

Geographical and Social Characteristics of Landscape conflicts on PV projects in Japan

— Case Study of 12 small-large scale PV projects—

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Establishment of the FIT (Feed-in tariff) in 2012 triggered the rapid growth of renewable energy in Japan. Inter alia, installed volume (2012-2013) of Photovoltaic (PV) power accounted for 80% out of all renewable energy sources, due to the higher FIT price and the easiest procedure. On the other hand, development site permission criteria has not been established well. For this reason, PV developments frequently caused environmental conflicts around the project sites. Yamashita (2016) showed that the most common causes of the environmental conflicts at PV project in Japan were the concerns about the impact on the natural landscape. The purpose of this study is to clarify the factors of PV landscape conflict by analyzing 12 controversial PV projects from four aspects: (1) tourism, (2) regional planning, (3) community, (4) historical aspects. We concluded that the project site locations close to sensitive areas, the gaps between the regional planning policy and the actual development projects and the highly economic beneficial legislations might have risks for causing landscape conflicts.

Keyword: Photovoltaic (PV) Development, Landscape, Project Site, Conflict, JAPAN

1. Introduction

After the great earthquake and fatal nuclear accident at Fukushima in 2011, Japanese national government has promoted policies for quickly expanding renewable energy including photovoltaic (PV), wind, hydro, biomass and geothermal. FIT (Feed-in tariff) was introduced as one of the promotion policies in 2012, and the FIT procurement price of PV were relatively higher than other renewable sources. As the result, grid connected commercial PV is the most quickly introduced among the other renewable sources (Table 1).

Table 1. FIT procurement price and the installed volume renewable energy (ANRE, 2014)

Sources	FIT procurement price in 2012 [JPY]	Installed volume in 2012-2013 [MW]	Ratio [%]
PV (residential)	42* ¹	227.6	25.41%
PV (commercial)	40* ²	643.9	71.90%
Wind	22-55	11.0	1.23%
Hydro	24-34	0.6	0.07%
Biomass (wood)	24-32	12.2	1.36%
Geothermal	26-40	0.1	0.01%

*1: Under 10kw, *2: more than 10kw

Add to this FIT scheme, an addition legislation regarding the renewable power promotion by effective utilization of countryside unutilized land^{*1} triggered the widespread of PV developments in quiet rural area (Sakamura, 2014). Tsujita (2015) pointed that the disorderly PV developments were avoided by the landscape regulations linked with development permissions and the FIT procurement prices varied from area to area. On the other hand, environmental conflicts were frequently reported which has been caused by the relatively loose development permission since the FIT system started (Yamashita, 2016). Yamashita (2016) also presented the most common reason for objecting the PV development in conflicted cases was landscape destruction.

This paper aims to find the common characteristics from geographical and social perspectives on 12 PV project sites where have caused disputes in respect of the landscape.

2. Research Framework

In order to find the frequently common geographical and social characteristics of the project site, we examined 12 nationwide PV projects which caused landscape conflict between the project proponents and the local residents (Yamashita, 2016)^{*2}. Table 2 shows the list of the 12 projects, but we prefer anonymity of the specific project names because some of the projects are under dispute condition.

As the first step of this analysis, we identified the locations of these 12 projects specific sites in the topographical maps, and we analyzed those locations from four aspects of the two different

Table 2. List of land landscape conflict PV projects

Project	Prefecture	Project Initiation	Approx. Scale
A	Akita	Jun. 2015	1.7MW
B	Yamanashi	Aug. 2014	2.0MW
C	Nagano	May. 2014	10.5MW
D	Nagano	Mar. 2013	1.0MW
E	Nagano	Dec. 2014	6.0MW
F	Nagano	Sep. 2015	24.0MW
G	Hyogo	Nov. 2015	2.0MW
H	Hyogo	Jul. 2014	1.5MW
I	Okayama	Nov. 2014	0.6MW
J	Oita	Aug. 2014	8.0MW
K	Oita	Nov. 2013	1.6MW
L	Oita	Nov. 2013	10.0MW

Table 3. Analysis items

Perspective	Aspect	Item
Geographical Perspective	Tourism aspect	Distance to officially designated Natural Parks, Cultural Properties and Scenic Spots.
	Community aspect	Distance to the closest residence and public school
	Regional planning aspect	Examine whether “inconsistent word” is present in the Land Use Plan and the Landscape Plan.
Social perspective	Historical aspect	Examine whether history of opposition movement for development project is present.

perspectives (Table 3). We assumed that distance to officially designated the National and Prefectural Natural Parks and distance to the Nationally/Prefectural designated Cultural Properties and municipally designated Scenic Spots may become the factors of landscape conflicts because those are recognized as one of the important tourism resources in those regions. Therefore, we examined the distances to those places from the project sites. From the same perspective, we also examined the distance to the closest residence and public elementary and/or junior high school because those are recognized as the center of those communities.

From the social perspective, we examined the consistency of land development policies with municipal planning documents and the PV development projects as an analysis of regional planning aspects. In this analysis, we read the Land Use Plan and the Landscape Plan of the municipal government that the PV project located, and we examined whether “inconsistent word” is present in the description of the Land Use Plans

Box 1. List of “Inconsistent Word”.

