Community acceptance of nuclear power generation in Japan and relevant influencing factors

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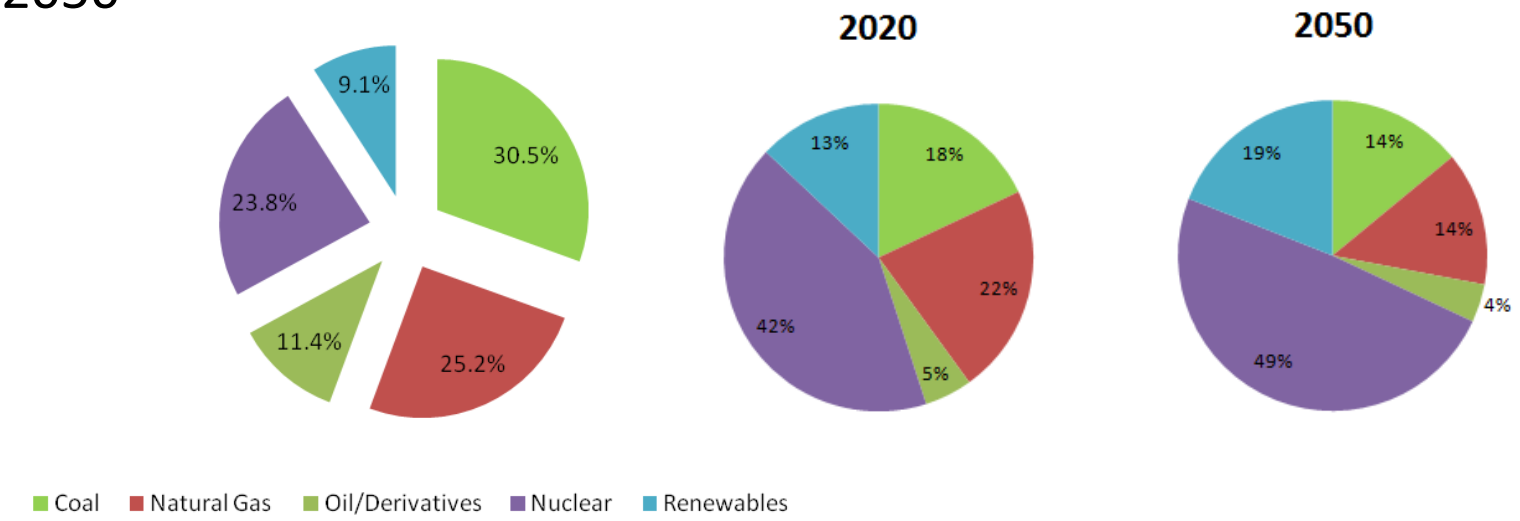
Presentation Flow

- Introduction
- Method / Locations
- Results: Acceptance / Locations/ Factors
- Recommendations
- Conclusion

Introduction

- Current Power Generation in Japan (2008)[1] and prospective expansions[2]
- Policy Goals: 25% and 80% reductions from 1990 levels by 2020 and 2050[3]



-> Direct implication on power production:

Substitution of some current 67% of electricity produced from fossil combustion (Renewables / Nuclear Power).

[1] IEA. Energy Balances of OECD Countries 2009

[2] Komiyama R. et al. (2009) Japan's Long Term Energy Demand and Supply Scenario to 2050 –Estimation for the potential of Massive CO_2 Mitigation- (IEEJ)

[1] Japanese Cabinet. "The Global warming countermeasures basic bill". Policy proposal approved on March 12, 2010

Introduction

Some problems regarding nuclear power[1]:

- Highest risks perception compared to other power generation forms (dread risk)
- The way risk communication is undertaken with stakeholders and the public

-> Acceptance or Rejection of nuclear power projects (NPP)

[1] Hiroshi Shimoda (2006). Chapter 8 – Risk Communication. Advanced Seminar of Socio-Environmental Energy Science. Kyoto University 2010.

Introduction

"Social Acceptance" of NPP[1]:

- **Socio-political** - Social acceptance on the broadest, most general level. Related to nuclear power policies.
- **Community** – Specific acceptance related to local stakeholders: residents and local authorities.
- **Market acceptance** – Social acceptance interpreted as the process of market adoption by nuclear power companies.

