REBUILDING A RESILIENT AND SUSTAINABLE COMMUNITY FROM THE LESSONS OF TSUNAMI

MIYAKO SMART COMMUNITY

People-first PPP Case study of
Miyako City, Iwate, Japan

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International Specialist Centre of Excellence on PPPs in Local Governments under the auspices of United Nations Economic Commission for Europe

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Message

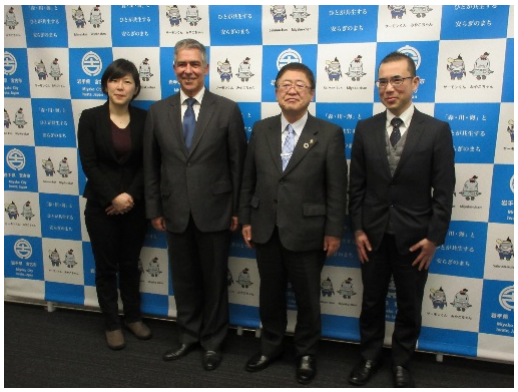
The quintessence of resilience is to make a someone's tragedy in disasters to your own experience. Every time a disaster occurs, we are making the same mistakes. That is because we lack the imagination and empathy to take as your own business, as if it happens to you.

Look around the world and disasters, visit them, listen people and feel it. Listen to people and ask what was most difficult. See what happened with your own eyes and feel it, then it sticks in your mind and help you mitigate the risk. If it happens to you in the future, that learning will tell you what to do. Come and visit us. We will share our experiences.

The most important is to protect lives and physical protection will only do a small part, run for your life to protect your own. Then we can think of who can do what in compliment to a person. Then can think of bringing someone and work together.

We have a lot of experience in disaster, especially tsunami, but recently we face new types of disasters　such as typhoons due to　the climate change. We are trying to apply our experience to this new challenges and hopefully that will be useful to others.

Masanori Yamamoto
Mayor of Miyako



Mayor Yamamoto (2nd from right)
and Toyo University and UNECE members

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(Cover photo: Courtesy of Miyako City)

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Highlights

This project's focus is to reconstruct tsunami-affected communities with resilient and environmentally sustainable infrastructures and to utilize the local natural resources and transform the community by creating a new industry development opportunity.

After the massive damage caused by tsunamis in 2011, the City suffered greatly because of the loss of energy and communication for two weeks. This experience led the city to include a renewable energy project into its reconstruction plan and to incorporate a smart community masterplan.

The masterplan included nine subprojects: Community energy management system (CEMS) and Power Producer and Supplier (PPS), Building Energy Management System (BEMS), ESCO-type service/ House Energy Management System (HEMS) , Power generation (renewable), Plant factory, Cogeneration (Combined Heat and Power, CHP) and possibly CO2 (to be used in the plant factory), Car sharing, Charging equipment, and Batteries.

While the physical resilience in inundated communities have been improved by relocation to higher ground and reconstruction of higher dikes and water gates, this energy project is expected to maintain the local government's function in disaster response, rescue and relief of victims. The solar PV plants also helped victims to relocate to higher ground by utilizing their inundated and prohibited land. In the peacetime, the power producer and supplier (PPS) provides locally produced renewable energy to public and private facilities at lower prices. The city is also planning to participate in the PPS as a shareholder to create a cashflow to contribute to other projects/public services.

Private sector brought money, technical expertise and the ability to see the trends happening outside of the city or Japan to develop a new business model to solve social challenges. Public sector developed a masterplan to lead the private activities to well align with the city's reconstruction efforts and strategic plan.

Public Organization: Miyako City
Ministry of Economy, Trade and Industry (METI) / Agency for Natural Resources and Energy

Private Organization: Asia Air survey consultant (Secretariat), a-Socca Inc., Iwate Bank, Northern Iwate Transportation Inc., NTT, NTT East, NTT Data, NTT Data Tohoku, NTT Data Hokuriku, NTT Data customer service, Enet, Kankyo-energy Promotion Co., JDC Corporation, Panasonic System Solutions Japan Co., Fukoku Packaging Materials Co., Fukken Co., Miyako Chamber of Commerce
(Observers in promotion council: METI Tohoku branch, Reconstruction Agency Iwate Branch and Iwate Prefecture Industry reconstruction division)

