

# **The Impact of the Great East Japan Earthquake and Fukushima Daiichi Nuclear Accident on People's Perception of Disaster Risks and Attitudes Toward Nuclear Energy Policy <sup>1</sup>**

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## **Abstract**

Multiple nationwide opinion surveys, carried out by the government (cabinet office), major media (national newspapers and NHK), the National Institute for Environmental Studies, and the Atomic Energy Society of Japan, have revealed that the Fukushima nuclear accident has heightened people's perception of disaster risks, fear of nuclear accidents, and increased recognition of pollution issues, and has changed public opinion on nuclear energy policy. The opinion gap on nuclear energy policy between specialists and lay people has widened since the disaster.

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The results of the Japanese General Social Survey data show that objections to the promotion of nuclear energy are strong among females, and weaker among young males and the supporters of the LDP. These findings are similar to the data collected after the Chernobyl accident. People who live in a 70km radius of nuclear plants tend to evaluate nuclear disaster risks higher. Distance from nuclear plants and the perception of earthquake risk interactively correlate with opinions on nuclear issues. Among people whose evaluation of earthquake risk is low, those who live nearer to the plants are more likely to object to the abolishment of nuclear plants. It was also found that the nuclear disaster has changed people's behavior; they now try to save electricity. The level of commitment to energy saving is found to relate to opinions on nuclear issues.

Keywords: Fukushima Daiichi Nuclear Power Plant, nuclear energy policy, public opinion survey,  
Japanese General Social Survey

This paper examines the impact that the Great East Japan Earthquake and Fukushima Daiichi nuclear accident had on people's perception of disaster risk and their attitudes toward nuclear policies based on the results of a nationwide public opinion survey and compares the findings from before and after the disaster. In addition, the paper investigates the factors related to people's attitudes toward nuclear policies based on Japan General Social Survey Data.

The government and news companies have continuously carried out surveys related to natural disasters and the use of nuclear power since the 1960s with the same or similar questions being asked. It has been known that there are slight differences in the results of each newspaper's public opinion survey concerning the approval rating of political parties, but the issues analyzed in this paper have almost no differences across newspapers. A list of the surveys in which the numbers were based is provided on Table 1 along with abbreviated titles which are used throughout this paper.

### **Perception of Disaster Risks**

The Meteorological Agency started designating names for remarkable disasters from 1954 with the "Toya Maru Typhoon (International name: Marie)." Of the 61 cases over the last 61 years, 30 cases have been earthquakes along with 15 cases of heavy rainfall, 8 typhoons, 5 volcanic eruptions, 2 cases of heavy snowfall, and 1 case of low atmospheric pressure. Japan experiences a remarkable disaster almost every year.

According to a public opinion survey in 1982, 40% of people have been affected by a disaster or had felt danger nearby: 41% for typhoons, 24% for fires, 23% for river flooding, and 17% for earthquakes. However, people in general had the most fear of earthquakes at 38% and fires at 31% (C8211: The abbreviation recorded on Table 1 (in the Appendix) signifies this survey was carried out by the cabinet office (C) in 1982 (82) in November (11)). Twenty-two percent of people thought that a major earthquake would occur within

the next 10 years in their residential area in 1978 (C7810). This number increased to 39% in 1995 after the Great Hanshin-Awaji Earthquake occurred (C9509). The main fears during a major earthquake were fires at 67% and walls collapsing at 61%, while only 14% of people had fears of tsunamis, floods, and bank collapsing (C9509). The percentage of people who thought a major earthquake would occur in their residential area increased to 64% in 2005, the year after the Niigata Chuetsu Earthquake (C0508).

The occurrence of the Great East Japan Earthquake further increased fears of a major earthquake occurring in people's residential areas. Seventy-eight percent of people felt some fear that a major earthquake would occur a half year after the disaster (Y1109) and three years later (Y1402). Fears toward earthquakes differed depending on region. Figure 1 shows the answers 1 year after the disaster to the questions about the possibility of a large-scale earthquake, tsunami, or nuclear accident<sup>3</sup> occurring in one's area which would require evacuation (J1202). Darker colors show the respondents feeling about the possibility of damage occurring. Fears of earthquakes along the so-called Nankai Trough including the Tokai, Tonankai, and Nankai regions are stronger than those in the Tohoku region.

Major earthquakes lead to various different phenomena. When asked about specific fears, 69% of people said collapsing of buildings due to earthquakes; 61% said stoppages in electricity, water, and gas; 57% said a shortage in resources such as food; 60% said confirming news from family members; 51% said fires; 40% said shortage in information or confusion; 39% said disorder on roads and public transportation; 32% said nuclear accidents; 32% said finding refuge; 22% said tsunamis; and 22% said an increase in crime (Y1202). The Great East Japan Earthquake reminded people that earthquakes bring tsunamis, 17 years after the Hokkaido Nansai-oki Earthquake of 1993. In addition, the Fukushima Daiichi nuclear accident highlighted the need for concerns about a new type of

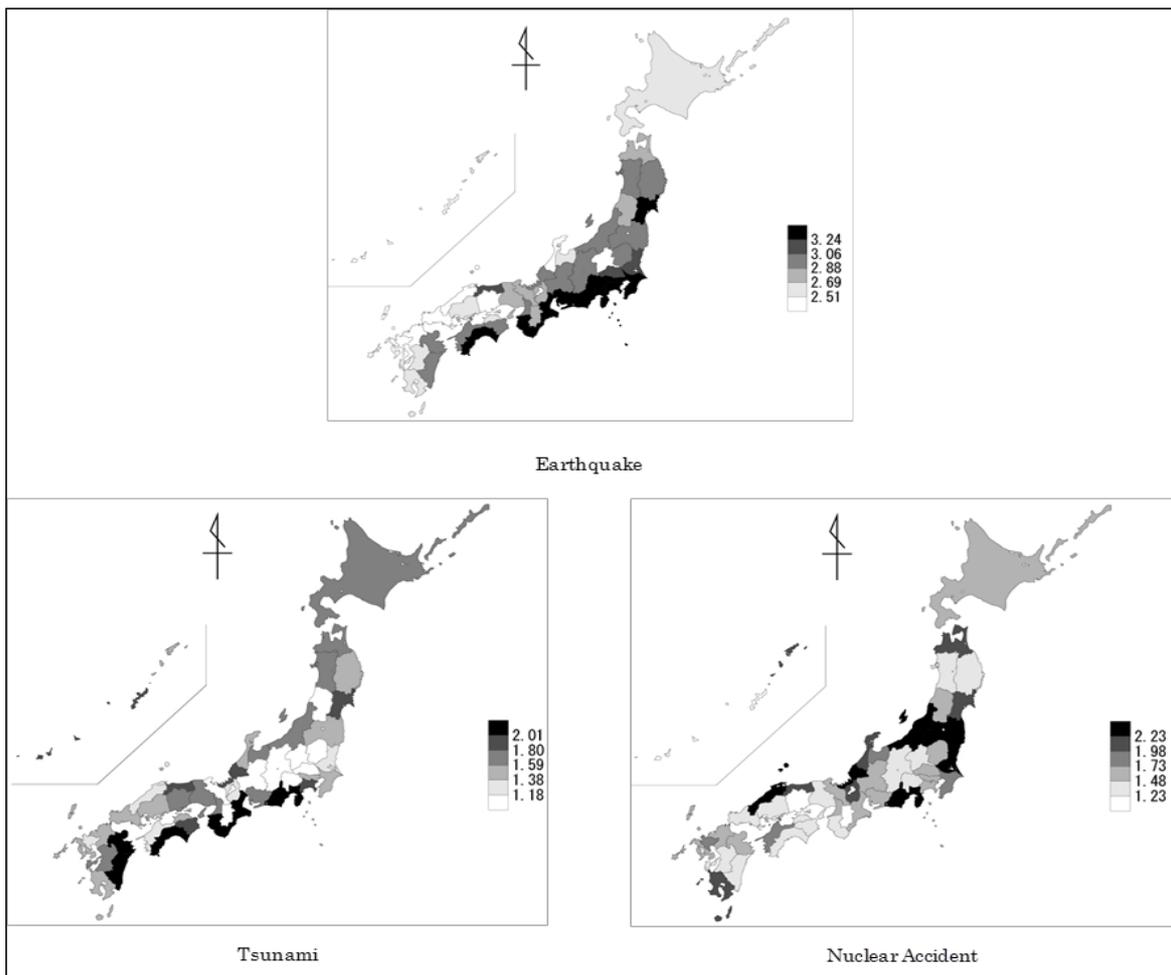
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<sup>3</sup> Figure 1 shows the average values by prefecture with 4 being significantly possible and 1 being almost impossible and separates the responses into 6 levels by color based on standard deviation. JGSS has grouped Japan into 6 regional blocks and sampled respondents from here so this is only a reference material concerning more detailed statistics by the prefecture.

