# Disaster Evacuation from Japan's 2011 Tsunami Disaster and the Fukushima Nuclear Accident

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## JAPAN'S 2011 DISASTER: RESPONSES TO NATURAL AND INDUSTRIAL CATASTROPHES

The triple disaster that hit the Tohoku region of Japan on 11 March 2011 triggered a massive human displacement: more than 400,000 people evacuated their homes as a gigantic tsunami induced by a magnitude 9.0 earthquake engulfed the coastal areas, and the following nuclear accident in Fukushima released a large amount of radioactive materials into the atmosphere. This study analyses the disaster response, with a particular focus on evacuation of the population, and social consequences of this complex crisis, based on intensive fieldwork carried out one year after the catastrophe. It reveals that the responses of the Japanese authorities and population were significantly different between a natural disaster and an industrial (man-made) accident.

## TWO EVACUATION PATTERNS: RISK PERCEPTION VERSUS VULNERABILITY

Being prone to both earthquakes and tsunamis, Japan had been preparing itself against such risks for many years. A tsunami alert was immediately issued and the population knew how and where to evacuate. In contrast, the evacuation from the nuclear accident was organised in total chaos, as a severe accident or large-scale evacuation had never been envisaged—let alone exercised—before the disaster. The population was thus forced to flee with no information as to the gravity of the accident or radiation risk. In both cases, the risk perception prior to the catastrophe played a key role in determining the vulnerability of the population at the time of the crisis.

## SOCIAL CONSEQUENCES FROM THE DISASTER: DIVIDED COMMUNITIES AND FAMILIES

While tsunami evacuees are struggling with a slow reconstruction process due to financial difficulties, nuclear evacuees are suffering from uncertainty as to their prospect of return. One year after the accident, the Japanese authorities began to encourage nuclear evacuees to return to the areas contaminated by radiation according to a newly established safety standard. This triggered a vivid controversy within the affected communities, creating a rift between those who trust the government's notion of safety and those who do not. The nuclear disaster has thus become a major social disaster in Japan dividing and weakening the affected communities.

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## LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AAR | Association for Aid and Relief |
| ADRA | Adventist Development and Relief Agency |
| ANR | Agence nationale de la recherche (France) |
| FoE | Friends of the Earth |
| ICANPS | Investigation Committee on the Accident at the Fukushima Nuclear Power Stations of Tokyo Electric Power Company (appointed by the Cabinet Office) |
| IIC | Independent Investigation Commission on the Fukushima Nuclear Accident |
| JST | Japan Science and Technology Agency |
| M | Magnitude |
| METI | Ministry of Economy, Trade and Industry |
| MEXT | Ministry of Education, Culture, Sports, Science and Technology |
| MHLW | Ministry of Health, Labour and Welfare |
| NAIIC | Fukushima Nuclear Accident Independent Investigation Commission (appointed by The National Diet) |
| NISA | Nuclear and Industrial Safety Agency (under METI) (replaced by the Nuclear Regulation Authority in September 2012) |
| NGO | Non-governmental organisation |
| NSC | Nuclear Safety Commission (under the Cabinet Office) (integrated into the Nuclear Regulation Authority since September 2012) |
| NUMO | Nuclear Waste Management Organization of Japan |
| OCHA | United Nations Office for the Coordination of Humanitarian Affairs |
| TEPCO | Tokyo Electric Power Company |
| TITech | Tokyo Institute of Technology |
| UNU | United Nations University |

# EXECUTIVE SUMMARY

The triple disaster that hit the Tohoku region of Japan on 11 March 2011 had a profound and transformative effect on Japanese society. Japan is globally known to be one of the countries best prepared for earthquakes and tsunamis, but the earthquake and tsunami that hit the country were far beyond the authorities' expectations. Indeed, this disaster represents the greatest challenge that Japan has faced since the World War II defeat: for the first time, a natural disaster on a massive scale was compounded by one of the worst nuclear disasters in history. The disaster caused nearly 16,000 deaths and displaced hundreds of thousands of people from their homes. One year later, there are still 344,000 evacuees who cannot go back home either because they lost their houses in the earthquake and the tsunami, or because their houses were contaminated by radioactive substances released from the crippled Fukushima nuclear power station.

The *Disaster Evacuation and Risk Perception in Democracies* (DEVAST) project is one of the first international research projects designed to analyse the social and political consequences of this triple disaster. Its aim is to collect immediate, first-hand evidence from the field, which is at risk of disappearing unless documented urgently. To achieve this goal, interviews were conducted in the affected areas from January to June 2012 with evacuees and other stakeholders such as public authorities and aid workers. This study presents the major findings from this fieldwork. It first analyses the disaster response with a special emphasis on the disaster evacuation. Risk perception among the affected communities is then examined in terms of how this perception, prior to the disaster, influenced the actual disaster response and individual decisions to evacuate during the catastrophe, and how it evolved in the aftermath. Then, the paper attempts to identify the major post-disaster challenges that face the affected communities and evacuees and the social and political impacts induced by the disaster that affect Japanese society as a whole. Ultimately, this research attempts to explore how a developed country with democratic institutions deals with disasters and draws lessons from this experience.

### Two displacements

The field research found that the displacements caused by the tsunami and by the nuclear accident had many dissimilar aspects. In particular, the evacuation process, the prospects of return and the related social impacts differ significantly as the displacements were induced by different causes: *one is a natural disaster, while the other is an industrial (man-made) disaster*.

### Evacuation triggered by the tsunami

The evacuation from the tsunami can be characterised as *an evacuation with warning, preparation and knowledge*. Given its geological conditions, Japan has developed an advanced system of disaster prevention and coping mechanisms against earthquakes and tsunamis over the years. The affected communities of Tohoku were particularly aware of the risk, as the region had already undergone many tsunamis, and the lessons from such experiences had been passed down by the older generations. These communities had therefore prepared themselves by building high breakwaters along the coast and creating hazard maps on which expected flood zones were clearly marked out. Disaster drills were also regularly conducted. On the day of the disaster, as early as three minutes after the earthquake, a tsunami alert was issued advising the local population to evacuate. The disaster prevention system against

the tsunami was thus initiated correctly. Yet it was not without limitations in the face of an extreme disaster. Despite its promptness, the tsunami alert lacked gravity in light of the actual threat: this in fact reassured the population instead of sounding the alarm. Some residents who thought that the breakwater was high enough to stop the tsunami decided to stay on the second floor of their house rather than evacuate to higher ground. The research also found that the knowledge and previous experience of tsunamis among the population did not always help save lives during the disaster. The tsunami anecdotes from the older generations embedded in the minds of the local population led people to expect that the maximum height of the tsunami would be six metres, and that the wave would arrive 10–15 minutes after the earthquake. Thus, many were taken by surprise when the tsunami actually arrived: it had a 10–15 metre inundation height and arrived 30–40 minutes after the earthquake. This created many victims among those who had underestimated the height of the tsunami, or assumed that the wave would not come once that 15 minutes had elapsed following the earthquake.

It is commonly assumed that local knowledge and experience are a key factor in reducing the population's vulnerability in the face of disasters. Yet our research found otherwise: in the case of the Japanese disaster, previous experience proved to be the key factor in creating their vulnerability.

### Consequences of the displacement due to the tsunami

One year after the disaster, the issue of resettlement for the tsunami evacuees is a key priority in the affected communities. Consultations between evacuees and local authorities have been organised regularly in order to come up with a resettlement plan that meets the expectations of most evacuees and ensures their safety from another disaster. But this process has reached stalemate due to financial and administrative obstacles. The resettlement scheme has indeed been poorly coordinated and synchronised among the different municipalities, creating disparities in the assistance provided to the evacuees. This has created resentment among the communities that received less financial assistance, with the result that the evacuees refused the resettlement plan initially agreed with the local authorities. With the evacuee resettlement plan at a standstill, the reconstruction of social and economic activities for the whole area has been put on hold or further delayed. Under these circumstances, young people, who are frustrated with the slow reconstruction process and the lack of job opportunities, have begun to leave for the big cities in order to rebuild their lives. Prior to the disaster, Tohoku was already a marginalised region with the chronic problems of a shrinking economy and an aging population. The disaster will simply exacerbate these trends unless acted upon urgently. The affected communities are thus now facing the enormous challenge of accelerating the reconstruction process and at the same time ensuring that the communities are rebuilt in such a way that they will be sustainable both economically and demographically in the future.

### Evacuation triggered by the nuclear accident

By contrast with the evacuation triggered by the tsunami, the evacuation from the nuclear accident can be described as *an evacuation without warning, preparation or knowledge*. The research found that the affected municipalities were not officially informed about the evacuation order issued by the government at the time of the disaster and therefore had no choice but to improvise an evacuation on their own. In addition, an evacuation on this scale had never been envisioned – let alone exercised – prior to the accident. As a result, the evacuation was organised in an *ad hoc* and chaotic manner, leaving the population in great confusion. From the field interviews, it became clear that the local population had indeed never prepared for such a serious accident, as the myth of absolute safety of nuclear installations had been nurtured over the years, leading people to believe that such an accident would never occur. Furthermore, no information on the gravity of the accident was communicated to the residents at the time of their displacement. Thus, the residents were forced to flee without any idea of how long their displacement would last or how far they should go. Nor were evacuees informed about the risk of radiation exposure or instructed on how to protect themselves against irradiation during their flight. The central government later admitted that it had had such information from the outset, but did not disclose it to the public in order to 'avoid panic among the population'.

### Consequences of the displacement due to the nuclear accident

The prospect of return for nuclear evacuees remains uncertain. One year after the accident, the question of return became a highly politicised issue and the authorities have encouraged evacuees to return, while the evacuees themselves remain concerned about the radioactive contamination of their communities and the

effects of radiation on their health. In March 2012, the government proposed a plan to reorganise the evacuation zone according to radiation dose levels, thus creating an area recommended for early return. The field research found that this was done with very little consultation with the affected municipalities or evacuees, which thus caused a division among the displaced communities between those who wished to return and those who hesitated to do so. As the return is regarded as a symbol of community survival and resilience, those who are reluctant, often from fear of radiation effects, are considered selfish and disloyal towards other community members. Similarly, the issue of evacuation is dividing communities affected by the radiation but located outside the evacuation zone in the Fukushima Prefecture. In these communities, the authorities are reassuring residents so that they will stay put, emphasising that it is safe to live in the area despite significantly high radiation levels. In this context, those who voluntarily evacuated by their own means, so-called *self-evacuees*, are regarded as cowardly, selfish or disloyal towards the community to which they belong. The nuclear disaster is also a social disaster creating many tensions and divisions in the affected communities, where those who choose not to follow the policy line set by the authorities are often marginalised. In addition, the information on radioactive contamination and health risks from radiation provided by the authorities is neither forthright nor comprehensive, leaving the evacuees in great confusion and anxiety. Under these circumstances, evacuees continue to suffer from uncertainties about their immediate future and the affected communities are at risk of disintegration. Reconstruction is still a distant prospect for the nuclear evacuees.

## Disasters and democracy

The 11 March disaster induced two patterns of displacement that were highly dissimilar. The disaster response of the authorities in dealing with these evacuations also differed in many ways. Despite the fact that Japan is a developed nation with highly advanced technologies, many vulnerabilities have been revealed in the way the country has dealt with the chain of impacts triggered by the 11 March catastrophe. No evacuation or contingency plans had been prepared for a nuclear accident of such magnitude, while the tsunami was far beyond the authorities' expectations. This leads us to question the common assumption that industrialised democracies are better prepared to deal with disasters.

In the aftermath of the disaster, a key question that arose was whether the disaster, particularly the nuclear accident, was intrinsically Japanese in nature, or whether it could have happened in other countries. Though elements of the Japanese culture and political system indeed played an important role, we believe that no country is immune to such disasters. Advanced democracies are not necessarily more resistant or better prepared than developing countries to deal with such events.

The 11 March disaster shook the very foundation of Japanese society, shattering the idea of a safe and secure society guaranteed by the authorities. The Japanese public has started to question the level of risk that they were willing to accept and the model of society that they had aspired to prior to the disaster. Though Japan certainly has both the technical and financial capacities to rebuild the towns affected by the disaster, the social tensions and divisions created as a result will probably take much longer to heal. The Japanese experience thus offers many unique lessons for other democracies in terms of dealing with future disasters.

# 1. INTRODUCTION

The DEVAST project was designed to analyse the disaster response, the population displacement, and the social consequences of the 2011 Japanese triple disaster. It is a joint research project between French and Japanese research teams financed by the ANR and the JST respectively. The French DEVAST team consists of five researchers in addition to two interns from IDDRI, Sciences Po. The Japanese team comprises three professors and four graduate students from TITech and Waseda University, as well as two post-doctoral fellows from the United Nations University (UNU). The project runs from October 2011 until March 2013.

This study presents the major findings from the field research conducted in Japan as part of this project. The fieldwork was carried out by the IDDRI research team in close cooperation with the Japanese team from January to June 2012. The survey consisted of face-to-face interviews with evacuees, affected municipalities and other stakeholders such as government officials and aid workers. Secondary data were also collected during this period to complement the information gathered from the field interviews.

The paper is organised in six sections. Following the introduction and methodology (Sections 1 and 2), Section 3 analyses the disaster response to the tsunami, examining how the authorities and population reacted to the disaster and, in particular, how the evacuation was organised. This section then shifts its focus to the affected communities' perception of risk: the extent to which the risk perception prior to the disaster influenced the disaster preparedness as well as individual decisions to evacuate during the crisis, and how this perception evolved after the event. The prospect of resettlement or return for the evacuees is also closely analysed to illustrate the challenges facing the affected communities one year after the disaster. Finally, the section attempts to identify major social consequences induced by the disaster. Section 4 examines the case of the Fukushima nuclear accident from the same angles of analysis. Lastly, Section 5 makes a comparative analysis of the characteristics of both displacements. The conclusion in Section 6 provides a summary of these analyses and some lessons learnt from the Japanese disaster in the nexus between disasters and democracy.

# 2. METHODOLOGY

The research involved collecting primary data (field interviews) and analysing secondary data (media reports, government documents, opinion surveys and scientific papers) available in three languages (Japanese, English and French).

### Interview method

In order to collect the primary data, semi-structured interviews were conducted with evacuees and municipalities, while unstructured interviews were organised with government officials, aid workers from non-governmental organisations (NGOs) and other researchers. Three questionnaires, with 40 to 60 questions each, were prepared and used to interview different target groups: evacuees, self-evacuees[1] and municipalities (see Appendices 1–3). The interviews were organised so that the interviewees could feel free to elaborate and express themselves on certain subjects, which enabled the interviewers

1 During this study, 'self-evacuees' refer to those displaced due to the Fukushima nuclear accident, who decided to flee voluntarily for fear of radiation effects, as opposed to 'evacuees' who were displaced on the government's order.

to interact and ask the interviewees additional questions when required. Thus, the questionnaires were used more as a guiding tool for the interviewers, with key questions being systematically asked while other questions were asked when time allowed. The interviews with government officials, NGOs and other researchers were conducted without questionnaires, which enabled the IDDRI research team to discuss in depth and exchange views on the research topic. As a result, the interviews carried out during this fieldwork were of a qualitative rather than quantitative nature. In order to supplement the quantitative aspect of our research, evacuee surveys conducted by other researchers (Imai and Tanba[2]) and public authorities (NAIIC and Naraha Town[3]) were also drawn on and analysed in this study.

One of the major difficulties in interviewing the displaced population is that it is difficult to ask what happened during the disaster as they are often deeply traumatised by the event: they had lost their family members, close friends or their homes. In view of the circumstances, the research team paid particular attention to creating an atmosphere that allowed a certain level of confidence to become established between the interviewer and interviewee, so that the interviewee felt at ease to tell his/her story. For this purpose, each interview was organised with an ample time frame, averaging from two to three hours. This meant that only two interviews were held per day (with some exceptions): one in the morning and the other in the afternoon. In order to increase the number of interviewees and thus obtain more robust results, interviews were also conducted with more than one interviewee at a time. The group interview with more than five interviewees was organised on two occasions. A group interview of ten tsunami evacuees from Ofunato City was organised in April 2012 and a group of five nuclear evacuees from Futaba town was conducted in June. In total, 66 interviews were conducted during the field research, while the total number of interviewees reached 106. Thus, the average number of interviewees for each interview was 1.6 persons.

### Selection and profiles of interviewees

The IDDRI research team interviewed a total of 106 persons, including 66 evacuees, 13 municipal officers, 11 aid workers, 7 residents and other non-evacuees of the affected towns, 7 researchers/academics and 2 government officials. Out of the total 106 interviewees, 49 persons were involved in the tsunami evacuation and 57 persons in the nuclear evacuation. Among the 66 evacuees interviewed, 37 were displaced because of the tsunami ('tsunami evacuees') and 29 due to the nuclear accident ('nuclear evacuees'). Among the 29 nuclear evacuees, 4 persons are self-evacuees who decided to evacuate on their own initiative from fear of radiation effects, and the other 25 persons are evacuees from the official evacuation zones. Table 1 shows the total number of interviewees according to the different categories. It is important to note that the name of towns and cities listed in the table are the places where the interviewees are originally from and do not always indicate the places where the interviews were held. For tsunami evacuees, the interviews were conducted in their towns of origin as they had often been displaced within their hometown. On the other hand, nuclear evacuees had been forced to leave their hometowns in order to avoid radiation effects and the interviews were thus conducted in their places of refuge, which were often scattered and far from their hometown. The names of cities and towns listed in Table 1 for nuclear evacuees and municipalities thus refer to the origin of the interviewees and not the location of interviews.

Figures 1 and 2 indicate the age and gender distribution of the evacuees interviewed during the field research. Figure 2 shows that the majority of interviewees (67%) were female. This is mainly due to the fact that in the traditional communities of the Tohoku region women tend to be available during the day for interviews as they stay at home while their husbands go out to work.

The research team used the following ways to find and select the evacuees for interviews. First, the team approached each municipal office and asked them to identify possible candidates for interviews. The evacuees they proposed were often the representatives of evacuee communities or the community service officers who were

2 Professor Akira Imai from Fukushima University conducted a panel survey among the nuclear evacuees in which the same questions were asked to the same interviewees over time, thus allowing an analysis of how their opinions evolved. The first survey was conducted three months after the accident in June 2011, while the second was six months later in September 2011 and the third 12 months after in February 2012 (Imai, 2011a; 2011c; 2012). In the survey, 300–400 evacuees were interviewed either face-to-face or by telephone. Associate Professor Fuminori Tanba from Fukushima University conducted a survey among the nuclear evacuees from eight affected municipalities between September and October 2011 (Tanba, 2011). A total of 13,576 evacuees responded to the questionnaires sent by post.

3 NAIIC is the Fukushima Nuclear Accident Independent Investigation Commission created by the National Diet of Japan in order to investigate the cause of the accident and make policy recommendations. It produced a final report in July 2012 (NAIIC, 2012). Naraha town commissioned Associate Professor Ryusuke Takaki of Iwaki Meisei University in Fukushima Prefecture to conduct a resident survey in February 2012 (Takaki, 2012).

**Table 1.** Number of persons interviewed

| Interviewee | Tsunami | | Nuclear Accident | |
|---|---|---|---|---|
| Central government | 0 | | 2 | 1: Ministry of Economy, Trade and Industry (METI)<br>1:Reconstruction Agency |
| Local government (Municipalities) | 4 | 2: Ishinomaki City<br>1: Ofunato City<br>1: Rikuzentakada City | 9 | 3: Naraha town<br>2: Minami-Soma City<br>2: Futaba town<br>2: Iwaki City |
| Evacuees | 37 | 28: Ofunato City<br>4: Ishinomaki City<br>2: Rikuzentakata City<br>3: Iwaki City | 29 | 11: Naraha town<br>7: Futaba town<br>2: Minami-Soma City<br>2: Iwaki City (Hisanohama District)<br>1: Namie town<br>1: Okuma town<br>1: Tomioka town<br>2: Fukushima City<br>2: Koriyama City |
| NGOs | 4 | 1: Child Fund Japan<br>1: Peace Winds Japan<br>1: Peace Boat[1]<br>1: Platform Japan | 7 | 3: AAR[2]<br>2: Fukushima CRMS[3]<br>1: Kodomo Fukushima[4]<br>1: ADRA[5] |
| Academics | 3 | 1: Aoyama Gakuin University (at the time)<br>1: California Institute for Technology<br>1: Kyoto University | 4 | 3: Fukushima University<br>1: Tohoku University |
| Affected residents (and other non-evacuees) | 1 | 1: Rikuzentakada City | 6 | 4: Iwaki City<br>1: Gumma City<br>1: Fukushima City |
| TOTAL | 49 | | 57 | |
| **GRAND TOTAL** | **106** | | | |

**Figure 1.** Age of evacuees interviewed

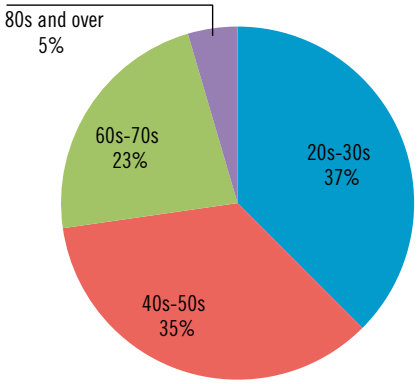
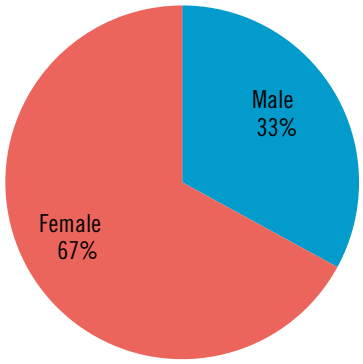



**Figure 2.** Gender of evacuees interviewed



evacuees themselves but temporarily employed by the municipality to assist evacuees living in temporary shelters. Secondly, we asked NGOs assisting evacuees in the field to introduce us to some of their beneficiaries or their local contacts. Lastly, the team met evacuees through the personal contacts that the researchers had established prior to the project implementation. For example, a member of the IDDRI research team had made many contacts when she worked as a volunteer in one of temporary shelters in Ofunato City. Many evacuees in this shelter agreed to be interviewed and introduced us to other evacuees willing to be interviewed. Finding evacuees through these three different channels enabled the team to gather diverse opinions on the questions asked and thus obtain a balanced and representative view of the evacuees.

