Tourist Response to Visual Impacts: Geothermal Power Plants in National Parks

The 35th International Conference of IAIA
April 21, 2015
Florence, Italy

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Background

- Promotion of Renewable Energy
  - Low carbon society
  - Energy security
    54 nuclear reactors were stopped in May, 2012
- Energy Policy Amendment in 2012
  - Pursuing zero operation of nuclear power plants by 2030s
  - Renewable energy introduction target
    40% in 2030s * current : 10.7% (as of 2013)
- Geothermal Power has advantages in terms of;
  - Stable energy supply
  - Unaffected by the weather conditions

2

Overview of Geo. Power in Japan

- High potential:

  23.5GW; 3rd largest country

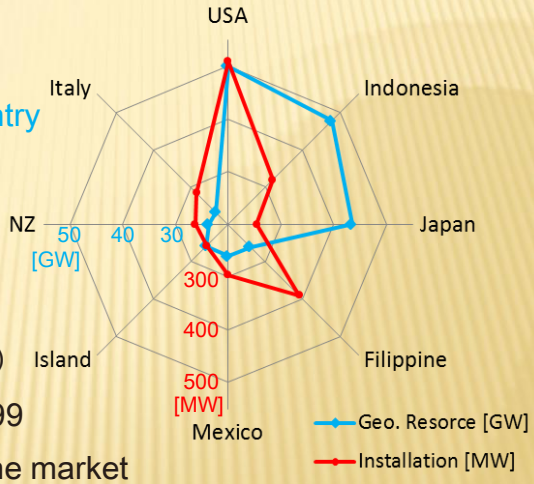
  (as of 2010)

- Installed Capacity:

  536MW; 8th country

  (18 power plants)

  - No big change since 1999
  - 70% share of geo. turbine market



What have prevented the promotion of Geo. Power?

3

4

Barriers to Geothermal Developments

- Economic Barriers: High-risk & Low-return?
  - High cost of drilling, Development risks of failure, Long lead times; 15-20 years etc (Kubota et al, 2013)
- Social Barriers: Can exist with “Onsen” culture?
  - Many hotels, Inns utilize hot spring water for bath
  - Onsen culture has a long history
- Institutional Barriers
  - 80% of geo. resources located in National Parks
  - Drilling permission, EIA

4

5

Promotion Factors for Geothermal Developments

- Feed-in Tariff (FIT) enactment in 2012
  - ¥27($ 0.23)/kWh for 15 years >15MW installation capacity
- Deregulation of Geo. Developments in Natl. Parks
  - MOE decided to relax the regulations since 2012
  - Adverse impacts on landscape?

Little is known about the Visual Impacts on landscape

5

6

Objective and Method

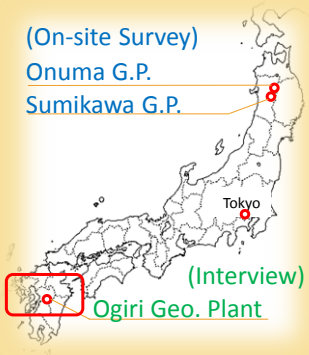
This study focus on the visual impacts due to the geo. developments in National Parks and clarify the evaluation of tourists visiting near the geo. power plant.

On-site survey & Interview

1. On-site survey on; developer, MOE
   - to clarify elements of visual impacts
2. Interview on tourists near the plant
   - to clarify evaluation of visual impacts

   1st survey: 44 sheets, Nov. 2-4, 2014

   2nd survey:147 sheets, Nov. 21-24



6

7

Major Elements of Visual Impacts

Steam

Power Transmission Line

Pipeline

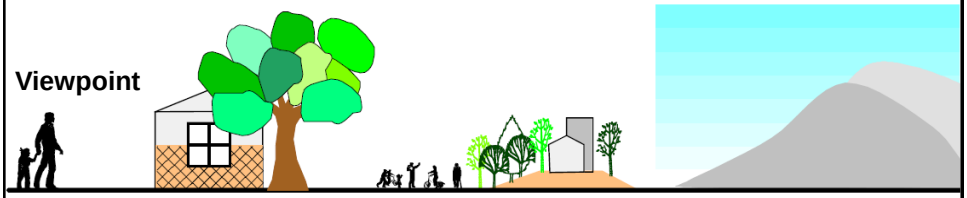
(Source:TEPCO)

(Source: Tohoku E.P. co.)

