

The Regional Initiative for Sustainable Woody Biomass Energy Business -A Case Study on Maniwa area, Japan-

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Abstract. The share of renewable energy has been increasing world wide. In recent years, the number of the regions which start the projects to promote utilizing renewable energy has been increasing. Maniwa area, Okayama, Japan is one of those regions and their project for utilizing woody biomass energy started in 1993. In this paper, some implications for sustainable regional businesses for utilizing woody biomass energy are clarified. Community surrounding the project plays an important role called “civic entrepreneurs” (Henton et.al 1997). It develops regional network through government-university-community partnership where many productive linkage produced in the area. Key success factors of the civic entrepreneurs and its growing network should be considered. Conducting this research, online and literature surveys were applied for data collecting. The interviews and field investigation were distributed among the companies and institutions inside and outside of Maniwa area. The result pointed out the importance of intermediary in regional network. The “regional” renewable energy business such as woody biomass energy business is sustainable in an area where people who can establish a business model that includes dissemination of a routine knowledge collection and learning and other economics, not “scale” or “scope”, take the initiative.

Keywords: Woody Biomass Energy, Civic Entrepreneur, Initiative, Regional Network

1. INTRODUCTION

The worldwide share of renewable energy has been on the increase, but in Japan, energy generated from renewable sources accounts for only 10% of the total. The Feed-In Tariff (FIT) is a system promoted by the Japanese government under which power companies buy electricity at a fixed price. In Japan, FIT for renewable energies began in July 2012. Solar, wind, hydro, geothermal, and biomass are included as renewable energy sources. Biomass energy

is a type of renewable energy that uses heat or gas from burning or fermenting resources such as wood chips, kitchen refuse, and scrap wood. The number of the biomass power generation plants has increased following implementation of FIT and other public projects. Figure 1 shows the number of articles in newspaper databases that include the word “biomass” from 1978 to 2015. As illustrated in Figure 1, the number of articles that mention “biomass” has increased rapidly since the beginning of the 2000s, suggesting that more biomass projects started during

this time period than previously. Because of certain problems such as the difficulty of resource collection or underdeveloped technical levels (e.g. power generation efficiency), only a few areas in Japan have been able to continue their biomass projects.

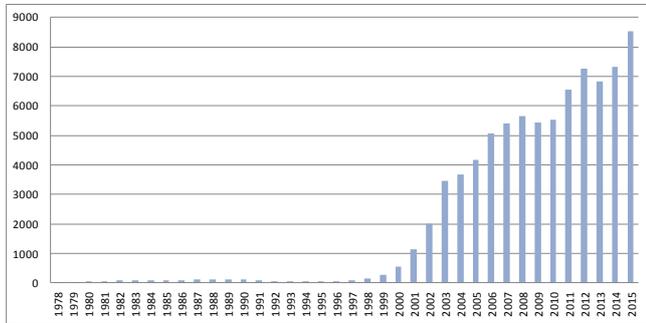


Figure 1: Number of articles including the word, “biomass”.
(Source: Data from NIKKEI Telecom 21)

Moreover, continuity of biomass energy projects is a problem that should be given more attention.

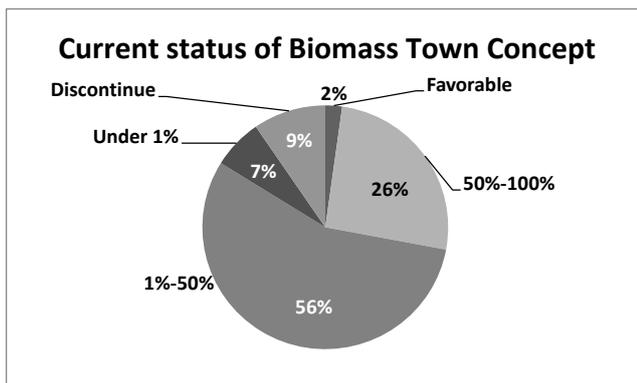


Figure 2: Current status of Biomass Town Concept
(Source: Data from Ministry of Internal Affairs and Communications)

In Japan, a Biomass Nippon Comprehensive Strategy has been promoted by 6 government departments since 2002. The objective of this strategy is to maximize biomass utilization through technical development. The notion of a Biomass Town forms part of this strategy. A Biomass Town is defined as “an area where a comprehensive biomass utilization system is established and operated through the cooperation of various stakeholders in the area” (Ministry of Agriculture, Forestry and Fisheries). Figure 2 indicates that most Biomass Town Concepts are difficult to implement. However, some areas have created sustainable biomass energy networks by utilizing existing networks. One of these is located in the Maniwa area of Okayama. In

this paper, a regional network construction process that took place over the course of 20 years will be analyzed. Our research object is to clarify the type of initiative which leads to a sustainable regional woody biomass energy business, focusing on the Maniwa area.