### Participation in meetings and seminars on voluntary evacuation

In addition to interviews, the IDDRI research team attended seminars and meetings organised by civil associations in order to collect more information and stories on the evacuation triggered by the nuclear disaster (the list of these seminars is attached in Appendix 4). The team attended a seminar in May 2012 in Tokyo organised by 'Fukushima hinan boshi no kai in Kanto' (the Association for Fukushima Evacuee Mothers & Children in Kanto[4]), during which a self-evacuee from Otama village, Fukushima Prefecture, presented her story of evacuation. Another workshop was organised in June 2012 by '3.11iko no kosodate wo kangaeru kai' (the Association to Consider Child-Rearing since 3.11 in Tokyo[5]), where a self-evacuee from Koriyama City, Fukushima Prefecture, told her evacuation story and a member of the civil association, Kodomo Fukushima, presented the situation of radioactive contamination and the difficulties that the residents face in Fukushima City. In addition to the seminars, a research member attended, as an observer, two meetings organised by a member of Kodomo Fukushima in Kyoto City, both of which were closed to the public. These were consultation meetings between a member of the Fukushima prefectural assembly and the evacuees from Fukushima Prefecture, during which the evacuees' grievances were presented to the member of the prefectural assembly. In total, 19 evacuees were present at the meetings, including 16 self-evacuees and 3 evacuees from the official evacuation zone. The stories collected at these meetings and workshops were extremely valuable for the field research with respect to understanding and analysing the phenomenon of voluntary evacuation, since it was very difficult for the research team to establish individual contacts with self-evacuees given that these people were dispersed throughout Japan and the municipalities did not have much information about them.

### Selection of target cities/towns for interviews

Table 2 lists the target municipalities for interviews. The target cities for the tsunami evacuation were selected according to the scale of damage or the contacts that the research team had already established prior to the field research. Ishinomaki City is the municipality that had the highest number of deaths due to the 11 March tsunami (3,471[6]), while Rikuzentakata City had one of the worst mortality rates compared to total population (7.63%[7]). Moreover, the Japanese DEVAST team had already visited Ishinomaki City before the arrival of the French team and already established contacts within the municipality, which facilitated our interviews. Ofunato City was selected due to the number of contacts that one of the IDDRI research team had already made through her previous volunteer activities. Iwaki City was chosen because it was affected both by the tsunami and the nuclear accident and is also the city that hosts a large number of evacuees from the evacuation zone due to its proximity to the zone.

As regards nuclear evacuation, the target municipalities for interviews were selected on the basis of their relationship with the crippled nuclear power station, the accessibility to the evacuees' place of refuge or the contacts that the research team had already established. Futaba town was selected because it is one of the two towns that host the crippled Fukushima Daiichi (No.1) nuclear power plant.[8] In addition, most of the Futaba residents evacuated to Iwaki City, which has relatively lower airborne radiation levels compared to other cities within Fukushima Prefecture and it was thus easier for the research team to visit this

4 Author's translation.

5 Author's translation.

6 Source: Miyagi prefectural government (http://www.pref.miyagi.jp/kikitaisaku/higasinihondaisinsai/pdf/09071600.pdf) (in Japanese)

7 Source: Iwate prefectural government (http://www.pref.iwate.jp/~bousai/taioujoukyou/20120905170 0jintekihigai.pdf) (in Japanese); The Statistics Bureau of the Ministry of Internal Affairs and Communications (http://www.e-stat.go.jp/estat/html/NewList/000001039448/NewList-000001039448.html) (in Japanese)

8 The Fukushima Daiichi (No.1) nuclear power plant is located on the border between Futaba town and Okuma town.

location. Moreover, the Futaba municipal office was relocated to Kazo City, Saitama Prefecture, which is very near to Tokyo and thus more easily accessible to the research team.[9] Naraha town was chosen because it is one of the two towns that host the Fukushima Daini (No.2) nuclear power plant,[10] which is situated 10 km south of No.1 station. The Naraha municipal office and most of its residents evacuated to Iwaki City, which facilitated our visit. Minami-Soma City was selected because of its particular situation as a nuclear community, as well as due to the contacts that had already been established by the Japanese DEVAST team. Minami-Soma City is located at 20–30 km north of No.1 station. Only one part of the city was included in the official evacuation zone. As a result, the municipal office stayed in the city while most of its residents evacuated either voluntarily or following evacuation orders. One year after the disaster, the city was trying to facilitate the return of its residents despite the high airborne radiation levels. The fourth target city, Iwaki City, is situated 30–40 km south of No.1 station. One part of the city was declared by the government as a zone for shelter indoors. This caused many residents from the other parts of the city to flee for fear of radiation effects despite reassurance from the city authorities and the government. The city was selected for the research due to its relatively low radioactive contamination compared to other cities in Fukushima, thus making it easier for the researchers to visit. In addition, it is the city that hosts the highest number of evacuees from the evacuation zone (23,000[11]) and tensions have arisen between the residents and the evacuees. In summary, the target cities include two towns hosting the nuclear power plants (one of which hosts the crippled nuclear power plant) and two others without the plants but heavily affected.

**Table 2.** Target municipalities for interviews

| | Tsunami | Nuclear |
|---|---|---|
| Municipality | Ishinomaki City<br>Rikuzentakada City<br>Oofunato City<br>Iwaki City | Futaba town<br>Naraha town<br>Minamisoma City<br>Iwaki City |

### Interviews for the tsunami disaster

In addition to the affected municipalities and evacuees, the research team conducted interviews with NGO workers, researchers/academics, and residents (non-evacuees) of the affected towns in order to collect more objective analyses and facts from third parties. Four NGOs were contacted: Peace Winds Japan, Child Fund Japan, Peace Boat Disaster Relief Volunteers Centre (PBV), and Platform Japan, all of which provide assistance to the municipalities and evacuees affected by the earthquake and the tsunami. Three professors were also interviewed for an exchange of views: Professor Toshiya Tsukamoto in Aoyama Gakuin University (at the time), Professor Haruo Hayashi in Kyoto University, and Emeritus Professor Hiroo Kanamori of California Institute of Technology. One resident of Rikuzentakada City who was not an evacuee but part of the volunteer fire brigade for search and rescue operations was also interviewed to gather complementary information on what happened at the time of the disaster.

### Interviews for the nuclear disaster

In addition to the affected municipalities and evacuees, two government officials were interviewed: one from the Ministry of Economy, Trade and Industry (METI) and the other from the Reconstruction Agency.[12] As for NGOs, four organisations were contacted: the Fukushima Network of Parents to Protect Children from Radiation (Kodomo Fukushima) and the Citizens' Radioactivity Measuring Station (CRMS), both based in Fukushima City, and the Association for Aid and Relief (AAR) and the Adventist Development and Relief Agency (ADRA) based in Tokyo. The first two NGOs are local associations created by the Fukushima residents after the disaster while the latter two are international NGOs that usually provide assistance abroad. Four professors who have conducted research on nuclear evacuation were also interviewed: Professor Akira Imai, Associate Professor Fuminori Tanba and Associate Professor Hazuki Ishida from Fukushima University and Associate Professor Yuzuru Isoda from Tohoku University.

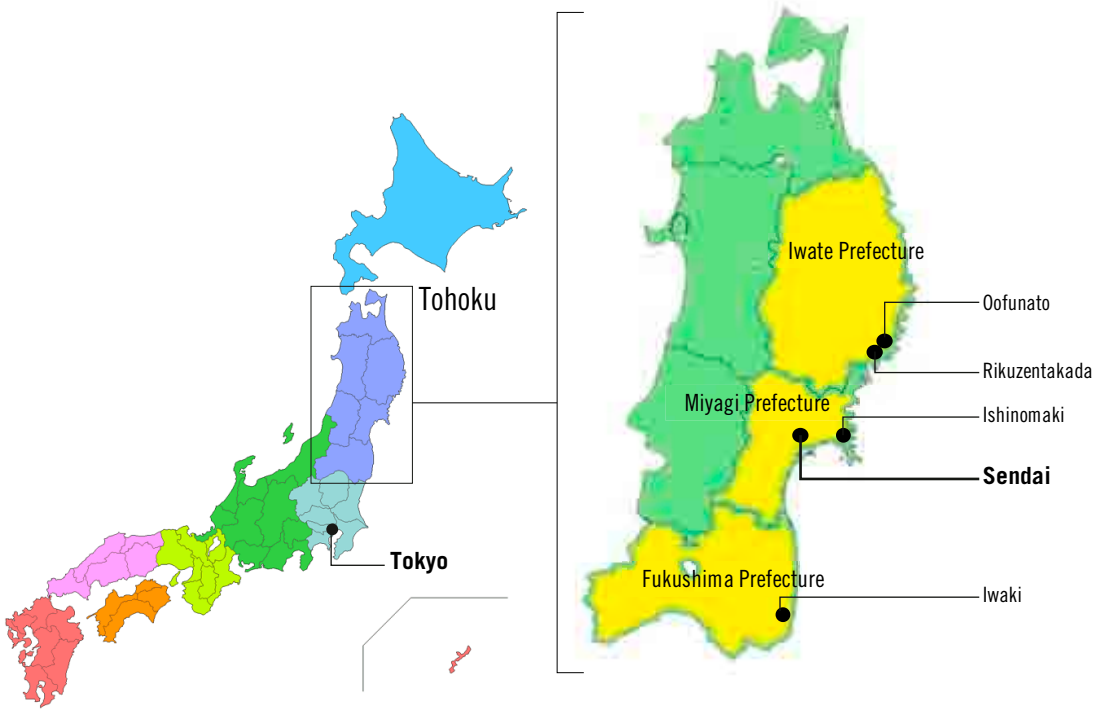
9 In general, the affected population evacuated to the place of relocation chosen by their municipalities. But there were also many who chose the place of refuge independently. As a result, evacuees are not necessarily living in the town where the municipalities set up their temporary offices.

10 The Fukushima Daini (No.2) nuclear power plant is located on the border between Tomioka town and Naraha town.

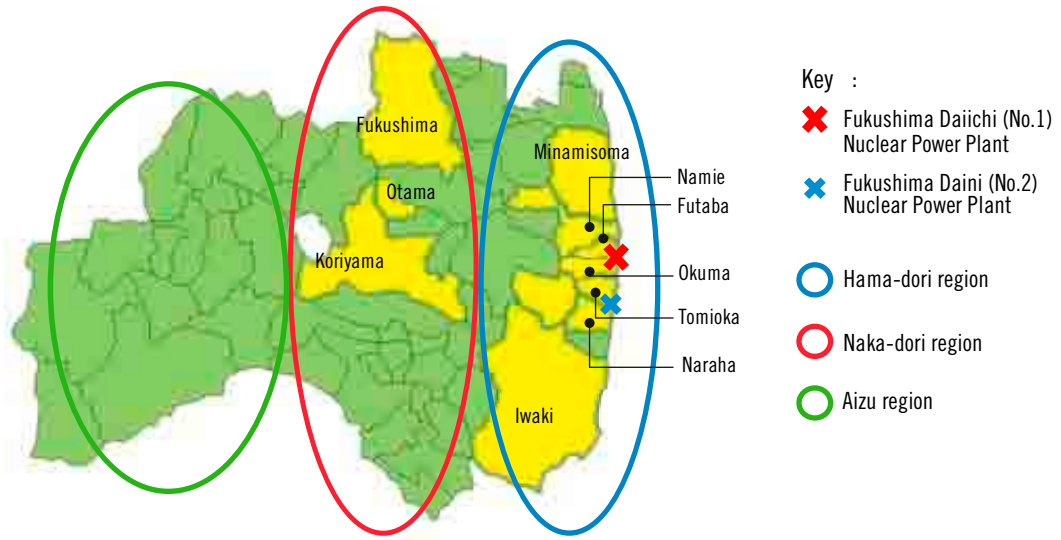
11 Source: Iwaki City Council (http://www.city.iwaki.fukushima.jp/info/dbps_data/_material_/info/zhigai20120912.pdf) (in Japanese)

12 This agency was established in December 2011 by the Prime Minister and is charge of reconstruction programmes for the affected Tohoku region.

**Map 1.** The Tohoku region and three heavily affected prefectures




**Map 2.** Map of Fukushima Prefecture



# 3. THE GREAT EAST JAPAN EARTHQUAKE AND TSUNAMI

## 3.1. Overview of the event

On 11 March 2011, a magnitude 9.0 earthquake struck off the Pacific coast of Tohoku in north-eastern Honshu, the main island of Japan. The tremor triggered a tsunami that had a mean inundation height of 10–15 m and a run-up height of 40 m in some places (Mori and Takahashi, 2012: pp.1 and 13). According to the National Police Agency, 15,871 people lost their lives, with 2,778 people missing (feared dead) and 6,114 people injured, as on 10 October 2012.[13] Nearly 400,000 houses were either severely damaged or completely destroyed. The Cabinet Office estimates the direct financial damage from the disaster at approximately 16.7 trillion yen (€167 billion).[14] It was the most powerful earthquake ever recorded in Japan,[15] and one of the world's biggest earthquakes after the 2004 Indian Ocean Earthquake (M 9.1–9.3). The then Japanese Prime Minister, Naoto Kan, described the disaster as the worst crisis that Japan has had to face since the Second World War.

According to the official figure, the disaster displaced a total of 386,739 people, recorded at one week after the disaster.[16] In March 2012, one year on from the disaster, the number was still as high as 344,290,[17] which indicates that most of the evacuees had not yet returned to their home or resettled in permanent shelters. Half of these evacuees originate from the Fukushima Prefecture and most were displaced following the nuclear accident. The number of evacuees who left on account of the earthquake and tsunami alone can thus be estimated at around 170,000 people.

These evacuees are currently accommodated in three types of temporary shelters: prefabricated houses, private apartments and public-sector apartments. As early as April 2011, one month after the disaster, prefabricated houses were erected to house the displaced population. By May 2012, a total of 52,858 prefabricated houses had been constructed for the disaster evacuees, of which 48,884 units are currently occupied.[18] There were 68,317 families living in private apartments, with rent covered by the government. Public-sector apartments, which were initially built to provide housing for public servants, were also utilised as evacuee accommodation. There were 19,041 of such apartments occupied by the evacuees.

## 3.2. Disaster response and evacuation

This sub-section presents the major findings from the field interviews on the disaster response and evacuation process induced by the earthquake and tsunami.

### Evacuation with a tsunami warning that underestimated the gravity of the situation

Japan is a country prone to earthquakes and tsunamis due to its geological conditions. Over the years, it has thus developed an adaptation and disaster prevention mechanism using advanced technologies. The coastal communities of Tohoku in particular had prepared themselves for the eventuality of a disaster, as they have already experienced many tsunamis. When the earthquake hit the Tohoku region on 11 March 2011, the tsunami warning was issued by the Japan Meteorological Agency (JMA) only three minutes after the earthquake, and immediately disseminated to the municipalities likely to be impacted (JMA 2011b: p.3). The warning was then transmitted through loudspeakers installed in these coastal towns for the purpose of public broadcasting. The disaster prevention mechanism was thus activated as planned. However, the field interviews revealed that the system had many shortcomings. First, the estimated tsunami height announced in the warning was considerably different from the actual tsunami height. The JMA issued a warning of a 6 m tsunami for Miyagi Prefecture and no more than a 3 m tsunami for Iwate and Fukushima Prefectures (JMA 2011a: p.3). On hearing this alert, some residents decided to stay on the second floor of their house instead of evacuating to higher ground. In addition, the fact that these coastal towns had 5–10 m breakwaters built along the coast for protection against the inflow of tsunami waves further delayed the residents' decision to flee. One evacuee from Ofunato City said:

13 Source: National Police Agency (http://www.npa.go.jp/archive/keibi/biki/higaijokyo.pdf). (in Japanese)

14 Source: Cabinet Office (http://www.bousai.go.jp/oshirase/h23/110624-1kisya.pdf). (in Japanese)

15 Source: Japan Meteorological Agency (JMA). (http://www.jma.go.jp/jma/en/2011_Earthquake/2011_Earthquake.html). (in Japanese)

16 Source: Cabinet Office (http://www.cao.go.jp/shien/1-hisaisha/pdf/5-hikaku.pdf). (in Japanese)

17 Source: Reconstruction Agency (http://www.reconstruction.go.jp/ topics/ 120413hinansya.pdf). (in Japanese)

18 Source: Reconstruction Agency (http://www.reconstruction.go.jp/topics/120521genjototorikumi.pdf). (in Japanese)

*When I first heard a tsunami warning for 3 metres, I thought that it would be all right because the breakwater in our town is higher than that.*

The survey conducted by the JMA in June 2011 on the post-disaster evacuation following the tsunami alert also collected the similar testimonies from tsunami survivors (JMA, 2011a: p.5). During our interviews, a couple of evacuees also mentioned that those who had already evacuated to higher ground even went back home after hearing the expected height of tsunami, thinking that they would survive in their house. Furthermore, citizen volunteers from the Community Fire Brigade[19] went to the coastal area to close the breakwater gates, a task allocated to them by the contingency planning, expecting the breakwater to be high enough to stop the tsunami. Many of them lost their lives as the tsunami engulfed the breakwaters. In reality, the tsunami that hit the three prefectures had a 10–15 m mean inundation height and a 40 m run-up height in some places. It was only after the arrival of the tsunami that the JMA amended the height to 'more than 10 m' for all three prefectures. As a result, despite the early tsunami warning, many residents were caught by surprise when the actual tsunami arrived.

Later, it was also discovered that the government possessed GPS-controlled tide gauge equipment, installed off the coast of Tohoku by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), which had accurately predicted the height of the tsunami prior to its arrival on the coast. According to the presentation made by the Member of Parliament, Itsunori Onodera, at the House of Representatives on 2 February 2012, the information from the GPS gauge was transmitted to the JMA before the tsunami arrived, but the JMA did not take this into account until after the event as it was neither part of their procedure nor integrated into their method of calculating the tsunami height.[20]

The second shortcoming of the tsunami warning was the way in which the warning was disseminated. The alert is usually transmitted by the relevant municipal offices via loudspeakers installed all over town. The interviews with evacuees and local authorities found that many of these loudspeakers did not function either because the earthquake had knocked down the speaker poles or because transmission had been disrupted by the power cut following the earthquake. According to the survey conducted by the JMA after the disaster, 17 out of 27 affected municipalities responded that their tsunami alert transmission system had broken down and did not function properly at the time of the disaster (Fire and Disaster Management Agency, 2011: p.7). This indicates that the installed system was simply not well adapted to the magnitude of the disaster and thus not reliable during the actual crises.

Thirdly, according to the interviewed survivors, even when the public speakers were functioning, the warning message issued by the municipal office was given in such a polite and calm tone ('Please evacuate') that the residents did not fully appreciate its gravity. The field research found that only 3 out of 28 interviewed evacuees had been prompted to flee on account of the tsunami warning transmitted by the local authority over the loudspeakers. The majority of residents fled after actually witnessing the tsunami, on the basis of their own judgement or previous experience, listening to the radio broadcasts, or being directly warned by the community fire brigade on patrol.

In summary, the tsunami warning during the 11 March disaster, although timely, suffered from failings with respect to an assessment of the gravity of the tsunami, the transmission system used and an inadequate communication of the level of risk.

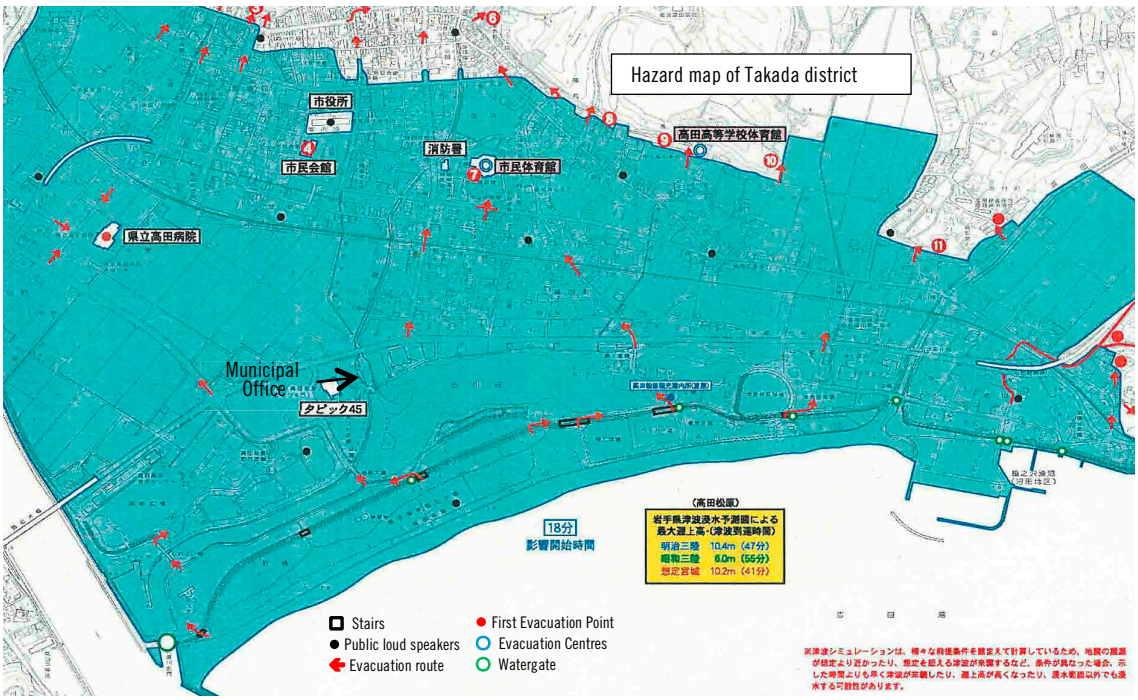
### Relief operations and a limited capacity to accept aid

In the field, local governments – both municipal and prefectural authorities – were the main coordination bodies for relief operations. The interviews with municipal officers and aid workers from NGOs made it clear that the affected local authorities in the remote coastal region of Tohoku often lacked experience in working with civil organisations such as NGOs and citizen volunteers, and were simply overwhelmed by the number of offers. In Ishinomaki City, according to the Director of Peace Boat Disaster Relief Volunteers Centre (PBV), the offer of volunteers was initially turned down by the local authority on the grounds that the city had no coordination or reception arrangements in place for the volunteers. In addition, one municipal officer from the same city recalled during the interview that food aid was sometimes wasted when the person in charge of evacuation centres, often municipal officers, did

19 This is a voluntary fire corps formed by the residents of each community/district in towns and cities. It participates in and helps the activities of fire fighters on a community level in case of fire and disasters.

