

To Evacuate Or Not: Factors That Determine This Crucial Decision During Disasters

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Why do some people evacuate ahead of natural disasters while others do not? Is this question as simplistic, as a matter of binary choice, as it is often posed in the aftermath of a disaster? Between 1996 and 2015, 1.35 million people have been killed by 7,000 natural disasters worldwide (UNISDR and CRED, 2016). The need for policies on evacuation under various situations cannot be emphasized enough. And yet, policies alone do not determine people's evacuation choices.

This paper will analyze the many variables that impact the decisions people take about evacuating from their homes in the event of a disaster, and whether "putting oneself first" can be purely understood in the singular framework of the Japanese concept of *tendenko*. This analysis will be done in the context of the evacuation by the people of Rikuzentakata city, in Japan's Iwate prefecture in the Tohoku region, during the tsunami that followed the Great East Japan Earthquake of March 3, 2011 (hereafter to be referred as 3/11 GEJE). In total, 19,533 people died during the earthquake and the subsequent tsunami, and 25,585 people were missing. A total of 560 square kilometers of land was wiped out.

The first chapter will introduce Rikuzentakata city in the context of the 3/11 GEJE and how it was impacted. This chapter will almost entirely comprise the inputs from various people in Rikuzentakata, based on a week-long intensive online study tour conducted as part of a Graduate level course at the International Christian University, Tokyo, which was led by Professor Naoko Obi, from November 30 to December 5, 2020.

The second chapter will look at the existing literature on the many factors across various geographies and markers of identity which motivate people to evacuate—or not. The various factors to be analyzed are risk perception, gender, temporality, age, economic capital, social capital and the level of trust in authorities.

The third chapter will look at the concept of *tendenko*, which is assumed to be the guiding principle of evacuation in Japan in the event of a disaster—and definitely reflected in the experiences of the people of Rikuzentakata—and the complexities within such a principle that has been passed down by generations, because of the region's susceptibility to tsunamis.

The fourth and concluding chapter will detail how the phenomenon of victim-blaming of those who do not evacuate, and how the various factors that determine evacuation decision-making need to be understood within the context of specific geographical regions and the varying factors.

Chapter 1

In the Great East Japan Earthquake, over 90% of the approximately 20,000 fatalities (including those still officially listed as "missing") died from drowning, not the earthquake itself (Sun et al., 2013, p. 128). Even in some regions known to be at high risk of tsunami incursion, residents had more than 10 minutes to evacuate before flooding began; also, residents of southern Miyagi Prefecture had almost an hour (Japan Meteorological Agency, 2011). The tremendous damage inflicted provides a clear example of how convincing residents to rapidly evacuate is among the greatest challenges in disaster risk management (Sun et al., 2013, p. 128)

Rikuzentakata city lies on the jagged edge of Japan's Ria coast. Since it is surrounded by two peninsulas, the impact of 3/11 GEJE tsunami was enormous. Professor Kiyoshi Murakami of Iwate University, a native of Rikuzentakata city, who is also a senior executive adviser to the City of Rikuzentakata, detailed how the highest level of tsunami in Rikuzentakata went up to a height of 15 meters, and the water entered inland, 40 meters into the city. He said, "There was the earthquake at 2:46pm and within 20 minutes, even though the earthquake-proof houses in Rikuzentakata were still standing, the tsunami came in. By 3:25pm, the sea wall broke and water gushed into the city. Even until then, some people had still not evacuated." Professor Murakami showed us two photos, taken 2 minutes apart, of how water made its way in into the same area. In all, of the city's 24,000 population, 1,706 people died and 13,500 were displaced. Half the houses in the city were destroyed.

But the region is not new to the phenomenon of tsunami. Ms Miho Saito, who works at the NGO Marugoto Rikuzentakata—which aims at developing the city beyond its identity as a victim of the disaster by organizing various educational tours—said, "This tsunami was the biggest since the one in 1923. Those above age 80 have experienced about 3-4 big tsunamis in their lifetime! So those in local community already have fear of tsunami and are already prepared for it."

But how did this historical knowledge impact the city's evacuation behavior? Makiko Kawahara, a resident of Rikuzentakata, was home with her month-old baby when she experienced the heavy jolt of the earthquake. "When the strong earthquake hit us and the possibility of a tsunami seemed imminent, I did not evacuate immediately because I had a newborn child, and I never believed that where I was living would get inundated. But by the time I came to terms with the reality, the tsunami was almost close to my house. I did not take anything else with me except the baby. My husband was away at work and I thought he had died. But thankfully, he was alive." When she reached the shelter, she found that everybody was trying to similarly ascertain the safety of their loved ones amid the collective chaos. "In Rikuzentakata, almost everyone lost at least one family member. So I tell people who visit our city that your daily life is very precious," she said.

