

### Superior Legitimization of a Concerned Party in NIMBY Problem as a Moral Dilemma: Case of Geological Disposal Facility of High-level Radioactive Waste

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**Abstract :** Legitimacy is defined as the approvability of an individual's or others' rights in the context of public decision-making. The superior legitimization of the concerned parties reveals the tendency of people to approve of the concerned parties' superior legitimacy in cases involving the "not in my backyard" (NIMBY) problem; induces concerned parties' rejections of NIMBY facilities, such as a geological disposal facility of high-level radioactive waste (HLW) involving various costs for the local area (compared with enhancing public interest for the whole of society); and undermines total social benefits. The superior legitimization of the concerned parties accrues from a moral judgment process rather than from a rational process. This research hypothesized that the aspects of moral dilemma of a NIMBY problem stimulate moral judgments. A survey that focused on the legitimacy of local residents and the government agency around the location of the geological disposal facility of HLW suggested that moral foundations affect legitimacy judgments indirectly. The moral foundations of legitimacy judgments were also discussed theoretically.

**Key Words :** NIMBY, superior legitimization of a concerned party, moral foundations, geological disposal facility of high-level radioactive waste

#### INTRODUCTION

The context of public decision-making includes various stakeholders who have dissimilar interests or values. To advance their acceptance of the decisions made in the given context, they must reconcile the mutual evaluations of the rights to be decision-makers and comprehend the situation so that they can grant approval regarding who are the decision-makers among them. For example, legitimacy is the term used for the approval of individuals to a government system (e.g., authority or rules) that decides on collective goals (Jost et al., 2001; Zelditch, 2001; Johnson, 2004). Many people in the context of public decisions must reconcile their evaluations of legitimacy.

In this study, legitimacy is defined as the

approvability of an individual's or others' rights in the context of public decision-making, and trustworthiness and legality have been proposed as key determinants of legitimacy (Häikiö, 2007; Moya et al., 2015; Ohtomo et al., 2016; Nonami et al., 2019). Trustworthiness is defined as the subjective estimation of how much oneself or others can be trusted as a decision-maker in the context of public decision-making. Legality is defined as individuals' beliefs that their or others' rights are based on laws, rules, or political or social norms. The determinants used in legitimacy judgments vary on the basis of the stakeholders involved in and around public decision-making (Häikiö, 2007; Moya et al., 2015).

This study investigates legitimacy judgments regarding the "not in my backyard" (NIMBY) problem. NIMBY problem is a social dilemma

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involving people's rejection of public facilities, such as nuclear power plants or waste treatment facilities that involve various costs for local residents, and interferes with upholding the public interest realized by facilities for the whole society (Burningham et al., 2006). Furthermore, NIMBY problem involves a conflict of interest between many recipients of the public interest (i.e., the beneficial sphere) and a local minority that bears the personal costs (i.e., the costly sphere). In accordance with Folger (2001), this study defined people from the costly sphere as the concerned party in a NIMBY problem.

Easterling (2001) assessed a geological disposal facility of high-level radioactive waste (HLW) as a NIMBY facility about which it difficult to derive a consensus. As of 2021, the location of the proposed sites for a geological disposal facility of HLW in Japan remains undetermined. However, people supporting the centralized management of HLW at somewhere in one location (35.9%) outnumber those opposing it (16.9%). Conversely, those that support the facility of HLW being located in residential areas (12.6%) total fewer than those that oppose it, 48.5% (Group Discussion about deliberative pooling in Science Council of Japan, 2016). Furthermore, Ohtomo et al. (2014) conducted a survey to compare acceptance intention of the proposal to use residential areas as sites for the HLW facility before and after the Fukushima Daiichi Nuclear Power Plant Accident. The result indicates that acceptance intention after the accident is not so lower though it is significant and continues to be consistently negative. In other words, geological disposal facilities of HLW are necessary in Japan but viewed as facilities with low levels of acceptance intention in one's neighborhood or NIMBY facilities. In this regard, geological disposal facilities of HLW induce psychological burdens among the residents of areas where sites are located. Such burdens include anxiety involved in the risk assessment of casualties that may emerge due to accidents and fears about the stigma of "a town contaminated with radioactivity." In addition to these psychological costs, geological disposal facilities of HLW are thought to lead to economic and social

costs, such as the decline of industry and division of local communities.

