2005, FTTH has grown rapidly, and DSL tends to be declining.

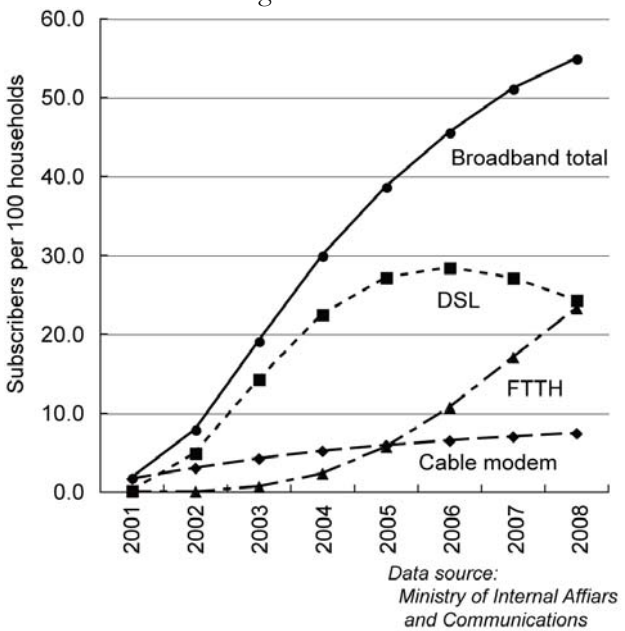

Figure 3. Diffusion of broadband subscribers in Japan (2001-2008)

Regional differences in broadband diffusion are shown in Figure 4. The penetration rate of broadband is higher in the three major metropolitan regions, Tokyo, Osaka, and Nagoya, and lower in peripheral regions. The Chubu and Hokuriku regions have higher broadband access figures than the national average, despite their mountainous terrain and lack of large provincial cities.

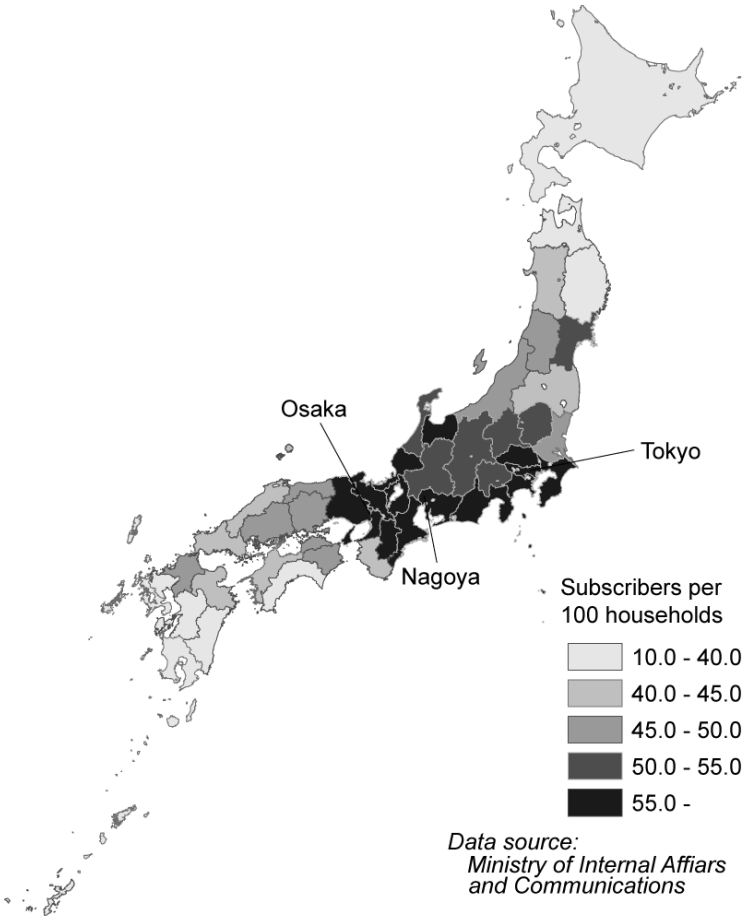

Figure 4. Geographical distribution of broadband penetration rate in Japan (2008)

There are also regional differences in broadband access by type. The rate of DSL tends to be higher in East Japan, whereas cable modem use is greater in several regions in West Japan. The three major metropolitan regions and the major provincial city regions lead in FTTH use. The preference of telecom companies to build FTTH networks in areas where the most potential users are concentrated obviously affects the distribution of FTTH use.