2. REVIEW

The Maniwa area has been investigated and analyzed from different viewpoints. From the viewpoint of the economy in that area, “contribution to regional vitalization by environmental resources such as wooden biomass” (Nakamura & Shibata, 2013, p. 31) was shown by “constructing an input-output table at the city level” (Nakamura & Shibata, 2013, p. 31) and the “direct and secondary economic effects on the Maniwa project for production and distribution of wooden chips were estimated” (Isa et al, 2013, p. 48) through “using a biomass accounting form” (Isa et al, 2013, p. 48). In a study on the status of the Biomass Town Concept, a public project promoted by the government was mentioned as being a pioneer of woody biomass utilization in this area of Japan (Yamazaki, 2007). In a study on Biomass Industrial Community, another public project promoted by government, it was suggested that the local private sector should be the main actor in promoting biomass projects (Sakamoto & Warashina, 2014). The influence of the introduction of FIT in Japan in July, 2012 on the Maniwa area was predicted (Tsuchiya, 2012). Some of the previous studies focused on the regional network in that area. The process of forming the network in the Maniwa area prior to 2009 was described. It was mentioned that the network in the Maniwa area was rooted in the area and had multilayered, coordinated simultaneous development with the keyword “biomass” (Ono, 2009). It was considered that the effort to utilize biomass in the Maniwa area involved a consistent strategy to connect regional resources to markets (Nakamura, 2012). Within the network, “the influence factor for cooperative behaviors required for business economic efficiency of woody biomass utilization projects” was clarified by conducting “a questionnaire survey for both establishments and citizens” in the Maniwa area (Kondo & Zen, 2013, p. 62). There are some studies on the nuclear factor and the support sector which promotes utilizing natural energy in other areas of Japan. “Driving actors” (Izutsu, 2011) that promote sustainable energy were analyzed and a framework for the introduction of sustainable energy in local communities was proposed through a case study in Bizen city, Okayama Prefecture (Izutsu, 2011). However, there are still few studies of regional networks or of business formation aimed at promoting biomass energy in Japan, and no research that analyzes the regional network of the Maniwa area over 20

years. Our research object is to clarify the type of initiative which leads to a sustainable regional woody biomass energy business, focusing on the Maniwa area. Also, the formation of players in the area will be analyzed.

An area which promotes some business can be conceptualized as a community that includes various actors such as the private sector, the public sector, universities and Non-Profit Organizations (NPO). The notion of conceptualizing such an area as a “Poly-Agent System” was suggested (Nonaka et.al, 1998). This concept itself has been proposed by many researchers, but we would like to consider the various kinds of players which form a regional network through the concept of a poly-agent system. In addition, it can be supposed that the players find some kind of value as “social capital” (Coleman, 1988) in continuing projects like the regional woody biomass energy business whose non-profit value could be “embedded” (Granovetter, 1985; Watanabe, 2015) in the area.

3. METHODOLOGY

In this paper, the regional network construction process over 20 years will be analyzed. On conducting this research, online and literature surveys were used for data collection. Interviews and field investigation were distributed among companies and institutions inside and outside the Maniwa area.

4. CASE STUDY

4.1 Research Settings

Figure 3 shows the location of the Maniwa area. It is located in the south of Okayama Prefecture. Approximately 80% of Maniwa is covered by forest. Maniwa has a population of about 48,000. There are three wood markets, about 30 sawmills and one wood products market.

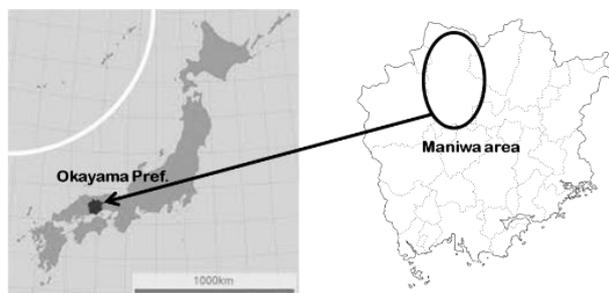


Figure 3: Location of Okayama Pref. and Maniwa area

The formation of the woody biomass energy network in Maniwa has taken place in three phases: the starting

phase, the expansion phase and the development phase. There are four factors in each network: core actors, knowledge hubs, supporting sectors and affiliates. A core actor is a player which leads the businesses or activities in the area. A knowledge hub is a place which concentrates the knowledge needed to promote projects collectively, efficiently and sustainably. A supporting sector is some association or institution which supports projects in the area, for example a cooperative association or a financial institution. An affiliate is a person or group that cooperates on projects by introducing woody biomass utilization into their lives or businesses.