When selecting the location of a geological disposal facility of HLW, the actors' rational strategy in the beneficial sphere (i.e., many members of the general public or a government agency aiming to increase the public interest) is to emphasize their legitimacy as recipients of the public interest. Nevertheless, these beneficiaries frequently estimate that the legitimacy of the concerned party (local residents) is higher than their legitimacy (Ohtomo et al., 2016; Nonami et al., 2019). This cognitive tendency is defined as the superior legitimization of the concerned party and can be supposed as voluntary cooperation with the concerned party. Nonami et al. (2019) and Nonami et al. (2021) reported that the superior legitimization of the concerned party was apparent in the context of a geological disposal facility of HLW.

However, the superior legitimization of the concerned party was predicted to reduce the possibility of locating the geological disposal facility of HLW in the long term as a result of the concerned parties' rejections. Therefore, the superior legitimization of the concerned party differs from rational processes to deliberate on the structure of the NIMBY problem around the geological disposal facility of HLW. By contrast, it is thought to result from an irrational process without deliberation on the structure of the NIMBY problem.

From the viewpoint of moral psychology, this study hypothesized that deontological moral beliefs (Kant, 1785) to protect disadvantaged people and correct the unfair including the unbalanced allocation of costs to them affect the judgment of legitimacies around the location of a geological disposal facility of HLW as a NIMBY problem.

To assess which moral beliefs inform legitimacy judgments, we focused on the moral foundations theory (Graham and Haidt, 2010; Graham et al., 2011; Haidt, 2012). From an evolutionary psychology perspective, Haidt and his colleagues asserted that the following five types of essential moral foundations exist across many Western and Eastern cultures.

Harm/care: feeling (and disliking) the pain of others, and cherishing them

Fairness/reciprocity: ideas of justice emphasizing reciprocity and proportionality

Ingroup/loyalty: underlying virtues of patriotism and self-sacrifice for the group

Authority/respect: deference to authority and respect for traditions in the group

Purity/ sanctity: underlying religious notions of striving to live in an elevated, less carnal, more noble way

This study investigated which local resident or government agency should have the right to decide whether a local area can become the proposed site for a geological disposal facility of HLW. This situation is a NIMBY problem. If the geological disposal facility of HLW is located in the area, the various costs will be borne by local residents; however, a location is required for the public interest. In this situation, the superior legitimization of the concerned party that emphasizes the local residents' right is preferred to a deontological viewpoint; however, the legitimacy of a government agency should be emphasized from a utilitarian viewpoint (Bentham, 1789).

The superior legitimization of the concerned party, namely, the tendency of the legitimacy of the local residents to be higher than that of the government agency, is considered conspicuous in the context of the location of the facility of HLW. This phenomenon is hypothesized to result from the effects of the moral foundation of harm/care, which corresponds to ethics to protect people at a disadvantage. Otherwise, fairness/reciprocity may also stimulate the tendency on the basis of ethics that reject unfair conditions, e.g., when people benefit from the public interest at the expense of others. This situation is unfair because costs are borne by the local residents only.

Haidt (2012), and Graham and Haidt (2010) have asserted that harm/care and fairness/reciprocity primarily emphasize the rights and welfare of individuals (*individualizing foundations*), whereas ingroup/loyalty, authority/respect, and purity/sanctity emphasize collective virtues, such as group-binding loyalty, duty, and self-control

(*binding foundations*). Ingroup/loyalty and authority/respect emphasize the public interest as well as collective virtues, and these are hypothesized to determine the legitimacy of a government agency.

In addition to these hypotheses, trustworthiness and legality were assumed to be related to legitimacy judgments, and the relationships between these two factors and moral foundations were also examined. Moral foundations were hypothesized to determine the legitimacies of the local residents and the government agency directly, or to affect them indirectly through trustworthiness and legality as determinants of the legitimacy at the beginning of this article.

## 1. METHODS

### 1.1 Participants

The participants were 199 adults (99 females and 100 males; 20-60 age range, median age of 45 years) who had registered at a research company in Japan. In the survey, participants were randomly collected throughout Japan without restrictions in terms of region, income, or occupation of them.