External Appearance of Facilities

7

View Types by Distance



Near View (-350m)

- ✓ Facility: existence
- ✓ Facility: external appearance
- ✓ Steam
- ✓ Pipeline: existence
- ✓ Pipeline: color

Intermediate View (350m-2,500m)

- ✓ Facility: existence
- ✓ Steam
- ✓ Transmission line

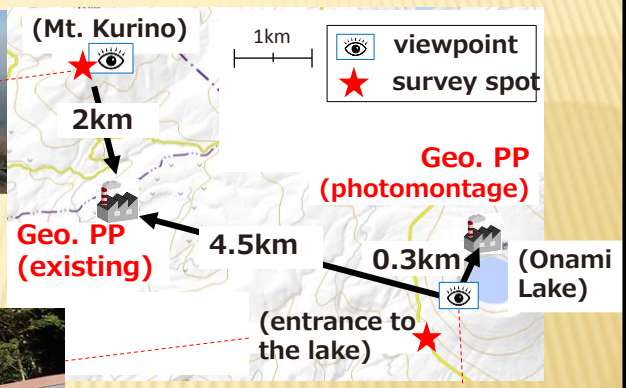
Distant View (2,500m-)

- ✓ Facility: existence
- ✓ Steam

8

Map: Plant, Viewpoints & Survey Spots

Survey spot in Mt. Kurino and Landscape



Survey spot:
At the entrance to the lake

Landscape from the viewpoint (photomontage)

9

Questionnaire Items

1. Recognition of Geothermal Power Plant		Existence of the plant in the park Recognition of the plant during trekking
2. Evaluation of Visual Impacts	**Near View**	Facility & steam from a major viewpoint Facility: unfavorable external appearance Pipeline: existence Pipeline: unfavorable color
	Intermediate View	Facility & steam from a major viewpoint Facility & transmission line
	Distant View	Facility & steam from a trekking trail
3. Awareness of Environmental Issues		Interests in Environmental Issues Development in national parks Promotion of Nuclear Power
4. Attribute of Respondents		Age Address Frequency of Visits

10

Example of Questionnaire Item

Q. Do the pipelines generate adverse visual impacts?

Interviewed tourists at viewpoint in Mt. Kurino

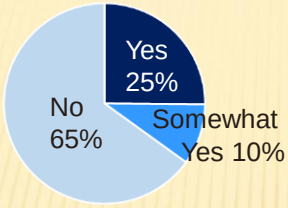
1. Agree, 2.Somewhat agree, 3.Somewhat disagree, 4. Disagree

Negative (adverse) ← **evaluation** → **Positive (not adverse)**

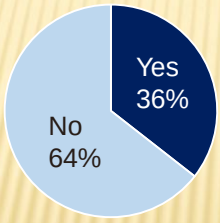
11

Recognition of the Geo. Power Plant

Do you know the Geo P.P. in the park? (n=183)



Did you notice the Geo P.P. during trekking? (n=180)

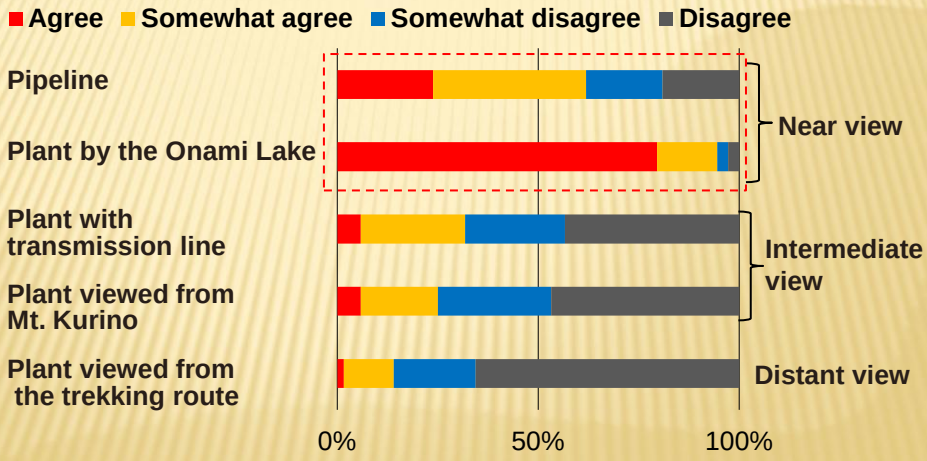


Existing view from the trekking trail (4.5km)