1. Background

This project is to reconstruct and transform City of *Miyako*, 600 kilometers north east of Tokyo, which was severely affected by the earthquake and tsunami in 2011, into a resilient and smart city. Prior to the tsunami, the city was considered as a resilient city, because of its Guinness-recorded world's largest dikes which stretched over 2400 meters to prevent damages from repeated tsunamis. However, the physical protection fell short in a large-scale disaster that is said to be once in 1,000 years and the coastal side of the city was inundated within an hour after the earthquake. The tsunami caused about 550 casualties. Over 9,000 houses were destroyed, and infrastructures like bridges, railroad, dykes, seaports were damaged. Ground floor of the municipal office was also inundated. The loss of electricity and communication lagged the disaster response efforts and supports for evacuees. It took fourteen days until electricity recovered and almost twenty days before the recovery of the landline. After this experience, the word "resilience" in this city was defined as a reliable and independent power supply. Therefore, Miyako's smart community project was designed to develop a resilient and sustainable power production and distribution in the time of disaster, and to also create a local energy consumption that contributes to the economic development and job creation.

(The city hall was inundated (left) and tsunami went over the 10 m height dikes and washed away *Taro* community (right). Photos taken in April 2011)

In addition to the devastation in the region, the nuclear disaster in *Fukusima* triggered the nation-wide debate on the necessity to review energy composition and development of the resilient and clean power sources. Before the earthquake, nuclear power consisted

almost 30 % of the overall power generation, but it dropped to 2% in 2012. On the other hand, renewable energy was only 1% in 2009, and the government then started to promote the renewable energy generation through the introduction of feed in tariff (FIT). This motivated the city to include renewable energy project utilizing local natural resources as one of five priority projects of the recovery and reconstruction plan, which was promulgated in October 2011.

This project started on an unsolicited basis, a group of private companies proposed the city to develop a resilient and renewable power supply chain that is independent from a major commercial power grid.

Japan's power sources (actual) and projection in 2030

Power	2010	2012	2016	2030
Nuclear	29%	2%	1%	20~22%
Thermal	61%	88%	84%	56%
Hydro	9%	8%	10%	9%
Renewable	1%	2%	5%	13~14%

2. Overview of the project

2.1 Objective

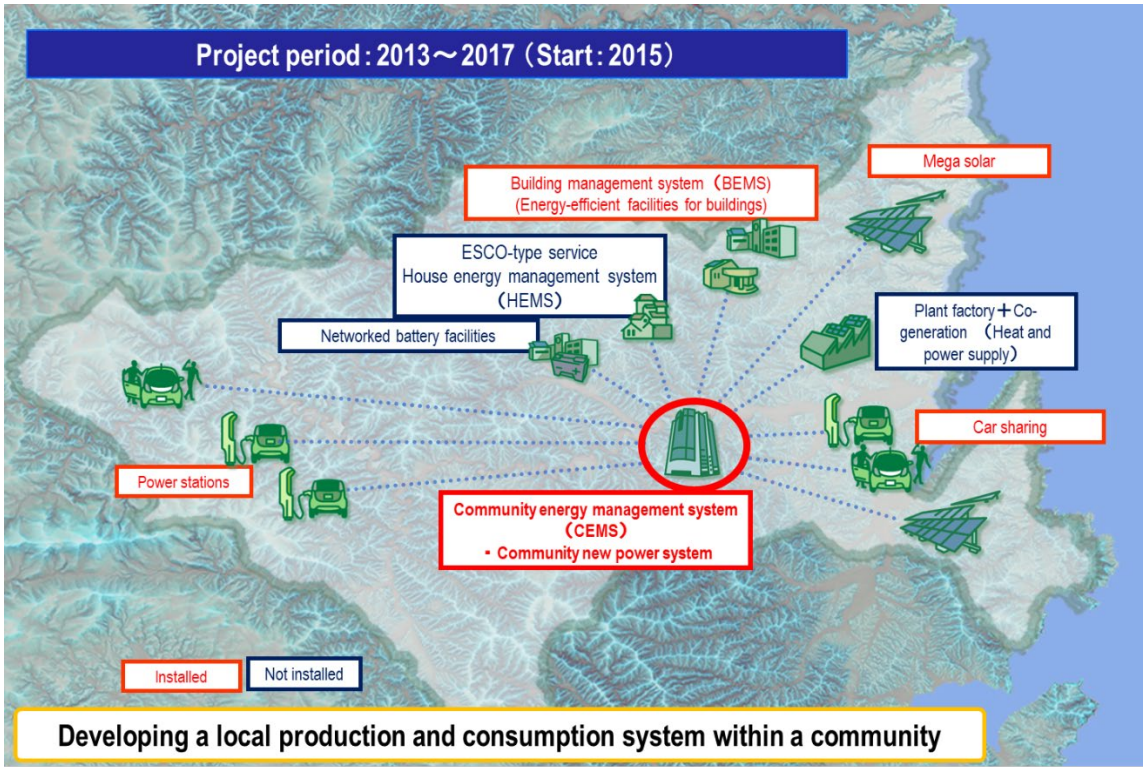
As a consequence of the damage from the earthquake and tsunami, the city recognized the necessities to establish a "stand-alone" power supply system that does not rely solely on the existing power production and transmission system; to develop a system that can supply the necessary energy at the time of a disaster; and to create renewable energy generation system utilizing natural resources in the region.