Previous works on community acceptance:

- Surveys of community acceptance (Cabinet[2], Onisawa[2])
- Understand differences between locations /regions (Kimura[4])
- Association to some influencing factors (limited research)

[1] Wungstenhagen R., Wolsink M., Burer M. J. (2007) Social acceptance of renewable energy innovation: An introduction to the concept. Energy Policy 35 pp. 2683–2691
[2] Cabinet Public Relations Office. "An overview of special public opinion survey on nuclear power". 2009 (in Japanese).
[3] Onisawa T. et al. (1986) Fuzzy measure analysis of public attitude towards the use of nuclear energy. Fuzzy sets and systems, 20, pp. 259-289.
[4] Kimura H. et al. (2003) Psychological Factors Affecting Public Acceptance of Nuclear Energy : Comparative Analysis Focusing on Regional Characteristics and Degree of Knowledge, Transactions of the Atomic Energy Society of Japan 2(4), pp. 379-388.

Purpose

- To obtain scores of community acceptance of NPPs in three locations and to analyse any statistical relationships to some factors of influence:
  a) Knowledge about advantages
  b) Quantity of information and reliance to it
  c) Incorporation in the decision making
  d) Motivations to know more about nuclear power

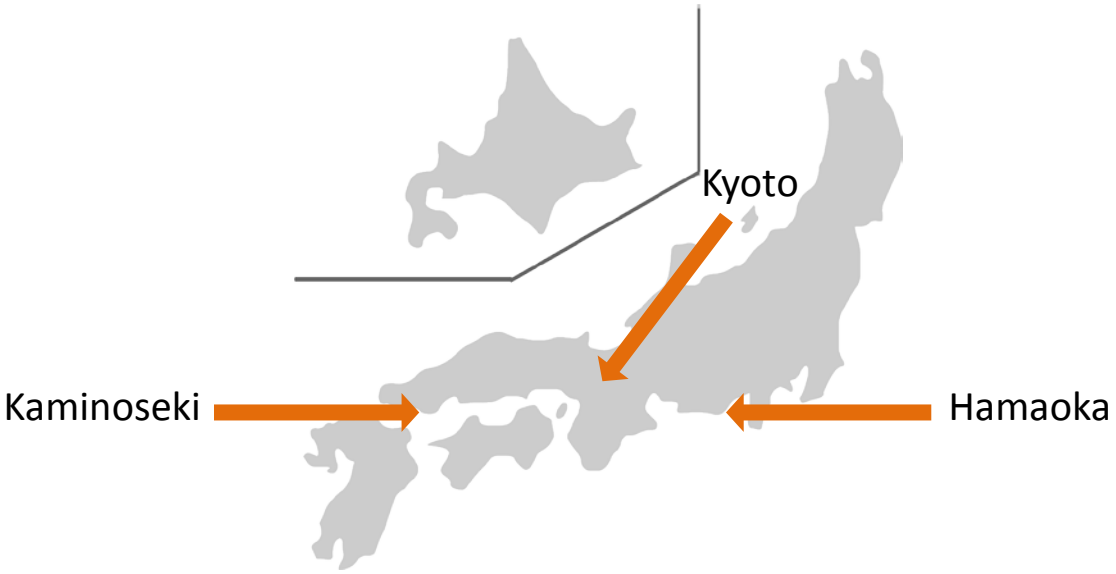
Method

a) Acceptance and “constrained” acceptance scores:
   - Overall and regional differences

b) Associations:
   - Acceptance – Location
   - Acceptance – Influencing factors
     - X^2 test of independence for each dimension to reveal associations and differences
     - Kendall’s Tau analysis to valuate the strenght of relationship

Method

- Total of 141 answered questionnaires collected in January 2011
- Three locations related to different phases of nuclear power:
  - **Kaminoseki-cho (Planning stage)** NPP project under construction by Chugoku Electric Co
  - **Hamaoka-cho (Operation stage)** NPP in operation since the early 90's by Chubu electric
  - **Kyoto city (Consumption stage)** No NPPs in its vicinity