Since the ocean is visible from Mr Seiji Murakami's house in the neighboring Nagohara village, the tsunami had reached 15.2 meters, to the second floor of his house. Even today, he said, the photos from that fateful gives him a shiver. "Some who did not evacuate were trapped with the assumption that tsunami wouldn't come to their doors," he said.

Nagahora is located on the peninsula, so it was hit from both sides. The town was flattened from the earthquake and the tsunami; all lifelines were shut with the infrastructure devastated. Mr Murakami said that even though there was a tsunami alert of 3 meters' height issued, a second alert said that it would be 10 meters. "After that, the public radio said that a huge tsunami was coming. Most of the alerts came in only after the earthquake. So the time gap was very little to evacuate. And since the first alert was only about a tsunami of 3 meters, many people did not take it seriously. Later, they couldn't even hear the announcement any more when the huge tsunami was approaching," Mr Murakami recounted.

On the other hand, a high school that found itself in the midst of tsunami, has been hailed for ensuring that all persons—students, teachers, non-teaching staff—escaped to safety when the tsunami came by. Ms Yoko Murakami was the Vice-Headmaster at Kamaishi East High School at the time of 3/11 GEJE. The principle of *inochi tendenko* which translates to "save your life first", was what led to the "Miracle of Kamaishi" such that all but five of the school's 3,000 students' lives were saved. (The five students who lost their lives had been taken away by their parents who had come to fetch them from the school after the earthquake). In total, 808 people died in Kamaishi city, and 152 were missing. All of the students who stayed at the school—and followed the

evacuation procedure—survived. As Ms Murakami said, “Evacuation is all about attitude: serious attitude towards running away; protecting your life no matter what. And team work matters.”

This particular attitude of evacuation has been analyzed by scholars from around the world, from disasters in different geographies. Globally, there is a marked difference in this attitude due to many factors.

Chapter 2

The key factors that determine the decision to evacuate, among others, are risk perception, gender, temporality, age, economic capital, social capital and the level of trust in authorities. I will now analyze each of these factors, based on previous research.

People’s perceptions of risks are based on their social contexts. As far as disasters are concerned, “risk” can be understood as the likelihood of a natural hazard, combined with the likely impact of the hazard on peoples’ lives, family and property; “risk perception” determines this perceived severity of the consequences (Adger et al., 2004).

Researchers (Wachinger and Renn, 2010) have explored how risk perception is a complex issue, influenced by psychological, social and cultural components. Krömker and Mosler (2002) describe many psychological factors that are crucial regarding the comprehension of private loss prevention measures.

The US and Europe have very different profiles for correlations of vulnerability, with some indicators such as social isolation, class, or household income (Kovats and Hajat, 2008). Yet, there are some common themes that emerge: people with high levels of knowledge might be overconfident regarding the (in)vulnerability of their household (Peacock et al., 2005). Individuals who evacuated their properties during a flood, showed high levels of risk awareness (Bradford et al., 2012). During storms, people who perceive their home sites as hazardous are much more likely to evacuate (Baker, 1991). Strikingly, missing risk perception and feeling as safe as anywhere in one’s own place were the most commonly cited reasons for not evacuating during a storm (Riad et al., 1999).

The decision to evacuate in the face of a disaster may thus be affected not only by whether people think they will encounter the hazard, but also ideas of how the hazard might affect them, whether they could cope. Different people tend to rank risk differently (Fischhoff et al., 1991). Huang et al. (2016) found official warnings, type of residence, observation of environmental and social cues and expectations of severe personal impacts to have significant effect on household evacuation before a hurricane.

People’s estimation of risk is at the heart of the problem, as it determines their response to evacuation orders (Kates, 1971). As suggested by Dombroski et al. (2006): “People understand some risk better than others, trust some officials more than others, and have greater freedom to act in some situations than others.”

As far as gender as a factor for evacuation behavior is concerned, there is research finding men to be less likely to evacuate due to a belief they can effectively protect their homes, which potentially puts them in danger. Riad et al. (1999, p. 930) have found that during a storm or flood, women are almost twice as likely to evacuate as men. This may also be true for women being responsible for the home and children, especially in developing countries (Werg et al., 2013, p. 1621)

In a study focusing on disaster risk management implemented in the Okitsu community of Shimanto town in Japan's Kochi Prefecture, it was found that 12.1% of males felt that they can evacuate within 3 minutes, compared to only 1.7% of females. Twice as many women as men claim they need more than 10 minutes to evacuate. ((Sun et al., 2013, p. 137)

Another researcher (Ikeda, 2010) found that that compared with men, women usually have less physical strength and lower coping capacity under emergency situations. Sun et al. (2013) found that different expected actions between men and women might lead to delayed evacuation among women: "When I go out without taking the bankbook with me, I'm anxious about the future livelihood of my family should an earthquake strike" (Sun et al., 2013, p. 137).