Aside from the disaster damage, the city is typical of remote local municipality in Japan, without a major industry in the jurisdiction, high elderly rate, scattered communities, and rich in natural resources. If this project is successful, the similar project will be replicated in other remote cities.

The city and a group of private companies applied to a "smart community installation project grant program (for masterplan development)" solicited by Ministry of Economy, Trade and Industry and selected as one of eight cities for masterplan development in 2012. Within six months, the city developed the smart community masterplan.

The key concepts of the smart community in Miyako were;

1. Local production and consumption of renewable energy (and realize the optimal supply and demand of energy without waste);
2. Promotion of local industry to boost industrial and economic recovery triggered by energy sector;
3. Creation of employment in new industry that uses clean renewable energy; and
4. To improve resiliency of the community with resilient and clean independent energy system



(Source: Miyako City)

The original plan of the smart community project consists of nine sub projects:

1. Community energy management system (CEMS) and Power Producer and Supplier (PPS)	System for efficient and effective use of energy throughout the community [Core system of this smart community project] To realize the supply of locally produced renewable energy to local consumers. Effective use of various renewable energy resources such as solar, biomass, and small hydropower that are abundant in the city.
2. Building Energy Management System (BEMS)	Introduce energy-saving equipment to large consumers (including public facilities) and to improve energy efficiency To connect with CEMS to manage supply and demand balance. Provide services to optimize energy usage.
3. ESCO-type service/ House Energy Management System (HEMS) *	Introduce energy-saving equipment for household (HEMS) to improve energy efficiency. To visualize the energy use and encourage the behavioral change to energy saving-life style. To connect with CEMS and requests power saving during the peak hours/energy shortage. In the future, to develop resilient energy supply

		system with real-time tariff depending on the supply/demand balance and emergency power management.
4.	Power generation (renewable)	Renewable energy such as solar, biomass or mini hydro power By developing a solar PV plant in the inundated areas (4MW in total), to remedy flood damage to the real estate. As a symbol of the renewable energy production in the city, produce clean energy and reconstruction. Sell produced energy to PPS using FIT system. There are some more plants under construction.
5.	Plant factory *	Develop photovoltaic plant factory that effectively utilizes electricity, heat, CO2 produced by cogeneration equipment in cooperation with CEMS To utilize the affected inundated area. Use the locally produced energy as a major consumer. To become a symbol of reconstruction that exemplifies the city's reconstruction goal that promote peaceful living with coexistence of forests, rivers and ocean. To cultivate bell peppers as high value product.
6.	Cogeneration (Combined Heat and Power, CHP) and possibly CO2 *	Cogeneration of power, heat and carbon dioxide to be utilized in plant factory through CEMS Also envisages the use of heat for road heating to defrost now and heating distribution to private facilities and households.
7.	Car sharing	Car sharing with plug-in hybrid (PHV) and electric vehicle (EV) to support community mobility For tourists and visitors under normal circumstances. Use as emergency batteries during the emergency.
8.	Charging equipment	Quick charger for PHV and EV In a location close to an emergency response office/shelter, charger, solar PV panel and batteries are installed.
9.	Battery equipment *	Maintain and manage battery facility in cooperation with CEMS, and to use it as an emergency power supply during peak power demand or blackout (disaster) The batteries were installed, but not connected with CEMS network. Once they are connected, develop a system to manage energy and effectively use it during the disaster.

*Subprojects that have not been fully implemented in a duration of the initial stage of the smart community project.

(Source: Miyako City)

3. Socio economic Environment

3.1. Demography and Socioeconomic Conditions

Miyako City is rich in marine resources, such as sea urchin, seashells and seaweeds. Ninety percent of the city area is covered by forest. Major industries are fishery and food processing, forestry and lumber industry, metal molding and electric connector manufacturing.