disaster which had not been considered before – damage to nuclear reactors. Risk perception of tsunamis is high in areas from the Nankai Trough to the Hyuganada Coast (Figure 1) but people in almost all coastal prefectures are aware of the possibility of this occurrence.

Figure 1

*Perception of the Possibility of a Large-Scale Disaster Occurring which would Require Evacuation (JGSS-2012)*



### **Fears of a Nuclear Accident Occurring**

The first nuclear power generation in Japan was carried out in 1963. Nuclear power reached 30.8% of the nation's power usage in 2010 (Agency for Natural Resources and Energy 2011:102). Basic energy plans established in 2010 aimed to build 14 or more new nuclear facilities in order to raise this percentage to 50% by 2030.<sup>4</sup> The cabinet office irregularly carried out opinion surveys on nuclear power from 1978 to 2009 before the earthquake (Refer to Table 1). A majority of people had fears about nuclear power generation even before the Great East Japan Earthquake. However, this percentage decreased from 68% in 1999 to 56% in 2009, and the percentage of people who felt nuclear power was safe increased from 25% to 42% over this time (C9902; C0910).

The reasons for feeling safe (2009 with multiple answers accepted) included 40% of people saying Japan has a satisfactory operating history in nuclear power generation, 36% saying Japan's nuclear power generation is safe, 33% saying that they trust the government, and 25% saying that they trust the electric companies. Except for actual operation history, it seems feelings of safety came from trust. Meanwhile, 40% of Japanese adults were aware of the possibility of an accident occurring even before the earthquake and close to 30% feared earthquakes leading to the possibility of nuclear accidents. There were also fears from distrust toward government safety regulations, reporting systems of electric power companies, and public notification and publicity activities from both parties even before the earthquake (C0910).

There is an awareness gap between nuclear specialists and the people concerning the relationship between society and nuclear power. The Atomic Energy Society of Japan has been carrying out surveys on a regular basis since 2006 with the purpose of realizing the differences in thoughts of specialists and the people and encouraging calm introspection while showing the thoughts of specialists to the public. Specialists were

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<sup>4</sup> Interim Compilation of Discussion Points for the Formulation of "Innovative Energy and the Environment" at the Energy and Environmental Council on July 29, 2011. [http://www.cas.go.jp/jp/seisaku/npu/policy09/pdf/20110908/20110908\\_02.pdf](http://www.cas.go.jp/jp/seisaku/npu/policy09/pdf/20110908/20110908_02.pdf)

randomly sampled from the Atomic Energy Society of Japan's members, and ordinary people were sampled using a quota method of residents living within 30km of the Tokyo Metropolitan area. In January of 2011, directly before the Great East Japan Earthquake, when asked if they thought an accident will occur which causes death(s) of an ordinary person(s) involving radioactive materials leaking outside the site of a nuclear power facility within the next 100 years in Japan, 37% of people answered that they thought it would happen. Meanwhile, 10% of nuclear specialists answered that way (AE1101). The gap between these 2 groups on the risk perception of a serious nuclear accident occurring was prominent even before the earthquake.

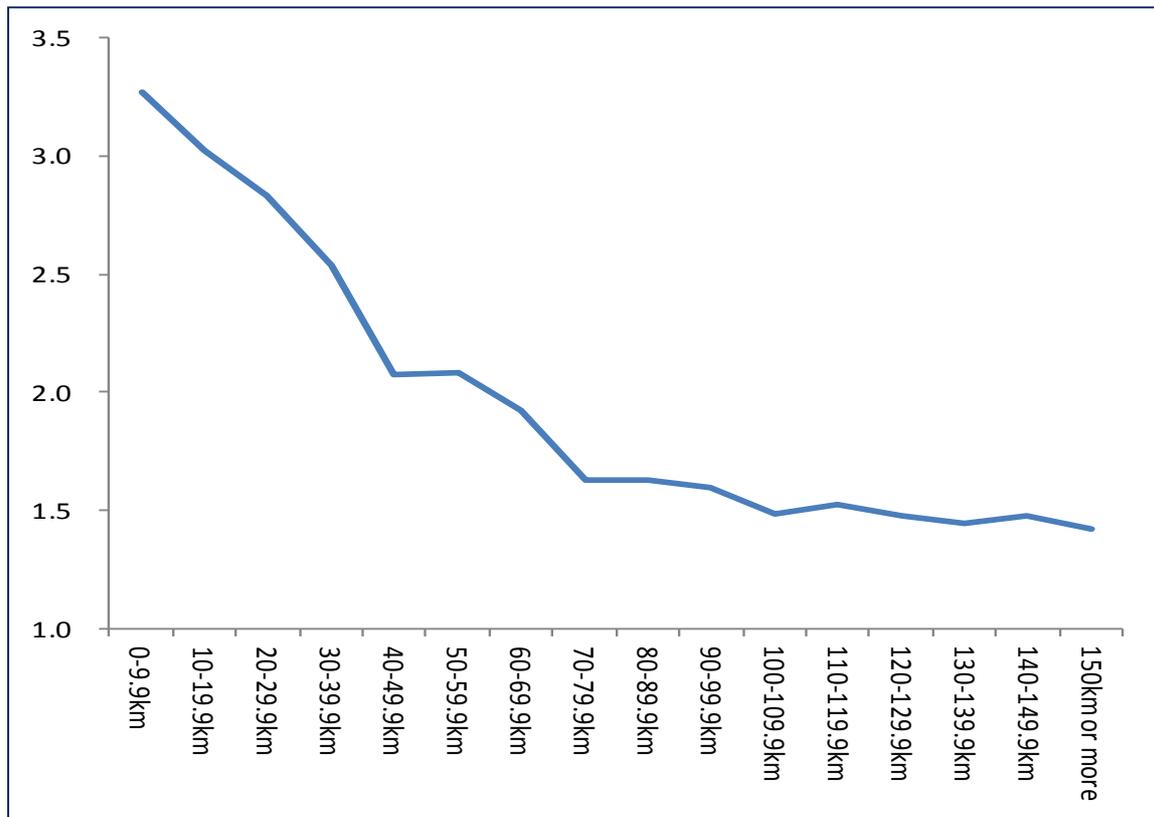
Fears about nuclear accidents increased due to the Great East Japan Earthquake. One month after the earthquake, 56% of people answered they felt significant fears about the Fukushima Daiichi nuclear accident, and 33% felt some fear, totaling close to 90%. Eighty-eight percent felt afraid that another major nuclear accident would occur (A1104) and this number was at 87% 2 years and 8 months later (NHK1311). Fears toward nuclear accidents are related to trust levels toward government safety management. For people who trust government safety management, 72% felt these fears while this percentage increased to 88% for people who did not trust government safety management and 94% for people who completely did not trust government safety management (Takahashi & Masaki, 2012).

