

Examination of Relationship between Nuclear Transparency and Nonproliferation

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1. Introduction

The starting point of our study is this question: “How would transparency of nuclear power development in a country be related to nuclear nonproliferation commitment of the state?” If nuclear transparency is positively related to nuclear nonproliferation, then nuclear transparency can be an essential prerequisite for nuclear power development including new comer countries ensuring confidence in nuclear nonproliferation.

2. Methods and Results

2.1. Definition of Nuclear Transparency

While importance of nuclear transparency has been recognized, the concept of nuclear transparency is still vague for practical applications and there is a very limited amount of research work on evaluating state-level nuclear transparency. Although most definitions of nuclear transparency are different from each other, they share a common theme: sharing information about nuclear activities. In this study, we define the state-level nuclear transparency as a set of the condition that shows how clearly the state’s information related to peaceful nuclear power program and nuclear proliferation is revealed to the international community.

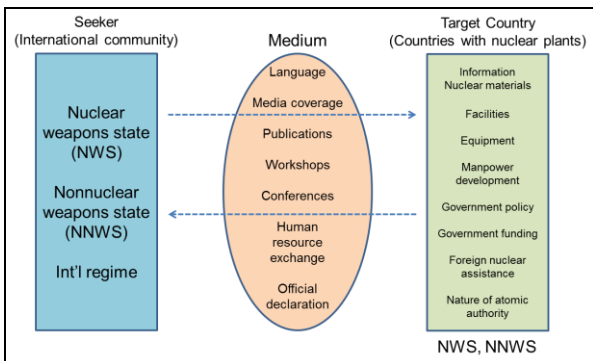


Fig. 1. Proposed framework of state-level nuclear transparency

Figure 1 shows that an information seeker is looking for the information through various mediums which may be associated with nuclear proliferation of a target

country. The contents and amount of information will differ depending on who is the seeker and how the information is provided and the relationship between the seeker and the target country.

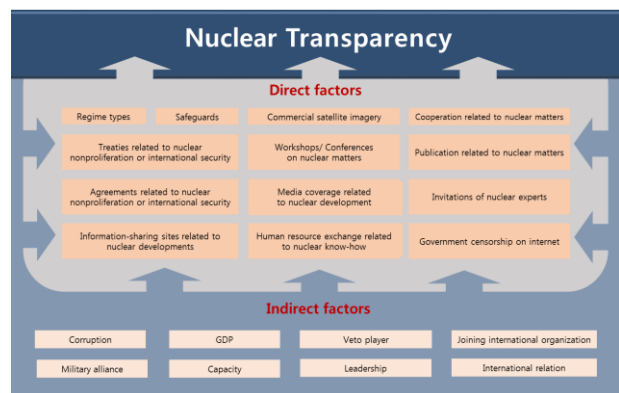


Fig. 2. Potential factors influencing state-level nuclear transparency

Figure 2 shows the examples of factors that may be directly or indirectly related to nuclear transparency of a state. Direct factors are the one that may directly reflect a state’s openness and information delivery in revealing nuclear transparency. Indirect factors are the factors which may have influence on direct factors.

2.2. Expert Survey on State-Level Nuclear Transparency

2.2.1. Composition of the Expert Survey

Based on the concept of nuclear transparency as depicted in Figure 1 and 2, expert survey on state-level nuclear transparency has been conducted. The survey was carried out to test the hypothesis that higher nuclear transparency is positively related to nuclear nonproliferation.

The survey comprised four questions. The first three questions asked about the concept of nuclear transparency and the last one asked to score the level of nuclear transparency of each country and reasons .

We chose total 30 states to evaluate their level of nuclear transparency and categorized in five groups: countries expected to be transparent (Group A), countries who succeeded in nuclear nonproliferation

(Group B), emerging nuclear power countries (Group C), nuclear weapon states (Group D), and countries who failed to nuclear nonproliferation (Group E). In addition, we also considered the variety of continents.

Respondents for the survey were comprised of nuclear nonproliferation experts from various states. Because the score of state-level nuclear transparency depends on who assesses it.