Temporality, in varied measures, has a bearing on evacuation behavior. According to Werg et al. (2013, p. 1621), the distinction between slow onset and sudden onset disasters might be more meaningful than distinguishing natural hazards in climatic terms. According to them, the underlying reasoning is that with long warnings, e.g., for a snow-melt flood, issues that are crucial in a situation requiring a fast evacuation (such as physical strength, mobility) become less important. Werg et al. (2013, p. 1621).

According to survey reports by the government of Japan, following the 3/11 GEJE, residents in the Tohoku region spent almost 30 minutes to evacuate to shelters, including the time period before and during evacuation (Ministry of Land, Infrastructure, Transport and Tourism, 2011).

Sun et al. (2013), both those who claimed to have the capacity to successfully evacuate within 3 minutes and those who would require more than 18 minutes insisted that disaster drills were important. This tendency might be explained in that people who can evacuate quickly realize the function and achievements of disaster drills and thus praise them, while people who suppose they need more time to evacuate intend to participate in disaster drills to enhance their evacuation capabilities (Sun et al., 2013, p. 138).

At the same time, the experience of past disasters of varying intensities has an impact on the time taken to evacuate. "Non-traumatic" experience seems to lead to overconfidence and lower levels of disaster evacuation. In contrast, traumatic experience makes people more attentive and responsive to evacuation orders and tends to open a broad window for public officials to transform institutional settings (Walch, 2018, p. 2).

Ms Miho Saito of Marugoto Rikuzentakata said that people above 80 years of age have experienced about 3-4 big tsunamis in their lifetime. Age, therefore, also is a determinant of evacuation behavior.

During a storm, elderly people tend to be reluctant to leave their home despite warning, even when in good health and sufficient resources (Gladwin and Peacock, 1997; Gladwin et al., 2001). Studying the behavior of a community with an aging population, in response to the potential of a tsunami, in the coastal city of Muroran in Japan's Hokkaido prefecture, Arimura et al. (2020) found that the increase in age, home ownership, and living alone negatively impact the act and intention of evacuation.

Interestingly enough, in a research conducted among three impoverished, majority-Hispanic counties in southern Texas in USA (Reininger, 2013), it was found that participants who are younger are less likely to intend to evacuate under mandatory orders than people who are older. This may be because younger participants feel more invincible in the face of a major hurricane, or

that older individuals feel less inclined to want to experience the discomforts associated with hurricanes both during and after a storm comes ashore (Reininger, 2013, p. 6).

At the same time, social and economic capital determines the decision to evacuate significantly (Bankoff, 2003; Gaillard, 2015). For example, people will not care about the risk of an earthquake if they struggle to get food on the table (Gaillard, 2015). In New Orleans where over 28% of the population lived below the poverty level prior to Hurricane Katrina, it was reported that 100,000 residents, many of whom were African-American and poor, did not evacuate despite a mandatory evacuation classification (Gabe et al., 2005; Loewenberg, 2005). Some studies of Katrina evacuees reported that although a car was available for evacuation, there was not enough disposable income for gas and food (Eisenman, et al., 2007).

Walch (2018) found that in the coastal districts of the eastern state of Orissa in India—which suffered from cyclone Phailin in October 2013—many landless peasants and fisherman did not evacuate because they were afraid of not being able to come back to their “illegal” settlement. They also became marginalized in the recovery process because they did not have the necessary documentation to demonstrate what they had lost (Walch, 2018, p. 14).

During a storm or flood, people with lower incomes are less likely to evacuate due to their lack of means of transportation (Gladwin and Peacock, 1997). During the 3/11 GEJE, up to 56% of evacuees reportedly used cars for evacuation. This information indicates that while the importance of walking or running to shelters has long been held as a principle of tsunami evacuation, such rules are not adhered to during emergency conditions (Sun et al., 2013, p. 129).

Social capital, which is intrinsically linked to socioeconomic capital, has also been suggested as an important factor, especially in terms of recovery and evacuation (Aldrich, 2012). Social capital is defined as informal institutions and organizations that are based on social relationships, networks, and associations that create shared knowledge, mutual trust, social norms, and unwritten rules (Durlauf and Fafchamps, 2005).