20 The testimony of Itsunori Onodera (Liberal Democratic Party) at the House of Representatives during the Budget Committee of the House of Representatives on 2 February 2012 can be viewed on the following site: http://www.youtube.com/watch?v=efGa86LURHg (in Japanese).

**Map 3.** Example of a hazard map (Rikuzentakada City)




not know how to distribute it properly. According to him, when food aid of rice balls arrived in an evacuee camp, the camp manager realised that the number of rice balls was not enough to distribute to everybody in the camp and thus decided to simply throw them in the garbage in order to avoid strife and chaos in the centre. In other instances, the municipal officials managing the distribution of relief items required the donating organisations and companies to provide 'each survivor with items that were exactly the same in brand, type and size' and, as a result, 'many resources were wasted or used inefficiently' during the relief operations (Yeoh, 2012: p.8).

The Secretary General of the Association for Aid and Relief (ARR), which operates mainly in developing countries, also pointed out the cultural hesitancy to accept aid, specific to Japanese society. The relief operation in Tohoku made him aware that, compared to beneficiaries in other countries, the Japanese population generally lack the capacity to seek help and accept assistance. When help is offered, Japanese people tend to decline, either to preserve their dignity or out of concern not to inconvenience others. Another aid worker from AAR recalled one scene:

> *When I arrived at a house badly damaged by the tsunami, there was a woman still living inside the house without any electricity, water or food. There was no heating stove either. When I asked her what I could bring to help her, she said 'No, don't worry about me. There are people who are in greater need than I am'.*

In Japan, an industrialised country with a functioning social welfare system, the local authorities were simply not used to receiving help and thus quickly became overwhelmed by all the offers of assistance that came in from all over Japan and abroad. Thus, the field interviews found that the population's cultural hesitancy to receive assistance compounded the difficulties that volunteers, NGOs and other private donors encountered in delivering aid to the needy during the relief operations.

## 3.3. Perception of risk

The affected region of Tohoku had long been aware of the tsunami risk and was thus highly prepared for the eventuality prior to the disaster. This subsection attempts to analyse how this perception influenced individual decisions to flee and disaster mitigation during the actual crises.

### High perception of tsunami risks

Prior to the 11 March disaster, the affected coastal cities had already been expecting a major earthquake (M 7.4) to occur with a 99% probability within the next thirty years, and the Tohoku region had thus prepared intensively against such risk (Mori and Takahashi, 2012: p.2). In the

estimation, the tsunami was predicted to have a 10.2 m run-up height in Rikuzentakada City and 7.3 m in Naraha town.[21] On the basis of these estimates, the municipalities had created hazard maps to mark out the zone at risk of flooding in the respective cities (Map 3). Based on the hazard maps, evacuation drills were organised regularly. All of the evacuees interviewed mentioned that they had been informed of such risk prior to the disaster. In addition, most of them were familiar with tsunami disasters and knew what to do in such an event, having learnt from previous experiences and stories told by the elderly.

### The shortcomings of hazard maps

The field survey found that the hazard maps designed to prepare the residents against tsunamis did not always help to save lives in the actual disaster. According to the local government employee of Rikuzentakada City that we interviewed, the map had indeed helped to raise the awareness of those residents living in the predicted inundation zone and prepare them for an eventual tsunami. On the other hand, it also created a feeling of reassurance for those who lived outside the predicted inundation zone, giving them the impression that they were safe from the tsunami risk. Another map shown by the same official during the interview indicated the location of houses whose residents lost their lives, and clearly shows the causal relationship between the hazard map and the survival of individuals. On the map,[22] it was evident that victims resided just outside the predicted inundation zone indicated on the hazard map – those residents who were not included in the tsunami drills. This suggests that the perception of risk and the disaster preparedness did, in the vast majority of cases, influence the survival of individuals at the time of disaster.

### Location of emergency evacuation points

All four evacuees interviewed in Ishinomaki City referred to the disaster as 'man-made', criticising the local authority for insufficient preparedness against a tsunami risk. In Ishinomaki City, which had the highest death toll (3,471[23]) of all the affected towns, survivors accuse the shortcomings of the municipality's disaster preparation as a main cause of this high fatality rate. One of their accusations targets the location of emergency evacuation points. These points were generally designated at schools and public buildings but also at public car parks or a flat field. Originally intended as gathering points in case of fires or earthquakes, some of them were situated on lower ground close to the shoreline or on river banks. When the earthquake hit on 11 March 2011, many inhabitants gathered at these emergency points instead of taking refuge on higher ground, quite simply because these places were regularly used during disaster drills as the first assembly points. As a result, some of these residents lost their lives as the locations were completely inundated by the tsunami. One of the most tragic examples is the case of Okawa primary school in Ishinomaki City. Teachers decided to take the children to the emergency evacuation point located on the river bank instead of climbing the hill just next to the school, because it was the evacuation point designated in the contingency manual. As a result of this decision, 70% of the school children and teachers lost their lives when the tsunami travelled up the river.[24]

These instances indicate that the evacuation points were not necessarily adapted to tsunami disasters and that the residents were not adequately informed or trained for tsunami evacuations in Ishinomaki City. This lesson needs to be properly addressed in future disaster planning.

### Vulnerability created by previous tsunami experiences

During the interviews, municipal officials and evacuees mentioned that having previous tsunami experiences had sometimes adversely affected individuals' decision to flee and hence their survival during the 11 March tsunami. It is often assumed that people with previous disaster experience respond more effectively to a subsequent disaster and that the lessons learnt from past experience help them to avoid similar mistakes in the future. As Alexandre Magnan argues in the context of adaptive capacity to climate change, in societies regularly exposed to natural hazards, the experience of risk may confer a certain ability to respond to a changing climate and to integrate its effects (Magnan, 2010: p.8). Yet in the case of the 11 March disaster, although experience did help to

21 Information provided by Rikuzentakada City and Naraha town councils during the interview.

22 The map was shown to us by the official of Rikuzentakada City during the interview but he declined to provide us with a copy of such a sensitive document out of respect for the victims' families.

23 Source: Miyagi Prefectural Government (http://www.pref.miyagi.jp/kikitaisaku/higasinihondaisinsai/pdf/09071600.pdf) (in Japanese).

24 The newspaper, *Mainichi Shimbun*, '3.11 shogen: jidou, nakisakebi outo, gakkou saita no giseisya' (Author's translation: Testimony of 3.11: screaming and vomiting pupils, the worst death toll for schools), 19 April 2011; the newspaper, *Yomiuri Shimbun*, 'hinan yori giron data 40 fun, giseisyatasuu no ookawasyou' (Author's translation: 40 minutes of discussion instead of evacuation produced many victims), 13 June 2011.

save lives of many, it also created a feeling of reassurance with respect to risk and thus made some of the population more vulnerable. The population in these coastal cities had their perception of the tsunami risk shaped mainly by the experiences of the 1960 Chile Earthquake (M 9.5), which produced a 6 m-high tsunami that took 142 lives, and the 2010 Chile Earthquake (M 8.8), which occurred almost one year before the 11 March disaster and induced a 1 m-high tsunami affecting the region. The field interviews found that these recent experiences had given the inhabitants a rather fixed idea that the biggest tsunami likely to hit their cities would be around 6 metres high. Moreover, in the past, all of the tsunami warnings issued by the JMA and transmitted via the municipalities had always predicted much higher waves that those that actually occurred, thus creating a misperception that an actual tsunami would always be much smaller than the one predicted by official warnings. Given such convictions, the population underestimated the height and gravity of the tsunami that hit on 11 March 2011. Several evacuees also asserted that the experience of the foreshock (M 7.3) that struck on 9 March 2011, two days before the 3.11 also led the population to underestimate the tsunami risk of 11 March. At the time of the foreshock, a tsunami warning was announced but the tsunami that actually arrived was only 0.5 m high.

Another fixed idea based on previous experiences involves the time lag between the occurrence of an earthquake and the arrival of the ensuing tsunami. According to the interviews, the past tsunami experiences of the local population had given them the idea that a tsunami would arrive 10–15 minutes after an earthquake. During the 11 March disaster, the tsunami reached the shoreline 30–40 minutes after the earthquake in the towns (JMA, 2011b: p.10), contrary to the population's expectations. As a result, many of those who had evacuated to higher ground immediately after the earthquake decided to return home once the fifteen minutes had elapsed, convinced that no tsunami would follow on from the earthquake, and were hit by the enormous tsunami that arrived thirty minutes later.

From these instances, we discovered that the lessons learnt from previous experiences had paradoxically sometimes been a contributing factor to the population's underestimation of the risk or its misinterpretation of the danger signs during the 11 March disaster, and that their experience had not always helped to mitigate the impacts. The interviews with tsunami survivors led us to the following factual conclusion: while risk perception based on former experience did indeed help to save lives of many, in the face of an extreme disaster that exceeded all assumptions in terms of its magnitude, it also produced the reverse effect by creating false assumptions as to the level of risk.

## 3.4. Prospects of resettlement

From the interviews, we learnt that most of the evacuees wish to resettle on new land located on higher ground either because they no longer feel safe living in the place where their houses had been swept away or because it is not emotionally possible to return as they are deeply traumatised by the loss of family members. One year after the disaster, the resettlement process began but evacuees were encountering many administrative and financial obstacles. The resettlement

**Figure 3.** Photos of temporary shelters (prefabricated housing)

Photo (top): A prefabricated housing unit in Ofunato City, Iwate Prefecture, for tsunami evacuees. Taken by R. Hasegawa on 22 March 2012. Photo (bottom): A prefabricated housing unit in Iwaki City, Fukushima Prefecture, for nuclear evacuees. Taken by R. Hasegawa on 5 April 2012.

plan proposed by the government has three main components. First, the local authority purchases the land owned by each evacuee affected by the tsunami. With the money from this sale, evacuees are expected to purchase new land for resettlement. Although the cost of house construction is not covered by the scheme, evacuees are entitled to receive financial assistance of up to around €30,000 as well as a special low-interest housing loan set up by the government worth up to €146,000 in order to rebuild their houses.[25]

The field research found that evacuees were finding it very hard to resettle despite the various forms of government assistance. First, there is a problem of 'double loans'. Some evacuees continue to pay for the mortgage of a house swept away by the tsunami. For these evacuees, it is extremely difficult to commit to another housing loan, even if it is part of the government scheme. Furthermore, many of them are still unemployed as their offices and factories were destroyed by the tsunami and have not yet been reconstructed. Secondly, purchasing the new land for resettlement is difficult simply because land located on higher ground is scarce in some cities or because landowners are sometimes unwilling to sell land that has been in the family for generations. In other instances, the land is sometimes protected as a natural reserve and cannot be purchased, or landowners cannot be found as they are either dead or living abroad.

Another obstacle stems from one of the conditions laid down by the government resettlement scheme: at least five evacuee families must join together and decide collectively to resettle in the same place in order to benefit from the scheme. This condition was initially aimed at maintaining community ties, but it is instead creating many problems on the ground as the population is now scattered around different parts of the town or sometimes outside the town. This means that it is extremely difficult for the evacuees to get in touch with friends and former neighbours who would agree to resettle together.

Lastly, the field interviews found that the management of resettlement schemes was very poorly synchronised by the local authorities. Many municipal governments lost patience with what they considered to be a slow or inadequate process and began their own assistance schemes to complement the government scheme. The problem is that they started these without consulting neighbouring towns, which has sparked off jealousy among the different communities and made it difficult to reach a consensus within the evacuee community. For example, Ishinomaki and Rikuzentakada Cities have proposed to purchase the tsunami-affected land for 70–80% of its original value, while Higashi-Matsuyama City (just next to Sendai City) has offered the evacuees up to 80–97% of the land value.[26] As a result, evacuees in some localities began to renegotiate the terms of resettlement schemes with the municipal administration, thus causing further delay in the whole resettlement process.

In this context, the resettlement process for evacuees is not advancing at a full speed. The situation is exerting an additional psychological strain on the evacuees, who have already suffered from the loss of close relatives or friends and now find themselves in the plight of displaced persons in camps and temporary shelters.

## 3.5. Post-disaster challenges

The following points are developed to illustrate the situation and challenges facing tsunami evacuees and the affected communities one year after the disaster.

### Reinventing the affected communities – 'building back better'

Prior to the disaster, Tohoku was already a marginalised region facing the challenge of an aging population and the migration of its youth to larger cities in search of better job opportunities. In 2010, 26.3% of the population in Tohoku was over 65 years old, 3.3% higher than the national average (and compared to 16.8% in France).[27] The economy of Tohoku was mainly based on agriculture and fisheries, with the average wage standing 17% lower than the national average.[28] This trend is likely to accelerate in the wake of the disaster.

One year after, reconstruction operations were intensified in the affected towns. The government budget for reconstruction amounts to €150 billion for the year 2011 and €37 billion for 2012.[29] Yet, so far, the authorities' reconstruction efforts have seemed to focus more on rebuilding the physical infrastructures – the traditional notion of

25 Source: Cabinet Office.

26 Source: Japan Institute of Construction Engineering (JICE) (http://www.jice.or.jp/sinsai/sinsai_result.php?q=%93y%92n%94%83%82%A2%8E%E6%82%E8&t=2). (in Japanese)

27 Source: Ministry of Internal Affairs and Communications (http://www.stat.go.jp/data/kokusei/2010/kihon1/pdf/gaiyou1.pdf) (in Japanese).

28 Source: Cabinet Office (http://www.esri.cao.go.jp/jp/sna/data/data_list/kenmin/files/contents/pdf/gaiyou2_1.pdf) (in Japanese).

29 Source: Reconstruction Agency (http://www.reconstruction.go.jp/).

reconstruction – and less on smaller but innovative social and economic projects to revitalise the communities.[30] During the interviews, several evacuees expressed concern that many young people were leaving the town due to the lack of job opportunities after the disaster. According to them, the reconstruction works created many temporary job opportunities but these were confined to the construction sector and contracts were on a short-term basis. Unable to find stable employment, many young people, especially those with qualifications, began to leave the town for big cities. According to a survey of 1,033 evacuees in Iwate, Miyagi and Fukushima Prefectures conducted by the newspaper, *Asahi Shimbun*, between January and March 2012, 40% of them were still unemployed either because they had lost their jobs or their employers had suspended activity following the disaster.[31] The results of the same survey showed that the affected cities, including Ishinomaki City, had on average lost 6% of their population between 2011 and 2012 (excluding the number of dead and missing due to the disaster) and, in the case of Rikuzentakada City, the figure was 13.8%.[32]

Under these circumstances, rebuilding the affected communities as they were before the disaster seems not only inefficient but also unsustainable both demographically and economically. The affected municipalities are thus dealing with the enormous challenge of implementing a well-thought-out reconstruction plan to ensure a rapid recovery from the disaster, whilst at the same time dealing with the chronic problem of a shrinking economy and aging population.

### The elderly and persons with reduced mobility were the hardest hit

The tsunami claimed many lives among the elderly and persons with reduced mobility living at home or in specialised facilities. During one interview, an Iwaki City employee explained that, for those who were living with their families, it was expected that the family members would help them to evacuate. But as the earthquake hit during the day, these members were either at work or at school and were unable to return home in time to rescue them. The elderly and persons with reduced mobility living alone at home were allocated to designated neighbours to assist them in case of disaster. But, likewise, these designated helpers were at work and could not assist those who needed help to evacuate. As a result, many lost their life as they were unable to move from the house. According to the 2011 White Paper on Disaster Prevention edited by the Cabinet Office, 64.4% of fatalities from the 11 March disaster were over 60 years old, whereas the proportion of the population over 60 in the region was 31%. The mortality rate for those in their seventies rose as high as 23.7%, and 21.8% for those in their eighties.

As for persons with reduced mobility, it was reported that their fatality rate was 2.5 times higher than that for all the affected populations.[33] According to a survey conducted by a network of associations for disabled persons, Japan Disability Forum Miyagi, the average fatality rate among 13 affected municipalities in Miyagi Prefecture was 1.4% while the rate for the persons with disabilities was as high as 3.5% and 3.9% for those with physical disabilities.

These statistics show that the disaster prevention measures were flawed when it came to addressing the needs of vulnerable groups in case of disaster, a lesson that should be taken into account for the future disaster preparations.

### Divided communities

The field interviews with evacuees found that the disaster had caused tensions and divisions among the local population, which still persisted one year on. While stories of mutual help and solidarity were often emphasised by the evacuees, they also pointed up the different treatments and discriminations in the distribution of the aid received at the time of disaster. It emerged from the interviews that the evacuees categorise themselves into three groups: those who lost their houses and all their belongings in the tsunami; those who lost their houses but not their belongings due to the earthquake; and those whose houses were only partially destroyed. The third group of evacuees was considered 'less affected' compared to the first two groups and thus regarded as 'less qualified' to receive aid. As an evacuee from Rikuzentakada City explained:

> *When someone from a partially destroyed house came to an evacuation centre to get food and relief items, the evacuees in the centre openly complained that the person did not have the right to receive assistance because her house was not completely destroyed. After such experiences,*

30 *The Japan Times*, 'Reconstructing Tohoku to fit today', 2 April 2012.

31 *Asahi Shimbun*, 'Jinko-gen keieishano-urei' (Author's translation: Falling population, business owners' grief), 11 March 2012.

32 *Asahi Shimbun*, *Ibid.*

33 The newspaper, *Nikkei Shimbun*, 'Higashinihon-daishinsai no shougaisyasibouritsu, zentaino 25 bai. Nigeokureta kanousei' (Author's translation: The fatality rate from the Great East Japan disaster is 2.5 times higher among the disabled population: a possibility that they were unable to evacuate in time)', 30 July 2012.

*those who were living in partially destroyed houses with no electricity, water or food often had to survive by their own means, hesitating to seek help.*

In addition, disparities also appeared depending on the evacuation centres. Large evacuation centres that attracted media attention received many offers of assistance from all over Japan, while small centres were most often ignored. These experiences have created jealousy and mistrust among neighbours and friends, leaving deep scars in relationships that had been nurtured over generations in these remote coastal communities.

While the public service is overwhelmed by reconstruction projects and the evacuee resettlement process is stagnating, the economic and social disparities that existed among the inhabitants before the disaster are also growing larger and more visible. According to the aid workers interviewed from Child Fund Japan in Ofunato City and PBV in Ishinomaki City, both of which assist evacuees in prefabricated housing units, evacuees with financial means tend to move out of the temporary shelters quickly as they construct their new home without waiting for financial assistance from the government, whereas the vulnerable and the marginalised are left behind. Those with a strong social network and personal connections also move out rapidly as they easily find new job opportunities. Information Technology (IT) literacy is also creating a new disparity. Evacuees who know how to surf the Internet are able to find more information on the various forms of assistance offered by the authorities, NGOs and individuals, while those who are not IT-literate have little access to such information as they rely solely on written material. In the absence of an effective public service during post-disaster recovery, this disparity is exacerbating the rifts in communities and leaving vulnerable populations in even greater destitution and a state of traumatism.