Categories	Inconsistent words
Natural	Natural conservation area, Natural environment area, Protected area
Traditional	Traditional area, Traditional woodlands area, Traditional farming village, Traditional architecture area, Traditional cultural area
Tourism	Tourism area, Scenic spots, Natural landscape, Mountains landscape area, Forest landscape area, Coastal landscape area

and the Landscape Plans. In this study we defined the “inconsistent word” as the words in Box 1 with assuming that the area which described with those words in the planning documents may have risks for landscape conflicts. At the last part of the analysis, we examined whether history of opposition movements for development projects is presented in the articles of past issues of local newspaper from 1985 to 2014. We assumed that the past experiences of opposition movements for development projects with respect of the landscape might increase the local recognitions of the landscape values and enhance the risks of landscape conflicts.

3. Result of Analysis

3.1 Tourism Aspect

We measured all the distance to the National Parks, Quasi-national Parks and Prefectural Parks which are located within 20km radius from the 12 project sites. Table 4 shows the existence number of the Natural Parks by each distance categories. 9 projects (A, B, E, F, G, H, I, J, L) out of the 12, have one or two Natural Parks in the distance of 5km from the site. Project G is located in the Ordinary Zone^{※3} of the National Park which is a area that large scale developments are limited by Natural Park Act. This table also shows all 12 projects have one or more Natural Parks within the 20km radius from the projects sites.

We also measured all the distance to the National Cultural Properties, Prefectural Cultural Properties and Scenic Spots which are located within a 5km radius from the 12 project sites.

Table 5 shows the existence number of those cultural properties and scenic spots by each distance categories. This Table shows 8 projects (B, D, E, F, G, H, J, K) have one or more officially designated cultural properties in the 3km distance from their project sites. And 10 projects (A, B, C, E, F, G, H, I, J, L) have one or more officially designated Scenic Spots in the 3km distance from their project sites. In total, every project except Project C has one or more National and/or Prefectural Properties, and the every project including Project C has one or more municipally

designated scenic spots within a 5km radius from the projects sites.

3.2 Community Aspect

We measured all the distance to the closest residence and public school from the 12 project sites. Figure 1 shows the X-Y mapping of those

Table 4. The existence number of natural parks by distance categories from the project site

Project	0km	~5km	5~10km	10~15km	15~20km	Total
A	-/-	-/1	-/-	-/-	-/-	-/1
B	-/-	-/1	-/1	1/-	1/-	2/1/1
C	-/-	-/-	-/-	-/-	1/-	1/-
D	-/-	-/-	-/1	-/1	1/-	1-/2
E	-/-	1/1	-/-	-/-	-/-	1/1/-
F	-/-	-/1	-/-	1/1	-/-	1/1/1
G	1/-	-/-	-/-	-/1	-/-	1-/1
H	-/-	-/1	-/-	-/1	-/-	-/2
I	-/-	1/-	-/-	-/-	-/-	1-/1
J	-/-	-1	-/-	-1/-	-/-	-1/1
K	-/-	-/-	-/-	-1/-	-/-	-1/-
L	-/-	1/-	-/-	-/-	-/-	1/-
Total	1/-	3/3/4	-/2	2/2/4	3/-	9/5/10

(National Park / Quasi-national Park / Prefecture Park)

Table 5. The existence number of Cultural Properties and Scenic Spots by distance categories from the project site

Project	0~1km	1~2km	2~3km	3~4km	4~5km	Total
A	-/-	-/1	-/-	-2/1	-/-	-2/2
B	-/-	-/3	1/ 3/1	-1/-	-/1	-4/5
C	-/-	-/2	-/4	-/1	-/-	-/7
D	-1/-	-/-	-/-1	-/3	-/1	-1/5
E	-/1	2/-	1-/3	-/1	1/-	4-/5
F	-/1	-/4	1-/5	-/2	-/-	1-/12
G	1-/1	1/-	3/-	-1/-	-1/-	5/ 2/1
H	-1/-	-/-	-/1	1/-	-/-	1/1/1
I	-/-	-/1	-/-	1-/1	-1/-	1/1/2
J	-/-	-/-	15/ 29/1	-1/-	1/13/-	16/43/1
K	-/-	-/-	-1/-	-1/1	-1/-	-3/1
L	-/-	-/1	-/1	-/1	-/-	-/3
Total	1/2/3	3-/12	21/33/17	2/6/11	2/16/2	29/57/45

(National Cultural Properties / Prefectural Cultural Properties / Scenic Spots)

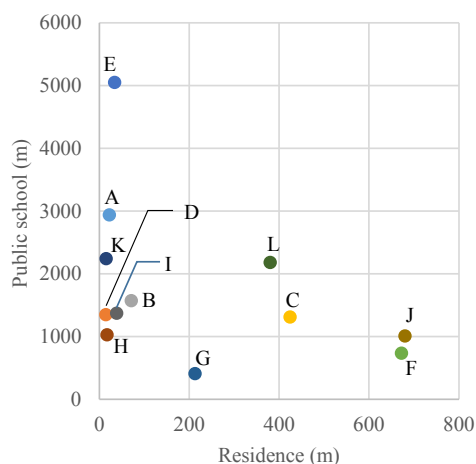


Figure 1. Distance to the closest residence and public school

distances of each project. This figure shows the 7 projects (A, B, D, E, H, I, K) have closest residence within a 200m radius from the project sites. And 8 projects (B, C, D, F, H, I, J, G) have a public school within a 2km radius from the project sites. Especially, regarding the 6 projects are located in less than 50m from the closest residence (A=22m, D=14m, E=34m, H=17m, I=38m, K=15m).