With regards to Hurricane Hugo in Cape Verde 1989 and Hurricane Andrew in southeast USA in 1992, residents with stronger perceived social support were found to be twice as likely to evacuate as residents with weaker perceived social support (Riad et al., 1999; Norris et al., 2008). The influence of friends and relatives was the most significant factor in predicting evacuation behavior with regards to Hurricane Katrina (Adeola, 2009).

Survey data collected from 427 households after Cyclone Aila which hit rural Bangladesh in 2009 showed that even though 60% of residences were inundated during the cyclone, only 41% evacuated, of which evacuation to emergency shelters accounted for only 15% (Shoji and Murata, 2018). It was also found that social capital is positively and significantly associated with the likelihood of evacuation. The significant effect of social capital is mainly attributed to the reduction of perceived risk of crime victimization ((Shoji and Murata, 2018, p. 17).

Aldrich and Sawada (2015) also found that social capital significantly reduced the mortality rate of tsunami-affected municipalities in Tohoku, Japan. Those with higher social capital may be more likely to receive supports from community members and the local government (Besley, 1995; Fafchamps and Lund, 2003; Galasso and Ravallion, 2005; Mahmud and Prowse, 2012). Further, social capital may reduce the loss if it helps people find job opportunities after the evacuation (Calvó-Armengol and Jackson, 2004; Ioannides and Loury, 2004; Montgomery, 1991).

Interestingly, (Reininger, 2013) found that those who completed education above a high school level are less likely to report intention to evacuate under mandatory orders than people who completed less than a high school education. Those with a high school education reported the greatest intention to comply. Residents with higher education may have less trust in local government officials and may not believe the government orders when they proclaim a mandatory evacuation order. Higher education levels also showed a relationship with higher income in our sample (Reininger, 2013, p. 7).

Such a skepticism to trust government orders is an important factor that determines evacuation. During Hurricane Katrina in 2005, more than 100,000 greater New Orleans citizens did not respond to evacuate warnings or mandatory evacuation orders. Distrust of authorities was identified as one factor that likely played a role in this non-compliance (Cordasco et al., 2007).

Because of the correlation between education and income (Reininger, 2013) it may be that people with higher education and economic means feel more able to care for themselves and have greater concern for protecting their households and its contents during an emergency and therefore are less likely to report intention to comply with evacuation orders. Respondents with a Spanish-only affiliation were more likely to follow the evacuation orders. These participants could be recent or first generation immigrants to the United States and feel compelled to respond to official government orders (Reininger, 2013, p. 7).

Walch (2018) found that that prior experience of natural disaster increases individual perception of risk and may lead to institutional learning, but only where the experienced disaster was traumatic. Trust between citizens and public officials is held to further increase the likelihood people will evacuate in advance of natural disasters. In the case of typhoon Haiyan in the Philippines in November 2013, the lack of traumatic disaster experience, coupled with a low trust in local officials, explain particularly well why people did not evacuate (Walch, 2018, p. 13).

At the same time, the impact of social capital on evacuation appears to be larger for those who do not trust law enforcement authorities. Further, trust in law enforcement authorities is positively associated with the probability of evacuation (Shoji and Murata, 2018, p. 16).

Chapter 3

On the day of the Great East Japan Earthquake, tsunami warnings accompanied by evacuation orders were issued all along the Pacific coast of central to west Japan. According to a survey, only 6% of Pacific coast residents evacuated to designated shelters on that day (Sun et al., 2013, p. 129).

Another issue is that before 3/11 GEJE, there were high expectations placed on community-level support under emergency conditions, particularly on local volunteer firefighters. However, 253 volunteer firefighters died while trying to evacuate others. One surviving volunteer firefighter said that “they knew precisely that the tsunami was coming, but they couldn’t bring themselves to evacuate while others remained behind” (CeMI, 2011). These poignant words illustrate the limitations of *kyojo*, the Japanese principle of mutual assistance. (Sun et al., p. 129)

The 3/11 GEJE led to a renewed interest in the concept of *tsunami tendenko*, the importance of an “each for themselves” or “putting oneself first” attitude toward escaping tsunami on the one hand, but the complexity of actually implementing such strategies for tsunami evacuation on the other (Yamori, 2014).

According to renowned tsunami researcher Fumio Yamashita (born 1924), who is credited with bringing about the term's widespread use (Yamashita 1997, 2005, 2008), *tendenko* has its origins in the actions of Yamashita's father (who also survived the giant tsunami generated by the 1896 Meiji-Sanriku earthquake) during the tsunami triggered by the 1933 Showa-Sanriku earthquake. However, Yamashita's father also claims to have heard the word from his grandfather. Moreover, Yoshi Tabata (born 1925), who has been active in passing on her experiences of the tsunami damage caused by 1933 Showa-Sanriku earthquake, also claims to have heard the term used by her grandfather who lived through the 1896 Meiji-Sanriku earthquake. These accounts demonstrate that the word *tendenko* dates back more than a century before the 1896 Meiji-Sanriku earthquake.