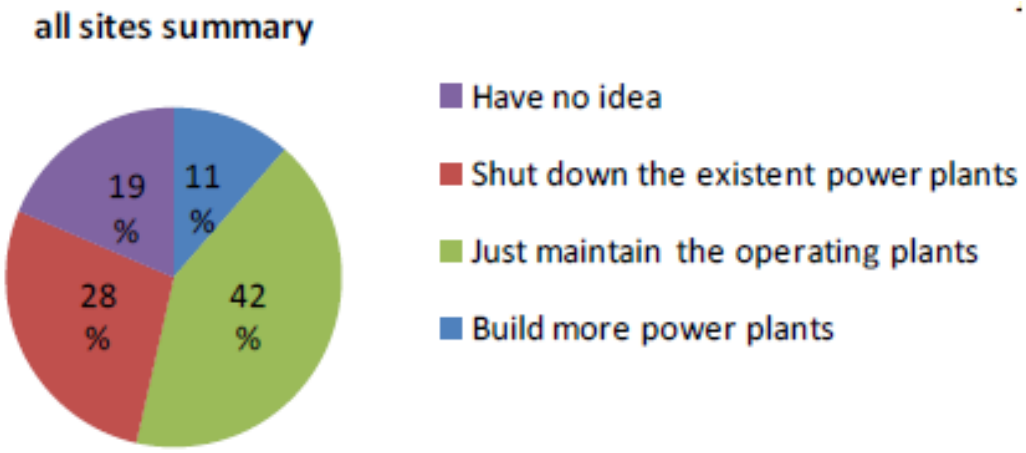


Locations

Overall Acceptance (1/2)

Findings:

- Only 11% in favour of expanding NPP (NPP “advocates”)
- 53% of respondents in favour of at least maintaining the current plants (NPP “tolerants”)



Overall Acceptance (2/2)

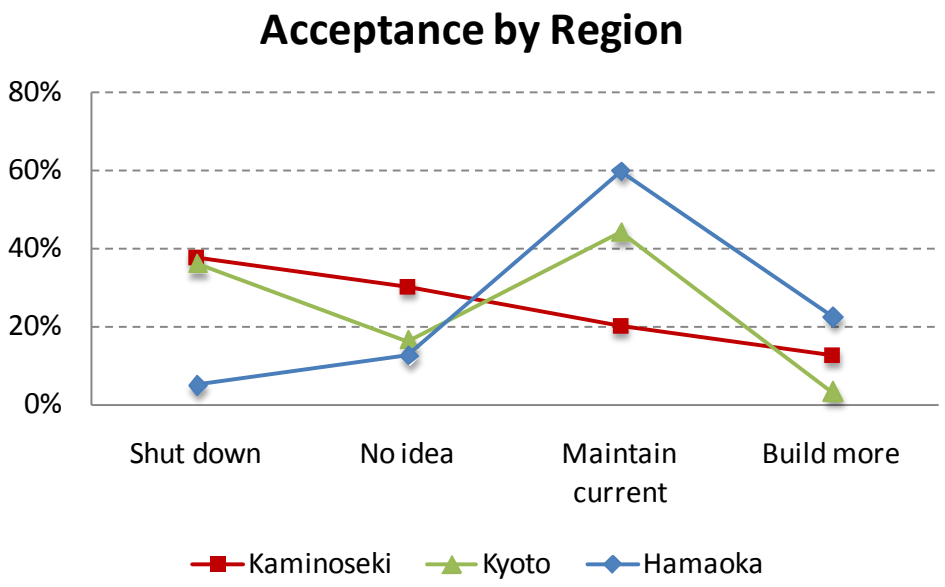
- In comparison to a Cabinet[1] report in 2009, overal scores:
  - Remained similar for NPP "advocates" (favour expansion)
    11% to 9.7%[1]
  - Reduced for NPP "tolerants" (those accepting "at least" to maintain the current NPPs working)
    53% to 80%[1]
  - Increased for NPP "skepticals" (those without a clear opinion)
    19% to 4%[1]
  - Increased for NPP "opponents " (those wishing to reduce the current NPPs)
    28% to 16%[1]