# 4. THE FUKUSHIMA DAIICHI NUCLEAR POWER PLANT ACCIDENT

## 4.1. Overview of the event

The earthquake and the ensuing tsunami caused serious damage to the installation of Fukushima Daiichi nuclear power plant situated 230 km north of Tokyo. This resulted in hydrogen explosions and nuclear meltdowns of three of the six reactors on site, due to the loss of all power supply and subsequently of control of the cooling systems. Tens of thousands of residents had to evacuate their homes as radiation leaked into the atmosphere, the sea and the food chain. Japanese officials rated the incident at level 7 (the maximum) on the International Nuclear and Radiological Event Scale (INES) defined by International Atomic Energy Agency (IAEA), which ranks the accident as the largest nuclear disaster since the 1986 Chernobyl accident (which is also rated at level 7). The post-accident management measures, including the decommissioning of the crippled reactors and compensation for the nuclear evacuees, are estimated at a cost of more than €200 billion.[34]

One year after the disaster, there were more than 160,000 evacuees, known as nuclear evacuees, from the Fukushima Prefecture. They represent 47% of all the persons displaced by the 11 March catastrophe.[35] A total of 11 municipalities (113,000 residents) were forced to evacuate following the government's evacuation orders. In addition to this forced displacement, there were also cases of voluntary evacuation where residents living outside of the official evacuation zone became worried about radiation effects and decided to flee on their own. As the Japanese government and TEPCO revealed the true scale of the radioactive contamination, there was a gradual increase in the number of voluntary evacuees, also referred to as self-evacuees. It is very difficult to obtain official statistics on the number of self-evacuees but we can estimate these at 47,000 from the difference between the total number of evacuees from the Fukushima Prefecture and the number of forced evacuees from the evacuation zone. In September 2011, the number was estimated at 50,327 by the Fukushima Prefecture.[36] This trend was continuing one year

34 Source: Japan Centre for Economic Research (JCER) (http://www.jcer.or.jp/policy/pdf/pe%28JCER20110719%EF%BC%89.pdf). (in Japanese)

35 Source: Reconstruction Agency.

36 Source: MEXT. (http://www.mext.go.jp/b_menu/shingi/chousa/kaihatu/016/shiryo/__icsFiles/afieldfile/ 2011/11/25/1313502_3.pdf).(in Japanese)

**Figure 4.** Changes in the number of Fukushima evacuees

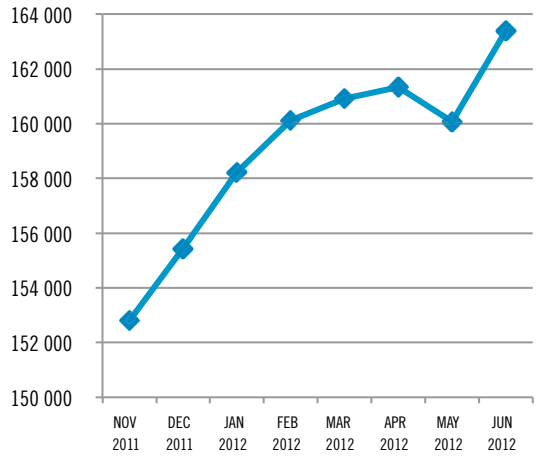
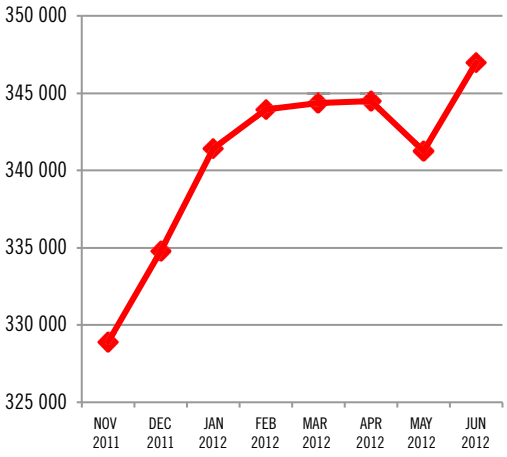



**Figure 5.** Changes in the total number of evacuees




Source: Japanese Reconstruction Agency.

after the disaster: the number of nuclear evacuees is increasing rather than decreasing (Figure 4) and is also pushing up the overall number of evacuees from the 11 March disaster (Figure 5). This phenomenon is specific to the 11 March catastrophe and is not often observed for other types of disaster.

## 4.2. Disaster Response and Evacuation

This sub-section describes the evacuation process implemented following the Fukushima nuclear accident. The field interviews found that the affected municipalities and population were taken by surprise and that the evacuation was organised in a chaotic manner, which reveals that the scenario of a serious accident had never been envisaged or adequately prepared for prior to the accident.

### Changes to the evacuation zones

From the onset of the crisis, the Japanese government issued various evacuation orders with vastly differing instructions and timing. From what evacuees said in the interviews, this created a great deal of confusion, uncertainty and distress among the affected population. Table 3 gives the chronology of the different evacuation orders issued by the government. As shown in the list, these orders were gradually expanded over a three-month period starting on 11 March 2011 and created four different evacuation zones (Map 4). First, a compulsory evacuation order was issued for the zone within a 2 km radius[37] from the crippled station and then, in the space of twenty-four hours, this was extended to a 20 km radius. This area was designated as a 'Restricted Zone' with entry prohibited. Three days after issuing the compulsory evacuation order, the government then instructed residents living within a 20–30 km radius from the station to shelter indoors, in what was called the 'Evacuation Prepared Area'. This 'shelter indoors' order continued for more than a month and finally, on 22 April, the same residents were advised to self-evacuate. On the same day, the government issued a new evacuation order to the area where a high airborne radiation level had been detected and which was located outside of the 20 km radius evacuation zone ('Deliberate Evacuation Area' shown in Map 4). The residents living in this area were instructed to evacuate within a month. It was at this time that the government began to take the threshold radiation dose of 20 millisieverts[38] per year (mSv/year) as a basis for recommending evacuations. In June 2011, the government began to identify 'hot spots' where an air radiation dose of more than 20mSv/year had been detected outside the evacuation zones ('Specific Spots recommended for Evacuation'

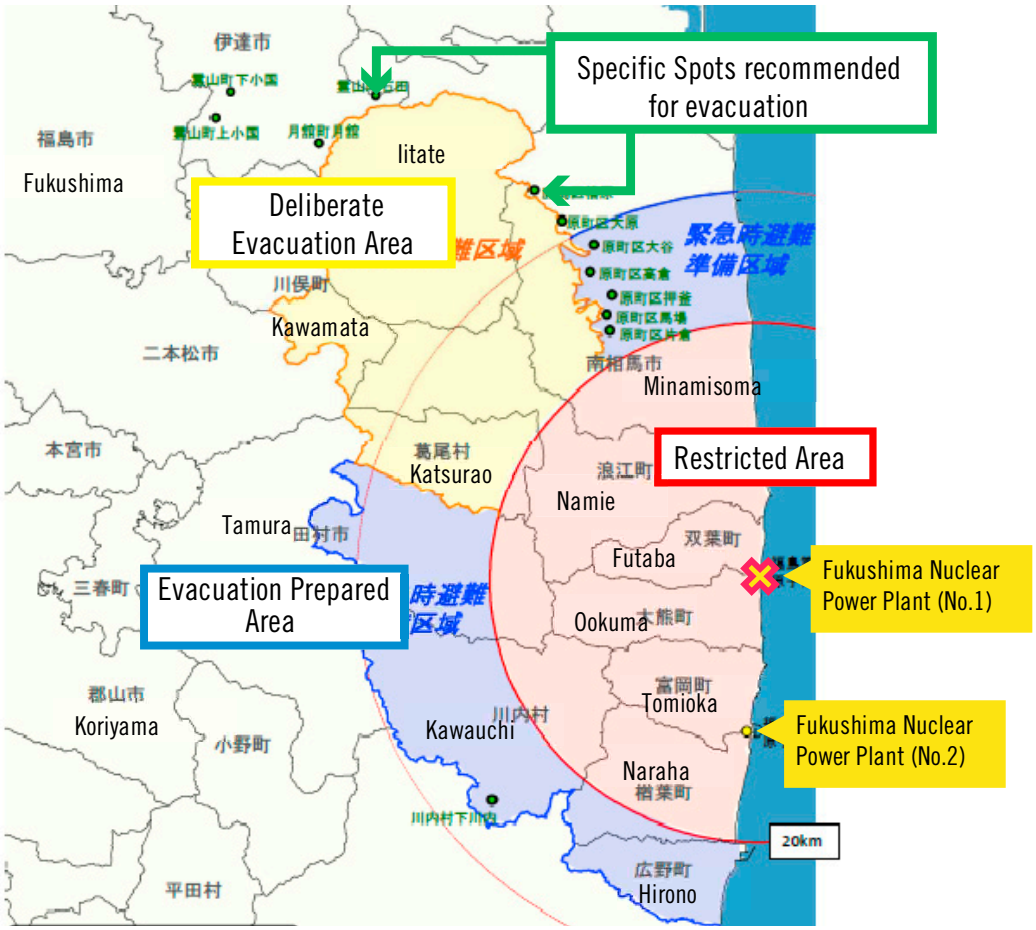
37 This first evacuation order was issued by the Fukushima prefectural government as a precautionary measure.

38 The sievert (Sv) is a unit to measure the radiation dose. 1 sievert (Sv) = 1,000 millisieverts (mSv). The International Commission on Radiological Protection (ICRP) recommends limiting artificial irradiation of the public to an average of 1 mSv per year, not including medical and occupational exposure (ICRP 2007).

**Table 3.** Chronology of the Government's evacuation orders/recommendations

| 2011 | Target | Orders | Name of the Zone |
|---|---|---|---|
| 11 March | 2 km radius from the station | Compulsory Evacuation (issued by the Fukushima prefectural government) | Restricted Zone |
| | 3 km radius | Compulsory Evacuation | Restricted Zone |
| 12 March | 10 km radius | Compulsory Evacuation | Restricted Zone |
| | 20 km radius | Compulsory Evacuation | Restricted Zone |
| 15 March | Between 20–30 km | Shelter indoors | Evacuation Prepared Area |
| 22 April | Between 20–30 km | Shelter indoors or evacuation by own means | Evacuation Prepared Area |
| | Areas with air radiation dose more than 20 mSv/year | Evacuation within 1 month | Deliberate Evacuation Area |
| 16 June | Spots with air radiation dose of over 20 mSv/year | Recommended for Evacuation | Specific Spots Recommended for Evacuation |
| 30 Sept. | Between 20–30 km | Lifting of the order to shelter indoors or evacuation by own means | Lifting of Evacuation Prepared Area |

**Map 4.** Official evacuation zones prior to 30 September 2011




Source: Ministry of Industry, Trade and Economy.

shown in Map 4). In this fourth category, the government first designates the spots after measuring radiation levels on a house-by-house basis upon a resident's request and then issues a 'recommendation for evacuation' instead of 'orders'. If the residents of the house qualified as a hot spot decide to evacuate, the government provides financial assistance.

On 30 September 2011, the government decided to do away with the second evacuation zone, 'Evacuation Prepared Area', situated within a 20–30 km radius from the station. Then in March 2012, it proposed reorganising the 'Restricted Zone' and 'Deliberate Evacuation Area' into three new areas according to the airborne radiation level, thus creating a zone to which evacuees were expected to return. This latest government proposal will be analysed in detail in the following sub-section.

Through these different decisions, taken one after the other by the government in a rather *ad hoc* manner, both the affected municipalities and residents were obliged to evacuate repeatedly from one place to another with scant information about their future prospects. The field interviews with evacuees found that this caused significant psychological stress for the evacuees during their flight.

### Improvised evacuation orders

The field survey revealed that at the outset of the crisis, the municipalities had very little information on the accident or the evacuation orders issued by the government. Only Futaba town, one of the two towns[39] hosting the crippled nuclear power plant, received the initial evacuation order from the central government.[40] The other three municipalities that we interviewed, Naraha, Minamisoma and Iwaki, learnt of the first evacuation order only through a television broadcast and were not directly notified by the government. Naraha town, which hosts another nuclear power plant (Fukushima No.2), managed to obtain some information on the situation of the Fukushima No.1 nuclear power plant from the plant operator, Tokyo Electric Power Company (TEPCO),[41] thanks to the relationship that it had built up with TEPCO over the years. On the basis of this information, Naraha town made the decision to evacuate the entire population, while Minamisoma City, for example, had nothing but the televised broadcasts to guide its decision. According to the survey conducted by NAIIC (NAIIC, 2012: pp.50-61),[42] none of the affected municipalities, except two towns hosting the damaged nuclear power station, were informed officially of the evacuation order: they had to decide on their own to evacuate their residents.

According to the Disaster Prevention Guideline[43] drawn up by the Nuclear Safety Commission of Japan (NSC) in 1980 based on the Act on Special Measures Concerning Nuclear Emergency Preparedness, Field Emergency Response Headquarters (referred to as the Off-Site Centre) should be set up within 5 km of the power station in case of an accident. The Off-Site Centre, comprising personnel from the nuclear regulatory agencies, the nuclear operator and the concerned municipalities, is in charge of managing the crisis and making decisions about the evacuation zone. During the 11 March disaster, this Off-Site Centre could not function properly given that communication equipment was damaged by the earthquake and that the personnel who were supposed to assemble there did not arrive as they judged the location of the centre too close to the affected station and thus too dangerous (Asahi Shimbun Special Reporting Unit[44], 2012: pp.72-74). Given these circumstances, the Prime Minister's Office in Tokyo took over the role of the Off-Site Centre when the crisis broke out. As a result, the procedure for issuing evacuation orders was never applied as planned in the disaster manual and the municipalities were left without any specific advice as to how to proceed with the evacuation.[45] Thus, the mayors had no choice but to act on their own initiative and evacuate all the inhabitants regardless of the government's decisions.

As the municipalities were at a loss at what to do, local residents took the advice of TEPCO employees, families and friends and fled before receiving the official evacuation orders. Among the 23 evacuees interviewed, only 9 had decided to flee on the basis of the evacuation order from the local authority. According to them, those who had information from TEPCO employees were the first to evacuate, as early as the night of 11 March, while the majority fled on the following day.

39 The other town that jointly hosts the crippled nuclear station is Okuma town.

40 From the DEVAST interview with the municipality; NAIIC, 2012: pp.50-61.

41 TEPCO is the largest of the ten electric utility companies in Japan and the fourth largest in the world after the German RWE, the French EDF and the German E.ON. It was set up in 1951 and *de facto* nationalised in July 2012 after the Fukushima nuclear accident.

42 The Fukushima Nuclear Accident Independent Investigation Commission (NAIIC) set up by National Diet of Japan.

43 http://www.bousai.ne.jp/vis/shiryou/pdf/bousai_shishin_h2208.pdf

44 Author's translation of *Asahi shimbun tokubetsu houduo bu.*

45 Information collected from the interview with the affected municipalities.

### Privileged evacuees

Information on the preoccupying situation at the power station thus first reached those who had relatives and friends working for TEPCO at the damaged station. Many evacuees interviewed told the same story. On the night of 11 March, a large number of residents had gathered in the evacuation centres as aftershocks were continuing and many houses had lost electricity. In the middle of that night, a handful of residents who had relatives and friends working for TEPCO started to receive calls from these contacts on their mobile phones and discreetly began to leave the evacuation centres as they had been informed on the real state of the accident and had been urged to evacuate immediately. They thus learnt about the severity of the accident and the need for evacuation even before the municipality and most of the population. What made matters worse is that they did not inform their fellow residents in the evacuation centres why they were leaving. As one evacuee from Futaba town explained:

> *On the night of the accident, the families of TEPCO employees started to receive calls on their mobile phones. After the conversation, they disappeared from the centres. I managed to catch one of them and asked why she was leaving. She answered that she wanted to go back home in order to pick up something. After she left, I realised that her house had been completely destroyed by the tsunami and so it was impossible for her to go back home. Then, I understood that she did not want to tell me that she was actually fleeing from the town. I felt I was going crazy with fear when I saw people sneaking out of the evacuation centre in the middle of the night, one by one, while I was left stuck and couldn't do anything.*

Those residents fortunate enough to know someone in TEPCO thus escaped sooner, leaving the others behind with no information. This incident deeply traumatised relationships among residents, a trauma that will probably take a long time to heal.

### Evacuation without preparation

The interviews with affected municipalities and evacuees revealed that the organisation of the evacuation had been chaotic, as the municipalities had been trying to find ways to evacuate all of their residents, a situation for which they had never practiced before. Prior to the accident, nuclear disaster drills were conducted mainly for the employees of the plant operator and the municipal offices along with a limited number of residents living in the immediate vicinity of the nuclear power station, and the crisis scenario used had been of a minimal nature. Out of all the 29 nuclear evacuees interviewed during the field research, one person had ever participated in such an exercise. A municipal worker also admitted that the participation of the residents was limited, a maximum of 30 persons at a time, mainly elderly, who were available during the day. The evacuee, a school teacher in Futaba town, had taken part in one nuclear disaster drill and described the exercise as follows:

> *These drills lacked seriousness. The participants were gathered in the school yard where a hot meal was prepared and served to everybody. The atmosphere was rather festive. What's more, we were eating and chatting outside during the exercise as if a radiation leak in the air was never expected from a nuclear accident.*

According to the Disaster Prevention Guideline of the Nuclear Safety Commission, the zone within an 8–10 km radius from the nuclear power stations is considered as an Emergency Planning Zone (EPZ), targeted for nuclear disaster drills and preparations. The guideline explains that the EPZ was set up 'based on the assumption that it is almost impossible to occur technically'[46] and that 'between 8 and 10 km there would be little difference in the response to the radiation effect'. In other words, as Akira Imai puts it, 'the nuclear disaster preparation was to be implemented only within 8 km and no further as the EPZ was designated on the basis of a nearly impossible scenario' and 'this, indeed, constitutes the basis of the notion in public policy that nuclear power stations were accident-free'[47] (Imai, 2012a: p.24). The NSC's report on nuclear disaster drills conducted during 2008 in 11 prefectures, for example, shows that the evacuation exercise for residents was conducted only within a radius of 1–3 km from the stations.[48] Therefore, at the time of the crisis, the municipalities and residents were not at all prepared for such an evacuation and thus completely at a loss. As a result, in the absence of an organised evacuation led by the municipalities as planned in the disaster manual, many people self-evacuated, using their own cars if they were lucky enough to have some fuel left. This created an enormous traffic jam on the escape route and delayed the whole evacuation process, leaving the population significantly distressed.

46 Author's translation.

47 Author's translation.

48 Source: NSC (http://www.nsc.go.jp/senmon/shidai/sisetubo/sisetubo019/ssiryo5.pdf). (in Japanese)

### Evacuation without information

The field research also found that evacuees had not been informed on the severity of the accident or the eventual radiation risk at the time of evacuation. Even when residents were ordered to evacuate by the municipal authorities, they were not told how long the displacement was going to last or what was happening at the nuclear power station, let alone what the radiation risk would be. As a result, many residents left without any extra clothes, food or money, thinking that it would be a matter of three or four days before they could go back home. According to the NAIIC report, only 20% of the residents in Futaba and Naraha towns, both of which host nuclear power plants, knew about the accident on the first day (NAIIC, 2012: p.52). The remaining 80% of residents learnt about the accident only on the following day when the evacuation order was finally issued by the municipalities, twelve hours after the first evacuation order issued by the government. The same report revealed that only 10% of the residents were aware of the first evacuation order issued by the government.

The interviews with evacuees and municipalities confirmed that the information on radiation risk was not communicated to them by the central and prefectural governments, despite the fact that this (albeit incomplete) information had been in authorities' possession from the outset of the crisis. The Japanese government had invested a total of €130 million in developing the System for Prediction of Environmental Emergency Dose Information (SPEEDI) since the 1980s (Asahi Shimbun Special Reporting Unit, 2012: p.21; Matsuoka, 2012: p.130). The system is designed to predict the likely pathway of radioactive materials emitted from a damaged nuclear power plant and carried by winds and rains, by calculating the weather and geographical conditions of the concerned area. After the accident, it was discovered that the Ministry of Education, Culture, Sports, Science, and Technology (MEXT) was actively utilising the SPEEDI from the first day of the accident to predict the pathway of radiation leaks from the crippled station. This information had even been communicated to the US army as early as 14 March 2011, three days after the accident, through the Japanese Ministry of Foreign Affairs upon a specific request made by the US government (Matsuoka, 2012: p.130). Furthermore, this information was also transmitted to the prefectural government of Fukushima as early as 12 March 2011 via 86 e-mails sent by MEXT's Nuclear Safety Technology Centre. However, the Fukushima Prefecture not only failed to inform the concerned municipalities but also deleted most of these e-mails.[49] When interrogated as to why this SPEEDI information had been deleted, the Fukushima Prefecture explained that 'these e-mails contained attachment files that were too heavy for our system to deal with'. When the government was interrogated as to why the information from SPEEDI was not made public in a timely manner, Special Advisor to the then Prime Minister Goshi Hosono explained that it was in order to 'avoid panic among the population'.[50]

While the SPEEDI information was kept from the public, MEXT dispatched a radiation monitoring team to Namie town, which lay in the radioactive pathway predicted by SPEEDI, as early as 15 March 2011 (Asahi Shimbun Special Reporting Unit, 2012: pp.61-62). There, the team measured a radiation dose rate as high as 330 microsieverts ($\mu$Sv) per hour (see Box 1).[51] Namie town was situated outside of the official evacuation zone (31 km north west of the nuclear station) and thus all the residents were still living in the town. Information on this high radiation dose rate was not communicated to the Namie administration or the residents and was made public only on the MEXT website the following day: a point was indicated on a blank map with no name shown for the place where this dose rate had been detected. In the meantime, the government spokesman repeated a televised message that 'this radiation dosage poses no

## Box 1. Basic information on air radiation dose levels

- Airborne radiation can be measured by a Geiger counter, which detects particles of ionising radiation.
- 1 millisievert (mSv) per year is the reference dose level in normal exposure situations, recommended by International Commission on Radiation Protection (ICRP). It is the dose limit for artificial radiation exposure (thus excluding natural radiation exposure) set for the public, excluding medical and occupational exposures.
- 1 mSv/year can be calculated on average as 0.11 microsievert (μSv)/hour.
- 0.001 Sv = 1 mSv = 1,000 μSv
- The average air radiation dose rate in Fukushima Prefecture before the accident was 0.038 μSv/hour.[6]

49 The newspaper *Tokyo Shimbun*, 'Kakusan yosoku: fukushima-ken ga sakujo syazai' (Author's translation: The Fukushima Prefecture apologizes for deleting the SPEEDI information', 21 April 2012.