### 1.2 Procedures

We conducted a survey on a hypothetical situation on the WEB, on January in 2019. At first, participants responded to a moral foundations questionnaire (MFQ) (Graham et al., 2011). Next, the participants were briefed online about the current state of HLW (i.e., radioactive waste equivalent to 25,000 canisters of HLW is stored temporarily within nuclear power plants across Japan and the temporal storage facilities are becoming full). They were given an overview of the geological disposal facilities for HLW (i.e., disposal denotes a method of burying HLW deep underground and separated from humans and that a technically formulated geological disposal method is the only way to dispose of HLW). The survey then requested the participants to read a vignette where the government requested a town to conduct a location assessment for a geological disposal facility of HLW. Additionally, in the vignette an

explanation of the public interest (a decrease in economical cost for management of the HLW and risk of natural disasters) posed by the facility of HLW were presented as opinions of the government agency (in the vignette, they were staff from specialized organizations and relevant ministries and agencies was entrusted with government projects related to the geological disposal of HLW). The cost to the local area (anxiety on unforeseen situations and damages caused by harmful rumors) were also presented as opinions of local residents (residents of a town, which is one of the proposed sites for the geological disposal facility of HLW in the vignette). After reading all, the participants evaluated the legitimacy of local residents and the government agency to decide on the appropriateness of the location assessment. All participants were required to judge the legitimacies from the standpoint of the public, not the local residents nor the government agency.

### 1.3 Materials

On the basis of the Japanese version of MFQ on Haidt and his colleagues' website for International Research of Moral Foundations (<https://www.moralfoundations.org/questionnaires>), 30 items were adopted. Fifteen items measured the relevance of individuals' moral judgments to each of the five moral foundations, namely, harm/care, fairness/reciprocity, ingroup/loyalty, authority/respect, and purity/sanctity, with the following introduction: "When you are judging whether someone's act is ethically right or wrong, how much will the below evidence be incorporated into your judgments?" Each item was rated on a six-point scale: *not at all relevant* (1) to *extremely relevant* (6). The 15 items from the second half rated individuals' agreement with specific opinions are related to each of the five moral foundation. All items were rated on a six-point scale: *strongly disagree* (1) to *strongly agree* (6).

Legitimacy, trustworthiness, legality, and acceptability of decisions were measured using the following items, which are based on the study of Ohtomo et al. (2016) and Nonami et al. (2019). First, four items rated the legitimacy of the local residents

and the government agency, including "I approve local residents (or the government agency) as the decision-maker for the geological disposal facility of HLW in this vignette" and "I agree that the local residents (or the government agency) will be an actor who decides on the appropriateness for the geological disposal facility of HLW in this vignette." Trustworthiness was rated using four items, including "I can trust the local residents (or the government agency) to make an appropriate decision about the geological disposal facility of HLW" and "I think the local residents (or the government agency) will make a reliable decision about the geological disposal facility of HLW." Four items were used to assess legality, including "I think that local residents (or the government agency) have the right to decide the propriety of the geological disposal facility of HLW according to laws or regulations" and "I think that laws or regulations should establish local residents' (or the government agency's) right to decide the propriety of the geological disposal facility of HLW" Finally, four items measured the acceptability of the local residents' and the government agency's decisions, including "I will accept the decision of the local residents (or the government agency) about the right and wrong location of the geological disposal facility of HLW," and "If the local residents (or the government agency) decide on the location of the Geological disposal facility of HLW, I ought to comply with their decision."

Moreover, two other items, namely, "I think that a geological disposal facility of HLW may be required in the future for the whole of Japan" and "I hope the location of the geological disposal facility of HLW is somewhere other than my residential area," were provided to assess the participants' evaluation of the NIMBY structure involved in the geological disposal facility of HLW dilemma. All items were rated on a five-point scale: *not at all matching* (1) to *extremely matching* (5).

## 2. RESULTS

### 2.1 Evaluation of the NIMBY structure

Participants negatively evaluated the

acceptability of a geological disposal facility of HLW located in their own residential area compared with their positive estimation of its necessity in Japan (on a five-point scales:  $M = 3.73$  for “The location of geological disposal facility of HLW is desirable in somewhere other than my residential area”;  $M = 3.60$  for “A geological disposal facility of HLW may be required”). These results indicated that the participants understood the NIMBY structure in the context of the location of a geological disposal facility of HLW.