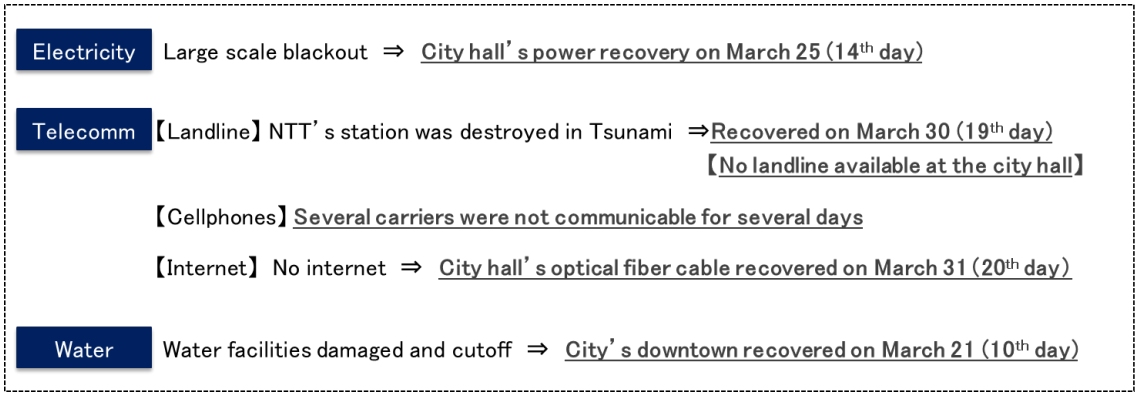
(Monuments are found across the city warning the danger of tsunami)

Because of the *Rias* coast, communities on the coast were dense. There are 33 communities in the city, of which ten are relatively populated and 23 are small. Miyako had been repeatedly struck by tsunami. After the damage of 1933 tsunami, the community of Taro decided to protect the community with a gigantic ten meters-high dikes, which stretched over 2.4 km in total. Visitors will come across with many stone monuments

that warn the danger of tsunamis.

The city does not have good highway or train access, therefore known as one of the farthest cities in Main island from Tokyo (timewise). Even before the tsunami, the city's population was aging and the percentage of population over 65 was over 30%.

After the tsunami, Miyako experienced the loss of the power (for 14 days), telephone/landline (for 20 days) and other essential infrastructures, which made the city lag behind in disaster response and victim rescue. Among the residents, the urgency to maintain such infrastructures (especially the electricity) in the event of disasters rose after this experience.



(Source: Miyako City)

3.2. Legal / Legislative Conditions

In Japan, when the 2011 earthquake occurred, the liberalization of electricity retail was under progress. The surplus electricity purchase scheme for solar PV power generation started in 2009, and in 2012 the FIT system was expanded to other renewable energies. The surplus power purchase was also changed to a "purchase-all" scheme. The electricity retail liberalization program was gradually introduced in the period of 2000 to 2016, starting at large-scale factories, retail stores, and office buildings became able to purchase electricity from new power producers and suppliers (PPS). In 2004 and 2005, the program was expanded to small and medium-sized factories and buildings. In 2016, retail to households started.

Renewable energy power generation, particularly solar PV generation caught popularity after 2011 by private operators, boosted by the advantageous FIT system. However, it was and still is very rare for a local government to operate as an Independent Power Producer (IPP). The Fukushima nuclear accident also fueled the promotion of renewable energy. METI/Agency for Natural Resources and Energy supported affected local

governments to reconstruct and develop smart communities. The smart community project in Miyako received the grant to develop a masterplan and to implement.

Solar PV plant in Taro (Photo courtesy of Miyako City)

In Japan, there is no restriction for local government to partner with private operators, and no approval from central government is needed for a PPP project. However, in general, it is said in many rural communities that lack of experience and knowledge in PPPs prior to the disaster had kept most local government from going to PPPs, given the urgent need to reconstruct. On the other hand, private entities have the will to help. The smart community grant program fit for the needs of the both ends.

3.3. Public acceptance

The importance of stable and independent power sources that do not rely on large-scale grids was strongly recognized by the general public. As a solution to the loss of the power due to the tsunami, the smart community projects to create a local energy supply chain was supported. In addition, to formulate a reconstruction plan for each district in Miyoko City, community boards were held in each community. In Taro community, one of the areas that suffered the most damage of tsunami in the city and the community's reconstruction plan included the idea to install solar PV panels in the land which was prohibited to reconstruct houses. Taro solar PV plant was built in a part of this area.

As of February 2020, the electricity generated in the city is consumed by approximately 200 businesses/facilities, mainly in public facilities. Once the retail to household starts, the public acceptance to the concept of local energy production and consumption and developing an independent and resilient power source for the countermeasure to the past

experience will once again being tested. (However, there is a big gap between supporting / accepting the project and actually making the decision to change the power contract.)

3.4. Political Conditions

In the city hall, the smart community project started from city office staffs in charge, and approved by mayor. The smart community masterplan was integrated into the city's strategic planning structure. Both the Reconstruction plan and the Smart Community masterplan have been approved by city council. Therefore, even if the composition of the city council changes in an election, stability of the plan is secured in a certain degree.