50 Asahi Shimbun Special Reporting Unit, 2012: p.76; Joint Government/TEPCO Press Conference held on 2 May 2011 (http://www.cas.go.jp/jp/genpatsujiko/pdf/godokaiken_110502.pdf). (in Japanese)

51 The newspaper, *Tokyo Shimbun*, 'SPEEDI information used by the government prior to being made public', 12 June 2012; Asahi Shimbun Special Reporting Unit, 2012.

immediate risk to human health[52]' (Asahi Shimbun Special Reporting Unit, 2012: p.54). Consequently, many evacuees were unnecessarily exposed to high levels of radiation during the initial phase of the evacuation, especially those who fled to the north-west of the station. This zone was in fact the pathway of the radiation clouds that SPEEDI had already predicted, but such information had not been shared with those concerned. The SPEEDI information was finally released to the public on 23 March 2011, twelve days after the accident, and additional evacuation orders for residents living in the area with high radiation levels were not issued until 22 April 2011, one month after the public release. As the NAIIC report states: 'Some residents were evacuated to areas with high radiation levels and were then neglected, receiving no further evacuation orders until April' (NAIIC, 2012: p.19), and by acting in this way, 'the government effectively abandoned their responsibility for public safety' (Ibid, p.38).

**Emergency response measures against radiation exposure**

In addition to the lack of information on the radiation risk, other emergency measures implemented by the authorities came under criticism in the wake of the disaster. These measures involved, in particular, the emergency medical care aimed at reducing the health effects of radiation exposure. The final report by the Investigation Committee on the Fukushima Accident commissioned by the Cabinet Office examined some of these measures in detail, notably the full-body screening procedure[53] for decontamination and the administration of stable iodine tablets (ICANPS, 2011: pp.353-361).

Prior to the accident, the Fukushima Prefecture had established an external contamination screening procedure for residents, whereby those exposed to high radiation levels would receive decontamination treatment in case of an accident. In the procedure, the threshold level triggering this treatment was set at 40 Bq/cm$^2$ (equivalent to 13,000 cpm).[54] Two days after the accident, the prefectural government decided to raise this screening level to 100,000 cpm: *eight times higher* than the pre-accident level. The Nuclear Safety Commission of Japan (NSC), although it had initially expressed some concerns, finally endorsed this threshold level on 19 March 2011. As a result, full-body decontamination procedures, including removal of contaminated clothes, showers and other preventive measures such as administration of iodine tablets, were not systematically applied to people whose external contamination level read below 100,000 cpm.

On 16 March 2011, the NSC recommended the administration of stable iodine tablets for those residents still inside the restricted zone within a 20 km radius from the crippled power station. In line with the Basic Disaster Prevention Plan, all the concerned municipalities had a sufficient stock of stable iodine tablets for the residents in case of an accident. However, the Fukushima prefectural government did not communicate the NSC's instruction to the concerned municipalities since it had already confirmed that everybody had evacuated and that nobody remained in the area (information that was not correct according to our interviews with evacuees). The ICANPS interim report published in December 2011 presents the case of Miharu town, situated 50 km from the crippled nuclear station. Assuming a high level of exposure to radiation, the town decided on its own initiative to advise residents to take stable iodine tablets. When Fukushima Prefecture was informed of this decision, it issued an order to the Miharu town officials to suspend the distribution and recall the tablets on the grounds that no such instruction had yet been given by the central government. Disregarding this instruction, the Miharu municipality decided to go ahead and distribute the iodine tablets to the residents. As a result, apart from Miharu town, no evacuees or other concerned populations in Fukushima took the stable iodine tablets during the disaster due to absence of instructions from the central and prefectural governments.

These examples show that the authorities did not properly follow the emergency procedures that were inscribed in their contingency manuals and hence failed to provide a maximum protection to the population against radiation exposures. These incidents led the population to lose trust in the handling of central and prefectural governments in effectively mitigating the effects of the accident and doing their best to protect their citizens.

## 4.3. Perception of risk

Prior to the accident, both evacuees and municipalities believed that the nuclear power station was extremely safe and that a severe accident was

52 Author's translation.

53 The screening procedure involves measuring the level of radioactive contamination on a person's outer body by placing dose measurement equipment over the body's surface. The medical team then is able to determine whether or not a person has been contaminated by radioactivity and thus needs to be decontaminated.

54 The becquerel (Bq) is a unit of radioactivity. 1 Bq represents the amount of radioactive material that will undergo one nucleus decay per second. Counts per minute (cpm) is a measure of the detection rate of ionisation events due to radioactivity.

almost impossible. The following section explores the circumstances that existed in these communities before the accident and analyses how this perception of nuclear risk heightened their vulnerability when faced with an actual disaster. Changes in the risk perception of nuclear energy among both the evacuees and the general public are also closely examined in order to demonstrate the immediate and profound impact that the accident produced on Japanese society.

### The myth of 'absolute safety'

During the interviews, most of the evacuees pointed out the myth of 'absolute safety' that had underpinned their confidence in nuclear power stations prior to the accident. During our field survey, the majority of interviewees said that they had believed that the nuclear stations were absolutely safe. Most interestingly, a couple of evacuees responded that they had previously never given thought to the nuclear power plant as it had been built long before their birth and they took its existence for granted. An evacuee from Naraha town recalls:

> *TEPCO used to tell us that its nuclear power plant was the safest in the world and that the occurrence of an accident was impossible. We were all brainwashed by them…*

As another evacuee from Futaba town remembers:

> *Every year TEPCO organised a town festival through which they carried out their information campaign, telling the residents that the nuclear power station was absolutely safe. I wondered, if it was so safe, why do they have to come every year to tell us the same thing? TEPCO also transferred 10,000 yen (€100) to all the households in town every year [as a sign of appreciation for hosting its nuclear facilities]. When I think of it now, why did they regularly send us money if their station was so safe and there was nothing to feel guilty about?*

Although few in number, there were also evacuees who had been sceptical about this myth. These evacuees are mainly people who had worked on site for TEPCO or those who, as members of their Local Nuclear Resident Committee, had been in regular contact with TEPCO and the state nuclear regulatory agencies.[55] Those who were connected in some way with the nuclear facility knew that the nuclear power stations were not failsafe, but they did not share their opinion with others at the time as it was considered as taboo for them to question the safety of nuclear installations. Their ultimate interest was to maintain the presence of the nuclear power plant on account of the benefits that it brought to their community, and questioning its safety was regarded as compromising this mutual interest (see the section below 'Nuclear-dependant communities').

Since the introduction of nuclear energy in 1955, the myth of 'absolute safety' – according to which a severe nuclear accident could never occur in Japan – has been nurtured by nuclear advocates in industry, government and academia, initially in order to convince rural communities to accept the installation of nuclear power stations and later to gain the population's continuing support. According to Yoichi Funabashi and Kay Kitazawa, who are the main authors of the report of the Independent Investigation Commission on the Fukushima Nuclear Accident (IIC) established by the Rebuild Japan Initiative Foundation, this myth was regarded as necessary by nuclear proponents in order to overcome the general public's strong opposition to nuclear power, an aversion that had its roots in the atomic bombing of Hiroshima and Nagasaki (Funabashi and Kitazawa, 2012: p.14). The authors explain that the disaster risk in the nuclear energy sector had been deliberately downplayed by these interest groups over the years. As time passed, the myth became ingrained in the thinking of nuclear regulators and plant operators, who also finally came to believe that an accident was impossible (IIC, 2012: p.298). The myth went as far as to misconstrue and distort common-sense logic. The IIC report describes the myth as 'the notion of safety where questioning is forbidden and logic is formulated in such a way as to preserve an already established idea'.[56]

At a symposium organised by Waseda University in March 2012, Professor Shunichi Murooka of Waseda University presented an interesting example to illustrate how this myth functioned prior to the disaster.[57] He explained that, in the wake of the Chernobyl accident, many nuclear facilities in Europe installed vent filters in order to avoid polluting the air with highly radioactive materials in

55 This committee is composed of residents and members of the town assembly to represent the residents' interests in matters concerning the nuclear power plant. It had regular contacts with the plant operator, TEPCO, and the nuclear regulatory agencies.

56 P.324; author's translation.

57 Presentation made by Professor Shunichi Morooka (Waseda University) at the Symposium on 'One Year after the Great East Japan Earthquake and the Fukushima Nuclear Disaster: The Cause, Impact, Countermeasure and Reconstruction from a Complex Mega Crisis', held at Waseda University on 8 March 2012.

the event of a severe accident. In Japan, however, the authorities and the nuclear operator considered that, if they fitted such filters, this would send out a message to the public that a severe accident might indeed happen one day and they therefore decided against this precautionary measure. According to Professor Murooka, had these vent filters been installed, the Fukushima accident would not have emitted as much radioactive material in the air as it did. The same logic governed the organisation of disaster drills for residents. When Niigata Prefecture, host to one of the nuclear power plants, planned to conduct nuclear accident drills for an earthquake scenario in 2010, the former Nuclear and Industrial Safety Agency (NISA), which reported to METI, advised that such drills would cause 'unnecessary anxiety and misunderstanding' among residents and thus suggested that they should not be implemented (Funabashi and Kitazawa, 2012: p.14). In Futaba and Naraha towns, disaster drills were conducted on a minimal scale with a minor incident scenario in which only those residents within the immediate vicinity of the power station were to be evacuated. In the logic of the safety myth, disaster preparation in itself had become a source of contradiction: if the nuclear power stations are so safe, why prepare the residents for an accident that would never happen? As a result, the local population was not sufficiently prepared for a disaster and eventual evacuation and, prior to the accident, their risk perception of nuclear power plants remained very low or, in some cases, non-existent.

**The safety myth shattered after the disaster**

All the evacuees interviewed, except a few of those who were employed directly by the nuclear power plants, said that they had completely lost confidence in the safety of nuclear power plants and wanted their towns to abandon nuclear energy. This tendency is also observed within the general public. Opinion polls taken prior to the accident showed that the majority of the Japanese population were in favour of stepping up the nuclear share of the energy mix. In the 2009 census conducted by the Cabinet Office, close to 60% of the respondents were in favour of promoting nuclear energy and another 20% were for maintaining the current nuclear energy production.[58] In total, almost 80% of the respondents approved of nuclear energy in 2009. However, in June 2011, three months after the accident, the opinion poll conducted by the Nippon Housou Kyoukai (NHK), Japan's national public broadcasting organisation, revealed a complete turn-around with those in favour of nuclear energy falling sharply to 28%, while the proportion of those preferring a reduction or halt of nuclear energy rose to 66%.[59] One year after the accident, in March 2012, the same opinion poll found 71% were in favour of phasing out and abandoning nuclear energy, while only 23% were in favour of promoting or maintaining nuclear energy.[60] Figure 6 below summarises these results and shows a reversal in public opinion toward nuclear energy in the wake of the Fukushima disaster.

Among the nuclear evacuees, this U-turn is even more pronounced. According to the survey conducted by Professor Akira Imai from Fukushima University in February 2012, the opposition to nuclear energy among the Fukushima evacuees rose to 82% (Imai, 2012a: p.33). Considering that an absolute majority of the local population supported the nuclear installation prior to the disaster (Kainuma, 2011), a fact also confirmed by our interviews, the change of opinion is most striking among the evacuees from those municipalities hosting the nuclear power plants. During the interviews, many voiced strong opposition to restarting the nuclear power stations (all the stations were in temporary shut-down for stress tests at the time of the interviews) and to nuclear energy in general, stating that there was no such thing as 100% safe nuclear power generation. At the same time, they also emphasised that the specific situations of the municipalities hosting nuclear power plants should be taken into account for any decision on whether or not to abandon nuclear energy. Being acutely aware of the benefits that a nuclear power plant also brings to a town in terms of job creation and economic prosperity (see the section 'Nuclear-dependant communities'), they did not wish to impose their opinion in favour of ceasing nuclear activities on the other hosting communities.

## 4.4. Prospects of return

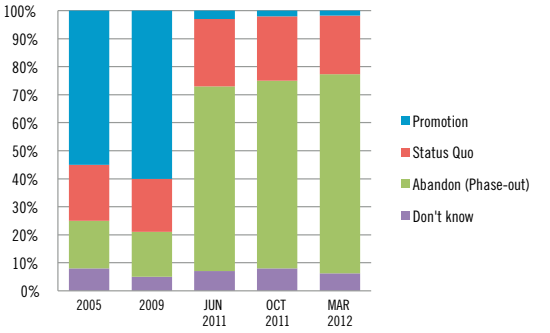
The prospect of return for nuclear evacuees remained uncertain one year after the disaster. The following sub-section analyses the situation facing nuclear evacuees with respect to their return and explores why the evacuees remain ambivalent on this question.

58 The survey result available in Japanese at: http://www8.cao.go.jp/survey/tokubetu/h21/h21-genshi.pdf

59 The survey result available in Japanese at: http://www.nhk.or.jp/bunken/summary/yoron/social/pdf/110709.pdf

60 The survey result available in Japanese at: http://www.nhk.or.jp/bunken/summary/yoron/social/pdf/120401.pdf

**Figure 6.** Trends in public opinion on nuclear energy




Source: Cabinet Office for 2005-2009 and NHK census for 2011-2012.

## The question of return is highly politicised

Unlike the return of tsunami evacuees, the return of nuclear evacuees has become a highly politicised issue one year on from the disaster. In the aftermath of the Fukushima accident, as early as 19 April 2011, the government raised the dose limit for public exposure to radiation from 1 mSv/year to 20 mSv/year.[61] Accordingly, the authorities, including the Fukushima prefectural government and several affected municipalities, began to emphasise that it was safe to return and live in areas with an annual radiation dose of less than 20 mSv. Policy priorities have thus focused on decontamination operations to 'cleanse' the affected communities of radiation and on the early return of evacuees. On the other hand, our field research found that the majority of evacuees are still anxious about the radioactive contamination of their houses and communities and remain highly sceptical about the effectiveness of decontamination operations. They are thus still undecided about their return.

In March 2012, one year on from the accident, the government proposed a new plan to reorganise the evacuation zone into three categories depending on the air radiation doses measured.[62] The first area, which has an air radiation dose of less than 20 mSv/year, is designated for intensive decontamination operations and the early return of evacuees. The second zone is defined as an area with a radiation dose of between 20–50 mSv/year, with return not deemed feasible for at least two to three years. The third zone is the area with more than 50 mSv/year, where the return will be difficult for at least the next five years (Table 4).

## Box 2. The government's compensation scheme for nuclear evacuees

The compensation scheme for the nuclear evacuees following the reorganisation of the evacuation zone was disclosed by the government in July 2012. The main elements of the scheme are as follows:

**Psychological damage caused by the evacuation**

In addition to the reimbursement of transportation and accommodation costs related to the evacuation, TEPCO will pay 100,000 yen (€1,000) per person per month from the date of the accident until the date when the evacuation orders are lifted by the government.

**Damages to fixed-assets (houses and land)**

As for private houses and lands located in the third zone (difficult to return to for 5 years), TEPCO will pay compensation equivalent to the pre-accident value of such assets. Those located in the first and the second zones will be compensated proportionally to the number of years the elapse until the lifting of evacuation orders for these zones.

**Damages to household effects**

The amount of compensation varies according to the size of families. For example, a family of two adults and two children will receive between €50,000–67,000 on the basis of the newly classified areas.

**Economic damages**

TEPCO pays an amount equivalent to the salary that an evacuee was earning prior to the accident (for a period of two years) and compensates for loss of business earnings based on the average profits that business owners were making before the accident (calculated on the previous five years for agriculture and forestry businesses, and three years for other business activities).

Source: METI. For further details, the following documents are available on the METI website in Japanese: http://www.meti.go.jp/earthquake/nuclear/pdf/institution.pdf; http://www.meti.go.jp/press/2012/07/20120720001/20120720001-1.pdf

**Table 4.** The government's proposal on the reorganisation of the evacuation zone

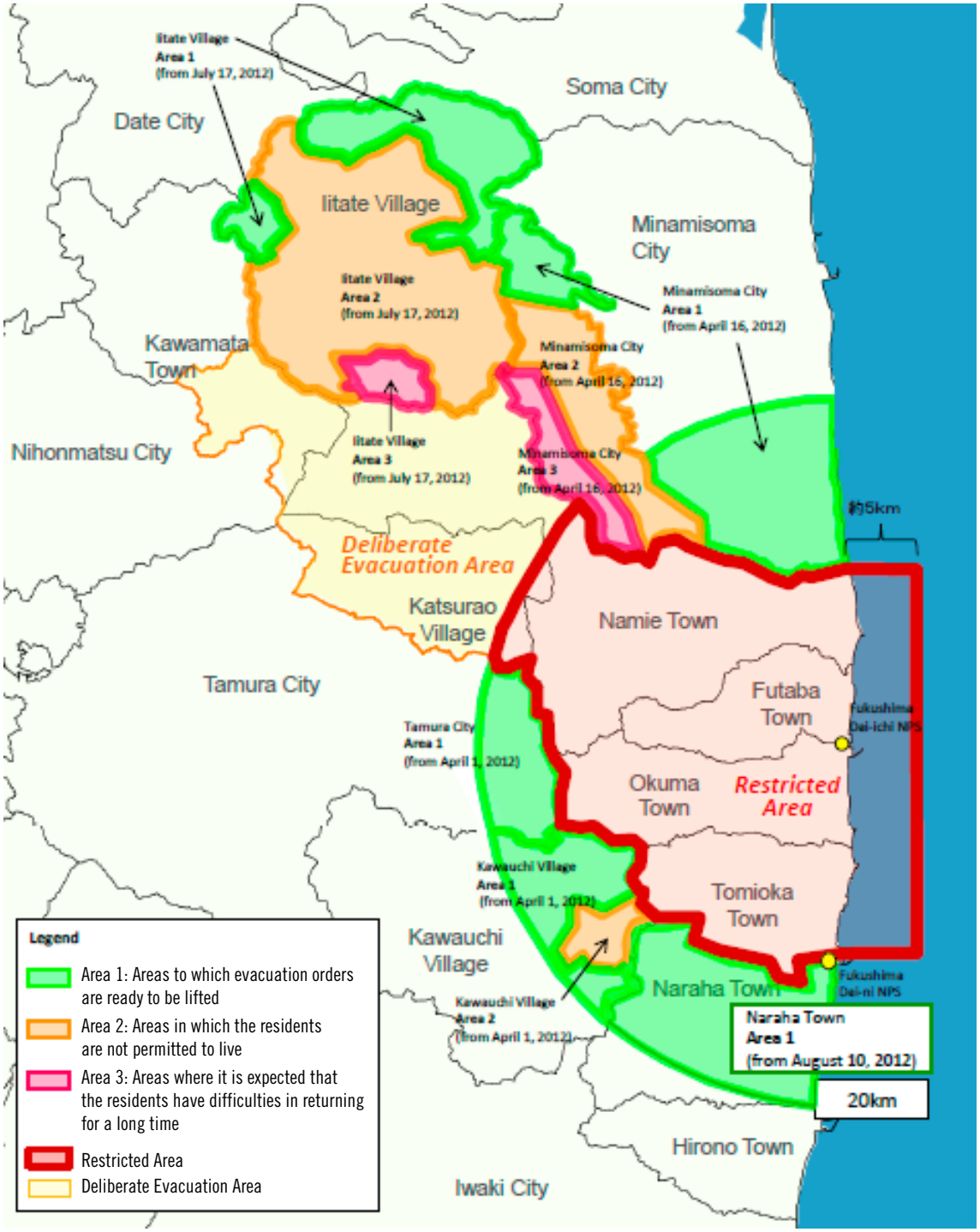
| Area | Name | Threshold Radiation Dose (airborne) | Timing of Return |
|---|---|---|---|
| 1 | Areas for which evacuation orders are ready to be lifted | Less than 20 mSv/year | Intensive decontamination and early return |
| 2 | Areas in which the residents are not permitted to live | Between 20-50 mSv/year | Evacuees cannot return for at least 2-3 years |
| 3 | Areas where it is expected that the residents will find it difficult to return to for a long time | More than 50 mSv/year | Evacuees cannot return for at least 5 years |

Source: Reconstruction Agency.

61 The reference dose for artificial irradiation for the public, excluding medical and occupational exposures, in 'regular exposure situations' defined by International Commission on Radiological Protection (ICRP) is 1 mSv/year (ICRP, 2007). The Japanese government refers to the ICRP's recommendation on the reference dose fixed for 'existing radiation exposure conditions', applied to occupational exposure situations and residual exposure situations after a nuclear reactor accident, to justify its decision to raise the dose limit to 20 mSv/year. The reference dose for 'existing radiation exposure conditions' is between 1–20 mSv/year according to ICRP.

62 Source: METI (http://www.meti.go.jp/earthquake/nuclear/pdf/20120330_02f.pdf).

**Map 5.** Reorganisation of the evacuation zone (as from August 2012)




Source: Ministry of Economy, Trade and Industry

However, this proposal raised many concerns among the affected communities, obliging the government to hold consultations with each municipality. In August 2012, only 5 out of 11 affected towns had officially adopted the plan, while the other 6 were still in consultation and undecided.[63] According to the interviews, their main cause for concern was that the proposal splits towns into three areas each benefiting from different levels of financial assistance (Box 2), which is likely to create jealousies among the residents and threaten the cohesiveness of the community. Secondly, it creates patches of land to which residents can return while the rest remain restricted access areas (Map 5). During the interviews, several evacuees questioned the feasibility of returning to such areas if vital social infrastructures such as clinics, schools and shops are located in the second or the third zone and thus simply not accessible. Thirdly, many evacuees, especially those with small children, are deeply anxious about radiation effects if they return. They remain sceptical of the new safety standard of 'less than 20 mSv/year', despite the government's reassurances.