2.2.2. Results of Survey

Nine experts from five states, who are leading experts in the area of nuclear nonproliferation, answered the survey during two months and Table 1. shows the score and ranking of state-level nuclear transparency.

Table 1. Score and ranking of state-level nuclear transparency

	State	Score	SD	Ranking
Group A	Belgium	4.3	0.87	8
	Germany	4.6	0.73	6
	Italy	4.3	0.89	9
	Netherlands	4.7	0.50	2
	Norway	4.6	0.73	6
	Canada	4.8	0.67	1
	Japan	3.8	0.83	10
Group B	South Korea	3.4	0.73	17
	South Africa	3.6	1.33	15
	Brazil	3.0	1.00	20
	Argentina	3.7	0.50	13
	Kazakhstan	3.8	1.09	10
	Libya	2.7	1.66	23
	Finland	4.7	0.71	2
	Sweden	4.7	0.71	2
Group C	Vietnam	3.4	0.88	17
	Saudi Arabia	2.3	1.00	24
	Jordan	3.7	0.87	13
	UAE	4.7	0.50	2
Group D	China	2.3	1.04	25
	Russia	2.9	0.99	22
	USA	3.5	0.53	16
	UK	3.7	0.76	12
	France	3.4	0.92	19
Group E	Pakistan	2.3	0.76	28
	India	2.9	1.04	27
	Israel	3.5	0.00	29
	North Korea	3.7	0.00	29
	Iran	3.4	0.87	26
	Iraq	1.5	1.22	20

2.2.3. Interpretation of the Survey Results

The score seems more reasonable when comparing among the same group than different groups. And the score vary depending on nationality and background knowledge of respondents.

Table 2 below indicates crucial factors for the high and low score among each group. Commonly, voluntary activities like removal of nuclear weapon-related equipment and record of unreported experiments have

the greatest impact on evaluating state-level nuclear transparency.

Table 2. Crucial factors for the high/low score among each group

	Crucial factors for the high score	Crucial factors for the low score
Group A	• Allowing visits to former fissile material production plants	• Determination to keep fissile material stockpiles
Group B	• Removal of nuclear weapons-related equipment	• The record of unreported experiments • Willingness to enrichment and reprocessing activities No functioning government
Group C	• Abandonment of enrichment and reprocessing (Gold standard)	• Willingness to enrichment and reprocessing activities
Group D	• Work on ways to verify weapons dismantlement	• Not providing data on nuclear weapons
Group E	• Implementing IAEA Additional Protocol • Removal of nuclear weapons-related equipment	• Not NPT party • Existence of its nuclear weapons program

The score for a certain state differed depending on respondents because of their different nationality and type of knowledge of evaluating states. Among 30 states, we arranged the reasons why they scored states and Table 3 below show s it.

Table 3. Positive/ negative reasons for the score of state-level nuclear transparency from the expert survey

Positive Reasons	Negative Reasons
<ul style="list-style-type: none"> • Clean safeguards record • Implements IAEA Additional Protocol • Removal of nuclear weapons-related equipment • Concluding nuclear cooperation agreements with major nuclear suppliers • Publicizing nuclear reductions • Verification of weapons dismantlement • Allowing visits to former fissile material production plants 	<ul style="list-style-type: none"> • Clandestine activities • The record of unreported experiments • Statements by officials who favor nuclear weapons • Opposition to Additional Protocol • Determination to keep fissile material stockpiles • No functioning government • Poor record regarding domestic nuclear program • Willingness to enrichment and reprocessing activities

According to Table 3, it is obvious that positive reasons indicate that states have intention of nonproliferation. Negative reasons, however, represent that information seekers concern about states due to possibility of nuclear proliferation. As a result, nuclear transparency, which means whether a state open their information or not, is highly and closely related to nuclear nonproliferation.

3. Conclusion

For conducting expert survey on state-level nuclear transparency, the concept of nuclear transparency should be clearly defined. Based on that concept, the survey was carried out and results show that it tend to score high when nonproliferation activities happen. It means that higher transparency is positively related to nuclear proliferation. Therefore, higher nuclear transparency is positively related to nuclear nonproliferation.

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