Furthermore, to assess the evaluations for the local residents as the concerned party, the variables for the local residents versus the government agency (“the local residents [or the government agency] are a prior concerned party that determines the acceptability” and “the local residents [or the government agency] are a party that is concerned about appropriateness,”  $\alpha = 0.83$ ) were compared by

Table 1 Goodness-of-fit Indices for Structural Models Representing Confirmatory Factor Analyses of Japanese MFQ

	$\chi^2$	df	AIC	GFI	CFI	RMSEA
Relative items						
Single factor	325.66	86	393.66	0.78	0.89	0.12
Two correlation factors	235.03	85	305.03	0.86	0.93	0.09
Three correlation factors	195.12	83	269.12	0.89	0.95	0.08
Hierarchical model	226.02	80	306.02	0.86	0.94	0.10
<b>Five correlation factors</b>	<b>168.37</b>	<b>76</b>	<b>256.37</b>	<b>0.90</b>	<b>0.96</b>	<b>0.08</b>
Judgement items						
Single factor	184.50	86	252.50	0.89	0.90	0.08
Two correlation factors	180.88	85	250.88	0.89	0.90	0.08
Three correlation factors	175.22	83	249.22	0.90	0.90	0.08
Hierarchical model	175.31	80	255.31	0.89	0.90	0.08
<b>Five correlation factors</b>	<b>158.95</b>	<b>76</b>	<b>246.95</b>	<b>0.90</b>	<b>0.91</b>	<b>0.07</b>
Full MFQ (all items)						
Single factor	1179.79	388	1333.79	0.65	0.78	0.10
Two correlation factors	1099.45	387	1255.45	0.68	0.80	0.10
Three correlation factors	1045.57	385	1205.57	0.70	0.81	0.09
Hierarchical model	1155.40	391	1303.40	0.66	0.79	0.10
<b>Five correlation factors</b>	<b>1005.39</b>	<b>377</b>	<b>1181.39</b>	<b>0.71</b>	<b>0.82</b>	<b>0.09</b>

Note: Model in bold is the best fitting model according to the comparison of  $\chi^2$ -statistics, GFI, RMSEA.

Table 2 Goodness-of-fit Indices for Structural Models Representing Confirmatory Factor Analyses of legitimacy, trustworthiness, legality, and acceptance of decisions

	$\chi^2$	df	AIC	GFI	CFI	RMSEA
Relative items						
Single factor	184.95	18	220.95	0.89	0.92	0.15
Two correlation factors	138.33	17	176.33	0.91	0.94	0.13
Three correlation factors	81.29	15	123.29	0.95	0.97	0.11
<b>Four correlation factors</b>	<b>20.11</b>	<b>12</b>	<b>68.11</b>	<b>0.99</b>	<b>0.99</b>	<b>0.04</b>

Note: Model in bold is the best fitting model according to the comparison of  $\chi^2$ -statistics, GFI, RMSEA.

a one-way within-subject ANOVA. The results revealed that the main effects were significant ( $F_{(1, 198)} = 68.28, p < 0.001$ ), and participants evaluated the local residents as the concerned party that is significantly higher than the government agency ( $M = 3.90$  for local residents;  $M = 3.24$  for the government agency).

## 2.2 Moral Foundations

We investigated the results of the MFQ by following the procedures described in Graham et al. (2011). First, the reliability coefficients of each of the five moral foundations items were generally substantial in moral relevance and moral judgments ( $\alpha = 0.45 - 0.87$ ). The results of the exploratory factor analysis (maximum likelihood method, promax rotation) on all moral relevance and moral judgment items revealed that five factors differed from Graham et al. (2011).

Furthermore, according to Graham et al. (2011), confirmatory factor analyses should be conducted to compare the models of items of moral relevance, moral judgments, and all items of both subscales. Table 1 shows that the goodness-of-fit indices (GFIs), confidence interval, and RMSEA were high for five correlated factor models comprising five moral foundations. Their  $\chi^2$  values indicated significant differences from three correlated factors models that showed the closest  $\chi^2$  values ( $\Delta\chi^2_{(7)} = 26.75, \Delta p < 0.01$ , on moral relevance;  $\Delta\chi^2_{(7)} = 16.27, \Delta p < 0.05$ , on moral judgments;  $\Delta\chi^2_{(7)} = 40.18, \Delta p < 0.01$ , on all items). These results were consistent with Graham et al. (2011). Only one the five correlated factors model of moral relevance had a CFI over 0.95, however, the other two models (five correlated factors models of moral judgements and all items) had CFIs under 0.95 or scored lower than 0.05 RMSEAs as a standard criterion.