Since the redefinition of the evacuation zone, the government, Fukushima Prefecture and several affected municipalities have mobilised to encourage evacuees to return to the localities classified as Area 1, which has annual air radiation dose below 20 mSv. For the municipal governments, the question of return is a matter of their own survival: if the residents do not return, the town will disintegrate and ultimately disappear from the map, thus putting their existence and identity into jeopardy. With slogans such as 'Without the revitalisation of Fukushima, there is no revitalisation of Japan'[64] and 'Don't give up Fukushima!', the authorities are setting priority on the 'normalisation' of the Fukushima disaster situation and urging the evacuees to return and reconstruct their lives. The majority of evacuees, however, are still fearful about the risks of radiation. One evacuee from Naraha town expressed his frustration:

> *The government forced us to evacuate in the first place. Now it's trying to force us to return without much information. When it comes to the issue of return, I feel as if we will do it at our own risk. We don't know whether the government will compensate the medical fees when we get sick [from radiation effects] after returning.*

The authorities' emphasis on return is thus making the evacuee communities mistrustful of the public authorities and becoming a source of grievances. Meanwhile, the municipalities are confronted with the extremely difficult task of making the right choice for a future that both ensures the evacuees' best interests and maintains their community's cohesiveness and identity.

### The nuclear evacuees' unwillingness to return

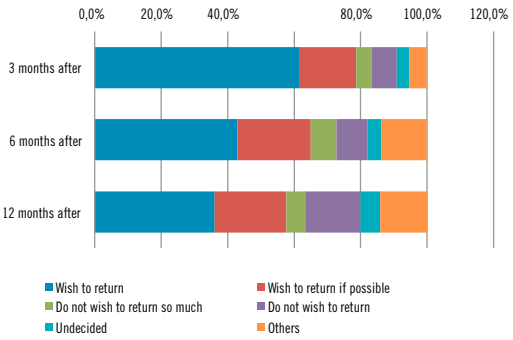
During the field research, the majority of evacuees said either that they wished to return but knew this would not be possible, or simply that they did not wish to return. This clearly shows the reality that nuclear evacuees are facing on the ground. Most express a wish to return, which in fact means that they will not probably return considering the situation, but they do not want to state this outright. In the field interviews, the DEVAST research team often felt that the evacuees were hesitant to give a clear response to the question of return, as return is closely linked to their community's cohesiveness and survival; any expression of unwillingness to return could be seen as lacking solidarity and betraying their community. The issue of return, therefore, has become an almost taboo subject and a fault line dividing the evacuee communities.

Professor Akira Imai from Fukushima University conducted a panel survey among the nuclear evacuees in which same questions were asked to same interviewees over time. He then analysed how their opinions had evolved. The first survey was conducted three months after the accident in June 2011, the second six months after in September 2011 and the third twelve months after in February 2012 (Imai, 2011a; 2011c; 2012a). The survey findings show that the willingness to return decreases with the passage of time and an increasingly realistic picture of the hometown situation (Figure 7). The evacuees who expressed their wish to return in June 2011 represented 61.7%, whereas in the latest survey conducted in February 2012 this figure had dropped to only 36.1%. In addition, a clear division of opinion was observed between the generations under the age of fifty and the over-sixties (Figure 8). According to a resident survey conducted by Naraha town in February 2012, the proportion of evacuees aged between twenty and fifty who expressed a willingness to return was around 34%, while more than half of those aged over sixty declared their wish to return (Takaki, 2012). In the same survey, over half of the respondents (56%)

63 Minamisoma, Iitate, Tamura, Kawauchi and Naraha have accepted the government's proposal. Tomioka, Okuma, Futaba, Namie, Katsurao and Kawamata have not yet made a decision.

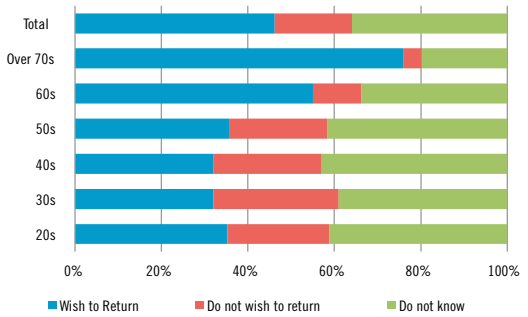
64 Prime Minister's speech at a press conference on 2 September 2011 available in Japanese at: http://www.kantei.go.jp/jp/noda/statement/2011/0902kaiken.html.

**Figure 7.** Changes in willingness to return




Source: Akira Imai, The Third Resident Survery, 2012.

**Figure 8.** Willingness to return according to age




Source: Naraha town's resident survey in February 2012.

stated that a decrease in the radiation level was a condition of their return, with their second biggest concern being the rehabilitation of basic social infrastructure (29.7%). During our own interviews, evacuees also raised the issues of employment prospects and the decontamination of their houses as conditions of their return. But the phrase that we heard repeatedly in all the municipalities is: 'people under sixty years old will probably not return as they are afraid of the radiation effects on their children'. If this turns out to be the case, the return of the evacuees aged over sixty will also pose enormous challenges. Several of those interviewed raised the following question: 'if there are no shops open in town, no doctors and nurses in the clinics and no helpers in elderly homes, how can we return and rebuild our lives?'. The prospect of return therefore remains uncertain and continues to cause a great deal of psychological stress for the evacuees.

### The government's contradictory policies for return

During the interviews, the municipal workers and evacuees from the towns hosting the nuclear power plants often expressed frustration at the contradictory policies proposed by the government with regard to return. In March 2012, when the government proposed a reorganisation of the evacuation zones, it also put forward a plan to set up an interim storage facility for the contaminated soil collected during the decontamination operations around the two nuclear power plants in Fukushima Prefecture. To this end, it officially requested the four hosting communities[65] to accept the plan. However, both the municipalities and the evacuees criticised this plan as being at odds with the government's policy for decontamination and the early return of evacuees. They fear that if they accept the installation of an interim storage facility, they will not be able to return to the community given that highly irradiated soil will be stored in the vicinity.

The field interviews clearly evidenced a situation of 'passing the buck' between the central and municipal governments on the issue of return. Municipal governments sometimes asked the central authority to make a decision on their return to ensure that the final responsibility for assisting their returning and for assuring the welfare of the returning communities would remain with the central government. On the other hand, the central government insists that it is up to each municipality whether or not to accept the plan for the reorganisation of the evacuation zone. In reality, the municipalities and evacuees have had little choice but to accept the plan as no other alternatives are proposed by the government. As things stand, neither the government nor the municipality have forced evacuees to return and thus neither party is ultimately responsible for the future of returnees.

### Decontamination or contamination-transfer?

Evacuees refer to the decontamination of their community as a key condition for their return. Yet, during our field survey, most of them were profoundly sceptical as to its effectiveness. Imai's survey revealed that 80% of the evacuees were unconvinced by the results of the authorities' decontamination operations since these are proving much less efficient than initially expected (Imai, 2012a). The standard decontamination operation involves removing topsoil, cutting away undergrowth and pressure washing roof tiles and asphalt roads.[66] In reality, the Fukushima evacuees

65 Futaba, Okuma, Tomioka and Naraha towns.

66 Source: Ministry of Environment (http://josen.env.go.jp/material/download/pdf/josen.pdf).

and residents have discovered, using their own Geiger counters, that if it rained or snowed after the operation, the radiation level went up again.[67] The survey conducted in Fukushima City by the international NGO, Friends of the Earth, showed that, after a decontamination operation, the radiation level had decreased by only 6.7% on average at 1 m above the ground (Yamauchi, 2011). Another problem is that the removed contaminated topsoil is put into plastic bags and stockpiled next to the site or inside the city limits, given that so far no specialised storage facility has been designated to stock the contaminated soil satisfactorily. As long as the removed soil is left on site, radiation levels in the area are not likely to decrease to any great extent. Furthermore, when roads and roofs are cleaned with water, the contaminated water ends up in the sewers or is absorbed into the surrounding fields and remains radioactive. This means that the decontamination operation is merely transferring radioactive materials from one place to another. Once materials become contaminated, their radioactivity cannot be eliminated simply by 'cleansing'. One evacuee from Futaba town expressed his frustration as follows:

> *There are many farmers in our town. When we return, if we cannot eat what we grow on our farms and we cannot drink the water because it comes from the contaminated river, how are we going to live?*

Another evacuee also from Futaba town added:

> *There are many radiation hot spots in individual houses as well. The authorities say 'it's safe to live in your area because the radiation level is OK but please don't get close to the four corners of your house [where the rain water drops from the gutter]'. When I actually went to my house and measured the radiation level, I was shocked to detect a very high radiation level around the gutters and the corners of window frames. It is impossible to live in a house that has hot spots in different places.*

In addition, radioactivity is often concentrated in the vegetation and soil of nearby hills, mountains and river banks. Many evacuees remarked that decontaminating the mountains was an almost impossible task. As the affected communities are often in a rural setting surrounded by hills and mountains, the evacuees are highly sceptical about the effectiveness of the decontamination operations and the prospects of their eventual return. In this context, some evacuees have started to question whether it is useful for the government to pursue its decontamination policy, which receives a large slice of the reconstruction budget.

## 4.5. Post-disaster challenges

This sub-section presents the major challenges facing the evacuees, the residents of Fukushima Prefecture, the affected municipalities, the government and the Japanese population at large one year after the Fukushima accident.

**Discrimination towards the 'contaminated'**

Some evacuees that we interviewed complained that they had suffered from discrimination both during their displacement and in their place of refuge. In the early stages of the crisis, the evacuees from Fukushima Prefecture were considered as 'contaminated' by the rest of the population. They often met with different forms of discrimination and, in some cases, were openly avoided by the public. As Japanese vehicle number plates indicate the place of registration, evacuees who fled by car were easily identifiable. A couple of evacuees mentioned that the cars with a Fukushima number plate were banned from using certain roads or entering certain localities. An evacuee from Okuma town recounted one of her experiences:

> *When I evacuated to Niigata Prefecture [200 km west of the Fukushima Daiichi plant], I was really discriminated against… For example, when I went to a public bath to take a shower, there was a hand-written notice saying 'Entry prohibited to persons from Fukushima'. I was really shocked. Actually, I experienced the same thing even in Aizu region [the western part of Fukushima Prefecture; 100 km from the nuclear station]. Although Aizu is part of Fukushima Prefecture, I saw a notice saying that the place is reserved for non-Fukushima people. Moreover, every time I parked my car in a supermarket car park, when I came back to my car, there were no cars parked around mine. In fact, because of my number plate, everybody could see that I came from the area included in the evacuation zone. So no one wanted to park their car close to mine.*

Some evacuees also mentioned that their children were often bullied at school in the towns where they had taken refuge: they are seen as 'contaminated' or called 'Mr/Miss Fukushima' by other pupils. As the crippled nuclear power station and the Prefecture share the same name, 'Fukushima', the accident has been amalgamated with the Prefecture and the entire Fukushima region is now viewed as 'contaminated' or 'condemned'. The additional traumatism of discrimination is one of the

67 Information obtained from the evacuees and the residents of Fukushima City during our interviews.

key aspects that differentiates the nuclear evacuation from the displacement caused by the tsunami. The widespread image of Fukushima as 'contaminated' and the self-image of nuclear evacuees as irradiated and discriminated against will have a lasting effect in the minds of the evacuees and the rest of the population.

**Nuclear-dependent communities**

When explaining the pre-accident context, the municipal workers and evacuees from the towns that host the nuclear power plants often referred to the 'special relationship' they had enjoyed with the plant operator, TEPCO. They describe it as a relationship of 'co-existence and mutual prosperity'. The municipal officers from both Futaba and Naraha towns confessed that it was difficult to criticise TEPCO even after the accident, as they were only too aware of TEPCO's substantial contribution to the prosperity of their towns. Hiroshi Kainuma explains, in his book entitled *Theory of Fukushima: How was the 'Nuclear Village' Formed?,*[68] the process whereby a town ends up becoming utterly dependent on the existence of a nuclear power plant for its economic survival. Whenever a nuclear installation plan is proposed, various upstream financial incentives are generally offered by the government and the nuclear operator so as to convince local residents to support the plan. The sites targeted for these nuclear facilities were often remote and sparsely populated regions, largely impoverished and with little industrial fabric. Traditionally, the men in such localities have to move to bigger towns and cities to find employment, leaving their wives and children behind. However, when a nuclear plant arrives and creates jobs for a hefty share of a town's population[69] and the local government receives large amounts of tax and subsidies, the town's economy flourishes and the presence of nuclear industry becomes indispensable to the residents' livelihoods. According to Kainuma, before the arrival of a nuclear facility, these towns were among the poorest municipalities in Fukushima Prefecture. Yet, by 1977, six years after the arrival of the Fukushima Daiichi nuclear power station, the residents from the two hosting towns were earning the highest salaries in the whole prefecture, even surpassing salaries in Fukushima City, the prefecture's capital city (Kainuma, 2011: pp.130-141). One evacuee from Futaba town recalls:

> *Thanks to the nuclear power station, our men did not have to look for a job away from the town. Everybody's life improved and we became the richest in all Fukushima Prefecture. As a result, no industry developed in the town except agriculture. When the station was installed during the 1970s, I was earning 52,000 yen (€520) per month at the agricultural cooperative. If you worked with TEPCO during that period, you earned 120,000 yen (€1,200), more than double your salary!*

But as the nuclear facility ages, it brings diminishing financial revenues to the town[70] (IIC, 2012: pp.329-330). Accustomed to a certain level of fiscal expenditure, these towns then begin to show budget deficits as the income from the nuclear facility declines. For this reason, the municipalities often ask the government to install more nuclear facilities in their town in order to offset the shortfall. The report from the Independent Investigation Commission[71] calls it the 'nuclear addiction' of the host communities (IIC, 2012: p.330). During one interview, a municipal employee of Futaba town murmured:

> *TEPCO was good for us. Most of us benefited from them in one way or another. I want to denounce them on account of the accident, but I also feel grateful to them for having given us a prosperous life. It's complicated. You know, before the accident, all the high school graduates in Futaba town found jobs in town thanks to the nuclear power plant. We had a privileged life.*

During the interviews, many evacuees from these communities voiced concerns about their job prospects when they eventually return to their hometowns. Since the government announced the decommissioning of the four damaged reactors in Fukushima Daiichi power plant, they are worried that they will not be able to return to their former jobs or find any other employment, given that most of the local jobs were connected with the nuclear industry. In addition to problem of radioactive contamination, the uncertainty of job opportunities further complicates the evacuees' decision to return.

68 Author's translation from the Japanese title: *Fukushima ron, genshiryoku mura ha naze umaretanoka?*

69 From the interviews with the municipalities of Futaba and Naraha. In addition to offering direct employment, TEPCO also generated a great deal of indirect employment in these towns, such as restaurants for the plant workers and hotels for the technicians who came periodically to maintain the nuclear reactors.

70 The revenue from a fixed property tax paid by the nuclear plant operator to the host community diminishes every year due to the depreciation of assets.

71 The independent investigation panel on the Fukushima accident set up by the Rebuild Japan Initiative Foundation.

### Controversy on the health risks of low-dose radiation exposure[72]

On 19 April 2011, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) set an interim reference radiation dose rate of 1–20 mSv/year for schools in the Fukushima Prefecture, whereas the normal reference dose rate for public exposure to radiation[73] remained at 1 mSv/year in other parts of Japan (ICPR, 2007).[74] Since taking this decision, the authorities have been using the annual dose rate of 20 mSv (which is the upper limit of the 1–20mSv interim dose rate) as the threshold value to mark out the evacuation zones and declare an area safe for return (see section 4.4. Prospects of return). To justify this choice, the Japanese government refers to the ICRP's recommendation on the reference dose rate for 'existing radiation exposure conditions' including occupational exposure situations and residual exposure situations after a nuclear accident, which should be limited to between 1 and 20 mSv/year.[75] The field interviews with the Fukushima evacuees, residents and local NGOs suggest that there are three main controversies on this governmental decision.

First, the 20 mSv limit is not only applied to adults but also to children, who are generally considered to be more sensitive to radiation effects than adults.[76] According to the ICRP recommendation, 1–20 mSv/year is also the reference dose for occupational radiation exposure applied to workers at nuclear facilities or radiological departments in hospitals (ICRP, 2007). This means that nuclear power plant workers and children in Fukushima are placed under the same dose limit. Furthermore, MEXT established the threshold dose limit per hour for children to play in the schoolyard at 3.8 $\mu$Sv/hour.[77] However, this dose limit was calculated from 20 mSv/year on the assumption that children spend only eight hours outside per day. If the average hourly rate is calculated normally from the 20 mSv annual dose[78], this gives 2.28 $\mu$Sv/hour. Thus, the hourly dose limit fixed by the government for Fukushima school children is 1.5 $\mu$Sv higher than the average hourly rate of the 20 mSv/year threshold fixed by the same authority. Compared to school children in other parts of Japan, where the reference dose remains 1 mSv/year, the children in Fukushima are exposed to the radiation level which is as much as *30 times higher.*[79] *On 1 May 2011, Tokyo University Professor Toshiso Kosako, a specialist on radiation safety, resigned his position as special advisor to the Cabinet in protest against this '3.8 $\mu$Sv/hour' and '20 mSv/year' limit for children in Fukushima. He explained in his resignation statement*[80] that 'it is completely wrong to use this standard for schools' and this limit must 'be used in cases of exceptional or urgent circumstances (for two to three days or one to two weeks maximum)', emphasising that 'it is very rare even among the occupationally exposed persons to be exposed to radiation of 20 mSv per year'. He concluded by saying that he could not possibly accept that this dose level be applied to babies, infants and primary school pupils, not only from his viewpoint as an academic but also on account of his humanistic beliefs. Despite many criticisms from both inside and outside Japan against this policy, the Japanese government has not yet reviewed its decision, and a radiation exposure dose of 20 mSv/year is still tolerated for the Fukushima population including children, with no fixed timeframe (as at September 2012).

The second controversial issue involves the authorities' dissemination of information on the health effects of radiation exposure. Since the decision on a new reference radiation dose, the authorities have started information campaigns designed to reassure the public rather than to alert them and raise their awareness of the radiation risk. MEXT has issued a number of information booklets on radiation intended for the general public and schools, in which it repeatedly emphasises that 'a causal relationship between radiation exposure and developing cancer is not clearly proven under the accumulative exposure dose of 100 mSv' (see Box 3) and that 'under the exposure dose of 100 mSv, the probability of developing a cancer is higher from other causes such as smoking or

72 Low-dose radiation exposure means an exposure situation under the dose of 100 mSv.

73 Here 'radiation' means artificial radiation excluding natural background radiation.

74 Source: MEXT (http://www.mext.go.jp/b_menu/houdou/23/04/1305174.htm).

75 http://www.irsn.fr/EN/Research/publications-documentation/Scientific-books/Documents/CIPR_103.pdf.

76 Koide refers to the book, *Radiation and Human Health,* published in 1981 and written by the late John W. Gofman, who was Professor Emeritus of Molecular and Cell Biology at University of California, Berkley. Citing this book, Koide mentions that 'an infant under one year old has four times more sensitivity to radiation exposure than an adult aged 20–30 ' (author's translation).

77 Source: MEXT (http://www.mext.go.jp/a_menu/saigaijohou/syousai/1305173.htm).

78 20,000 $\mu$Sv (20 mSv) / 24 hours / 365 days = 2.28 $\mu$Sv/hour.

79 The regular dose limit is around 0.11$\mu$Sv/hour calculating on the basis of 1m Sv/year.

80 Cf. Professor Kosako's statement of resignation at a press conference held in Tokyo on 29 April 2011 (http://www.japanfocus.org/events/view/83). (in-text quotations translated by Izumi Tanaka and the author).

## Box 3. ICRP guidelines (ICRP 2007)

**The health effects from radiation: 'deterministic effects' and 'stochastic effects'**

Deterministic effects occur once a threshold dose of exposure is exceeded, generally following high radiation exposure events. These effects include skin redness, cataracts, infertility and, in the worst cases, death. Stochastic effects such as cancer or heritable effects are caused by relatively low radiation doses. For exposure to a radiation dose of more than 100 mSv, there is a clear causal relationship established between the exposure dose and cancer rate. But for exposure under 100 mSv, this causal relationship has not yet been scientifically proven conclusively. Notwithstanding, the ICRP recommendation is based on a hypothesis that there is also a proportional relationship between exposure doses and cancer rates even under 100 mSv exposure.

**The reference level* for three different exposure situations (ICRP, 2007: p.102; Holm, 2007):**

| | | |
|---|---|---|
| Between 20–100 mSv | *Emergency exposure situations* | Radiological emergency situations which require urgent action in order to avoid undesirable consequences. |
| Between 1–20 mSv | *Existing exposure situations* | Occupational exposures in planned situations; natural background radiation (radon in dwellings); post-accident recovery situations |
| Under 1 mSv | *Planned exposure situations* | Public exposures in planned situations |

* An acute dose or an annual accumulative dose.

**Two types of radiation exposure: 'internal exposure' and 'external exposure'**

External exposure is irradiation from external radioactive sources such as airborne radioactive materials. Internal exposure is irradiation from radioactive sources inside the body such as ingested contaminated food and water. After the intake of radioactive materials into the body, the person is continuously exposed to radiation until the radioactive source has completely decayed, a process that can take many years. The above reference dose does not include such internal exposure.

insufficient consumption of vegetables'[81] (MEXT, 2011a: pp.10-12). In addition, a booklet issued on 24 June 2011 clearly states that 'there is almost no possibility of developing thyroid cancer due to the recent Fukushima accident'. It concludes by saying that 'the psychological stress caused by the anxiety of "being irradiated" has more harmful effects to health than radiation exposure itself and that this stress causes many health troubles'.[82] These booklets do refer to the hypothesis underpinning the ICRP recommendation for radiation protection: the probability of developing a cancer is proportional to the dosage exposed, even under 100 mSv (ICRP, 2007). However, this message is only very briefly mentioned, usually in one sentence, and the focus is more on reassuring the public that there is little cancer risk for exposure to radiation doses of under 100 mSv.