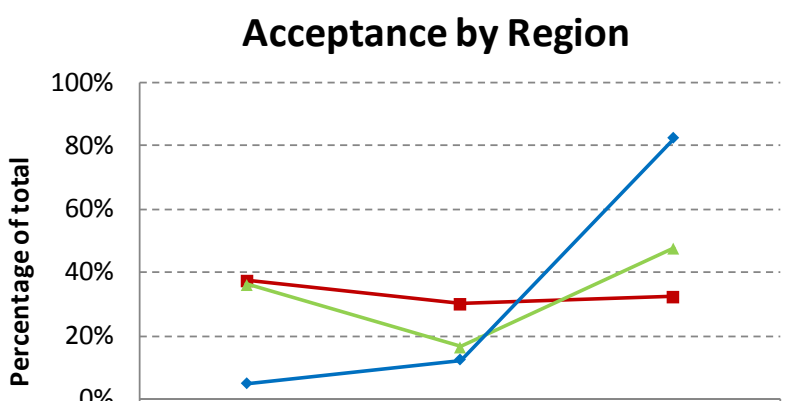
- Overall scores found a reduction of those in favour of maintaining the current NPPs, an increase of people skeptical about or opposed to NPP, but almost no change for those supporting it.

[1] Cabinet Public Relations Office. "An overview of special public opinion survey on nuclear power". 2009

Regional Difference (1/3)

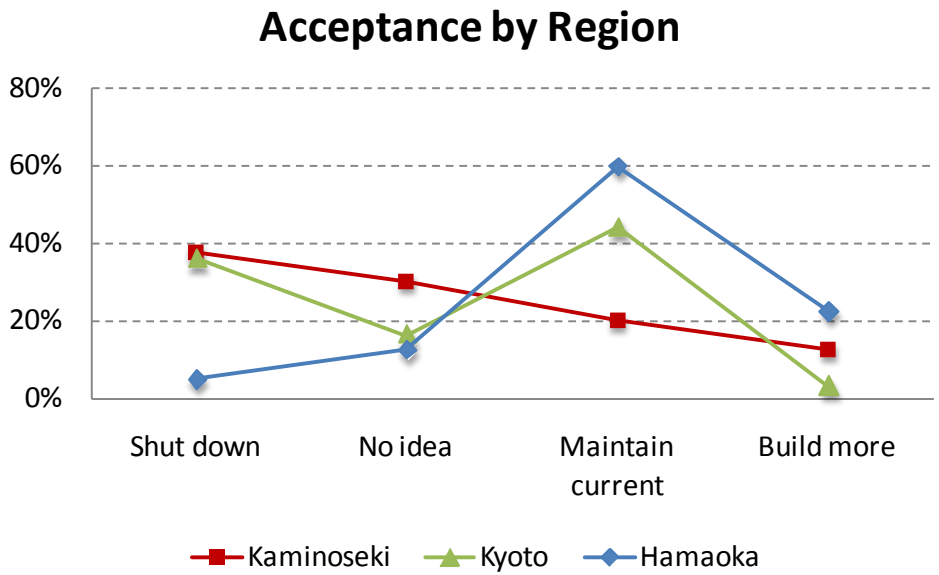
- Regional difference of community acceptance is statistically significant ($p<0.05$) according to our X^2 test of independence, however the strength of association is weak ($\tau = 0.21$).





	Don't Accept	Skeptical	Accept
Kaminoseki	38%	30%	33%
Kyoto	36%	16%	48%
Hamaoka	5%	13%	83%

Regional Difference (1/3)



- The operation stage (Hamaoka):
  - The most favourable towards expanding and maintaining nuclear power.
  - The lowest in favour of reducing the current NPPs (5%)
  - The least skeptical (13%).
- Consumption has the most divided opinion but fewer nuclear “advocates”
- Planning site the least favourable towards expansion and the most skeptical.

Regional Difference (2/3)

Possible reasons for the outcomes

- The longer plants have remained without trouble the better acceptance it tends to have among residents.
  - Large accidents have not occurred at Hamaoka giving people nearby a constant flow of benefits (governmental subsidies or promotion of regional employment) without demerits.
  - In contrast, at Kaminoseki the NPP on its initial stage bears less confidence because there is no connection to previous experience.