A survey asked about the possibility of a nuclear accident that would require an evacuation of the area the respondent lived in one year after the earthquake (J1202). Fifty-seven percent of people answered that it was almost impossible while 9% said it was considerably possible (=4), 10% said it was quite possible (=3) and 25% said it was somewhat possible (=2). Figure 1 shows the risk of a nuclear accident is perceived higher in areas with nuclear power facilities. Figure 2 looks at the geographical distance from the respondent's residential area to the closest nuclear power facility and shows this relationship with perception of the risk of a nuclear accident. Respondents who live close to nuclear power facilities have a high perception of the risk of a nuclear accident. This

tendency can be confirmed within 70km of nuclear power facilities (J1202).

Figure 2

*Distance from Nearest Nuclear Power Facility and Perception of Risk towards a Nuclear Accident (JGSS-2012)*



The Fukushima Daiichi nuclear accident caused a loss of trust in the awareness and efforts that the people involved in nuclear power have toward safety. In January 2011, before the nuclear accident, 44% of Tokyo Metropolitan residents said they had trust. However, that percentage was halved in January 2012 to 22%. The answers of Atomic Energy Society of Japan members to the same question showed 81% had trust before the accident and 66% after the accident. Nuclear specialists trust the work of specialists in the same field but they cannot gain this trust from ordinary people.

The Nuclear Regulation Authority implemented new regulation standards for nuclear power plants that reflect lessons and knowledge from the accident in July 2013. However, 81% of people think it possible that a nuclear accident requiring an evacuation of the residents would happen even with the nuclear power plants that meet the new regulation (NHK1410).

### Fears about Changes in Environmental Pollution Awareness and the Impact of Radioactive Materials

The largest threats brought about by nuclear accidents are the invisible radioactive materials that are dispersed from the accident. The Yomiuri Shimbun asked the same question about radioactive materials for 3 years after the earthquake. A half-year after the earthquake, 68% of people said they felt afraid of the bad impact that radioactive materials could have on them or family members (Y1109). This percentage was at 66% a year later (Y1202) and 69% 3 years later (Y1402).

Figure 3

*Perception of Air Pollution (JGSS-2010, JGSS-2012)*

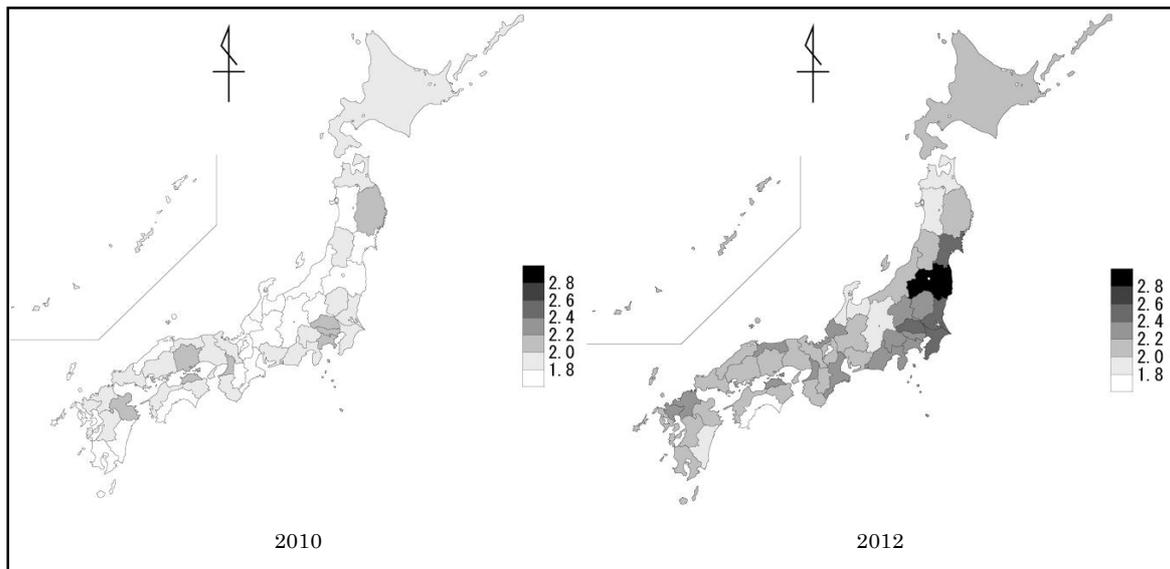


Figure 3 shows the results when asked how serious the air pollution in the respondent's area was at a prefectural level and displays these results by color corresponding to the degree of seriousness (J1002; J1202). Darker colors show the respondents feeling that the air pollution is more serious. The map on the left shows the results from February-April of 2010 before the nuclear accident and the map on the right shows the results from February-April of 2012 after the nuclear accident.<sup>5</sup> Areas in which the degree of seriousness in air pollution has increased statistically significantly in these 2 years include the southern part of the Tohoku region, all of the Kanto and Chugoku regions, and part of the Kinki region. It is clear that environmental pollution awareness has increased over a vast area. Pollution awareness is higher for areas closer to the Fukushima Daiichi nuclear power plant. People who felt air pollution was serious in 2010 accounted for only 18% of people. However, in 2012 this percentage increased to 33%. Fukushima showed a particularly large increase with 2% in 2010 to 70% in 2012.

The number of areas where opinions on water pollution are getting worse increased from 2010 to 2012 centering on Fukushima (Figure not shown<sup>6</sup>). Questions about soil pollution were only asked in 2012. Eighty-two percent of respondents in Fukushima felt that soil pollution is serious which shows that soil pollution is perceived as a more serious problem than air and water pollution (J1202).

The dispersion of radioactive materials from the nuclear accident resulted in an increase in fears about the safety of Japanese food and other products, which had been considered very safe and reliable. People who felt fears increased to 76% 5 months after the earthquake (A1108). However, there is a clear gradual decrease with 65% 8 months

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<sup>5</sup> Overall pollution not limited to radioactive materials was asked about in 2010 and 2012. The number of areas where yellow dust was observed increased from 311 in 2008-2009 to 731 in 2010-2012 focusing on Kyushu and San'in. Due to this, the worsening air pollution in these areas is thought to be related to yellow dust.

<sup>6</sup> [http://jgss.daishodai.ac.jp/research/news/news\\_J12-2.pdf](http://jgss.daishodai.ac.jp/research/news/news_J12-2.pdf)

later (Y1110) and 55% 1 year later (J1202). The proportion of people who refrain from buying produce grown in Fukushima is 23% while 72% of people do not care four year later (A1502). It is thought that the establishment of an inspection system for food and other products as well as reports such as attention notifications about harmful rumors has impacted these percentages.