## 2.3 Legitimacy of local residents versus the government agency

One factor was revealed on the basis of the results of exploratory factor analysis (maximum likelihood method and promax rotation) for all items that measured the legitimacy, trustworthiness, legality, and acceptance of

decisions. Table 2 indicates the results of confirmatory factor analyses to compare the models of these items. The GFI for four correlated factors models comprising the aforementioned four

variables were the highest, and their  $\chi^2$  values were significantly different from three correlated factors models showing the closest  $\chi^2$  values ( $\Delta\chi^2_{(3)} = 61.68$ ,  $\Delta p < 0.001$ ). The means of legitimacy of the local residents and the government agency were as follows ( $as > 0.77$ ). Local residents' legitimacy was  $M = 3.40$  ( $M = 2.74$  for the government agency), trustworthiness was  $M = 3.12$  ( $M = 2.52$  for the government agency), legality was  $M = 3.35$  ( $M = 2.82$  for the government agency), and acceptance of their decisions was  $M = 3.35$  ( $M = 2.78$  for government agency). The one-way within-subject ANOVAs were conducted to compare these variables for local residents versus the government agency. They revealed that the main effects were significant in all aforementioned variables ( $F_{(1, 198)} = 39.36$ ,  $p < 0.001$ ;  $F_{(1, 198)} = 53.21$ ,  $p < 0.001$ ;  $F_{(1, 198)} = 30.79$ ,  $p < 0.001$ ;  $F_{(1, 198)} = 37.02$ ,  $p < 0.001$ , respectively). Participants rated the legitimacy of the local residents higher as the concerned party than that of the government agency; therefore, the superior legitimization of the concerned party was obvious.

#### 2.4 Relations between moral foundations and legitimacy

Table 3 presents the means and correlation coefficients between the five moral foundation values and the legitimacy, trustworthiness, legality, and acceptability of decisions made by local residents or the government agency. On the basis of these correlations, multiple regression analyses (stepwise selection method) were conducted to examine the effects of the moral foundations on legitimacy, trustworthiness, legality, and acceptability of decisions (see Table 4).

First, regarding the trustworthiness of local residents, positive standardized beta coefficients of harm/care and ingroup/loyalty and a negative beta coefficient of authority/respect were observed as a result of the analysis by defining the five moral foundation values as explanatory variables ( $R^2 = 0.15$ ,  $p < 0.001$ ). Regarding the trustworthiness of the government agency, a positive beta coefficient of ingroup/loyalty and a negative beta coefficient of harm/care were indicated ( $R^2 = 0.17$ ,  $p < 0.001$ ).

Table 3 Correlations among Moral Foundations, Legitimacy and others of each Local Residents and Government Agency

	Means (SD)	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Harm/Care ( $\alpha = 0.84$ )	4.43 (0.94)	1.00	0.87***	0.64***	0.58***	0.82***	0.36***	0.31***	0.36***	0.37***	-0.17*	-0.13	-0.10	-0.11
2. Fairness/Reciprocity ( $\alpha = 0.79$ )	3.86 (0.87)	1.00	0.62***	0.59***	0.82***	0.32***	0.30***	0.36***	0.36***	0.36**	-0.16*	-0.14	-0.09	-0.07
3. Ingroup/Loyalty ( $\alpha = 0.70$ )	3.71 (0.78)	1.00	0.82***	0.75***	0.75***	0.09	0.17*	0.06	0.19**	0.20*	0.20*	0.23**	0.23**	0.21**
4. Authority/Respect ( $\alpha = 0.72$ )	3.73 (0.82)	1.00	0.73***	0.73***	0.73***	-0.02	0.01	-0.01	0.15*	0.02**	0.22**	0.25***	0.25***	0.31***
5. Purity/Sanctity ( $\alpha = 0.80$ )	4.08 (0.86)	1.00	0.25***	0.21**	0.24**	0.21**	0.24**	0.31***	0.31***	-0.02	0.01	0.03	0.03	0.03
6. Legitimacy of Local Residents	3.40 (0.90)	1.00	0.56***	0.72***	0.72***	0.66***	0.66***	0.66***	0.66***	-0.33***	-0.19**	-0.30***	-0.29***	-0.29***
7. Trustworthiness of Local Residents	3.12 (0.76)	1.00	0.56***	0.72***	0.72***	0.66***	0.66***	0.66***	0.66***	-0.25***	-0.04	-0.12	-0.20**	-0.20**
8. Legality of Local Residents	3.35 (0.81)	1.00	0.53***	0.40***	0.40***	0.40***	0.40***	0.40***	0.40***	-0.40***	-0.29***	-0.38***	-0.35***	-0.35***
9. Acceptance of Local Residents	3.35 (0.91)	1.00	0.53***	0.40***	0.40***	0.40***	0.40***	0.40***	0.40***	-0.08	-0.01	-0.05	0.02	0.02
10. Legitimacy of Government Agency	2.74 (0.93)	1.00	0.69***	0.72***	0.72***	0.72***	0.72***	0.72***	0.72***	1.00	0.69***	0.72***	0.83***	0.83***
11. Trustworthiness of Government Agency	2.52 (0.84)	1.00	0.62***	0.66***	0.66***	0.66***	0.66***	0.66***	0.66***	1.00	0.62***	0.66***	0.66***	0.66***
12. Legality of Government Agency	2.82 (0.82)	1.00	0.71***	0.71***	0.71***	0.71***	0.71***	0.71***	0.71***	1.00	0.71***	0.71***	0.71***	0.71***
13. Acceptance of Government Agency	2.78 (0.96)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Note: Pearson's product moment correlation coefficients. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$