4. Project structure

4.1. Members of the Private entity

Sixteen companies are member of the Smart Community Promotion Council. The expertise of the companies varies from civil engineering, system engineering, energy management, PPS, banking, transportation to packaging.

Organizations	Organizations
Prof. Toshihiko Nakata (Academic)	Mr. Kotaro Takemura (Academic)
Asia Air survey consultant (Secretariat)	a-Socca Inc.
Iwate Bank	Northern Iwate Transportation Inc.
NTT	NTT East
NTT Data	NTT Data Tohoku
NTT Data Hokuriku	NTT Data customer service
Enet	Kankyo-energy Promotion Co.
JDC Corporation	Panasonic System Solutions Japan Co.
Fukoku Packaging Materials Co.	Fukken Co.
Miyako Chamber of Commerce	Miyako City (Secretariat)
Observers: METI Tohoku branch, Reconstruction Agency Iwate Branch and Iwate Prefecture Industry reconstruction division	

(Source: from document provided by Miyako City, translated by the author)

4.2. Payment Method and Finance

The subprojects' funding relies on feed-in-tariff and user payment. The private corporations or project SPCs bare responsibilities to obtain finance and implement. For

the solar PV plants, Iwate Bank and Development Bank of Japan announced that they launched a syndicate loan, but no details have been made public.

Ministry of Economy, Trade and Industry/Agency for Natural Resources and Energy provided grants for municipalities to develop a smart community masterplan in reconstruction from 2011 disaster, and also partial grant for capital expenditure for its implementation.

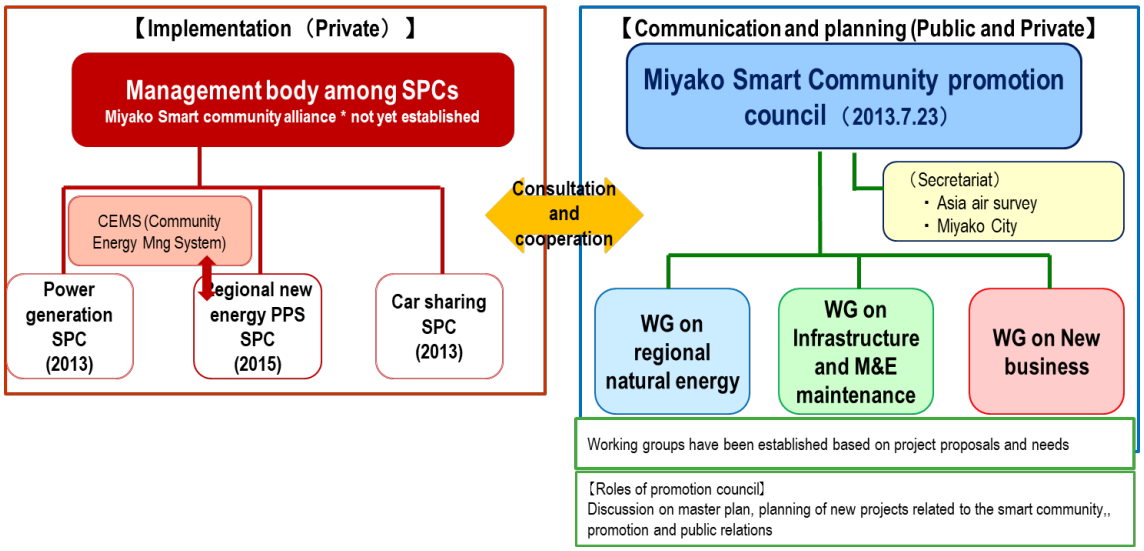
4.3. Risk Transfer

Implementation of the subprojects were sole responsibilities of private operators, thus such risks were borne by private sector.

The city supported projects through the development of city's smart community masterplan, integrating it with other strategic plans, coordinating and governing private operators, public engagement and negotiation for land acquisition with landowners. The city acted as a catalyst for the project.

4.4. Governance

Though the city is not directly involved with any contract with private operators, it provides governance to the smart community project. The city and private operators created a council called Miyako Smart Community Promotion Council in 2013 to discuss about masterplan implementation and other related issues. Also, the council has established several working groups when new issues arose. So far, three working groups were set up. To implement individual subprojects, private operators set up Special Purpose Companies (SPCs). Original plan was to establish a management and coordination body among SPCs, but it has not been established as of February 2020. Another "governance" comes from Ministry of Economy, Trade and Industry/Agency for Natural Resources and Energy to make sure the subprojects were implemented in accordance with the masterplan.