### **Public Opinions on Contaminated Water Problems**

The Prime Minister at the time of the accident was the Democratic Party of Japan representative Naoto Kan. A half year later, Democratic Party of Japan representative Yoshihiko Noda became the Prime Minister. In December of 2012, the president of the revived Liberal Democratic Party Shinzo Abe became Prime Minister after a general election of the House of Representatives. Prime Minister Abe declared that problems (contaminated water) in Fukushima were “under control” during his presentation for Tokyo’s bid for the 2020 Summer Olympic Games at the assembly of the International Olympic Committee held on September 7, 2013 in Buenos Aires. Amidst continuing questions and answers, he replied that the impact of contaminated water was blocked off in a 0.3km<sup>2</sup> area inside the harbor of the Fukushima Daiichi nuclear power plant. According to public opinion surveys taken by media outlets, the government approval rating increased to over 60% while 2 out of 3 people thought that the contaminated water from the Fukushima Daiichi nuclear power plant was not blocked (M1309; Nippon News Network1309) in the latter half of September after Tokyo’s bid was accepted. At the same time, 86% of people thought that the government should use any means possible to create contaminated water containment measures regardless of the costs (M1309). The Abe Cabinet is receiving approval for deciding policies on solutions for contaminated water problems (86% approve in NNN1309 and 85% approve in the Sankei Shimbun and Fuji News Network1309) with 90% of people thinking that the government should make these decisions more quickly (S1309). Three years later, 83% of the residents of Fukushima Prefecture did not give credit to the Government and Tokyo Electric Power Company for their response on the issue of contaminated water (A1403).

### Public Opinion on Energy Policies and Opinions of Nuclear Power Specialists

Figure 4

What should the future of nuclear power plants be in Japan? (1978- January 2015)

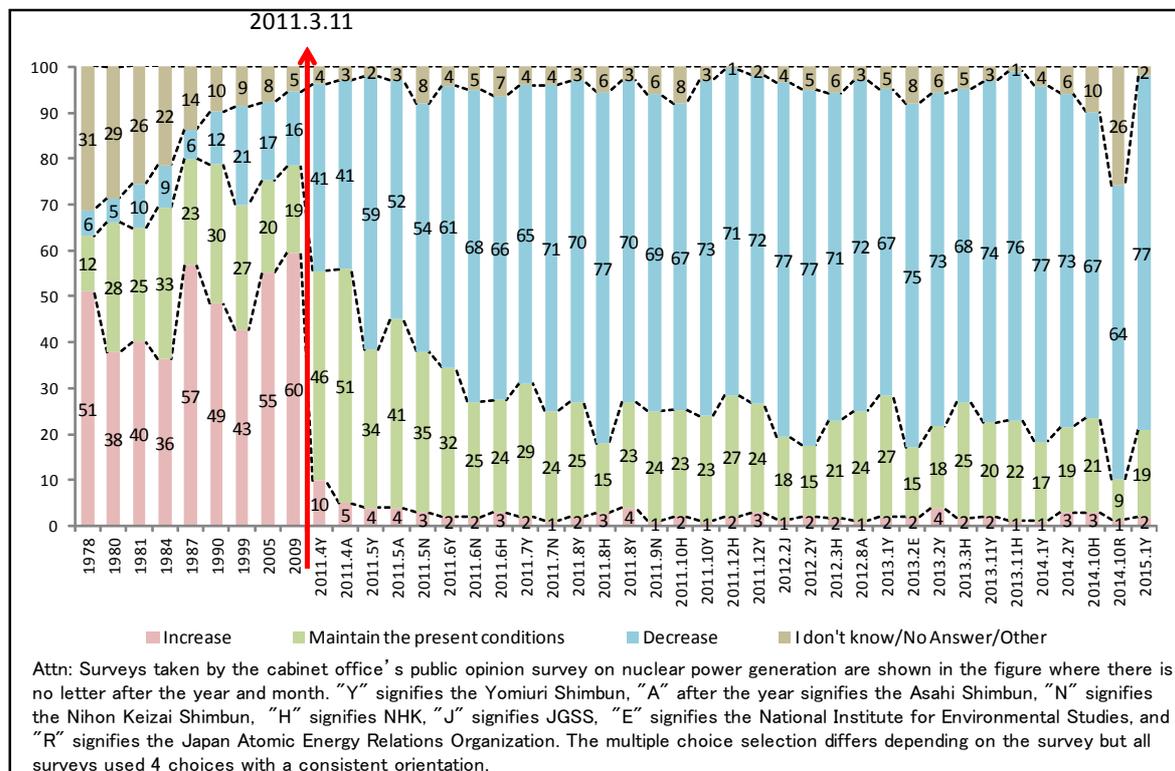


Figure 4 shows the results when people were asked what Japan should do with nuclear power plants in the future in chronological order based on surveys carried out by the government (cabinet office), major media (national newspapers and NHK), JGSS, and the National Institute for Environmental Studies before and after the earthquake. A majority of people said to increase nuclear power plants in 1978. This percentage dropped to 38% in 1980 after the Three Mile Island nuclear accident but increased to 57% in 1987 despite the Chernobyl nuclear accident in 1986. After that, this percentage decreased in the 1990s but shifted back to an increasing percentage in the 2000s with 60% of people saying to increase

nuclear power plants in 2009. In September of 2010, people who said that nuclear power plants were necessary accounted for 77% in the public opinion survey of nuclear power usage, which has been conducted by the Japan Atomic Energy Relations Organization since 2007<sup>7</sup> (R1009).

After March 11th 2011, the percentage of people favoring an increase in nuclear power plants rapidly decreased. One month after the earthquake, there were more people who answered to keep the number of nuclear power plants the same than people who answered to decrease the number. However, 2 months later, the percentage of people who answered to decrease the number of nuclear power plants was predominant in all surveys taken by the press, and 3 out of 4 people believed the number of nuclear power plants should be reduced 4 years after the earthquake. The percentage of people who said nuclear power plants were necessary was at 38% in November of 2011 and 25% in November of 2013 (R1111). Thirty-six percent said nuclear power plants were unnecessary and 38% couldn't choose either (R1311).

Prime Minister Abe said, "We will decrease nuclear power ratios (concerning the energy supply system). We will accelerate renewable energy and energy saving promotions to a maximal degree within the next 3 years," at a press conference for Tokyo receiving the award for the 2020 Summer Olympic Games. All of the nuclear power plants in Japan were shut down in May 2012. One plant reopened in July 2012 but was shut down in September 2013. No nuclear power plant is running as of May 29, 2015. A majority of people opposed the re-opening of the nuclear power plants in which their safety has been confirmed (52% opposed and 36% in favor in Y1501; 62% opposed and 27% in favor in N1503).