Table 4 Effects of Moral Foundation Values on Legitimacy and others of each Local Residents and Government Agency

	Trustworthiness	Legality	Legitimacy	Acceptance of Decisions
Evaluation of Local Residents				
Harm/Care	<b>0.38*** (1.72)</b>	<b>0.28* (4.16)</b>	0.09 (1.17)	0.06 (1.88)
Fairness/Reciprocity	0.24 (4.26)	<b>0.34** (4.25)</b>	0.05 (1.17)	0.09 (1.84)
Ingroup/Loyalty	<b>0.29** (3.57)</b>	-0.11 (3.58)	0.02 (1.03)	-0.02 (3.23)
Authority/Respect	<b>-0.44*** (3.15)</b>	<b>-0.37*** (1.57)</b>	-0.01 (1.00)	<b>0.16** (1.00)</b>
Purity/Sanctity	0.02 (4.59)	0.01 (4.85)	0.07 (1.07)	0.05 (2.48)
Trustworthiness	-	-	<b>0.23*** (1.45)</b>	0.04 (1.45)
Legality	-	-	<b>0.59*** (1.45)</b>	0.12 (2.05)
Legitimacy	-	-	-	<b>0.67*** (1.00)</b>
$R^2$	0.15***	0.22***	0.54***	0.46***
Evaluation of Government Agency				
Harm/Care	<b>-0.47*** (1.70)</b>	<b>-0.44*** (1.72)</b>	-0.07 (1.02)	-0.01 (2.11)
Fairness/Reciprocity	-0.24 (4.18)	-0.19 (4.26)	-0.07 (1.02)	0.05 (2.05)
Ingroup/Loyalty	<b>0.53** (1.70)</b>	<b>0.30* (3.57)</b>	-0.00 (1.07)	<b>-0.21** (3.14)</b>
Authority/Respect	0.18 (3.15)	<b>0.26*** (3.15)</b>	0.01 (1.08)	<b>0.28*** (3.16)</b>
Purity/Sanctity	0.01 (4.20)	-0.11 (4.59)	-0.04 (1.00)	-0.04 (2.79)
Trustworthiness	-	-	<b>0.40*** (1.63)</b>	<b>0.12* (2.06)</b>
Legality	-	-	<b>0.47*** (1.63)</b>	<b>0.20*** (2.22)</b>
Legitimacy	-	-	-	<b>0.58*** (2.58)</b>
$R^2$	0.17***	0.16***	0.61***	0.74***

Note: Beta coefficients (VIFs) and multiple coefficient of determination by stepwise selection method, \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$  Significant beta coefficients and VIFs indicated in bold.

Second, harm/care and fairness/reciprocity were presented as significant positive determinants for the legality of local residents, and authority/respect was presented as a negative determinant ( $R^2 = 0.22$ ,  $p < 0.001$ ). The positive effects of ingroup/loyalty and authority/respect and a negative effect of harm/care on the legality of government agency were significant ( $R^2 = 0.16$ ,  $p < 0.001$ ).

Third, significant positive coefficients of trustworthiness and legality for the legitimacy of local residents were observed as a result of the analysis with the five moral foundation values, trustworthiness, and legality as explanatory variables ( $R^2 = 0.54$ ,  $p < 0.001$ ). Trustworthiness and legality were also significant determinants for the legitimacy of the government agency ( $R^2 = 0.61$ ,  $p < 0.001$ ).

Finally, positive standardized beta coefficients of authority/respect and the local residents' legitimacy for the acceptability of their decisions were significant according to an analysis conducted by defining the five moral foundation values,

trustworthiness, legality, and legitimacy as explanatory variables ( $R^2 = 0.46$ ,  $p < 0.001$ ). The significant positive paths of the government agency's trustworthiness, legality authority/respect, legitimacy, and a negative path of ingroup/loyalty for the acceptability of the government agency's decisions were observed ( $R^2 = 0.74$ ,  $p < 0.001$ ). Almost all VIFs of these variables were under 5.0.