One week after the disaster, the Fukushima Prefecture invited Professor Shunichi Yamashita from Nagasaki University, appointing him as Radiation Risk Management Advisor for Fukushima Prefecture. He has given talks on radiation risk in all major cities in Fukushima, reiterating that there is absolutely no health risk from radiation exposure under 100 mSv per year and that children can play outside without any problem.[83] However, several months later he corrected this information stating that 'it was rather 10 mSv/year, not 100 mSv/year, under which there is no health effect'.[84] A similar message was disseminated by other prefectural authorities such as the Tokyo Metropolitan Government and public research institutions such as the National Institute of Radiological Sciences.[85]

Thirdly, this reference dose concerns only external exposure to radiation and does not include the effects of internal exposure (Box 3). In its 2007 recommendation, ICRP urges that, in the case of emergency exposure situations, an individual's total exposure dose from different sources be taken into account when developing radiation protection measures (ICRP, 2007). People living in Fukushima most likely consume local produce that could be contaminated by radioactive substances. The government policy, which focuses only on the air radiation dose and external exposure, thus tends to overlook other exposure risks and fails to fully address the radiation protection needs of the concerned population.

According to the field interviews, this situation occasioned a great deal of confusion and distress among the residents and evacuees of Fukushima Prefecture, as they no longer knew whom or what to trust concerning the risk related to radiation exposure. Furthermore, such circumstance created divisions and tensions among the affected population depending on the individual opinion and perception of the radiation risk, as explored below.

81 Author's translation.

82 Author's translations.

83 Author's translations. Lecture on Radiation Risk organised by Fukushima City Council on 21 March 2011, available in Japanese at: http://wwwcms.pref.fukushima.jp/pcp_portal/PortalServlet?DISPLAY_ID=DIRECT&NEXT_DISPLAY_ID=U000004&CONTENTS_ID=23695

84 *Ibid.*

85 The official statement concerning the 'safe-under-100 mSv' level is quoted in many Twitter messages and on Internet blog sites (For example, http://blog.livedoor.jp/wisteriabook/archives/3289454.html), but today it is untraceable on the websites of those institutions consulted at the time of the writing (September 2012). The author assumes that the pages were simply erased or made inaccessible by the institutions after they received criticisms from members of the public.

## The plight of Fukushima residents – the phenomenon of 'self-evacuees'

In order to fully understand the grave social consequences of the Fukushima nuclear disaster, we must look at the situation in the Naka-dori region of Fukushima. Fukushima Prefecture comprises three regions (Maps 2 and 6): *Hama-dori* on the coast, most of whose territory was designated as evacuation zones, *Naka-dori* in the middle, the political and economic centre of the Prefecture, and *Aizu* located inland to the west. In the Hama-dori region, many residents were forced to evacuate on the government's orders, whereas the residents in the Naka-dori region were reassured by the authorities that it were safe to stay despite the elevated radiation dose, which in some places was as high as that of the official evacuation zones. For example, the Onami and Watari districts of Fukushima City have spots where radiation doses of 3.87 μSv/hour and 10.36 μSv/hour were detected by the residents and an NGO (Yamauchi, 2011).[86] On 16 June 2011, the government began to designate the areas identified as having a radiation dose of more than 20 mSv/year (or 3.0 μSv/hour)[87] as Specific Spots Recommended for Evacuation (Specific Spots), and decided to provide financial assistance for the evacuation of the residents involved. However, these districts were not finally designated as Specific Spots as the authorities' own readings showed a radiation dose under the threshold level. Moreover, in May 2011, MEXT disclosed information on the level of soil contamination in Fukushima Prefecture, which indicated that the amount of cesium-137 detected in the soil of Fukushima City and other cities in the Naka-dori region was more than 550 kBq/m² (kilobecquerels per square metre) (Kawata, 2011). This level equals the threshold contamination level for the Strict Radiation Control Area where residents were temporarily resettled after the Chernobyl accident, fixed by the radioprotection regime of the former Soviet authorities at the time.[88]

In this context, the residents in the Nada-dori region, fearing the radiation effects, started to evacuate from their homes to other parts of Japan without any government assistance.[89] Many of these self-evacuees were mothers with small children[90] who had either financial means or family connections outside Fukushima. Moreover, those with Internet knowledge and thus able to obtain information other than the official announcement made by the government and Fukushima Prefecture were among the first to flee. Meanwhile, others, due to financial or family reasons were obliged to remain in Fukushima, living with high levels of anxiety about the radiation risk. To cope with these fears, many of them are trying to convince themselves that they can trust the authorities' assurance that it is safe for them and their children to live in Fukushima as long as the radiation dose does not exceed 20 mSv/year.[91] As a result, these 'stayers' started to criticise self-evacuees as well as other residents who remain sceptical of the official reassurances, labelling them as cowardly and selfish. As one self-evacuee from Koriyama City explained:

> *The words, 'radiation' and 'evacuation', have become a taboo in Naka-dori region. Voluntary evacuation is considered as an escape from the hardship that the community is trying to overcome collectively and thus labelled as an act of betrayal… Mothers who oblige their children to wear masks all the time or to refuse the lunch served at school cafeteria [as schools in Fukushima purchase local produce to cook lunch] in order to protect their children from internal exposure, are often considered by other mothers as paranoid and annoying. In this situation, many mothers have become depressive and developed other psychological conditions, as their level of anxiety and the pressures from society are becoming too high.*

This is a tragic situation for both self-evacuees and the residents who stay on. Self-evacuees often

86 The newspaper, *Mainichi Shimbun*, 'Higashinihon daishinsai: fukushima daiichi genpatsujiko onami district, menteki josen ha isshin ittai jisshi ichinen senryou saijousou no basyo mo' (author's translation: One year from whole-area decontamination operation - radiation dose increased in some places), 17 October 2012.

87 The threshold hourly radiation dose required for an area to be designated as a Specific Spot changes depending on the municipality, as does the method of calculating the hourly dose from the 20 mSv/year threshold value. The 3.0 μSv/hour is the threshold dose adapted by Date City, Fukushima (http://www.City.date.fukushima.jp/profile/k-kaiken/pdf/h23/20111125-shiryo01.pdf).

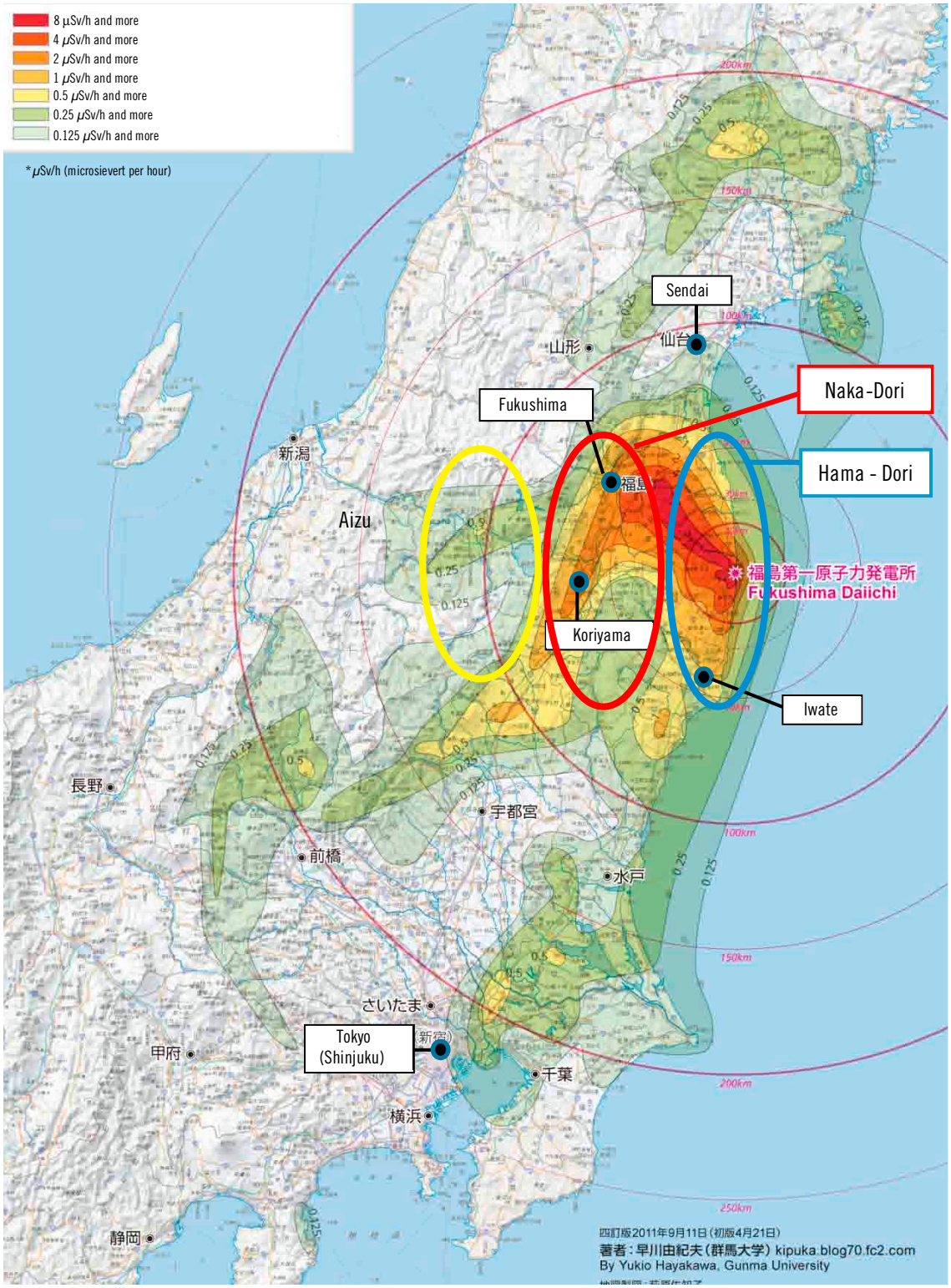
88 Kawata, 2011.

89 In December 2011, the government decided to provide compensation for self-evacuees from the selected 23 cities located mainly in the Naka-dori region of Fukushima. However, the scheme targeted only those who self-evacuated between 11 March and 31 December 2011, and was a one-off payment of 80,000 yen (€800) for an adult and 400,000 yen (€4,000) for a child or a pregnant woman.

90 In culturally traditional regions such as Fukushima Prefecture, it is mainly the mothers who take care of the children and generally stay at home as housewives. It is thus easier for them to flee with the children while their husbands stay on and continue to work in Fukushima in order to financially support such evacuation.

91 From the interviews with the residents and self-evacuees from the Naka-dori region of Fukushima.

**Map 6.** Radiation contour map of the affected region




Source: map created by Professor Yukio Hayakawa*, 11 September 2011.
Professor Yukio Hayakawa is a geologist at Gunma University (http://kipuka.blog70.fc2.com).

feel isolated and abandoned in their place of refuge, as their relationship with their hometown has been cut off; they have lost friends and sometimes their husbands if these opposed voluntary evacuation and decided to stay in Fukushima. The research team also learnt that self-evacuees often evacuated during the night without telling anybody in order to avoid uncomfortable encounters with neighbours and friends. Once they evacuate, it is difficult for them to return as they are stigmatised by the community. For those who stay, the situation is no easier. In particular, mothers who are worried about the radiation effects on their children but do not have a choice of voluntary evacuation are experiencing significant psychological distress. The resident survey conducted in May 2012 by Fukushima City found that 34% of the residents still wished to evacuate from the City, with 89% of these respondents saying that they were worried about the future health of their children.[92] Over a long run, this situation will have devastating consequences for the welfare of the population in the Naka-dori region. Yet, neither Fukushima Prefecture nor the government has set up any concrete programme to assist the self-evacuees and the 'stayers', thus leaving a deeply divided and broken community.

### Divided communities and families

The nuclear accident is creating many rifts and tensions in Fukushima's affected communities. One of the main causes of these divisions stems from the government's decision to raise the radiation dose reference level for Fukushima from 1 mSv/year to 1–20 mSv/year, as well as its emphasis that radiation exposures of up to 20 mSv/year, and in some cases up to an accumulative dose of 100 mSv, have little effect on health. This policy of reassurance, rather than precaution, has created an atmosphere where those who challenge the official notion of safety are viewed as anti-establishment, disturbing the harmony of the community, and egoistic, jeopardising the community's joint effort to overcome hardship.

The main divisive issue for the evacuees is that of return. Those who openly express unwillingness to return are often regarded as selfish and disloyal to the community to which they belong. This has thus become a taboo subject among the evacuees, as revealing one's preference implies that the person concerned is likely to be pigeonholed into one of two boxes: 'willing to return' (loyal) or 'not willing to return' (disloyal). Fukushima university professor Akira Imai, author of the three aforementioned evacuee surveys, asserts that forcing the evacuees to choose between 'return' and 'no return' should be avoided (as a policy) because this transforms a situation of 'not being able to return' into one of 'not wanting to return' thus leaving those who are anxious about the radiation risk and reluctant to return to condemnation exposed to judgement from the rest of the community (Imai, 2012b). Thus, whereas previously individuals had had no choice but to evacuate and this common plight had given them a sense of unity, the choice of return is now dividing communities, stigmatising those reluctant to return and causing further trauma to the evacuee communities.

Moreover, tension has also arisen between evacuee communities and host communities within Fukushima Prefecture. Iwaki City, situated 30–40 km south of the crippled nuclear station, for example, hosts the highest number of evacuees (23,000[93]) from the evacuation zone due to its geographical proximity. The interviews with the evacuees and Iwaki residents revealed friction between the evacuee community and the city's residents. This is mainly caused by the government's different treatment for the affected population. During the first six months following the accident, the northern part of Iwaki City was included in the recommended evacuation zone and thus many residents, including those who were living outside of the designated zone, evacuated with or without government assistance. In addition, the city's agriculture and tourism industries have been hard hit by radioactive contamination from the accident. Life has become difficult for the residents but, despite this hardship, they do not receive much financial compensation or assistance from the government because the city has not been included in any evacuation zone since October 2011 and they perceive this situation as unfair. On the other hand, the evacuees from the evacuation zone who took refuge in the city receive various types of compensation from the government. As an Iwaki resident explains:

> *These evacuees who receive a lot of money from the government act like the 'new rich' buying all the goods in a shop and always eating at restaurants. They don't work and spend all day in a gambling house wasting the compensation money. Plus, there are many car accidents in the city because they are villagers and do not know how to drive in a city.*

92 The newspaper, *Asahi Shimbun,* 'Ima demo hinan shitai, fukushima shimin no 34%: shi tyousa' (Author's translation: 34% of residents in Fukushima City currently wish to evacuate, the City's survey found), 17 September 2012.

93 Source: Iwaki City council. (http://www.city.iwaki.fukushima.jp/info/dbps_data/_material_/info/zhigai20120912.pdf)

This situation is further isolating the evacuee community from the host community and adding more stress to their displacement.

Furthermore, residents from the Naka-dori region in the Fukushima Prefecture are divided on the issue of evacuation. The interviews with self-evacuees and the Naka-dori residents found that those who self-evacuated are seen as 'the privileged' or 'the escapees' within the community and they thus often feel isolated and abandoned. On the contrary, those who stay, mostly for economic reasons,[94] are frequently envious of those who evacuate and often feel deprived and marginalised. Moreover, this division or tension does not stop at the community level: it also penetrates family relationships. Differing perceptions of radiation risk are causing tensions within families or couples both among self-evacuees and stayers. The recent survey conducted by the Fukushima City found that 62% of self-evacuees are living apart from other family members and 71% of them answered that they had no prospect of going back to live together.[95] The field interviews also found that the majority of self-evacuees are mothers with children, whose husbands have stayed behind in Fukushima. The main reason for this separation is the husband's employment. In order to meet the costs of voluntary evacuation, husbands often stay behind in Fukushima to continue working. A few self-evacuees also pointed to a difference of opinion between husband and wife as a reason for separation. In their view, in the traditional communities of Fukushima, the husband and his parents tend to give credence to the authorities' reassurances on the radiation risk, whereas the wife tends to worry about the radiation effect on their children. These wives are sometimes treated as cowardly and naive by their husbands and parents-in-law. Frustrated by their husbands' inaction, some mothers decide to evacuate on their own, taking the children to their maternal grandparents' house if this is located outside Fukushima Prefecture. Equally, among the stayer families, the wife becomes disillusioned with her husband due to different opinions on radiation risk and fissures appear in their relationship. Communities and families in Fukushima are thus suffering from rifts and weakening community ties that will take long time to heal.

94 The survey conducted among the self-evacuees and residents in the Fukushima Prefecture by two NGOs, Friends of Earth Japan and Fukuro-no-kai, in September-October 2011 revealed that residents stayed in Fukushima mainly for economic or job-related reasons.

95 *Asahi Shimbun*, 17 September 2012, *op.cit*.

## 5. COMPARATIVE ANALYSIS OF THE TSUNAMI EVACUATION AND THE NUCLEAR EVACUATION

From the field interviews, we found that the pattern and consequences of the two evacuations, one caused by the tsunami and the other by the nuclear accident, were markedly different. In particular, the evacuation process, the authorities' disaster response, the prospect of return and the challenges facing the evacuees one year after the disaster are significantly dissimilar, though both displacements were induced by the same combined disaster. This section attempts to identify the specific features of the two evacuations through a comparative analysis. Table 5 illustrates the main elements of these differences.

Firstly, as regards the reasons for evacuating, evacuation from a natural disaster is ultimately 'voluntary' while nuclear evacuation can be compulsory or 'voluntary' depending on one's location – in other words, depending on whether an individual evacuates from within or from outside the official evacuation zone. Certainly, evacuation from a tsunami is not strictly voluntary insofar as a person flees because his or her life is at risk. By the same token, the self-evacuees from Fukushima decided to evacuate because they felt their lives and those of their children were under threat. Nevertheless, the distinction between voluntary and compulsory evacuation impacts the nature of post-disaster financial assistance that the displaced receive from the state: financial aid on compassionate grounds for the tsunami evacuees, financial compensation for the nuclear evacuees from the evacuation zones and little assistance for the self-evacuees.

One of the specific characteristics of the nuclear evacuation is that the displaced have tended to flee further and are now dispersed throughout the country, while tsunami evacuees are most often displaced within the town or the same prefecture. The main reason for this is that as nuclear evacuation is induced by the risk of radiation, distance is an important way for evacuees to protect themselves and feel safe. For example, half of the interviewed population of Futaba town is currently displaced outside Fukushima Prefecture.[96] Another distinct characteristic of the nuclear evacuation is that evacuees were displaced many times compared to the tsunami evacuation. Our field interviews show that nuclear evacuees changed their place of refuge four or five times on average before settling into temporary shelters. In contrast, tsu-

96 Source: Futaba town (http://www.town.futaba.fukushima.jp/hinan.html/). (in Japanese)

**Table 5.** Comparative analysis of the two evacuations

| | Tsunami (Natural Disaster) | Nuclear Accident (Industrial/Man-Made Disaster) |
|---|---|---|
| **Nature of Evacuation** | 'Voluntary' | Imposed/'Voluntary' |
| **Place of Refuge** | Within the City or within the Prefecture | Outside of the City and often the Prefecture, scattered all over Japan |
| **Frequency of Displacement** | 2–3 times | 4–5 times or more |
| **Psychological Stress** | Acute stress immediately after and progressively less with time | Stress of not knowing its own future lingers over a long term, increment with time |
| **Main Target of Complaints** | Municipal government | Central government, TEPCO |
| **Challenges** | Resettlement of the population, population loss, building back better | Issue of return, decontamination, community survival, loss of identity |
| **Reconstruction** | Concentrate on infrastructure | Not yet reached this stage |
| **Resettlement/ Return** | Safety of the population is main concern, individual choices | Highly politicised, collective choices |
| **Transparency of Information** | High | Low |
| **Decision-Making on Return** | Democratic | Top-Down |

nami evacuees changed their place of refuge two or three times on average. Many of the tsunami evacuees first evacuated to hilltops to avoid the tsunami, then moved quickly to emergency evacuation centres such as schools and finally settled in temporary shelters three to six months later. The NAIIC report (NAIIC, 2012) also confirmed the result of our study and found that 70% of the nuclear evacuees were displaced at least four times. One of the main causes of this phenomenon is that the evacuation zone was expanded over time by the authorities, thus obliging the already displaced population to flee further away each time. Over a three-month period starting on 11 March 2011, the authorities (Fukushima Prefecture and the government) issued a total of eight evacuation orders and recommendations. Another reason for this repeated displacement is that, at the time the nuclear evacuees fled, they were not informed of the severity of the accident or the radiation risk level. As a result, they initially sheltered in locations close to their hometown and later evacuated further afield once they learnt more about the status of the accident and the radiation leak. This repeated flight inflicted both psychological and physical distress on the nuclear evacuees.

As for psychological stress, both categories of evacuees are currently deeply anxious about their uncertain future, but the trauma of the nuclear evacuees appears to be persisting over the longer term. The tsunami evacuees experienced acute psychological stress immediately after the disaster, having suffered the sudden loss of family members, friends, and homes. However, the trauma caused by this loss could subside with time. Nuclear evacuees, on the other hand, are suffering from a psychological stress that seems to be increasing with time. The authorities provide them with scant information about their future and whether they will eventually be able to return to their towns or homes, which means that they are unable to take the next step in rebuilding their lives. They feel blocked in permanent uncertainty and this psychological imprisonment is taking a toll on their health and well-being over time.

There is also a difference between the two evacuations with respect to the target of the evacuees' complaints. In the case of natural disasters, it is hard to lay the blame for psychological pain on a specific party. To vent their frustration, the tsunami survivors thus tend to criticise their local municipal office for its shortcomings as it was the main actor in the disaster management. On the contrary, the Fukushima nuclear disaster was caused by human error as well as by a natural disaster and the nuclear victims have well-defined interlocutors for their complaints – TEPCO, the operator of the nuclear power plant, and the government. The handling of the Fukushima accident by TEPCO and the authorities is severely criticised not only by the evacuees but also by the public at large. In Imai's survey (Imai, 2011a), 86% of the evacuees said that they were not satisfied with the government's disaster response and 83% were dissatisfied with TEPCO.