More than 60% of tourists didn't know/recognize the plant

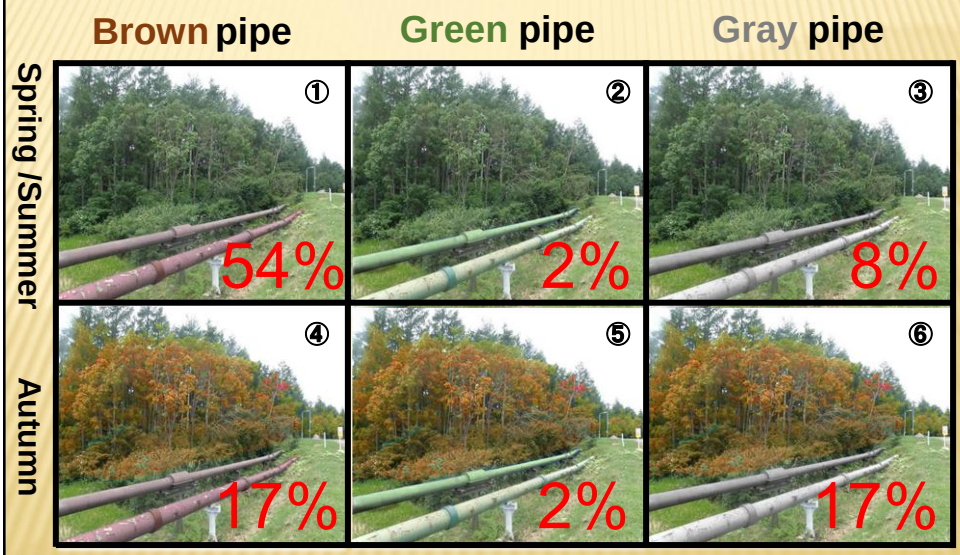
12

Tourists' Evaluation
Question: Unfavorable Visual Impacts?



13

Unfavorable Pipeline Color



(N=182)

14

Discussions

- ✓ According to the results, impact in near view is more significant than that of intermediate/distant view, because visual intrusion/effect of near view is larger than that of distant view.
- ✓ Most of tourists rated the existence of the plant by the Onami Lake as unfavorable due to its visually sensitive area. Despite of its more distant view than that of pipeline, the evaluation result shows more negative.

Large effects on less sensitive sites < **Significance** < **Small effects on highly sensitive sites**

- ✓ According to the survey, green colored pipelines are rated visually preferred option due to the existence of evergreen trees. This result, however, is not consistent with the guideline of the National Park Management Plan.

15

Correlation Analysis

		Landscape Evaluation				
		Overall Facility				Pipeline
		Distant View	Intermediate V. from Mt. Kurino	Intermediate V. with trans-mission	Near V.	
Recognition	Existence	0.02	-0.14	-0.04	-0.09	-0.06
	Recognition	-	-0.01	-0.09	0.10	0.09
Attribute	sex	0.00	0.00	-0.02	-0.10	-0.13
	age	0.14	0.26**	0.18	0.24**	0.04
	Frequency of visits	0.00	0.10	-0.03	-0.08	-0.02
	Address	0.03	-0.08	0.12	0.07	0.01
Awareness of Env. Issues	Interests in Env. issues	-0.21	-0.16*	0.06	0.05	0.04
	Nuclear P.	-0.08	-0.07	-0.15	0.02	-0.21*
	Development in national park	-0.08	-0.12	-0.33**	-0.33**	-0.24**

**p<0.01, *p<0.05

17

Conclusions

- ✓ Most of tourists regarded visual impacts due to the geothermal plant as not significant apart from adverse effects on near view or highly sensitive sites.
- ✓ Tourists rated brown colored pipelines the most unfavorable, which was different from the guideline of the National Park Management Plan.
- ✓ There was a correlation between age and visual impact evaluation, which might be related to the difference of attitude toward nuclear policy between the generations.

18