1.2. Goals of national governmental policies

Since 2000, the Japanese Government has promoted broadband access in Japan. For example, in the promotion known as the "e-Japan" Plan, the government's goal was to bring broadband accessibility to more than 30 million households by 2005, and to bring high-speed broadband service to more than 10 million households in the same timeframe. In the "u-Japan (Ubiquitous Japan)" Plan, the government's goal was to have universal (nationwide) broadband access by no later than 2010 (Ministry of Internal Affairs and Communications, 2008a). The government, which has carried out various programs to achieve these goals, claimed in 2008 that 98.3% of all households in the country have broadband services, and 86.5% had access to high-speed broadband, mainly using FTTH (Ministry of Internal Affairs and Communications, 2008b). Although these figures seem to include some overestimation, broadband access has undoubtedly become possible throughout most of the country.

The Japanese Government has a new policy called "Program for the Complete Dissolution of Geographical Digital Divide Areas (Burodobando Zero Chiiki Kaisho Jigyo)," which aims to remove the remaining "broadband zero areas." The program is trying to use new broadband technologies in deep mountain areas and small remote islands. Several high-speed wireless technologies, such as WiMax and satellite connections, are being tested, and the government is developing a policy to subsidize the installation of these technologies in relevant areas (Ministry of Internal Affairs and Communications, 2008a).

2. CASE STUDY I: THE CONSTRUCTION OF AN FTTH NETWORK IN A REMOTE DEPOPULATED AREA: NISHIOKOPPE VILLAGE, HOKKAIDO

Who contributed to the dissolution of the geographical digital divide in broadband access? How did national and local governmental policies contribute to this process? To examine these questions, case studies in three selected areas were conducted (Figure 5). These cases were selected as typical cases in the three patterns of the dissolution process observed in Japan. The case of Nishiokoppe Village, Hokkaido described in this section is the first field experiment on the construction of an integrated FTTH network for digital broadcasting and broadband services conducted mainly by the Japanese Government. The case of Kiso Region, Nagano Prefecture, where DSL has diffused most widely in Japan, shows the transition from private DSL services to cable modem services by local governments. In the case of Mie Prefecture, where digital cable television services have widely spread, the expansion of universal broadband services by private cable television companies under the initiatives of national and local governments can be observed.