(Source: from document provided by Miyako City, translated by the author)

4.6. Future of the project

Of nine projects listed in the masterplan, five have been implemented so far. The retail sale of electricity to household is expected to start, while others have faced challenges. Some of the projects were not implemented within the initial grant period, because they took time to review the business plan responding to change in external factors. It is partially because the rigidity of grant programs that limited the flexibility in plan changes.

At the moment, the PPS purchase all the amount produced in one solar PV plant (*Tsugaruishi*), but not yet from another, so the Taro solar PV plant sells electricity to the traditional electric company. The continuous efforts to expand the business through finding new consumers and purchase from Taro plant are the next actions for the PPS. In addition, there are some new solar PV plants and other renewable energy plants have been under construction. It is desirable to integrate such activities with the smart community masterplan.

The city is now developing the city's Renewable energy vision and will integrate it with existing environmental basic policy to create the Environmental energy promotion plan. These plans are to set policies to create an active local economic cycle and strengthen disaster preparedness and resilience of the community through renewable energy, as well as protecting natural resources in the city. The Environmental energy promotion plan will also set out countermeasures for the climate change.

5. Benefits of the Project

5.1. For the City's Residents

Experiencing difficulties in 2011 disaster, the residents in the city wished to have a resilient power source that is independent from the existing large-scale power production and distribution. In this regard, the disaster preparedness is considered to be increased. Solar PV plants have been built and being operational and shelters are also equipped with solar PV panels and batteries.

5.2. For the Public entity

The city could realize a priority project listed in the reconstruction plan. Because the city purchases local energy from the PPS, which is cheaper than the conventional electricity contract, the tax payer's money is spent more efficiently. Mayor Yamamoto of Miyako City told that "The primary reason to partner with private operators was that we expected them to bring finance, secondly their technical expertise because renewable energy production and PPS were new at the time, and thirdly we expected their ability to understand global trends." Before 2011, the city had a limited experience of PPPs. However, because of the smart community project, they actively worked together wit h private sector and created a basis for the institutional improvements.

5.3. For the Private entities

According to the data submitted by the private sector members to METI in 2012, the overall IRR of the project was expected to be over 5%. Since the project's payment system is backed by the FIT, stable profits have been expected. In addition, the Smart Community Promotion Council, a forum among public, private and academia was established for this project, creating a foundation for partnerships. The promotion council will continue in the future. Participating companies also gained the experience of developing a business in a rural area and trying to transform the social and economic challenges through innovations.




(Top left) School equipped with solar PV panels to charge batteries (top right), that can provide energy for shelter
(Bottom left) a public facility installed BEMS
(bottom right) PHV char sharing and charger

6. Evaluation

6.1. PPP Methodology

Toyo University defines this type of PPP as "regulation and incentive type PPP." Rather than the public sector directly involving in the project and asking private sector to provide public services, public sector leads the private sector to work in the favorable manner through planning, regulation/deregulation, subsidies and other financial/non-financial or tangible/intangible supports. In this project, the city incorporated and integrated the smart community masterplan with other strategic planning, listing renewable energy project as a priority project in reconstruction from the disaster. In addition, the city provided supports to private operators such as public engagement activities and negotiations to speed up the land acquisition.

As of February 2020, the city has been in negotiation with the private sector for the city's equity participation to the PPS. By investing to the business and proactively get involved in the project, the city can influence the project in a way to protect public interests and receive financial benefits. The city is envisaging to develop a Japanese version of "Stadwerke," the local public utility corporation that is widely established in Germany.

6.2. United Nations Sustainable Development Goals and PfPPPs

6.2.1 SDGs

With regards to the contribution to SDGs, Miyako's smart community project is related

to the following goals and targets.

Goals and targets	Description
Goal 7 Ensure access to affordable, reliable, sustainable and modern energy **7.2** By 2030, increase substantially the share of renewable energy in the global energy mix	This project is to create a smart community through local power production and consumption cycle, enhance greater energy efficiency and improve preparedness to the disasters using renewable energy.
Goal 9 Build resilient infrastructure, promote sustainable industrialization and foster innovation **9.1** Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all **9.4** By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities	In the case of Miyako, their luck of resiliency realized in the 2011 Great Eastern Japan Earthquake and tsunami luck of local and reliable power production and supply network. The delay in recovery of power by major power producer/supplier affected the local government's efforts and lives of the victims. Therefore, their focus is on the energy sector. The smart community masterplan envisages to create a mechanism to generate profits and create a new economic development opportunity. At the same time, on the coast lines of severely affected communities, dikes and water gates have been rebuilt (higher and stronger). Some communities relocated to higher grounds and certain areas of inundated land have been prohibited to rebuild houses. Solar PV plants have been built In most severely inundated areas to salvage the economic situation of land owners and helped them to relocate to new communities built in higher ground. The city's smart community masterplan is in line with the city's reconstruction plan, which is a part of the city's strategic planning. Currently, the city is planning to promulgate Environmental energy promotion plan, which integrates the city's Renewable energy vision and Environmental masterplan, which will include the countermeasures for climate change.
Goal 11 Make cities inclusive, safe, resilient and sustainable **11.5** By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations **11.B** By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels	
Goal 13 Take urgent action to combat climate change and its impacts **13.1** Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	