The current challenges facing evacuees are also quite dissimilar. For the tsunami evacuees, the prime concerns are resettlement and the rebuilding of their houses and lives. Nuclear evacuees, however, are still a long way from the reconstruction phase as they are not even sure where they will live in the near future. Their concerns are focused on the issue of return, decontamination and compensation from the government. They are unable to make plans for the future and suffer from the loss of their previous life and identity.

Finally, the issue of resettlement/return reveals another marked difference between the tsunami evacuation and the nuclear evacuation. First of all, the resettlement of the tsunami evacuees is organised on a purely voluntary basis and individual choice is fully respected by both the authorities and the community. Resettling in a safe place is

the primary concern for the evacuees and the local authority. Should they decide to settle elsewhere, this does not put their loyalty to the community or their courage in overcoming hardship into question. The only obstacles faced for the resettlement of these evacuees are of a financial and administrative nature. For the nuclear evacuees, on the other hand, the question of return involves completely different stakes. First, the issue is highly politicised: the authorities including the government, the prefectural government and several affected municipalities have been encouraging these evacuees to return. The municipalities, in particular, have emphasised that the choice to return must be made on a collective basis as the town's very existence is at stake. Priority is thus placed on the cohesiveness of the community rather than on individual choices. One of government officials interviewed during our research repeated that 'we will not abandon Fukushima'. The authorities' emphasis on the region's recovery and their determination to 'normalise' the Fukushima disaster situation have had many serious consequences for the residents and the evacuees.

This official stance on the question of return has also impacted the transparency of the information communicated on the level of radioactive contamination, the effect of radiation on human health and the effectiveness of decontamination operations, all of which are key issues conditioning the nuclear evacuees' decision whether or not to return. While the majority of these evacuees are hesitant about going back due to the lack of information, the decision to return has often been made by the municipal offices without any thorough discussion or consultation with the evacuees. Thus, when it comes to resettlement/return, a democratic decision-making process is wanting in the case of nuclear evacuees in a contrast to the case of the tsunami evacuees.

## 6. CONCLUSIONS

The triple disaster that hit Tohoku on 11 March 2011 is the most serious crisis that Japan has had to face since the end of the Second World War. Some refer to the disaster as the second largest defeat that Japan has experienced after its 1945 defeat. In many ways, the disaster has served as a revelation as well as a reality check for the democratic, prosperous, safe society that the country has aspired to build over the last sixty-six years.

Our field study confirmed the assumption that Japan had intensively prepared itself against tsunami disasters. The disaster drills conducted prior to the disaster and countermeasures such as tsunami barriers constructed along the coast indeed saved many lives. Yet, in some instances, these preparations in fact created an excessive degree of reassurance among the local population, who came to believe that they were immune to the risk of tsunamis and thus underestimated the threat during the actual disaster. In other cases, previous tsunami experiences had instilled a fixed idea about tsunami risk in people's minds, which led them to misjudge both the need to evacuate and the timing. In other words, the risk perception shaped by disaster preparations and previous experience did not always lessen the population's vulnerability in the wake of extreme disasters such as the 2011 Japanese tsunami. In addition, one of the most serious shortcomings revealed by the catastrophe was the lack of preparedness regarding the evacuation of the elderly and persons with reduced mobility. Given that Japan is facing the growing demographic challenge of an aging population, future disaster plans need to urgently address this issue.

The Fukushima nuclear accident, on the other hand, has revealed the total unpreparedness of the Japanese authorities and the local population. The evacuation of the population by the local authorities amounted to chaotic improvisation and the population was forced to evacuate with no information as to the gravity of the situation or the risk of radiation. Furthermore, the authorities did not promptly or fully communicate information on radioactive contamination and health risks from radiation exposure to the concerned population. The choice of return tends to be a foregone conclusion decided on more or less unilaterally by the authorities without much consultation with evacuees and municipalities, and the collective choice for return is encouraged at the expense of individual choices and safety concerns. The displaced population thus remains at a loss with little prospect for the future. Moreover, the way in which the disaster has been handled by the authorities has created profound divisions and tensions in the affected communities. The nuclear disaster has triggered a major social disaster in which communities remain divided regarding both the perceived radiation risk and the issue of return. The population has lost trust in public authorities as well as among themselves, which is threatening the social cohesion and the sense of solidarity that previously existed within these communities.

What we have also seen in the case of the nuclear accident, in contrast to the tsunami case, is that the likelihood of an accident was purposely understated by the government and the plant operator, creating the myth that their nuclear power plants were almost failsafe. In the quasi absence

of a realistic perception of risk, the municipalities and population in the vicinity of the nuclear power plants were extremely vulnerable and insufficiently prepared for a severe accident and evacuation. The disaster demonstrated, especially concerning the exploitation of SPEEDI data, that Japan's advanced technology and financial capabilities served little purpose when it came to improving disaster preparedness and response, as there was a lack of political will to use them effectively.

Japan is one of the world's largest economies, best known for its highly advanced technologies. The experience of the 11 March triple disaster has shown that even a country with such economic and technological resources could not fully mitigate the effects of the disaster or avoid a serious nuclear accident. It suggests that no country is immune to the risk of extreme disasters and that the basic assumptions and disaster scenarios used to design disaster prevention measures should be thoroughly revisited, particularly in the current context of climate change. Moreover, the post-disaster management of the Japanese authorities, particularly regarding the Fukushima nuclear accident, revealed many shortcomings in terms of transparency of information and democratic decision-makings vis-à-vis the affected population. This confirms our hypothesis that democracies do not always respond better to disasters, especially a nuclear one. The repercussions of the Japanese disaster thus go well beyond the national borders and other democracies can learn many relevant lessons.

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# APPENDICES

## Appendix 1: Questionnaire for evacuees (tsunami and nuclear)

**QUESTIONNAIRE (Evacuee)**

**1. Basic Information**
Date & Time of the Interview:
Gender & Age Group of the Interviewee:
Place of Interview:
Type of Shelter:
1.1 Where were you living prior to the disaster?
1.2 Was your house situated within a special zone, such as the tsunami inundation zone?
1.3 When did you start living in your current shelter?

**2. Evacuation Process**
2.1 Where were you when the earthquake occurred?
2.2 On the basis of what information, did you decide to flee?
2.3 When did you actually evacuate from your home/office?
2.4 Please tell us about your evacuation itinerary. Where did you flee to first and how many times did you change shelter?
2.5 Did you know about the evacuation order issued by the central government/local government?
2.6 What was your first thought when you heard the evacuation order?
2.7 What do you think about the disaster response of the municipal government?
2.8 What do you think about the disaster response of the central government?
2.9 What do you think about the evacuation order issued by the authorities?

**3. Perception of Risk**
3.1 Prior to the disaster, what was your perception of the risk of earthquake and tsunami?
3.2 What about now (after the disaster)?
3.3 Were you aware of the tsunami risk after the earthquake hit?
3.4 Prior to the disaster, what was your perception of risk with respect to the nuclear power plant?
3.5 What about now?
3.6 What was the source of information on which you based your perception of risk prior to the disaster?
3.7 Were there any disaster drills organised prior to the disaster? By whom? Have you ever taken part in such drills?

**4. Prospect of Return and Current Challenges**
4.1 How would you describe your current situation?
4.2 Do you have family members who live apart following the disaster?
4.3 Do you wish to return to where you were living before?
4.4 What are the conditions for your return?
4.5 Have you returned to your home even temporarily?
4.6 What was your (family's) occupation prior to the disaster?
4.7 Are you currently back at your previous job?
4.8 If not, do you have any prospect of returning to your previous job?
4.9 If not, do you have any prospect of finding a new job?
4.10 What kind of assistance do you receive from your municipal government?
4.11 What kind of assistance do you receive from the central government/TEPCO?
4.12 Do you have opportunities to communicate with other evacuees from the same community or other communities? Is there any subject you tend to avoid when speaking with them?
4.13 Do you have opportunities to communicate with inhabitants of the hosting community? Is there any subject that you tend to avoid when you speak with them?
4.14 Have your children become used to the life and the school in the place of your temporary resettlement?
4.15 What were the most difficult issues when you decided to evacuate?
4.16 What things have you appreciated most since you evacuated?
4.17 What do you think about the volunteers and their activities?
4.18 What do you think about the media coverage of the disaster?
4.19 What are the most pressing issues for you?
4.20 What lessons have been learned from the disaster?

## Appendix 2: Questionnaire for self-evacuees (only nuclear)

**QUESTIONNAIRE (Self-Evacuee)**

**1 Basic Information**
Date & Time of the Interview:
Gender & Age Group of the Interviewee:
Place of Refuge/Resettlement:
Type of Shelter:
1.1 Where were you living prior to the disaster?
1.2 When did you start living in your current shelter?

**2. Evacuation Process**
2.1 Where were you when the earthquake occurred?
2.2 How did you decide to evacuate? Please tell me about your decision-making process.
2.3 From the moment that you decided to evacuate, how long did it take for you to actually do so?
2.4 How did you decide on the place of refuge/resettlement? What was the main reason?
2.5 Was the cost of evacuation financed by others? Or paid for entirely by yourself?
2.6 What was the reaction of your relatives, friends and neighbours regarding your decision to evacuate?
2.7 What was the reaction of your children?
2.8 What were the most difficult issues when you decided to evacuate?
2.9 What were the things that helped you the most with respect to the evacuation?
2.10 What information would have been useful when you had decided to evacuate?
2.11 Did you receive any assistance from the local government of your town/city with respect to your evacuation?
2.12 Did you receive any assistance from the hosting local government of your resettlement/refuge?
2.13 What do you think about the evacuation zone declared by the government?

**3 Perception of Risk**
3.1 Prior to the disaster, what was your perception of the risk of earthquake and tsunami?
3.2 What about now (after the disaster)?
3.3 Prior to the disaster, what was your perception of risk with respect to the nuclear power plant?
3.4 What about now?
3.5 What was the source of information on which you based your perception of risk prior to the disaster?

**4 Current Challenges and Impacts**
4.1 How would you describe your current situation?
4.2 Do you currently have a job?
4.3 What was your (family's) occupation prior to the disaster?
4.4 Do you have family members who live apart following the disaster?
4.5 Do you wish to return where you were living before?
4.6 What are the conditions for your return?
4.7 Have you returned to your home even temporarily?
4.8 What do you think about the disaster response taken by the municipality and the prefectural government?
4.9 What do you think about the disaster response taken by the central government and TEPCO?
4.10 Do you have opportunities to communicate with other self-evacuees or the evacuees from the evacuation zone? Is there any subject you tend to avoid when speaking with them?
4.11 Do you still have a contact with friends and neighbours in your city/town?
4.12 Do you have opportunities to communicate with the inhabitants of the hosting community? Is there any subject that you tend to avoid in the conversation?
4.13 Did you experience any culture shock in the city of resettlement compared with your city/town of origin?
4.14 Have your children become used to the life and the school in the place of your temporary resettlement?
4.15 What things have you appreciated most since you evacuated?
4.16 What were the most difficult moments since you took refuge?
4.17 Have any civil organisations/NGOs assisted you?
4.18 What are the most pressing issues at the moment?
4.19 What do you think about the media coverage of the disaster?
4.20 What lessons have been learned from the disaster?

## Appendix 3: Questionnaire for municipalities

**QUESTIONNAIRE (Municipality)**

**1. Basic Information**

Name of City/Town:
Date & Time of the Interview:
Title of the Interviewee:
Cause of Evacuation:

| | |
|---|---|
| Population Before the Disaster | |
| Population After the Disaster | |
| Of which, number of evacuees inside the city | |
| Of which, number of evacuees outside the city | |
| Total Number of Evacuees | |
| Number of Prefabricated Housing Units | |

**2. Disaster Prevention and Management**

2.1 Please tell us about the disaster preparation and contingency planning established prior to the disaster.
Earthquake
Tsunami
Nuclear Accident
2.2 How did (or did not) this preparation function during the actual disaster?
2.3 What were the most important obstacles/causes of the malfunctioning?

**3. Evacuation Process**

Evacuation Order
3.1 When and how was the evacuation order issued?
3.2 How was it disseminated among the population?
3.3 Are there any lessons learned regarding the evacuation order?
3.4 Are there any lessons learned regarding the dissemination of evacuation orders?
3.5 As for the emergency evacuation points, how were they designated prior to the disaster?
3.6 Are there any lessons learned regarding the emergency evacuation points?
Evacuation Route
3.7 As for the evacuation route, how was it designated prior to the disaster?
3.8 Are there any lessons learned regarding the evacuation route?
Evacuation Centre
3.9 As for evacuation centres, were there any changes from the contingency plan?
3.10 Please tell us about the development of evacuation centres (from schools to prefabs).
3.11 Who managed the evacuation centres?
3.12 What was the most challenging task in managing these centres?
3.13 Did you make any special arrangement for the elderly at these centres?
3.14 How was the distribution of food and non-food items and the hygiene/waste management organised?
3.15 How often was the monitoring/assessment of the living conditions of centres carried out?
3.16 How often was the monitoring/assessment of physical and psychological health of the evacuees carried out?
3.17 Are there any lessons learned from the management of evacuation centres?
Evacuation of Vulnerable Groups
3.18 How was the evacuation organised for the vulnerable groups such as the elderly and persons with disabilities?
3.19 Are there any lessons learned from the evacuation of vulnerable groups?
Response to Offers of Assistance
3.20 How did your municipality respond to various offers of assistance from all over Japan and abroad? Was there any coordination mechanism established within the municipality?
3.21 What was the most valuable assistance, in terms of materials and services, and what was the most troublesome offer?
Designation of Uninhabitable Zones (for tsunami-affected municipalities)
3.22 Were uninabitable zones designated after the disaster?
3.23 What is the compensation scheme for those whose houses are included in the zone?
3.24 Are there any other zones that prohibit house construction?
In General
3.25 What are the lessons learned regarding the evacuation from this disaster?
3.26 What are the most pressing issues regarding the evacuees at the moment?

**4. Relationship with Central Government, Prefectural Government and TEPCO (if applicable)**

4.1 As for the evacuation order, when and what kind of information did you receive from Central Government/Prefectural Government/TEPCO?
4.2 Amidst the confusion, were there any conflicting orders/information regarding the evacuation?
4.3 From this experience, what would you ask them to improve for the future disasters?
4.4 As for the designation of evacuation zones, what would you ask them to improve?
4.5 What financial/personnel/material assistance is provided by Central Government/Prefectural Government/TEPCO?
4.6 How is this assistance used for the municipality?
4.7 Regarding assistance, what would you ask them to improve?

4.8 Are there any lessons learned in dealing with Central Government/Prefectural Government/ TEPCO?

**5. Perception of Risk**

5.1 Prior to the disaster, what was your perception of the risk of earthquake and tsunami?
5.2 What about now? (after the disaster)
5.3 Were the previous tsunami experiences incorporated in the disaster preparation and evacuation exercise? Were these experiences widely shared among the population?
5.4 Prior to the disaster, what was your perception of the risk with respect to the nuclear power plant?
5.5 What about now? (after the disaster)

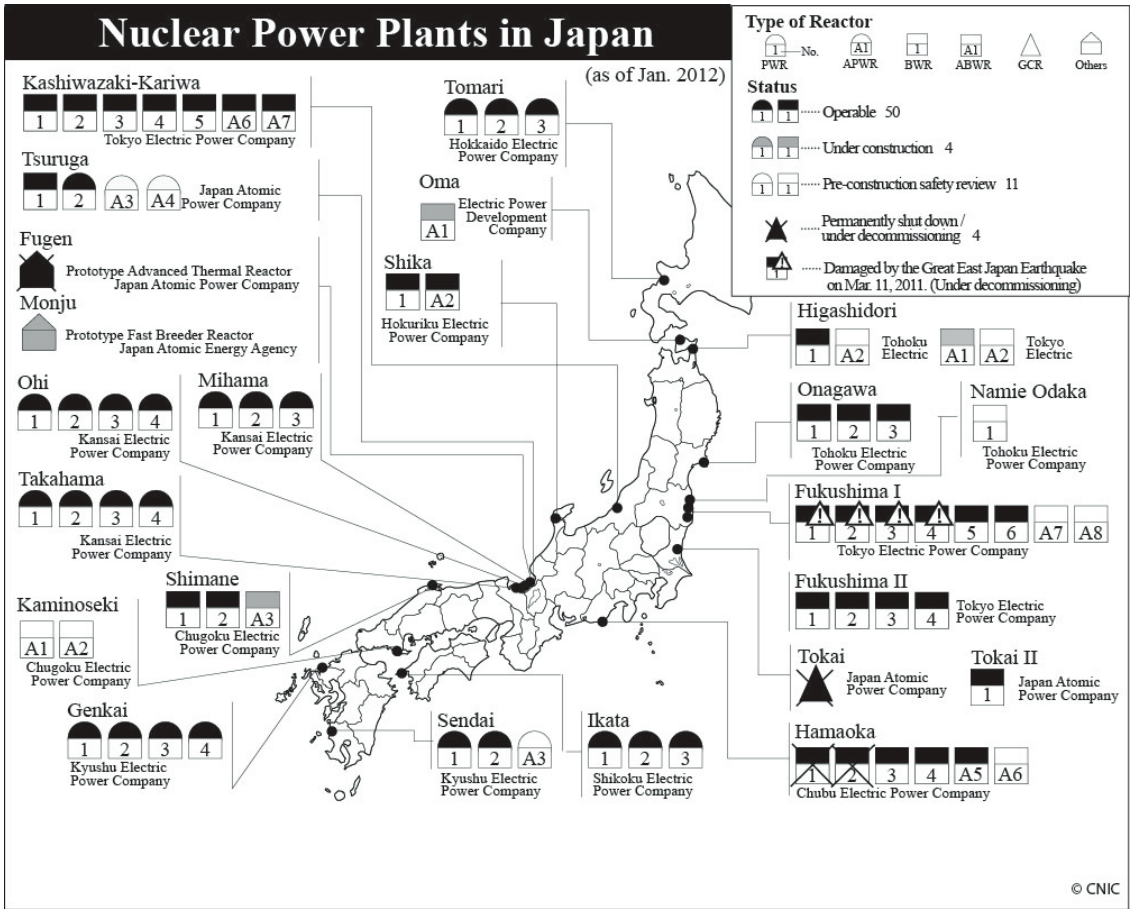
**6. Current Challenges and Impacts of the Disaster**

6.1 What are the prospects for the return of the evacuees/population?
6.2 What do you think the conditions for the return of evacuees will be?
6.3 What kind of incentives/strategies do you have to encourage their return?
6.4 How many companies and shops have stopped their activity/business after the disaster?
6.5 What do you think the conditions for these companies to restart their activity/business will be?
6.6 hat are the prospects for the return and restarting of businesses?
6.7 What kind of incentives/strategies do you have to encourage them to return and resume their activities?
6.8 Concerning evacuation centres, it seems that some functioned very well in terms of relations among the evacuees, and some did not. Did you observe the similar situation in your town?
6.9 What do you think was the cause/reason?
6.10 Were there any problems in disseminating information to the former communes that had previously been incorporated into the City?
6.11 What do you think about the media coverage of the disaster?
6.12 How do you think the municipality responded to the offer of assistance (materials and services) from all over Japan and abroad?
6.13 What did you appreciate most in disaster response?
6.14 What was the most surprising thing that you encountered in the disaster response?
6.15 What are the lessons learned from this disaster?

## Appendix 4: List of meetings and seminars attended during the field research

| Date | Meeting | Organiser (Place) | Place | Speaker | Title/Organisation |
|---|---|---|---|---|---|
| 27 May | The 4th Talk- Talk Fukushima | Association for Fukushima Evacuee Mothers & Children in Kanto | Tokyo | Self-Evacuee from Ootama village (Fukushima) | Evacuated to Kanagawa Prefecture<br>Member of Kaachan's (NGO in Sagamihara City) |
| 2 Jun | Symposium 'To protect children from radiation' | Association to consider child rearing since 3.11 | Tokyo | Mr Nobuyuki ABE | Member of CRMS/Fukushima Kodomo (NGOs in Fukushima City) |
| | | | | Self-Evacuee from Koriyama City (Fukushima) | Evacuated to Yokohama City |
| | | | | Mr Ryuhei KAWATA | Member of the House of Councillors |
| 6 Jun | Closed consultation meeting | Hiroyuki Yoshino, Member of Kodomo Fukushima (NGO in Fukushima City) | Kyoto | Evacuees from Iwaki City (3)<br>Minamisoma City(2)<br>Fukushima City (1)<br>Naraha town (1) | Residents of Yamashina public-sector apartments (used by evacuees from Fukushima) |
| | | | | Mr Shinichiro ISHIHARA | Elected member of the Fukushima prefectural assembly from Koriyama City |
| 7 Jun | Closed consultation meeting | Hiroyuki Yoshino, Member of Kodomo Fukushima (NGO in Fukushima City) | Kyoto | Evacuees from Fukushima City (5)<br>Koriyama City (2)<br>Iwaki City (2)<br>Namie town (1)<br>Kawamata City (1)<br>Minamisoma City (1),<br>Unknown (1) | Member of Fucco Salon Nagomi, created by NGO Hibiscus |
| | | | | Mr Shinichiro ISHIHARA | Elected member of the Fukushima prefectural assembly from Koriyama City |

## Appendix 5: Map of nuclear power plants in Japan




Source: Citizens' Nuclear Information Centre (http://www.cnic.jp/english/cnic/index.html).

# Disaster Evacuation from Japan's 2011 Tsunami Disaster and the Fukushima Nuclear Accident

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IDDRI'S PUBLICATIONS

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