(Yamori, 2014; p. 51)

Yamashita describes tsunami evacuation as follows: Basically, to escape with your life from the awesome speed and wall of destruction that is the tsunami, you must flee quickly and urgently on your own as though in a race against the seconds and minutes, disregarding all others including your parents and siblings even though doing so may seem heartless (Yamashita, 2008).

Yamashita also makes the following statement: "I have described *tsunami tendenko* as a lamentable teaching because it leaves the emotionally irreconcilable issue of what to do about those who are vulnerable to natural disasters and need assistance to evacuate such as children, physically impaired elderly persons, and the physically disabled" (Yamashita 1997, p. 175). It has already been pointed out that *tendenko* is not an all-encompassing solution in that it does not address issues concerning people who would have difficulty evacuating. (Yamori, 2014, p. 52)

Observing the behavior of people who are already escaping is a powerful source of disaster information that can encourage others to evacuate (Yamori, 2009; Kawata, 2010). According to Yamori (2014), the wisdom of *tendenko* lies not only in escape but also in encouraging escape or escaping together. The presence or appeals of other evacuees evoke a stronger response (Yamori, 2014, p. 54). *Tendenko* therefore also possesses the wisdom of *kyoujo* (which literally means "mutual help" in contrast to *jijo* or "self-reliance") to help everyone quickly and effectively, forming a stream of evacuees based on the ripple effect (Yamori, 2014, p. 55).

Yamori (2014) details that for *tendenko* to function effectively, an important precondition must be met: the person intending to practice *tendenko* must trust that loved ones will definitely do the same. He writes: "For example, parents at home who perceived the threat of a tsunami would likely be unable to practice *tendenko* unless they could expect their child facing the same situation at school to do the same. Furthermore, this trust must be complementary so, using the previous analogy, children at school would not be able to perform *tendenko* unless they could trust that their parents were doing the same" (Yamori, 2014, p. 55).

Chapter 4

Ms Yoko Murakami, the former Vice-Headmaster at Kamaishi East High School, said that every time she sees the videos of the evacuation process from that fateful afternoon of March 3, 2011, her heart beats fast. They had all initially evacuated to a nearby parking lot; but when Ms Murakami saw a stone falling from a cliff nearby, she considered that it indicated a possible landslide, and hence decided to evacuate again. This shows that the process of evacuation is one

steeped with multiple quick decisions, and after, one's immediate context is ignored—especially when the non-evacuation has led to disastrous consequences.

And this is evident in the existing research: In a telephone survey conducted by the Harvard School of Public Health (Blendon et al., 2007), 23% Katrina-affected respondents and 28% of other high-risk area respondents indicated intention to stay in their homes during a major storm, despite mandatory evacuation order by government officials.

So is there a finality in understanding the motivations of different people and communities in evacuating in the face of disasters? The response is as diverse as the diversity of communities and situations, even within the factors that have been explored in this paper. Furthermore, the philosophy of *tendenko* for evacuation has complex implications.

In an article in Japan's *Mainichi Shimbun* newspaper in 2011, the head of a neighborhood association within a ward devastated by the 3/11 GEJE made an accurate assessment about *tendenko*: "No matter which way you look at it, a contradiction exists between *tendenko* and voluntary disaster prevention organizations" (Yamori, 2014, p. 60).

As Yamori (2014) has detailed, *tendenko* has a unique psychological effect on survivors in that it reduces feelings of self-reproach for not having saved loved ones despite managing to evacuate and survive one's self. This effect is not limited to individuals but also impacts towns and communities. In other words, it acts not only on small units of mutual loved ones but also on the entire community that experienced the disaster, helping to release it from feelings of self-guilt at not having done more. (Yamori, 2014, p. 58)

But would *tendenko* be applicable in every context? It might be, if the inherent principle of the concept is understood within the context of different cultures. Communities facing emergencies and disasters undertake the decisions that suit them best; it does not necessarily imply that they do not put themselves first. It only means that their conceptual understanding of "putting oneself first" depends heavily on a variety of factors, based on what they can best assume to be safe. Ultimately, safety is the goal under distressing circumstances like a disaster, and people perceive risk, and thereby safety, in as many varied ways. Hence, the idea of not evacuating does not necessarily translate to not "putting oneself first" in the purely conceptual framework of *tendenko*.

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