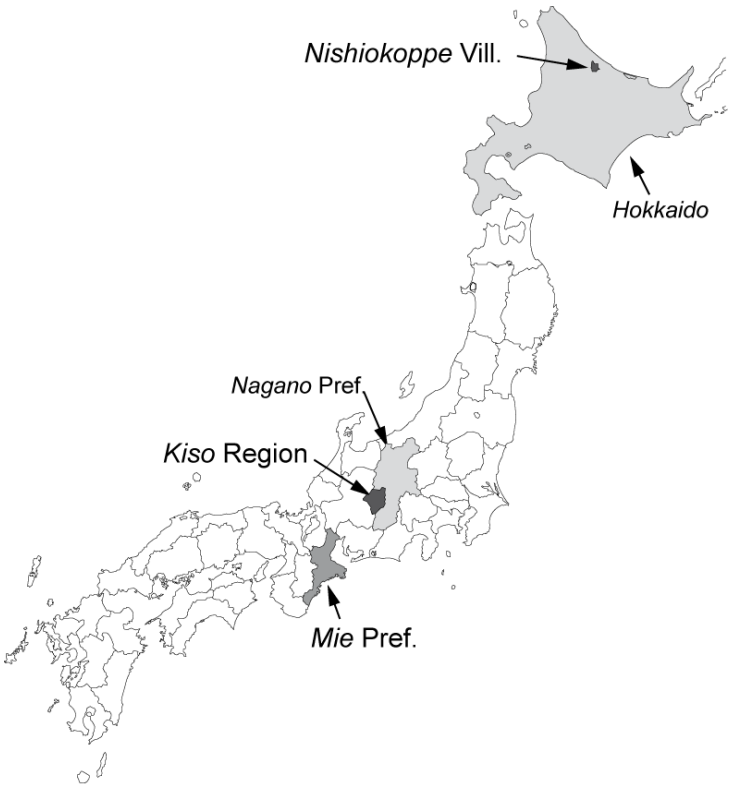

Figure 5. Study areas

In the case of Nishiokoppe Village, a new full-optical-fibre information network was constructed, funded mainly by the national government. Nishiokoppe is a small village of 1200 inhabitants, or 600 households, located in the Ohotsuk Region in the northeast part of Hokkaido, which is one of the most remote parts of Japan. As reported by Arai (2007), there were no dial-up ISPs in the Ohotsuk Region during the early period of Internet diffusion in Japan. All municipalities in the region formed an Internet service consortium to construct their own telecommunication network and to operate Internet services for local firms and residents.

Nishiokoppe Village is located in the deepest mountain area of the region. Nearly 90% of the village territory is covered by forest, and settlements are dispersed in the village territory. Because regular television radio waves are barely received in this mountainous village, the local government established an analog cable television system. When it was time to replace the old system, the government planned to construct an integrated information system based on an FTTH network. In this ambitious plan, they designed a full-optical-fibre digital network connected to all houses and other buildings to carry broadcast, telephone, and Internet services. The old analog cable television network and telephone lines would be completely replaced by the new network, and the government would also provide Internet services through the same network. Because the existing conventional telephone network was

completely absorbed by the new network, there is no copper telephone line in the village territory.

The optical cable network, which is 103 km in length, was constructed from 1999 to 2002 and is called the Nishiokoppe Communication Network (NCN; Iwasa et al., 2006). The network relays 10 TV and two FM channels. In addition, the government broadcasts its own TV programs. The government provides Internet services using the NCN to all households. The basic Internet service, which provides 1 Mbps connection, is free. Set-box equipment is distributed to those households without a computer, such as the elderly. Manifold additional services, such as farm management services and elderly care support services, are also provided through the NCN.

The construction cost for the NCN was 1.7 billion Yen (ca. 13 million Euros) in total, or 2.8 million Yen (ca. 22,000 Euros) per village household. The national government subsidized the village government for the construction of the NCN under the "Initiative for the Construction of Multimedia Systems in Rural Areas (Den'en Chiku Maruchimedia Moderu Seibi Jigyo)." The national government and the Hokkaido Prefectural Government paid 60% of the total construction expense of the NCN. In addition, 20% of the total expense was substantially borne by the national budget through a budget-transfer scheme called a local allocation tax (chiho kofu zei). Because of this tremendous financial support by the national government, the local government did not have to ask the local residents to share the construction expense of the NCN.

In the planning phase of the NCN, there were few commercial FTTH services in Japan. The Nishiokoppe Village project was positioned as a model for the national scheme to promote the use of FTTH services in less-favoured regions. Therefore, many new technologies were employed, and various possibilities for ICT were tested in this project. The national government supported the project through the exceptional deregulation of broadcasting and telecommunications services. The fact that Nishiokkope is a small, isolated village was a major reason why this area was chosen for this field experiment.

After the construction of the NCN, the national government was committed to introducing full-optical-fibre integrated information networks to larger municipalities than Nishiokoppe Village (Kuroda, 2006). The Nishiokoppe Village project played a leading role in the diffusion of FTTH in Japan.