13.2 Integrate climate change measures into national policies, strategies and planning	
Goal 17 Revitalize the global partnership for sustainable development **17.14** Enhance policy coherence for sustainable development **17.16** Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries **17.17** Encourage and promote effective public, public-private and civil society partnerships, building on the experience	Miyako city's smart community masterplan and reconstruction plan are to enhance the sustainable development of the city to create new industry using the local natural resources. The city created a platform with private companies to discuss about masterplan, project implementation and related issues. The city worked as a catalyst to accelerate project implementation and gain public awareness and engagement to projects.

(Created by Author)

6.2.2 People-first PPPs

United Nations Economic Commission for Europe's International Centre for Excellence on PPPs promote the concept of People-first PPPs. That is, of all stakeholders involved in a PPP project, people are on the top. The following five criteria are used to assess a project's People-first characteristics.

a) Improving access and equity,
b) Economic effectiveness,
c) Environmental sustainability and resilience
d) Replicability, and
e) Stakeholder engagement.

a. Increase access to essential services and promote equity

This project's focus is to maintain the access to essential service (energy) in disaster time. The experience of the recent tsunami revealed the vulnerability of the local government and communities in disaster response and rescue of the victims after disaster without power and communication.

The solar PV plants were built in the areas which were severely inundated and prohibited to reconstruct houses, that left the house and land owners in such area in economic and financial difficulties. Land acquisition for the solar PV plants in such areas helped to support vulnerable residents to relocate to higher ground community. In addition, dikes and water gates are now being reconstructed to protect such areas,

expecting to maintain the power generation and distribution in the future earthquake/tsunami.
The schools with designation as evacuation shelters are equipped with solar PV panels and batteries to provide electricity to shelters after disasters.
Now the PPS plans to start selling electricity to households, residents will also gain access to the locally produced clean energy.
Once the constructions of toll roads to Miyako are finished, the city will gain better access to larger market. Therefore, it may improve the feasibility of the plant factory.

b. Develop a resilient infrastructure and improve environmental sustainability

The "resilience" that the community urged was a local power production and distribution that can remain functional even in the event of disasters. Besides that, the physical protection (such as dikes and water gates) have been reinstalled and some parts of The city, where the inundation and the casualty were particularly severe have been prohibited to reconstruct residences. The city is physically and functionally more resilient than before.

Prior to the tsunami in 2011, because if the restriction of energy retail sales, the electricity was provided only by regional dominant electric companies. The major power source was thermal and the government was promoting wider nuclear power production to reduce the CO2 emission. However, the Fukushima nuclear disaster triggered the major shift in national energy policy. For the city to realize the resilient community, where it can maintain power and utilize the local resources, they needed to go for green energy. Solar PV was selected because of the suitable climate and advantageous FIT program.

c. Demonstrate the economic and financial effectiveness of the project

The project is privately financed and self-sustaining (user pay and FIT).
The masterplan includes a plant factory and co-generation (heat and power). Initial idea includes not only to develop a resilient and sustainable infrastructures, but to make it self-sustaining during the normal circumstances.

Another aspect is to utilize the inundated land, where the residential resettlement was banned, as a site for solar plants, hence the affected former house and landowners could get some money by selling the land to the project SPC. This helped most affected people to relocate to a community built in higher ground, while lessening the financial burden

of the city.

The city benefits from cheaper locally-produced energy provided to public facilities so that they can reduce the cost of electricity. The city is in negotiation with the PPS for equity participation, the city will gain profit from the PPS and expected to become able to have funding to finance other infrastructure or public services.