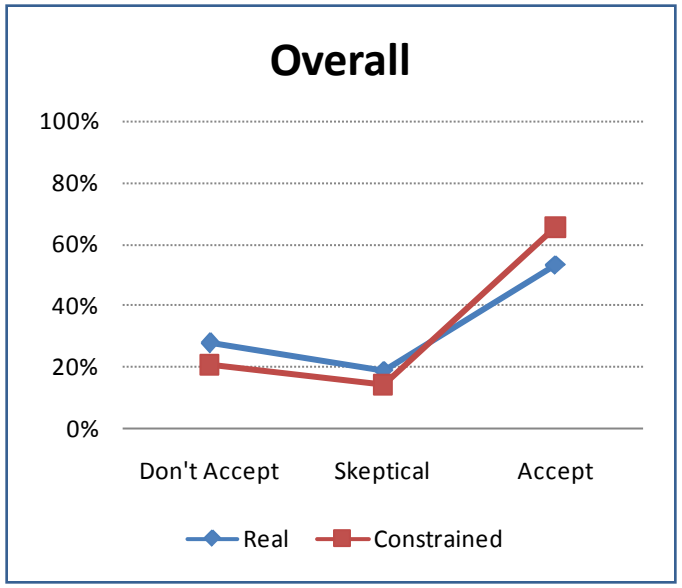
-> Constant contact with a successful project may positively influence the standpoint of citizens towards it.

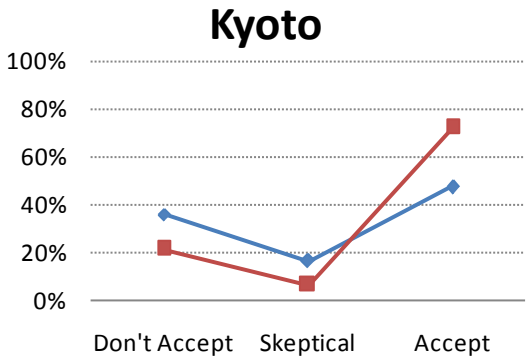
Constrained Acceptance (1/2)

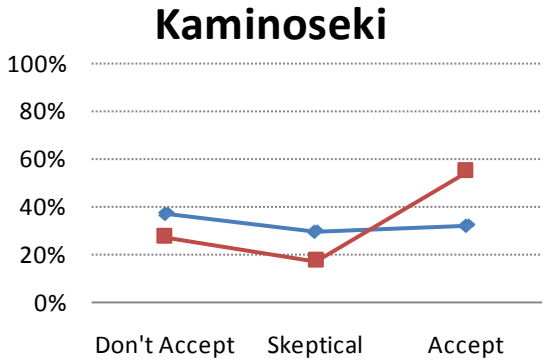
- Individuals set in a renewables-constrained scenario (limited renewable expansion) were asked to choose among fossil fuels and nuclear power for future energy expansion.

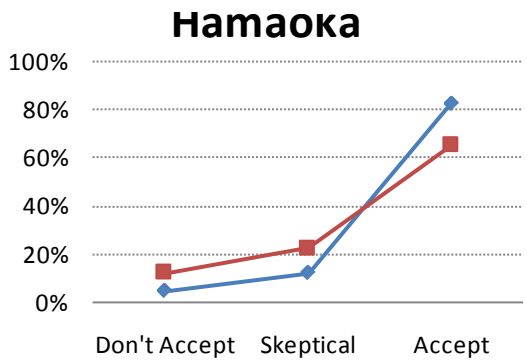
- This result may be associated with a potential acceptance of NPPs (only when renewables are not enough to satisfy energy needs).

Constrained Acceptance (2/2)









- Acceptance scores have NO drastic changes when renewables are constrained. However, in some regions there is difference (Kyoto+34%, Kaminoseki +20%, Hamaoka -17%)