3. CASE STUDY II: COMPETITION BETWEEN DSL AND CABLE MODEM SERVICE IN A MOUNTAINOUS REGION: KISO REGION, NAGANO PREFECTURE

Kiso Region is a deep mountainous area in Nagano Prefecture, which is in the interior of central Honshu (Figure 5). A number of small settlements are dispersed in valleys, which is typical of the depopulated areas in this region. With respect to broadband access, this region is distinguished by competition between DSL services

provided by a regional company and cable modem services operated by the local governments.

3.1. Diffusion of DSL

JANIS, which is a business division of a private regional ICT company, Nagano Ken Kyodo Densan, operates DSL services throughout the Nagano Prefecture. JANIS launched the first commercial DSL service in Japan by using the "wire radio and telephone (yusen hoso denwa)" networks in 1999, and it has expanded its services by using the public switched telephone networks of Nippon Telegram and Telephone (NTT). JANIS operates the network, which included 241 wire centres throughout Nagano Prefecture in 2009 (11 wire centres in the Kiso Region; Nikkei Digital Core, 2005). Although several companies operate DSL services in Nagano Prefecture, the JANIS service area is far wider than the others. The JANIS network is assumed to be responsible for the higher rate of DSL usage in this region than other parts of Japan.

Generally speaking, the range of a DSL service area is limited by the nature of DSL technology. Because transmission loss increases with distance, DSL subscribers must be within approximately 4 km of the provider's wire centre, which is usually located in a telephone switching station. In the Kiso Region, a number of houses are away from the central settlements where wire centres are located.

To analyse the relationship between the service coverage of DSL and the distance to the nearest wire centre, a GIS analysis using 1 km grid-cell population data and buffer analysis techniques based on straight-line distance was conducted. Figure 6 summarizes the results of the buffer analysis for distances ranging from 1 km to 10 km. Fifty-one percent of the households are located within a 1 km radius of a wire centre. The percentage of households increases rapidly with the size of the radius, such that 97% of the households are within 5 km of a wire centre, and 99.9% are within 10 km. However, this analysis also reveals that only 80% of the households in this region are located within 3 km of a wire centre, which is assumed to be the limit of standard DSL services (Figure 7). In other words, 20% of all households cannot use the standard DSL services due to the technical reasons. Although this percentage is significantly lower than what Wood (2007) reports for non-metropolitan rural areas in the U.S., it should not go unheeded.

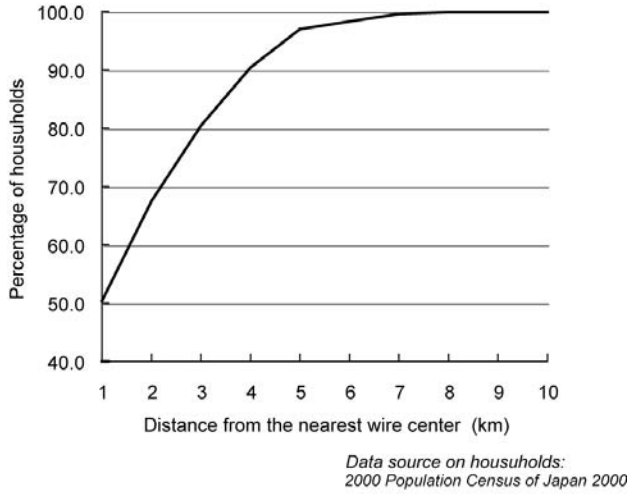

Figure 6. Percentage of the households available for DSL and distance from the nearest wire center