According to a survey by the Atomic Energy Society of Japan concerning whether nuclear power should be used in the future (Figure 5), the percentage of Atomic Energy Society of Japan members who agreed with using nuclear power decreased in a survey taken 10 months after the earthquake. However, that percentage has almost returned to its

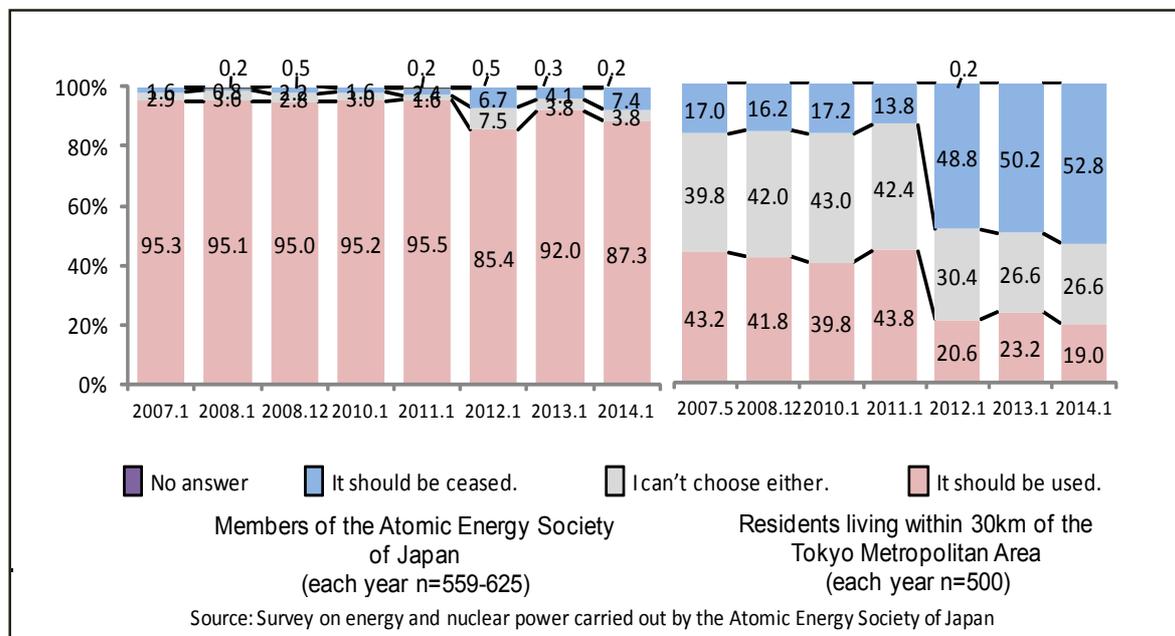
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<sup>7</sup> Referred to as materials of the Nuclear Energy Committee.

original level 22 months after the earthquake. Meanwhile, the percentage of Tokyo Metropolitan residents who agree with nuclear power usage was around 40% before the earthquake. This percentage decreased to around 20% and people who answered that nuclear power should be ceased accounted for around 50% after the earthquake. The gap between ordinary people and specialists has increased since the earthquake.

Figure 5

*How should nuclear power generation be used in the future?*



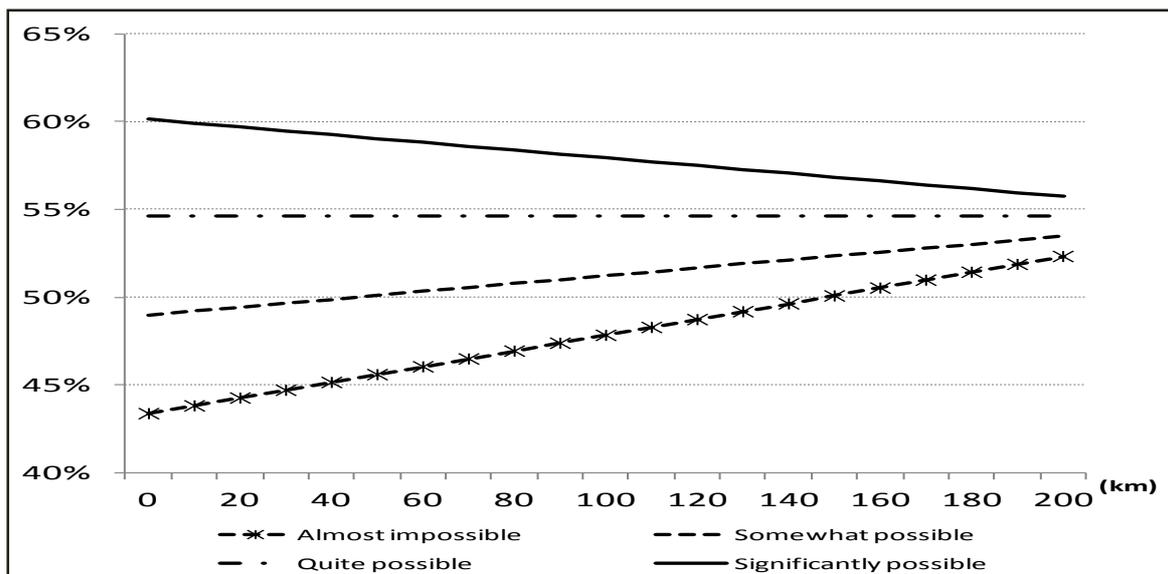
### The Background of Doubts toward the Promotion of Nuclear Power Plants

What factors are related to people's attitudes toward nuclear power policies? We investigated this question using the JGSS 2012 data in which 52% of people supported the immediate or long-term elimination of all nuclear power (J1202). According to logistic regression analysis, the groups which had a significant amount of people supporting nuclear power elimination included women, university graduates, supporters of the parties outside of the Liberal Democratic Party and the Democratic Party of Japan, and those who

believe there is a high risk of an earthquake occurring (Table 2 in the Appendix). Conversely, groups which had significantly fewer people who supported nuclear power elimination included men, those in their 20s and 30s, Kinki residents, supporters of the Liberal Democratic Party, and people employed outside of the agriculture, forestry, and fishing industries. In addition, the effect of the interaction between the perception of risk toward earthquakes and the geographical distance from nuclear power facilities are significant. Figure 6 shows the estimated values of the effect of interaction calculated from Table 2. Supporting the total elimination of nuclear reactors slightly increases the closer someone lives to a nuclear facility for people who feel an earthquake which would cause a large-scale disaster will occur in their region. Meanwhile, the awareness of supporting total elimination of nuclear reactors decreases the closer someone lives to a nuclear facility for people who have a low perception of risk toward an earthquake occurring.

Figure 6

*Interaction Effect between Distance from Nuclear Power Facilities and Perception of Risk towards Earthquakes in regards to the Total Elimination of Nuclear Reactors*



Opposition to nuclear power is strong for women and weak for young men and supporters of the Liberal Democratic Party. These findings are consistent with the results from surveys conducted after Chernobyl (Asahi Shimbun August 29, 1986). The National Institute for Environmental Studies (2013) asked, "To what degree do you think there will be health impacts from the dispersing of radioactive materials from the nuclear accident caused by the Great East Japan Earthquake on future generations such as your children's or grandchildren's generations?" 2 years after the earthquake. Fifty percent of Japanese people believed it will have a significant impact and 40% said it will have a slight impact with less than 1% saying it will have no impact. A higher percentage of women said this will have an impact than men.<sup>8</sup>

The amount of opinions supporting the elimination of nuclear reactors tends to be high in the 3 prefectures afflicted by the disaster but it is significantly low among residents of the Kinki region where dependency on nuclear power generation is strong. The percentage of nuclear power which accounts for all electric sources was highest in the Kansai Electric Power Co. at around 48%. It was around 27% for Tokyo Electric Power Co. and 16% for Tohoku Electric Power Co. in 2010 when nuclear power was in normal operation.<sup>9</sup>

Nuclear power has been supposedly a low-cost power source (Agency for Natural Resources and Energy 2010:123). However, reparations from the nuclear accident are naturally not often included in these calculations along with other costs including elimination and dismantling of nuclear reactor costs, disposal costs for high level radiation, contributions to the community, and contributions to the community paid out through taxes. It is unclear what the total cost would be and when it could be calculated. There is an argument that the lowering of the ratio of nuclear power generation usage caused electric

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<sup>8</sup> Investigations on risk trade-off regarding climate change risk and energy choices at the 26th Assembly of the Society for Risk Analysis, Japan, Midori Aoyagi, 2013

<sup>9</sup> These numbers are from the home pages of each electric company. These also include the amount of electricity received from other companies.

fees to rise, which in turn caused Japan's industrial competitiveness to decrease after the earthquake. Looking at the impact on industry by occupation in Table 2, there are currently significantly fewer workers in all industries (including public servants but excluding people in the agricultural, forestry, and fishing industries) who support the elimination of nuclear reactors when compared to unemployed people 1 year after the earthquake.