Small and medium enterprises (SMEs) in the city also benefits from the cheaper electricity. Approximately 200 facilities are in contract with the PPS. (Of 194 facilities the PPS has contracts with, 151 are Public facilities and 43 are Private facilities)

However, because this project used grants from national government in masterplan development and installation, it is said that the project had limited flexibility to reflect change in the plans. If the grant system were more flexible to accept change in plans to improve cost efficiency or profitability, the economic efficiency of the project would increase and would motivate more innovations from private operators.

d. Be replicable and scalable

The socio-economic condition of Miyako was typical in rural Japan, scattered population in mountains and woods with high elderly ratio. Therefore, Miyako City's smart community model could be applied to other rural communities across Japan and beyond. The city incorporated and integrated its smart community masterplan into the city's strategic planning structure. Institutionalizing the masterplan was important for the smart community project to have stability in administrative and political environment. In addition, the city established the Miyako smart community promotion council to discuss openly with private operators and to give coordination and governance amongst subprojects. This committee also cultivated the atmosphere in the city government to work with private operators and lead to institutional iimprovement.

The promotion council also solicited new business ideas from private operators so that it can expand the business opportunities and continue to grow.

The city is now negotiating with the PPS for the city's participation as a minority shareholder. It will give the city to gain profit and to have capacity to invest in other projects/sectors. The city's vision is to establish a stad werke-like public utility corporation, where local governments' corporation run utility businesses to earn profit and reinvest in other public utilities/services.

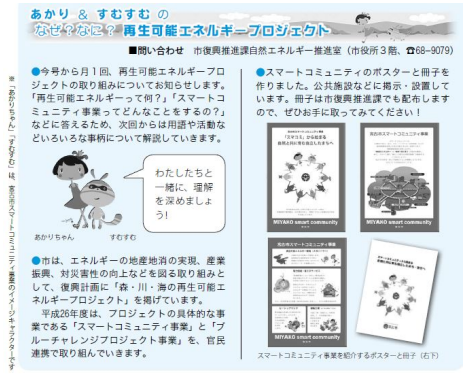
In addition, once a major consumer of the power (such as a plant factory) is established, the business model would become more stable, scalable and replicable.

e. Engage all stakeholders

Miyako city applied methods for each community to come up with their own reconstruction plans. Among 33 communities in the city, ten relatively big communities established community board led by community members, and 23 communities worked closely with the dispatched city officials to discuss and develop each community's vision, land use, relocation and other ideas. In the *Taro* community's reconstruction plan, there were discussions to use inundated prohibited area to be used as a sports field or for industry use, such as a solar PV plant. A part of the very area is now used as a solar plant.

The city government, private sector and academics sit together in the Smart Community Promotion council, including the chamber of commerce in the city to discuss among different stakeholders.

During the implementation, the city took the initiative for public engagements and negotiation with the communities. In addition, the city has been active in public relations activities, using different tools and programs. The city's official bulletin, Websites, Facebook, symposia, events in a shopping mall and lectures for elementary school children are examples.

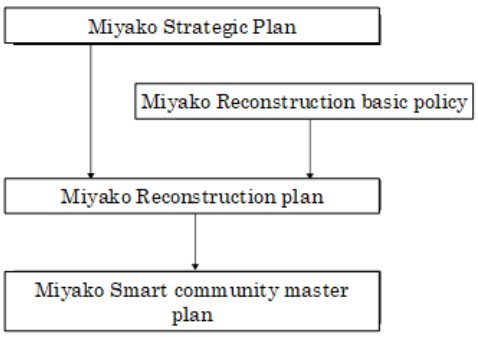


(An article in the city bulletin and a elementary school program. images courtesy of Miyako City)

6.3. City Strategy

The city's strategic planning includes the utilization of renewable energy in reconstruction. Though several subprojects in the smart community masterplan has not been implemented, main infrastructure have been constructed and being operational.

The city is now in negotiation with the PPS for the equity participation, and also studying the possibility of developing a public utility corporation



Miyako Smart community master plan in the City's Planning structure

like Germany's Stad werke, to make it possible to circulate the money within the local community.

7. Implications and steps forward

Even with the tragic disaster damage, the city turned it as an opportunity for technological and institutional improvement in reconstruction. The development of a smart community in the energy sector is to improve the resiliency of the community and the local government to keep on the lives after disaster. Though not yet completely realized, the idea of creating a local cycle of renewable energy production, distribution and consumption that can contribute to a new industrial and economic development opportunity in peacetime and to provide stability to the business, and serve as an essential infrastructure in the emergency. Resilient infrastructure should not always be a cost center but can be a profit center to sustain the community.

It also opened a door for private operators, which were not active in rural aging and declining communities to partner with the city and to bring technologies and innovative solutions. The governance and communication platform the city and private member companies created served as a place for open discussion and creating a foundation for partnerships.

The city's intention to invest in the PPS to create a virtuous cycle of the public finance. That is, by proactively participating in the project, the city will get the financial return and to invest in the other projects/services.

Japan has long history of battling and coming back from disasters, therefore, relatively high preparedness in disasters. Such experiences and knowledge should be useful to cope with the new challenge we face—climate change.

8. References

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