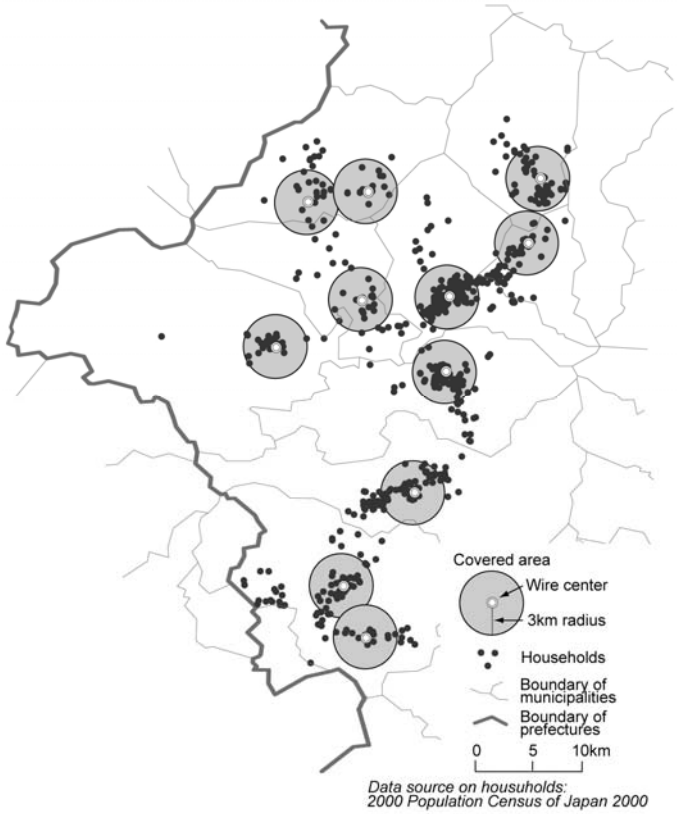

Figure 7. Coverage of DSL Services by JANIS in Kiso Region (3km radius)

JANIS uses special low-speed DSL modems to overcome this limitation, and they claim that this service can cover an 8 km radius from a wire centre. Although this would cover an estimated 99.9% of the households in the region according to the above GIS analysis, this service is of limited practical use, because the transfer rate of low-speed modems is relatively slow.

3.2. Construction of a digital cable television network

On the other hand, broadband services using cable modems have diffused corresponding to the expansion of cable television networks. In the Kiso Region, a number of small community antenna television facilities used central antennas located on the tops of mountains to serve tens to hundreds of households through coaxial cables. Because the Japanese Government is in the process of digitizing terrestrial television broadcasting by July 2011, existing community antenna television facilities have been pressing ahead with digital replacement systems. However, most of the areas served by community antennas have decreasing and aging populations that cannot afford the expense of digital replacement equipment, so they asked the local government to provide new digital cable television services. The Kiso Wide Area Union (Kiso Union), a consortium of six local municipalities in the Kiso Region, constructed a new publicly-owned cable television network to meet the residents' request by 2007 (Kiso Wide Area Union, 2003). This network uses hybrid fibre coaxial (HFC) techniques through 1,300 km of optical cables, and had 17,000 subscribers in March 2009. The Kiso Union launched their integrated information services (broadband Internet and digital television broadcasting) in 2007. Ninety-four percent of households subscribe to the television service, and 36% to the Internet service. The network relays twenty terrestrial/satellite broadcasting channels, as well as seven programs produced by member municipalities. Broadband access and Internet Protocol telephone services are also provided. A basic service of 0.5 Mbps and an enhanced service of 15 Mbps are available.

Because the Kiso Union's network is a governmental business, universal access was requested for the region. The Union planned to connect every household, even those located far from the settlements. In fact, they spent 7 million Yen (ca. 54,000 Euros) to lay more than 4 km of optical fibre cable from the settlements to isolated housing. Because the cables are laid throughout holiday villa districts where the demands for cable television services are sparse, the residents in these villas can easily connect to the network whenever they wish.

The Kiso Union received subsidies under national programs such as the "New Age Cable Television System Construction Program (Shin-sedai Keburu-terebi Shisetsu Seibi Jigyo)" and the "Telecommunication Infrastructure Construction Program (Joho-tsushin Kiban Shisetsu Seibi Jigyo)" to build the network. Seventeen percent of total expenses were subsidized by the national government and 3% by the prefectural government. Most of the rest of the expenses was substantially borne by the national government through the local allocation tax scheme. The local governments paid only 35% of the cost. Because of the national subsidies, subscription charges have been reduced. The monthly charge for television services is

one-third of the price for the same services provided by the average private cable television company in Japan. The access charge for 15 Mbps broadband service is 2,600 Yen (ca. 20 Euros) per month, which is about 70% of what JANIS charges for DSL services. The charge for the low-speed (0.5 Mbps) access, which corresponds to the long-distance service by JANIS, is merely 840 Yen (ca. 6.5 Euros) per month. As a result, the existing DSL services are not competitive with the new cable modem services.