Influencing Factors

Factors	Overall acceptance X^2	Overall acceptance τ_B	Constrained Acceptance X^2	Constrained Acceptance τ_B
(1) Knowledge about advantages				
a. Generate electricity at high efficiency	0.61	0.04	0.99	0.00
b. Reduce CO2 emissions	0.53	-0.06	0.00**	**0.26**
c. Reduce the reliance on fossil fuels	0.51	-0.03	0.23	0.11
(2) Information received				
a. Company	0.23	-0.08	0.29	0.09
b. Trust	0.94	-0.06	0.01*	**0.26**
c. Government	0.04*	**0.10**	0.59	0.05
d. Trust	0.69	0.06	0.17	0.16
e. NGOs	0.73	-0.06	0.46	-0.07
f. Trust	1.00	-0.02	0.65	0.06
g. Mass Media	0.16	0.05	0.62	0.04
h. Trust	0.07	0.17	0.20	0.12
(3) Interest to know more about NPP	0.00**	**-0.23**	0.11	0.14
(4) Incorporation in the decision making	0.18	0.08	0.01*	**0.22**

*: $p<0.05$, **:$p<0.01$

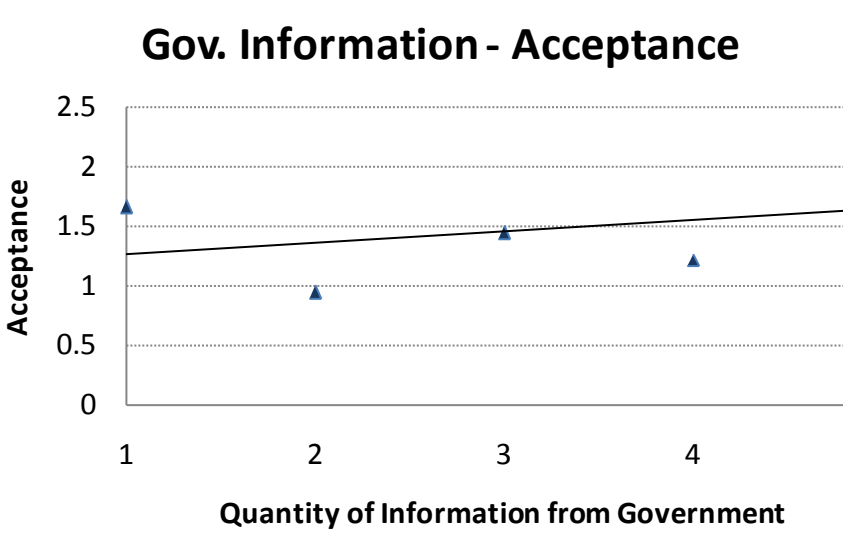
Factors with significance to acceptance:

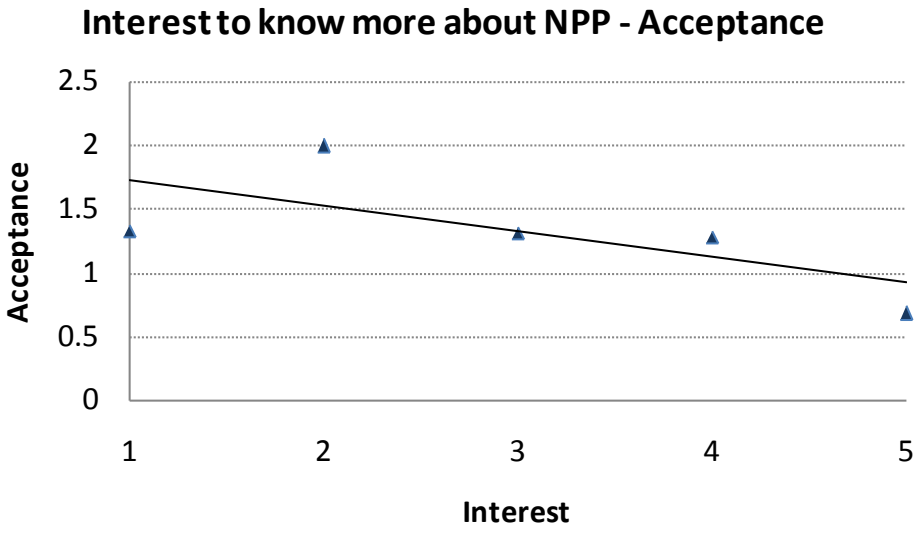
- *Government Information*
- *Interest to learn more about NPP*

Factors with significance to constrained acceptance:

- *Knowledge of benefits from CO2 emission reduction*
- *Trust in company's information*
- *Incorporation in the decision process*