Resources and occupational opportunities brought to local areas by nuclear power plants complicate people's awareness toward nuclear power policies. As shown in Section 2, the closer people live to a nuclear power facility, the higher their perception of risk of a large scale nuclear accident occurring which requires evacuation for people who live within 70km of a nuclear power facility. Despite this, the closer people live to a nuclear facility, the less likely they are to support the elimination of nuclear reactors and the further away they live, the more likely they are to support the elimination of nuclear reactors for those who have a low perception of risk toward an earthquake occurring. Someone who lives close to a nuclear facility and has a perception of risk toward a nuclear accident occurring may take into consideration grants from the government, contributions from related companies, and the stable employment brought to their area from being located close to a nuclear power facility. It may be difficult for these people to support the elimination of nuclear reactors.

### **Conclusions**

The Great East Japan Earthquake and the Fukushima Daiichi nuclear accident caused the significant transition in people's awareness toward the risks of a disaster and nuclear policies. Not only did Japanese people change their awareness but they also changed their behaviors. After the nuclear accident, energy saving activities were demanded due to the shutdown of nuclear power plants. Most Japanese people were diligent in turning off electric items. Eighty-nine percent of people were doing so in 2008 (J0810) and 90% in 2012 (J1202). After the earthquake, people took up initiatives to decrease electricity consumption such as using less lighting, raising the cooling temperature, making use of the

shade, using fans instead of AC, and lowering the heating temperature. Seventy-six percent of people made some kind of effort, and their practices were found to relate to their attitudes on nuclear policies. The frequency of turning off electric items diligently or making energy saving efforts is higher in people who support the elimination of nuclear power when compared to people who supported an increase in nuclear reactors and people who supported maintaining the current conditions.<sup>10</sup>

The demand for electrical power was 906.4 billion kWh in 2010 but it decreased 5.1% in 2011, another 1.0% in 2012, 0.4% in 2013 and 3.0% in 2014 to bring it to 823.0 billion kWh.<sup>11</sup> Both household use and commercial use has decreased. While eight out of ten power companies have increased electricity prices from 2012-2014, one of the many factors that brought about a decrease in the demand for electric power may be a statement by the people concerning the future of nuclear policies.

The Ministry of Economy, Trade and Industry proposed an optimal energy mix for 2030 on April 28, 2015.<sup>12</sup> The mix consists of 56% from thermal power, 20-22% from nuclear power, and 22-24% from renewable energy. It consisted of 88%, 1%, and 11% in 2013. The current heavy dependence on thermal power makes it difficult to reduce Japan's greenhouse gas emissions.

This paper showed that the Fukushima Daiichi nuclear accident widened the awareness gap between specialists and ordinary people on nuclear power policies. The Subcommittee of the Sociology Committee in the Science Council of Japan compiled a

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<sup>10</sup> [http://jgss.daishodai.ac.jp/research/news/news\\_J12-2.pdf](http://jgss.daishodai.ac.jp/research/news/news_J12-2.pdf)

<sup>11</sup> <http://www.fepec.or.jp/library/data/demand/2014.html>

<sup>12</sup> At the 8th meeting of the Long-term Prospect of Supply and Demand of Energy Subcommittee of the Advisory Committee on Natural Resources and Energy.  
[http://www.enecho.meti.go.jp/committee/council/basic\\_policy\\_subcommittee/mitoshi/008/pdf/008\\_07.pdf](http://www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/mitoshi/008/pdf/008_07.pdf)

recommendation in June 2013.<sup>13</sup> It points out that the most serious problem caused by the Tokyo Electric Power Company's Fukushima Daiichi nuclear accident was that this accident caused the people to lose trust in science and the long-term policy formation by the government. The Follow-up Exploratory Committee on Disposal of High-level Radioactive Waste in the Science Council of Japan compiled a recommendation in April 2014.<sup>14</sup> It points out the importance of regaining the trust of the public that scientists, electric power companies, and the government can solve the issue of the disposal of high-level radioactive waste. It also states that re-opening nuclear power plants without making a clear plan for provisional storage of high-level radioactive waste is irresponsible because it shifts the responsibility to future generations.

Sociology through its knowledge and methods can be used to support a path toward restoring people's trust in science. Actions involving understanding public opinion, searching for why these opinions are formed, and continuously presenting ideas as policy proposal materials are one major contribution that sociology is capable of doing. When people try to recover from an event that has never occurred in human history, it is not only vital to understand the awareness and conditions in which the afflicted people have been placed in but also to consider the involvement between resource redistribution and energy policy.

From a perspective of opinion research, the continuity of survey questions and data publication are strongly desired. A slight change in the way the questions are written or the response options influences the response distribution. Making survey data from the press available to researchers could enable secondary data analysis and the re-examination of the reports.

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<sup>13</sup> Subcommittee to Find a Path Toward Understanding the Damage From the Great East Japan Earthquake and the Reconstruction of Japanese Society. <http://www.scj.go.jp/ja/info/kohyo/pdf/kohyo-22-t174-1.pdf>

<sup>14</sup> <http://www.scj.go.jp/ja/info/kohyo/pdf/kohyo-23-t212-1.pdf>

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Originally published in the June 2012 issue of *Hoso Kenkyu to Chouse* [the NHK monthly report on Broadcast Research].