4.2 Status

In this section, we'd like to describe the details of development per phase, focusing on key factors of the network in the Maniwa area and on the turning points which resulted in the changes to the network referred to in our survey results. And also we'd like to clarify the formation of players in the area.

4.2.1 Starting Phase

This phase began in 1993 with the startup of “21 Seiki no Maniwa Juku”, a forum where young managers gathered to consider the future of the Maniwa area. At that time, highways were planned to the north, south, east and west. People in Maniwa were concerned over the risk of becoming a bundling point and worried about “hollowing out”. However, because the construction was not imminent, the problem was not especially urgent. They had time to decide what to do for the future of Maniwa and to organize themselves. They invited people from government institutions and outside companies and researched the best way forward for the Maniwa area. Thanks to a civil servant who was a forum member and who had a wide network of contacts, they were able to receive information from the national government directly without it being filtered through the biases of the prefectural or municipal governments. The forum met 80 times for a total of 300 hours (Ono, 2009, p. 32). About two years after starting up, the forum focused on environment-related industries. Finally, forum members agreed that their efforts towards an ideal future for Maniwa would revolve around biomass industries utilizing wood. Meiken Lamwood Corporation, a local sawmill, spent 1 billion yen (approximately US\$ 8.3million at the time) on a 2,000kW woody biomass-fueled electric power generation plant. Figure 4 shows the status of the Maniwa network during the starting phase.

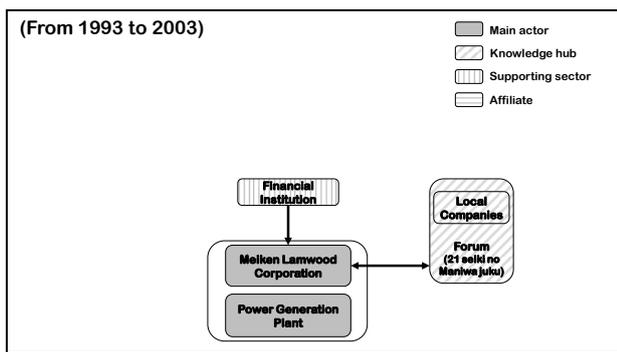


Figure 4: Status of the network during starting phase
(Source: Authors)

During this phase, the core actors were Meiken Lamwood Corporation and its power generation plant. The knowledge hub was “21 Seiki no Maniwa Juku”. The supporting sector was a financial institution. An affiliate had not yet appeared. During this phase, woody biomass energy utilization in Maniwa began in earnest.

The trigger to move to the expansion phase was the construction of the power generation plant by Meiken Lamwood Corporation because the role of woody by-products changed from industrial waste to woody biomass fuel. The civil servant who started “21 Seiki no Maniwa Juku” played an important role as “motivator” in this phase. He intended to make efficient use of his wide network of contacts and motivated himself in the beginning. Next, he invested his own private time to set up the next forum. He was the coordinator who connected local and outside people, acting more as an “editor” than as a “scenario writer”. Because he didn’t anticipate the process in advance, he was able to respond to each change. He understood the necessity of involving new people in the regional network and forged the commitment to the person who was necessary for the Maniwa area. He always asked himself about the best role to take and how best to accumulate or utilize the group’s knowledge throughout the area through interaction between “needs-side” and “seeds-side” (Nonaka, 1998). The role he played in this starting phase was essential for construction of the regional network. In addition, his attitude and efforts on behalf of the forum motivated the other members.

4.2.2 Expansion Phase

The expansion phase began with the establishment of two firms, Maniwa Bioenergy and Maniwa Biomaterial in 2004. Bases of both energy and biomass materials were established. In 2005, nine municipalities merged to form Maniwa city. In the same year, the Biomass Energy Regional System Experimental Project, a consignment