Influencing Factors

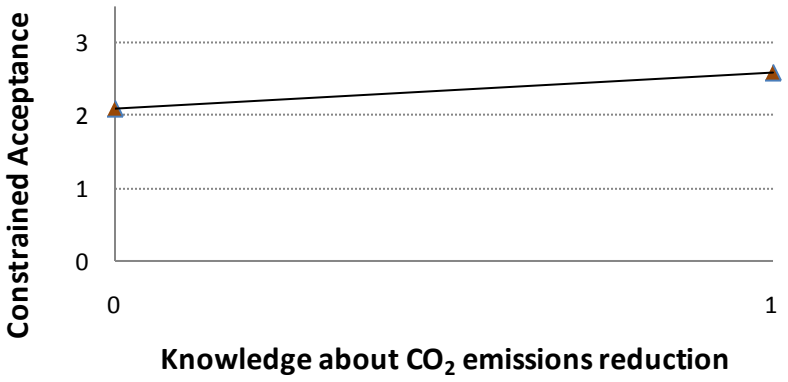




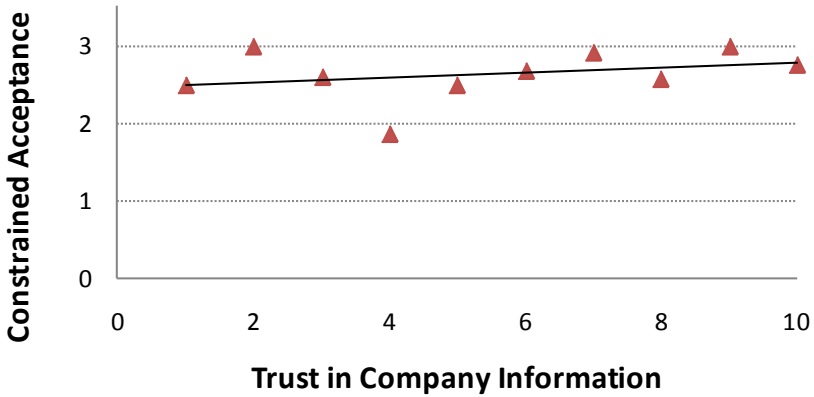
-> More information from government may influence positively acceptance scores

Influencing Factors

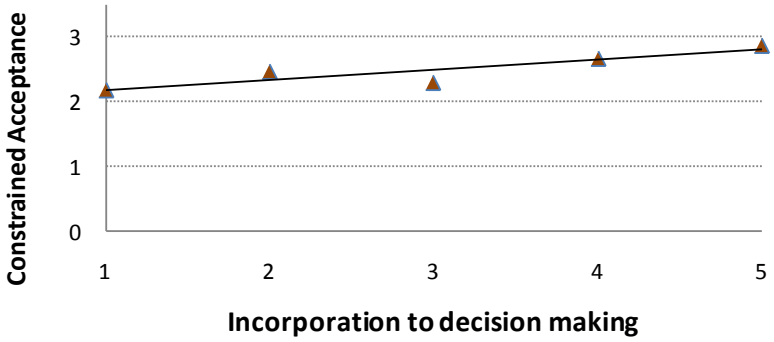
Knowledge about CO_2 emissions -Constrained Acceptance



Trust in information - Contrained acceptance



Incorporation to decision making - Constrained Acceptance



Recommendations

The following could enhance NP expansion:

- Trust building measures, such as disclosure of information regarding risks of plants and safety measures (e.g. Local Civic Forum [8]).
- Other mechanisms for transmission of information showing the advantages of NPPs through campaigns and community programs with regular feedback from community leaders.

Conclusions

- Compared to previous studies, the percetage of NPP supporters remained the same while an increase of opponents and skepticals has been noticed.
- Operation stage is more favourable towards maintaining and expanding nuclear power; the planning stage the least favourable and the consumption stage neutral (although highly polarised and with the fewest advocates).
- Constant contact with a successful project may positively influence the opinion of citizens – at places near NPPs the longer plants have remained without trouble the better acceptance it tends to have among residents.
- Reliable information flow from government and companies may influence positively acceptance among the public.
- Knowledge about nuclear power advantages may increase acceptance however, information needs to be from trustworthy and reliable sources.
- Inclusion in the decision making may have a discrete effect on acceptance.

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