## Appendix

Table 1

*The List of Disaster surveys for Prevention and the Use of Nuclear Power*

| Survey Title   | Abbrev. Survey Title   | Fieldwork Date | Publication Date (Newspapers only) | Survey/Sampling Methods | N                                    | Response Rate |     |
|--|--|----------------|------------------------------------|-------------------------|--------------------------------------|---------------|-----|
| <b>Surveys on Disaster Prevention</b>                              |  |                |                                    |                         |                                      |               |     |
| Cabinet Office <sup>1)</sup>                                       | Public Opinion Survey (POS) on Fire Prevention and Earthquake  | C7810          | 1978/10                            | —                       | Interview/<br>2-stage <sup>11)</sup> | 2456          | 82% |
|  | POS on Disaster Prevention   | C8211          | 1982/11                            | —                       |                                      | 2442          | 81% |
|  | POS on Disaster Prevention <sup>3)</sup>   | C9509          | 1995/9                             | —                       |                                      | 7232          | 72% |
|  | Special POS on Countermeasures Against Earthquake Disaster   | C0508          | 2005/8                             | —                       |                                      | 1863          | 62% |
| <b>Surveys on Disaster Prevention and the Use of Nuclear Power</b> |  |                |                                    |                         |                                      |               |     |
| Cabinet Office <sup>1)</sup>                                       | POS on Energy and Resource Saving  |                | 1978/2                             | —                       | Interview/<br>2-stage                | 8032          | 80% |
|  | POS on Energy Saving   |                | 1980/11                            | —                       |                                      | 4113          | 82% |
|  | POS on Energy Saving   |                | 1981/11                            | —                       |                                      | 4007          | 80% |
|  | POS on Nuclear Power   |                | 1984/3                             | —                       |                                      | 2252          | 75% |
|  | POS on Nuclear Power   |                | 1987/8                             | —                       |                                      | 2370          | 79% |
|  | POS on Nuclear Power   |                | 1990/9                             | —                       |                                      | 3751          | 75% |
|  | POS on Energy  | C9902          | 1999/2                             | —                       |                                      | 2125          | 71% |
|  | POS on Energy  |                | 2005/12                            | —                       |                                      | 1712          | 57% |
| National Institute for Environmental Studies                       | Special POS on Nuclear Power   | C0910          | 2009/10                            | —                       |                                      | 1850          | 62% |
|  | POS on Lifestyle <sup>4)</sup>   | E1302          | 2013/2                             | —                       | Interview/<br>2-stage                | 1121          | 37% |
| Atomic Energy Society of Japan <sup>2)</sup>                       | 1st Survey for Members of the Atomic Energy Society of Japan on Energy and Nuclear Power (Survey for AESJ Members) <sup>5)</sup> | —              | 2007/1                             | —                       | Mailing/<br>Random                   | 559           | 40% |
|  | 1st Survey for Residents in the Greater Tokyo on Energy and Nuclear Power (Survey for Tokyo Residents) <sup>6)</sup>             |                | 2007/5                             | —                       | Placement/<br>Quota                  | 500           | —   |
|  | 2nd Survey for AESJ Members <sup>5)</sup>  | —              | 2008/1                             | —                       | Mail/Random                          | 591           | 42% |
|  | 2nd Survey for Tokyo Residents <sup>6)</sup>   | —              | 2008/12                            | —                       | Place/Quota                          | 500           | —   |
|  | 3rd Survey for AESJ Members <sup>5)</sup>  | —              | 2008/12                            | —                       | Mail/Random                          | 611           | 44% |
|  | 3rd Survey for Tokyo Residents <sup>6)</sup>   | —              | 2010/1                             | —                       | Place/Quota                          | 500           | —   |
|  | 4th Survey for AESJ Members <sup>5)</sup>  | —              | 2010/1                             | —                       | Mail/Random                          | 625           | 45% |
|  | 4th Survey for Tokyo Residents <sup>6)</sup>   | AE1101         | 2011/1                             | —                       | Place/Quota                          | 500           | —   |
|  | 5th Survey for AESJ Members <sup>5)</sup>  | AE1101         | 2011/1                             | —                       | Mail/Random                          | 624           | 45% |
|  | 5th Survey for Tokyo Residents <sup>6)</sup>   | —              | 2012/1                             | —                       | Place/Quota                          | 500           | —   |
| Japan Atomic Energy Relations Organization                         | 6th Survey for AESJ Members <sup>5)</sup>  | —              | 2012/1                             | —                       | Mail/Random                          | 611           | 44% |
|  | 6th Survey for Tokyo Residents <sup>6)</sup>   | —              | 2013/1                             | —                       | Place/Quota                          | 500           | —   |
|  | 7th survey for AESJ Members <sup>5)</sup>  | —              | 2013/1                             | —                       | Mail/Random                          | 559           | 40% |
|  | 7th Survey for Tokyo Residents <sup>6)</sup>   | —              | 2014/1                             | —                       | Place/Quota                          | 500           | —   |
|  | 8th survey for AESJ Members <sup>5)</sup>  | —              | 2014/1                             | —                       | Mail/Random                          | 558           | 40% |
|  | 4th POS on Peaceful Usage of Atomic Energy <sup>7)</sup>   | R1009          | 2010/9                             | —                       | Placement/<br>Quota                  | 1200          | —   |
|  | 5th POS on Peaceful Usage of Atomic Energy <sup>7)</sup>   | R1111          | 2011/11                            | —                       |                                      | 1200          | —   |
|  | 6th POS on Peaceful Usage of Atomic Energy <sup>7)</sup>   |                | 2012/10                            | —                       |                                      | 1200          | —   |
| 7th POS on Peaceful Usage of Atomic Energy <sup>7)</sup>           | R1311  | 2013/11        | —                                  | 1200                    |                                      | —             |     |
| 8th POS on Peaceful Usage of Atomic Energy <sup>7)</sup>           |  | 2014/10        | —                                  |                         | 1200                                 | —             |     |
| <b>Major Media</b>   |  |                |                                    |                         |                                      |               |     |
| The Asahi Shimbun (newspaper)                                      | Regular Public Opinion Poll  | A1104          | 2011/4                             | 4/18                    | RDD                                  | 1999          | 60% |
|  | International Public Opinion Survey Conducted by Seven Countries   |                | 2011/5                             | 5/27                    | RDD                                  | 2059          | 60% |
|  | Regular Public Opinion Poll  | A1108          | 2011/8                             | 8/8                     | RDD                                  | 1806          | 55% |
|  | Public Opinion Survey by Mailing   |                | 2012/8                             | 9/24                    | Mail/2-stage                         | 2178          | 73% |
|  | Joint POS conducted with Fukushima TV <sup>8)</sup>  | A1403          | 2014/3                             | 3/4                     | RDD                                  | 1000          | 54% |

Table 1

The List of Disaster surveys for Prevention and the Use of Nuclear Power (Contd.)