Thus, in the Kiso Region, a typical mountainous area, DSL was introduced first, but then cable modem service (using the digital cable television network) took its place. Of course, the national policies to reduce the geographical digital divide facilitated this transition. However, the Japanese Government's push to renovate existing cable television services to digitize terrestrial broadcasting was also an important factor.

4. CASE STUDY III: BROADBAND SERVICES THROUGH CABLE TELEVISION NETWORKS IN MIE PREFECTURE

Mie Prefecture is a coastal region in central Honshu. In Mie Prefecture, cable modem services have contributed to the diffusion of broadband access. Partially because of the prefectural government's positive response to the promotion of ICT service to local communities, cable television services spread rapidly in the prefecture. From 2000 to 2003, digital cable television networks were built. Broadband services using digital cable television networks were provided throughout the prefecture, including the deep mountainous regions. The rate of cable modem diffusion in Mie Prefecture was the highest among all prefectures in the country in 2002. Cable modem service has maintained its predominance among all broadband services in Mie Prefecture (Figure 8).

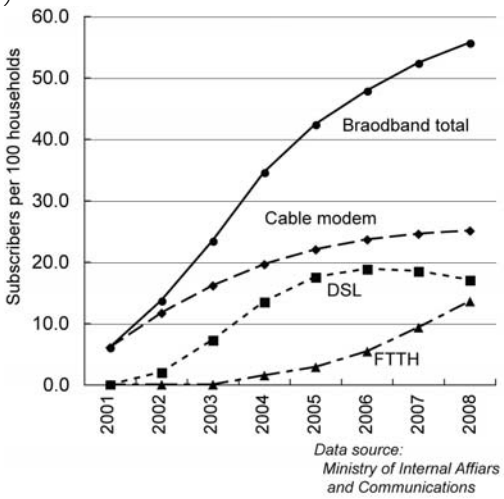

Figure 8 Diffusion of Broadband in *Mie* Prefecture (2001-2008)

All of the cable television network operators in Mie Prefecture are private companies, in contrast to the Kiso Region, where the local governments operate the cable television business. Why did these private companies expand their services to deep mountainous areas, which are assumed to be less profitable? National policies to promote digital cable television networks and positive actions by the local governments in the less-favoured regions are two important reasons. The cases of ZTV Corporation and the Matsuzaka Cable Television Station will be examined.

ZTV Corporation (ZTV) operates cable television services in the Tsu Region (in the heart of Mie Prefecture), in the East Kishu Region (in the southern part of the prefecture), and in some parts of the adjacent prefectures. ZTV is the largest cable television company in the prefecture, with 225,000 subscribers and 10,600 km of cable. Although ZTV has been providing cable television since the mid-1990s in the plains around Tsu City, the seat of the prefectural government, in 2000 it started building cable television networks in mountainous East Kishu Region, and then expanded its service to a part of Wakayama Prefecture, which is adjacent to Mie Prefecture. ZTV could receive support for the construction of a new network under the "New Age Cable Television System Construction Program" by the national government. ZTV's network provides digital television broadcasting and Internet services to all its subscribers because it is completely digitalized. Broadband access is available universally—not only in urbanized areas, but also in all deep mountainous areas. The penetration rate for Internet services was 25.4% for the Tsu Region and 19.1% for the East Kishu Region at the beginning of 2009.

In the ZTV's service areas, every isolated household was connected to the new network. Irokawa District, Nachi-Katsuura Town, in Wakayama Prefecture is a good example of the remote, sparsely populated districts served by ZTV. In this district, where even mobile telephone services are not sufficient, cable networks were built in 2005, and Internet service has dramatically improved. Irokawa District is an exceptionally less-favoured area with a number of immigrants from large cities. Even the immigrants, who are familiar with broadband access, state that they experience no problems with their Internet service after the launch of ZTV's network.