Meditational analyses were conducted to examine the indirect effects of variables with significant paths on the legitimacy and acceptability of decisions of the local residents and the government agency. CFIs were estimated using the 95% bias-corrected and accelerated bootstrap approach based on 2000 bootstrap samples. Table 5 shows the indirect effects on the legitimacy and acceptability of decisions of the local residents and government agency. First, harm/care and ingroup/loyalty indirectly affected the legitimacy of the local residents via trustworthiness. Furthermore, the indirect effects of harm/care and fairness/reciprocity via legality on the legitimacy

Table 5 Indirect effect of moral foundations on trustworthiness, and legality

Process	Indirect effect estimation	Standard error	Sobel test (z)	Boot strapping 95% CI	
				Lower	Upper
<b>Local Residents</b>					
Harm/Care → Trustworthiness → Legitimacy	0.15	0.04	3.96***	0.07	0.25
Ingroup/Loyalty → Trustworthiness → Legitimacy	0.09	0.05	2.30*	0.01	0.22
Authority/Respect → Trustworthiness → Legitimacy	0.01	0.05	0.18	-0.11	0.11
Harm/Care → Legality → Legitimacy	0.24	0.05	4.99***	0.14	0.34
Fairness/Reciprocity → Legality → Legitimacy	0.25	0.05	5.05***	0.16	0.40
Authority/Respect → Legality → Legitimacy	-0.01	0.06	-0.17	-0.14	0.13
Trustworthiness → Legitimacy → Acceptance	0.36	0.06	6.84***	0.31	0.57
Legality → Legitimacy → Acceptance	0.42	0.07	6.74***	0.34	0.64
<b>Government Agency</b>					
Harm/Care → Trustworthiness → Legitimacy	-0.09	0.05	-1.84	-0.19	0.01
Ingroup/Loyalty → Trustworthiness → Legitimacy	0.15	0.06	3.16**	0.07	0.33
Harm/Care → Legality → Legitimacy	-0.07	0.05	-1.35	-0.18	0.04
Ingroup/Loyalty → Legality → Legitimacy	0.16	0.06	3.23**	0.09	0.33
Authority/Respect → Legality → Legitimacy	0.18	0.06	3.53***	0.08	0.37
Trustworthiness → Legitimacy → Acceptance	0.49	0.06	9.34***	0.42	0.71
Legality → Legitimacy → Acceptance	0.47	0.06	9.13***	0.42	0.69

Note : Sobel test (z), \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

were significant. Second, a significant indirect effect of ingroup/loyalty via trustworthiness in the legitimacy of the government agency was found. Furthermore, the indirect effects of ingroup/loyalty and authority/respect via legality on the government agency's legitimacy were significant.

### 3. DISCUSSION

Some studies that have used social surveys or simulations have reported that people tend to estimate the legitimacy of a concerned party to be higher than others when public policies are included in decision-making on NIMBY facilities,

such as a geological disposal facility of HLW (Nonami et al., 2019; Ohtomo et al., 2016). In the current paper, this tendency is called the superior legitimization of the concerned party. This research observed that evaluations of local residents' legitimacy were higher than that of the government agency. Thus, the superior legitimization of the concerned party was observed by using a hypothetical situation and a web-based survey. This observation suggests that the phenomenon can occur extensively in NIMBY situations across various public decision-making forums and by using a range of research methods.

Furthermore, the moral foundations of



harm/care and fairness/reciprocity affected the legitimacy of local residents indirectly via their trustworthiness and legality. The indirect effects of ingroup/loyalty authority/respect via legality and trustworthiness regarding the legitimacy of the government agency were significant. These results supported the first hypothesis.

Graham and Haidt (2010) advocated that the harm/care and fairness/reciprocity of five moral foundations focus on maintaining the dignity of individuals' rights, whereas ingroup/loyalty and authority/respect focus on collective virtues such as the obligations of individuals in their groups. The above-mentioned results in our study are consistent with Graham and Haidt (2010).