|  |  |  |         |        |  |                       |                  |
|--|--|--|---------|--------|--|-----------------------|------------------|
| The Yomiuri Shinbun<br>(newspaper)                         | Nationwide Public Opinion Survey                               |  | 2011/4  | 4/4    | RDD                                    | 1036                  | 62%              |
|  | Nationwide Public Opinion Survey                               |  | 2011/5  | 5/16   | RDD                                    | 1073                  | 62%              |
|  | Nationwide Public Opinion Survey                               |  | 2011/6  | 7/4    | RDD                                    | 1057                  | 60%              |
|  | Nationwide Public Opinion Survey                               |  | 2011/7  | 7/4    | RDD                                    | 1068                  | 62%              |
|  | Nationwide Public Opinion Survey                               |  | 2011/8  | 8/8    | RDD                                    | 1059                  | 63%              |
|  | Urgent Nationwide Public Opinion Survey                        |  | 2011/8  | 8/29   | RDD                                    | 1055                  | 62%              |
|  | POS 6 Months after the Great East Japan Earthquake Disaster    | Y1109  | 2011/9  | 9/10   | Interview/<br>2-stage                  | 1673                  | 56%              |
|  | Joint POS with China and South Korea                           | Y1110  | 2011/10 | 11/12  | RDD                                    | 1005                  | 55%              |
|  | Japan-U.S. Joint POS   |  | 2011/12 | 12/18  | RDD                                    | 1023                  | M49%:F51%        |
|  | POS 1 Year after the Great East Japan Earthquake Disaster      | Y1202  | 2012/2  | 3/3    | Interview/2-<br>stage                  | 1661                  | 55%              |
|  | Japan-U.S. Joint POS   |  | 2013/1  | 2/15   | RDD                                    | 1001                  | M48%:F52%        |
|  | POS 2 Year after the Great East Japan Earthquake Disaster      |  | 2013/2  | 3/4    | Interview/2-<br>stage                  | 1455                  | 49%              |
|  | Japan-U.S. Joint POS   |  | 2013/11 | 12/16  | RDD                                    | 1004                  | M47%:F53%        |
|  | Yomiuri-Waseda University Joint POS                            |  | 2014/1  | 3/22   | Mailing/2-<br>stage                    | 1997                  | 67%              |
|  | The Nikkei<br>(newspaper)                                      | POS 3 Years after the Great East Japan Earthquake Disaster | Y1402   | 2014/2 | 3/7                                    | Interview/2-<br>stage | 1512             |
| POS 4 Years after the Great East Japan Earthquake Disaster |  | Y1501  | 2015/1  | 3/8    | Mailing/2-<br>stage                    | 1927                  | 64%              |
| Nikkei-TV Tokyo Joint POS                                  |  |  | 2011/5  | 5/30   | RDD                                    | 898                   | 59%              |
| Nikkei-TV Tokyo Joint POS                                  |  |  | 2011/6  | 6/27   | RDD                                    | 893                   | 60%              |
| Nikkei-TV Tokyo Joint POS                                  |  |  | 2011/7  | 8/1    | RDD                                    | 914                   | 61%              |
| The Mainichi Shinbun                                       | Nikkei-TV Tokyo Joint POS                                      | N1503  | 2011/9  | 10/3   | RDD                                    | 930                   | 65%              |
|  | Nikkei-TV Tokyo Joint POS                                      |  | 2015/3  | 3/22   | RDD                                    | 1043                  | 70%              |
| The Sankei Shinbun   | Nationwide POS   | M1309  | 2013/9  | 9/15   | RDD                                    | 950                   | 61%              |
| NHK (TV)   | Sankei-Fuji News Network Joint POS                             | S1309  | 2013/9  | 9/16   | RDD                                    | 1000                  | — <sup>12)</sup> |
|  | POS on Nuclear Power and Energy                                |  | 2011/06 | —      | RDD                                    | 1813                  | 68%              |
|  | POS on Nuclear Power and Energy                                |  | 2011/08 | —      | RDD                                    | 1589                  | 66%              |
|  | POS on Nuclear Power and Energy                                |  | 2011/10 | —      | RDD                                    | 1775                  | 68%              |
|  | POS on Disaster Prevention, Energy and Living <sup>9)</sup>    |  | 2011/12 | —      | Placement/<br>2-stage                  | 2579                  | 72%              |
|  | POS on Nuclear Power and Energy                                |  | 2012/03 | —      | RDD                                    | 1585                  | 61%              |
|  | POS on Nuclear Power and Energy                                |  | 2013/03 | —      | RDD                                    | 1655                  | 65%              |
|  | POS on Disaster Prevention and Energy <sup>9)</sup>            | NHK1311  | 2013/11 | —      | Placement/<br>2-stage                  | 2459                  | 68%              |
| NNN (TV)   | POS on the Sendai Nuclear Plant and Engery                     | NHK1410  | 2014/10 | —      | RDD                                    | 1001                  | 66%              |
|  | POS  | NNN1309  | 2013/9  | 9/15   | RDD                                    | 1039                  | 51%              |
| JGSS Research Center                                       | Japanese General Social Survey (questionnaireA) <sup>10)</sup> | J0810  | 2008/10 | —      | Interview and<br>Placement/<br>2-stage | 2060                  | 58%              |
|  | Japanese General Social Survey (questionnaireB) <sup>10)</sup> | J1002  | 2010/2  | —      |  | 2496                  | 62%              |
|  | Japanese General Social Survey (questionnaireA) <sup>10)</sup> | J1202  | 2012/2  | —      |  | 2332                  | 59%              |
|  | Japanese General Social Survey (questionnaireB) <sup>10)</sup> | J1202  | 2012/2  | —      |  | 2335                  | 59%              |

1) Public opinion survey taken by Cabinet Office: <http://survey.gov-online.go.jp/index.html>.

2) Atomic Energy Society of Japan: <http://www.ponpo.jp/DMWG/>.

3) Target respondents were men and women aged 15 or older.

4) Target respondents were men and women 20-79 years of age.

5) Target respondents were members of Atomic Energy Society of Japan.

6) Target respondents were men and women living within 30km from Tokyo in radius.

7) Target respondents were men and women 15-79 years of age.

8) Target respondents were men and women aged 20 or older living in Fukushima Prefecture.

9) Target respondents were men and women aged 16 or older.

10) Target respondents were men and women 20-89 years of age.

※except 3) to 10), target respondents were men and women aged 20 or older (voting age).

11) Two-stage stratified random sampling.

12) Number of attacks was not open to the public.

Table 2

*Causal factor affecting the opinion of supporting immediate or long-term elimination of nuclear reactors*

|                                     |   | <i>exp(b)</i> |
|-------------------------------------|---|---------------|
| Gender                              | Male  | 0.679 **      |
|                                     | Female                                      | ref.          |
| Age                                 | aged 20-29                                  | 0.402 **      |
|                                     | aged 30-39                                  | 0.624 **      |
|                                     | aged 40-49                                  | 0.868         |
|                                     | aged 50-59                                  | ref.          |
|                                     | aged 60-69                                  | 1.082         |
|                                     | aged 70-79                                  | 0.970         |
|                                     | aged 80 or older                            | 1.011         |
| Education                           | Junior Highschool graduation                | 0.982         |
|                                     | Highschool graduation                       | ref.          |
|                                     | University graduation                       | 1.246 **      |
| Marital status                      | Married                                     | 1.004         |
|                                     | Divorced/widowed                            | 0.730 +       |
|                                     | Unmarried                                   | ref.          |
| Household income level              | 1: Far below average ~ 5: Far above average | 0.987         |
| Region                              | Hokkaido                                    | 1.143         |
|                                     | Aomori/Akita/Yamagata                       | 0.898         |
|                                     | Fukushima/Iwate/Miyagi                      | 1.358 +       |
|                                     | Ibaraki/Chiba                               | 0.877         |
|                                     | Tokyo/Tochigi/Gunma/Saitama/Kanagawa        | 0.904         |
|                                     | Chubu                                       | ref.          |
|                                     | Kinki                                       | 0.732 **      |
|                                     | Chugoku/Shikoku                             | 0.856         |
|                                     | Kyushu/Okinawa                              | 1.072         |
| Political Party support             | Liberal Democratic Party                    | 0.544 **      |
|                                     | Democratic Party of Japan                   | 0.853         |
|                                     | Other party                                 | 1.281 *       |
|                                     | Don't know                                  | 0.855         |
|                                     | There is no particular party I support.     | ref.          |
| Industry of respondent's work place | Agriculture/forestry/fishing                | 1.000         |
|                                     | Manufacturing industry                      | 0.746 *       |
|                                     | Electricity/gas/heat supply/water service   | 0.421 +       |
|                                     | government official                         | 0.627 *       |
|                                     | Other industries                            | 0.811 *       |
|                                     | Unemployed                                  | ref.          |
| Age of youngest child               | 0-6 years old                               | 1.177         |
|                                     | 7-12 years old                              | 1.123         |
|                                     | 13-19 years old                             | 1.036         |
|                                     | 20 years old or older                       | 1.090         |
|                                     | I don't have a child                        | ref.          |
| Distance from the nearest NPP       | (1 unit = 10km)                             | 1.028 *       |
| Percepted risks of earthquakes      | 1: Unlikely ~ 4: Most likely                | 1.254 **      |
| Distance × percepted risks          |   | 0.991 *       |
|                                     | <i>n</i>                                    | 4,411         |
|                                     | <i>Cox &amp; Snell R<sup>2</sup></i>        | 0.056         |
|                                     | <i>Nagelkerke R<sup>2</sup></i>             | 0.074         |

+  $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$

### Biographical Notes

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