project conducted by the New Energy and Industrial Technology Development Organization (NEDO), began in Maniwa. NEDO is an organization which undertakes the development of new energy and energy conservation technologies, verification of technical results, and introduction and dissemination of new technologies. In this project, some local firms participated in carrying out R&D. In 2006, to accommodate increasing numbers of interested visitors, the Maniwa Biomass Tour was started. This tour has become a good commercial tool. Over 2,000 people participate in this tour every year. In 2007, the Maniwa Biomass Tour received a prize from the Japanese Ministry of Economy, Trade and Industry along with other awards. These positive external evaluations play an important role in improving residents’ attitude toward the projects. From 2008 to 2009, a new stockyard for wood, the Maniwa Biomass Collection Base, was constructed by a local timber business cooperative association and sawmills with help from a government subsidy. This base produced new employment and purchases wood from residents at a typical exercise price of 3,000 to 5,000 yen (approximately US\$30 to 50 as of mid-2016) per ton. Many residents have yards and fields of grape or peach trees; elderly people also carry pruned tree limbs into the base. Additionally, this system also helps small local sawmills that previously had to bear the cost of disposing of chips and shavings. Now they can eliminate that cost and instead receive money thanks to this system. In this collection base, wood is processed into chips or sawdust to be used as fuel and sold at 10,000 yen (approx. US\$100) per ton to woody biomass power generation plants. The difference between the exercise price and selling price is applied to processing and returned to owners of the forest land the wood came from. Thus the cycle of woody biomass production and consumption contributes to forest conservation. This business is not profitable for people who collect and carry wood, but the collection system is established. This is a side business for them. They understand the necessity for cooperation by everyone involved within the area. As the regional rule of the quality of woody biomass, they made arrangements to stabilize fuel properties, and for use of low-quality fuel, automation of the fuel supply, reinforcement of security, and standardization of the woody biomass. “A prescriptive norm within a collectivity that constitutes an especially important form of social capital is the norm that one should forgo self-interest and act in the interests of the collectivity” (Coleman, 1988). In the Maniwa area, these rules don’t have restrictive strength, but are accepted loosely, widely and deeply. These rules are one kind of social capital for people who continue the woody biomass business in Maniwa area. Moreover, this capital plays the role of preventing dependence on external organizations to introduce a standardized woody biomass energy business.

Figure 5 shows the status of the Maniwa network during the expansion phase.

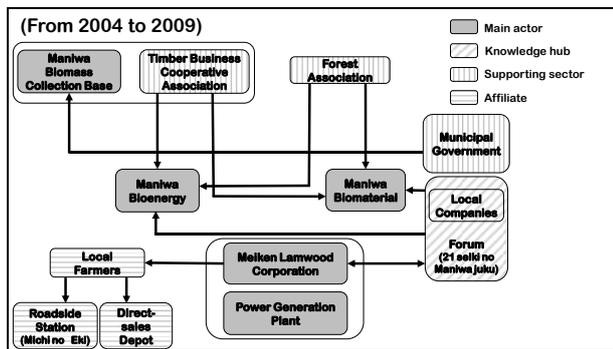


Figure 5: Status of the network during expansion phase (Source: Authors)

During the expansion phase, Maniwa Bioenergy, Maniwa Biomaterial and the Maniwa Biomass Collection Base were added to the network as core actors. The municipal government was added to the supporting sector after the merger of surrounding municipalities into Maniwa City. The timber business cooperative association and forest association became supporting sectors during this phase. Local farmers, roadside stations and direct-sales depots became affiliates. Also during this phase, wood chips usage was extended to the Maniwa area, where some local small farmers started used it as fuel to heat tomato greenhouses. Local production and local consumption including fuel added additional value. Roadside stations and direct-sales depots were effective places to more widely introduce agricultural products made using woody biomass. Roadside stations, called “Michi no Eki” are facilities located next to main expressways for travelers to have a rest, get sightseeing information and buy local specialties of the region.

During this phase, necessary factors were prepared for the efficient collection and utilization of woody biomass energy throughout a wider area. The number of players in the regional network increased and the necessary factors for more efficient wood collection system or wider utilization of woody biomass were satisfied.

In this phase, the president and managing director of Meiken Lamwood Corporation supported and led the regional network. They led the woody biomass energy business in the Maniwa area and also promoted market development outside the area. Each of them helped to plan and run every business. While the number of players in the network increased, the network could be reinforced due to the civic entrepreneurs who supported and led. In the Maniwa area, the foundation of the regional network was reinforced by the participants who aggressively “push for a continuous process of change” (Henton et.al, 1997).

4.2.3 Development Phase

The event which triggered the change to the development phase was the establishment of the Maniwa Biomass Lab in 2010. Research institutions, universities and firms outside of Maniwa joined this laboratory. The laboratory brought a new wind of change from the outside into this intra-area network. Maniwa Biomass Lab is a base for training people who participate in the biomass refinery business. In the same year, the Maniwa City Biomass Refinery promotion Committee was established as an industry-university-government collaborative organization. In the Maniwa area, the civil servant mentioned earlier started to promote the utilization of woody biomass as functional chemicals as well as fuel. He understood the necessity of forming new relationships with outside organizations along with promoting new ways of utilizing woody biomass. In the Maniwa area, most woody chips or sawdust is reused as livestock bedding, mushroom bed and boiler fuel for timber products. The businesses investigated in the lab were the development of a type of woody powder whose active ingredients are cellulose and lignin. Through these businesses, a wider range of private sector or research institutions came to have a connection to projects in the Maniwa area.