The Matsuzaka Cable Television Station (MCTV) is the third-largest cable television company in Mie Prefecture, with 64,000 subscribers and 2,900 km of cable. MCTV was founded in 1990 in Matsuzaka City, and expanded its service areas to adjacent inner mountain areas. MCTV built its digital network with a subsidy from the "New Age Cable Television System Construction Program." As with ZTV, MCTV's network construction cover their entire administrative territories of the local governments, even in the districts farthest from major settlements.

MCTV merged a number of existing community antenna television facilities when it has built its digital television network. The penetration rate of the television services has reached nearly 100% in the areas where the old facilities were used. Although these areas have declining and aging populations, the subscription rate for broadband services is higher than it is in urbanized coastal areas (Figure 9). This fact suggests that the deep penetration of digital television services helps to significantly promote the diffusion of broadband services.

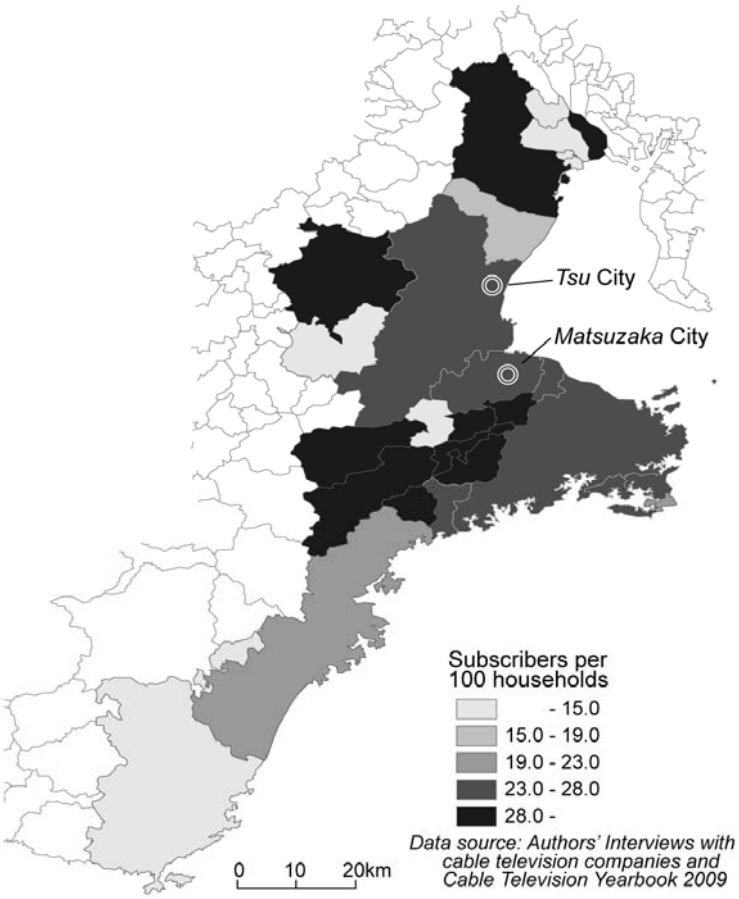

Figure 9 Geographical distribution of penetration rate of cable modem in *Mie* Prefecture (2008)

Both ZTV and MCTV are private companies, and they must face the challenge of making a profit in sparsely populated mountainous areas. Why they decided to build digital cable television networks in less-profitable mountainous areas? The national and local governmental policies affected strongly these decisions.

The Japanese Government plans the digitalization of terrestrial television broadcasting by July 2011 and promotes the replacement of an analog television broadcasting system with digitalized one. The "New Age Cable Television System Construction Program" was a typical national promotion policy for the replacement of television broadcasting systems. In the case of Mie Prefecture, prefectural and municipal governments planned to replace a number of existing old community antenna television facilities in mountainous areas with new networks to meet the digital terrestrial television-broadcasting standard. Every local government is eager to attain universal television services throughout its territory. The "New Age Cable

Television System Construction Program" requests the municipal governments where the network is expanded through their territories to invest in stocks of the cable company. Under the scheme of this program, the cable company received the investments by the local governments and promised to provide services throughout the entire administrative territories of the investors in return.