Table 6. The described number of “inconsistent word” in planning documents

Project	Land Use Plan							Landscape Planning						
	Traditional	Nature conservation	Tourism	Scenic spots	Natural landscape	Natural environment	Protected area	Total	Traditional	Nature conservation	Tourism	Scenic spots	Natural landscape	Natural environment
A	-	✓	✓	-	-	-	-	2	✓	-	-	-	✓	-
B	-	-	-	-	-	✓	-	1	✓	✓	✓	✓	✓	-
C	✓	-	-	-	✓	✓	-	3	-	-	-	✓	-	-
D	-	✓	-	-	✓	✓	-	3	-	-	-	-	✓	-
E	✓	-	-	-	✓	-	✓	3	-	-	✓	✓	✓	-
F	✓	-	-	-	-	✓	-	2	-	-	✓	-	✓	-
G	-	-	✓	-	✓	-	✓	3	-	-	-	✓	✓	-
H	-	✓	-	-	✓	✓	-	3	✓	✓	-	-	-	✓
I	-	-	✓	-	-	✓	-	2	-	-	-	-	-	✓
J	-	-	-	-	-	✓	-	1	✓	-	-	✓	✓	-
K	-	-	✓	-	✓	-	-	2	✓	✓	-	-	✓	-
L	-	✓	✓	-	-	✓	-	3	-	✓	-	-	✓	✓
Total	3	4	5	0	6	8	2		5	4	3	5	9	2

Table 7. The experience of past conflict

Project	Year	Type of development project
A	1990	Tourist resort development
B	1996	Resort condominium development
C	-	-
D	2007	Wind power generation development
	2011	Wind power generation development
E	1991	Resort condominium development
F	2001	Resort condominium development
G	1989	Golf course development
	1992	Seaside resort development
	2009	Large commercial complex development
H		Industrial waste treatment facility development
	2015	Industrial waste treatment facility development
I	1991	Large resort development plan
J	1991	Golf course development plan
K	-	-
L	1991	Golf course development
	2006	Resort condominium development

3.3 Regional Planning Aspect

Table 6 shows the result of examination whether “inconsistent word” is present in the description of Land Use Plans and the Landscape Plans. This table shows that one or more inconsistent words were used as terms, which describe the area where the project sites are located in all 12 Land Use Plans and 12 Landscape Plans. And the most commonly used “inconsistent word” were “Natural Environment” in Land Use Plans and “Natural Landscape” in Landscape Plans.

3.4 Historical Aspect

Table 7 shows the list of past development conflicts related to landscape destruction in the each project site area. As this table shows, the all areas of projects except project C and K have an experience of opposition movements for landscape conservations by those residences in these decades.

4. Conclusion and Discussion

In this paper, we analyzed the geographical and social characteristics from four aspects on 12 PV project sites where have caused disputes in respect of the landscape. As the results, we found that all 12 PV project sites have one or more officially designated Natural Park within a 20km radius, and they have one or more officially designated Cultural Properties and Scenic Spots within a 5km radius. From the geographical analysis, we also found that 6 projects out of 12

have closest residences in the 50m radiuses, and 8 projects out of 12 have public schools in the 2km radiuses. These are though to be important tourism resources of each community or community living spaces. From these reason, we deduced that a project site location close to those sensitive areas might has risks for causing landscape conflicts.

From the analysis of social perspectives, we found that one or more inconsistent words were used in the policy descriptions of all 12 Land Use Plans and 12 Landscape Plans as the result of regional planning aspect analysis. Based on this result, we can point out that there is the gap between the regional planning policies and the actual PV development projects. As the result of historical aspect analysis, we found that the area of 10 projects out of 12 have an experience of opposition movements for landscape conservations. One of the common causes of past conflict was the development related to resort facilities. Actually these development projects were triggered by Resort Development Promotion Act (1987). And after the two decades, FIT Law (2012) has caused landscape conflicts in same areas. These highly economic beneficial promotion legislations powerfully advance the development projects, but they also cause various problem. This study suggests that a fine-grained careful site selection guidance and a pre-zoning are effective for operate the FIT without causing landscape conflicts.

- ※1: Act on the Promotion of Renewable Energy Electric Power Generation Harmonized with Sound Development of Agriculture, Forestry and Fisheries.
- ※2 Yamashita (2016) reported 16 landscape conflict projects, but four projects out of the 16 projects the specific geographical site were not be identified.
- ※3 The area of each National Park is divided into ordinary, special and marine park zones.

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