A new 10,000kW woody biomass power generation plant, the Maniwa Biomass Power Generation Plant, was constructed between 2014 and 2015. The Maniwa Biomass Power Generation Plant collects wood from outside the area.

Recently, the Maniwa Biomass Industrial Community Concept has been promoted. This concept includes four projects: enlargement of a woody biomass power generation project; a woody biomass refinery project; expanding utilization of Bio Diesel Fuel (BDF) and kitchen refuse; and an industry tour expansion project. Figure 6 shows the status of the Maniwa network during the development phase.

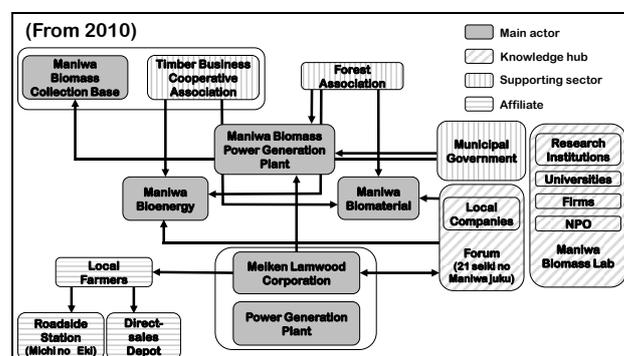


Figure 6: Status of Maniwa network during development phase (Source: Authors)

During the development phase, the Maniwa Biomass Power Generation Plant was added to the network as a core actor and the Maniwa Biomass Lab was added as a knowledge hub. This phase features forming cooperation in earnest outside the Maniwa area and developing its network in the area beyond Maniwa. Maniwa's projects began to extend beyond the local area. During the development phase, the regional network in Maniwa started to develop outside through making connections to outside institutions. The number players in the network increased. They determined their direction from the knowledge they received in the forum before they came to consider what to do next without relying on the knowledge from outside of the area. In the future, more and more areas and organizations will start to learn of the projects in the Maniwa area.

5. DISCUSSION

Starting meetings with "surplus risk consciousness" has contributed greatly to smooth promotion of the projects. One of the civic entrepreneurs connected people inside and outside of Maniwa area acted as an "editor". These things made it possible to continue the establishment of a knowledge hub such as "21 Seiki no Maniwa Juku" and to directly obtain information from the government. Through the forum and discussions, participants could understand that regional development leads each individual firm's development and they could come to a common vision for the area. There is a main stream of forestry as an existing industry already, and the players in this network have been managers in this area. These factors all contribute to realizing a sustainable woody biomass energy business over 20 years.

The case study notes that, some unreasonable projects were promoted in the Maniwa area. For example, collecting and carrying wood to Maniwa Biomass Collection Base is not profitable. In another area, the exercise price is several thousand yen higher than in the Maniwa area. However, regional economic activities are not motivated only by immediate profit. Disseminating the notion that their business is effective use of industrial waste, not solely temporary profit leads to the continuity of the businesses. This "embeddedness" (Granovetter, 1998) of the regional social values is shown in other areas and is very important to consider in evaluating the sustainability of regional energy businesses. A shared norm of the Maniwa area can be thought of as a form of social capital, and social capital "arises or disappears without anyone's willing it in or out of being" (Coleman, 1988). Also, in Maniwa, social capital has been inevitably formed without expectation. Also, the four years it took to reach agreement in "21 Seiki no Maniwa Juku" were considered to be unreasonable.

However, that time was used not only for collecting knowledge and information, but also for spreading the "style" of collecting and utilizing knowledge and sharing awareness. The "regional" renewable energy business is sustainable in an area where people who can establish a business model that includes dissemination of a routine knowledge collection and learning and other economics, not "scale" or "scope", take the initiative.

6. CONCLUSION

In this paper, the regional network construction process over 20 years was analyzed and the type of initiative which leads to sustainable regional woody biomass energy business was clarified with reference to a case study of the Maniwa area. It may be able to learn a lot of things from the case in Maniwa area. However, we'd like emphasize that it is not enough to copy each factor in a network to create a new project. Many factors must be mutually supportive in order to create a successful system.

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