The NIMBY problem is a social dilemma that can be defined as a moral dilemma because the majority benefits while the minority bears the cost, such as in the trolley problem or footbridge problem (Thomson, 1985).<sup>1)</sup> The reason people frequently and conspicuously attribute higher legitimacy to the concerned party who bears the costs in NIMBY situations is thought to stem from moral values on saving people who are disadvantaged and preventing unfairness in this type of moral dilemma.<sup>2)</sup> If the superior legitimization of the concerned party is a judgment based on the moral foundation of harm/care, as suggested in our research, this could be considered the people's goodwill to save people who are disadvantaged. In any usual context, actions based on goodwill between members are essential in maintaining ingroup stability (Haidt, 2012). However, the goodwill does not affect the selection of a rational choice in the context of a NIMBY problem such as a geological disposal facility of HLW; by contrast, it might prevent the individuals from resolving the problem.

The participants in our survey understood that the context regarding the location of a geological disposal facility of HLW is a NIMBY problem. Therefore, the participants understood that the accomplishment of the public interest in exchange for the location of a geological disposal facility of HLW was a rational choice for many members of the general public, including themselves. Nevertheless,

the superior legitimization of the concerned parties was conspicuous in our research, and legitimacy judgments based on harm/care and fairness/reciprocity were thought to be dominant among many participants.

According to Haidt, (2012), moral foundations stimulate intuitive and momentary ethical judgments and not rational and deliberate judgments. Therefore, in the context of the NIMBY problem, intuitive processes are hypothesized to inform legitimacy judgments on the basis of the results of our examination, which suggested that relationships exist between these moral foundations and legitimacy. Further research could investigate a hypothesis stating that intuitive processes rather than rational and deliberative processes influence preference via moral foundations in the context of a NIMBY problem as one type of social dilemma.

This research discussed on the intuitive processing of a moral dilemma in the context of a NIMBY problem that stimulated deontological moral judgments. However, this research is incomplete because the goodness-of-fit results of the confirmatory factor analysis on the MFQ and VIFs of multiple regressions were insufficient. Further research is necessary to investigate the validity of the intuitive model by applying it to various NIMBY problems and not merely to the location of a geological disposal facility of HLW. If the superior legitimization of the concerned party is intuitively based on moral foundations, it would prevent the controllable and rational judgment processes from occurring and would complicate the NIMBY problem. To resolve a NIMBY problem, moral psychological approaches should propose an intervention into intuitive judgment processes to stimulate controllable judgment processes.

#### **4. Conclusion**

With respect to the location of NIMBY facilities, many people develop a superior legitimization of concerned parties and approve local residents' legitimacy to make a decision as dominant compared to that of other actors. However,

the superior legitimization of the concerned party cannot be considered a rational process of judging because it may lead to reduce its potential as a location for the NIMBY facility as a result of a chain of rejections on the part of the concerned parties of the facility. Our study verified the legitimacy of the local residents as a concerned party, which is more valued than the legitimacy of the government agencies with respect to the location of geological disposal facilities of HLW, which are a form of NIMBY facility. Thus, the study confirmed the superior legitimization of the concerned party in the context of facilities for HLW. More importantly, the result indicated that moral foundation based on harm/care and fairness/reciprocity affected the legitimacy of the local residents via trustworthiness and legality. Conversely, the legitimacy of the government agency was affected indirectly by ingroup/loyalty and authority/respect. The findings are consistent with our hypotheses and suggest that an intuitive process through moral judgment rather than rational deliberation can influence the process of judging the legitimacy in the context of a NIMBY problem involving both aspects of social dilemma and moral dilemma.

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#### NOTES

<sup>1)</sup> The trolley problem as an ethical proposition: "A runaway trolley is headed for five people. You can save them by the only way to hit a switch that will turn the trolley onto an alternate track. However, this decision will kill one person on the alternative if you do it. Should you turn the trolley to save five people at the expense of one?" The footbridge problem is as follows: "A runaway trolley threatens five people. You are standing on a footbridge that spans the track, and there is a stranger next to you. If you push the stranger off the bridge, the stranger's body will hit the trolley, thus stopping the trolley before reaching the five people. He will die if you do it, but you can save the five people. Should you push the stranger to save the five?" These two propositions have the same structure: save five people at the expense of one. Many people make a utilitarian judgement that saves the five in the former but make a deontological judgement to save one in the latter (Thomson, 1985; Green, 2013).

<sup>2)</sup> In our research, participants who were neither local residents nor the government agency judged the legitimacies of these two actors. They might have focused on the judgement of the

appropriateness of the location of a geological disposal facility of HLW based on local residents' backyard in exchange for the public good that the government agency was aiming to supply, rather than on their backyard. Here the scene could be related to the Not In Their Back Yard (NITBY) situation. Participants were thought to recognize the NITBY problem as one type of moral dilemma more easily than the NIMBY problem, because they were more sensitive about others' interests compared with their own.

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