Through the "New Age Cable Television System Construction Program," the national and local governments subsidize half of the construction expense for new digital cable television networks. A cable company can increase profitability using a subsidy program. In addition, attractive policy-based financing was offered to cover the remaining expense. This preferential treatment by the government encouraged investments in the expansion of digital networks. Goolsbee (2003) has emphasized the importance of subsidies for the fixed costs of broadband businesses based on a microeconomic analysis of broadband diffusion in the U.S. He concluded that subsidies for fixed costs to create new broadband services in areas where broadband is not available provide greater benefit than direct subsidies to consumers to offset the expense of broadband access in areas that are already served. Our case studies support his conclusion with respect to the importance of a public role in the promotion of broadband use in less-favoured areas.

On the other hand, companies can charge relatively high subscription fees for broadband services, which contribute to their operating income. In the case of ZTV, the subscribers' cost for broadband services is 42% of the cable bill. Thus, the income from broadband services contributes nicely to the profitability of cable companies' business.

However, these economic reasons are insufficient to understand the cable companies' decisions to attain universal services. Many staff members in local governments and cable companies claim that television services are fundamental to people's life, like "air." Such a mindset may be the primary driving force behind the dissolution of the geographical digital divide.

CONTRIBUTIONS OF GOVERNMENTAL POLICIES TO THE DISSOLUTION OF THE GEOGRAPHICAL DIGITAL DIVIDE: CONCLUDING REMARKS

The contributions of national and local governmental policies to the dissolution of the geographical digital divide are summarized based on the above case studies.

The Japanese Government's strategies, such as "e-Japan" Plan, promote ICT use through the spread of broadband access have improved Internet access throughout the country. The rapid rise of broadband access suggests the impact of this policy.

DSL, which has been the major technology for broadband access in many countries, was adopted in Japan later than in other developed countries. However, DSL cannot provide universal services in remote, sparsely populated regions because

of technological limitations that require users to be within 3 km of a telephone wire centre.

Digital cable television networks have played a significant role in the completion of universal broadband services in less-favoured regions, such as mountainous areas. A number of digital cable television networks were constructed to replace existing old community antenna television facilities located in deep mountainous districts. The national government has promoted the construction of digital cable television networks to accommodate the move to digital terrestrial television broadcasting.

The "New Age Cable Television System Construction Program" is a typical example of the subsidy programs that were used to promote the construction of cable television networks. This program provided opportunities to construct cable television networks not only for public businesses, but also for private cable television companies.

Local governments, in response to the subsidy programs, pushed strongly to have cable television networks provided throughout their territories. These requests, in turn, pressed the private cable television companies to expand their services to even the most sparsely populated districts. The optimistic view concerning universal Internet access in urban areas expressed by Downes and Greenstein (2007) does not apply to sparsely populated areas. Some governmental participation is needed in those areas.

For public cable television businesses, the national government contributed funds for construction through budget-transfer schemes. The national government's support for pubic broadband service businesses is very different to that the U.S. reported in Wood (2007).

It is difficult to run a digital cable television business based solely on the income from television broadcasting services. Such businesses are thought to be profitable only when broadcasting services are integrated with broadband services, which can earn higher subscriber fees than television services.

In conclusion, the case studies described here have several implications. First, the dissolution of the geographical digital divide cannot be achieved solely by means of simple Internet services. It is better to construct communication infrastructures that integrate manifold digital services, such as cable television services. Second, support by the national and local governments can play a key role in the construction of integrated communication networks. Third, public businesses are an effective option in remote areas that would be unprofitable for private services providers. In such cases, some means of regional support for public businesses should be used, such as budget-transfer schemes. In general, the challenge of the geographical digital divide should be tackled with a broad set of support policies for less-favoured regions.

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