

Paper:

Current Status and Issues of Life Recovery Process Three Years After the Great East Japan Earthquake Questionnaire Based on Subjective Estimate of Victims Using Life Recovery Calendar Method

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This paper clarifies recovery status and life recovery processes based on victims' feelings following the March 2011 Great East Japan earthquake. Specifically, a questionnaire was given to about 3,000 quake victims to determine their status and any issues they may have had. The overall recovery picture was obtained using measurement called a "recovery calendar." The structure of the recovery process was compared to disasters such as the Great Hanshin-Awaji (Kobe) earthquake in 1995. The recovery calendar indicated that 80% of respondents felt that local activities have not been restored to their original state and saw themselves as victims three years after the earthquake, indicating that recovery had progressed slower than it had following the Great Hanshin-Awaji earthquake. In a comparison of the three prefectures of Iwate, Miyagi, and Fukushima, Iwate and Miyagi displayed the same recovery trends. Fukushima recovered later than the other two prefectures. For the item "The local economy was no longer influenced by the earthquake," it was indicated that the economic situation in Iwate was worse than that in Miyagi or Fukushima. General characteristics of the life recovery process were also investigated through a comparison to other earthquake and water disasters. Life recovery proceeded in five phases:

- 1) Victims prepared to have an uncomfortable life for a while and understood the extent of the damage.
- 2) Victims felt safe and office and school activities had resumed.
- 3) Everyday life settled down, housing problems were finally settled, and personal financial situations were no longer influenced by the earthquake.
- 4) Respondents no longer defined themselves as victims.
- 5) The local economy was no longer influenced by the earthquake.

In cluster analysis for classifying life recovery processes, 12 items were classified into five clusters corresponding to the above five phases, statistically showing that victims' lives recovered through these phases. As a result of decision tree analysis for predicting causes of "they no longer defined themselves as victims" in an attempt to organize life recovery processes, the same structure of life recovery processes was found as for the three-layer recovery model of the Great Hanshin-Awaji earthquake. In short, physical and economic recovery such as of houses and regions was achieved based on the reconstruction of infrastructures, followed by the achievement of life recovery. It is predicted and proposed that life recovery in areas affected by the Great East Japan earthquake took the course of infrastructure reconstruction at first, then achieved physical recovery in local areas by supporting house recovery on a parallel with economic support. To achieve them, a long-term plan from a perspective of at least 10 years is required, as was the case of the Great Hanshin-Awaji earthquake.

Keywords: life recovery process, disaster process, housing recover, questionnaire survey, "life recovery calendar" method, three-layer recovery model

1. Research Background and Purpose

1.1. Status Three Years After the Great East Japan Earthquake

The Great East Japan earthquake on March 11, 2011, caused a huge tsunami unprecedented in modern Japan. Deaths numbered 18,958, the missing 2,655, totally collapsed houses 127,291, and half-collapsed houses 272,810 (Fire and Disaster Management Agency, 2014) [1]. Some 2,916 victims were acknowledged as succumbing to earthquake-related deaths as of September 30, 2013, meaning that rather than being killed di-

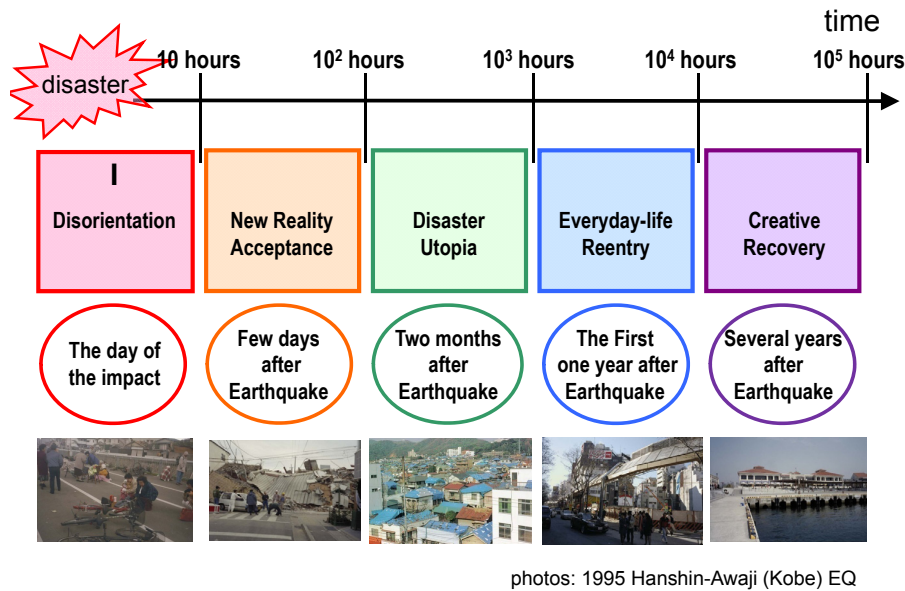


Fig. 1. Five post-disaster time phases.

rectly by the earthquake or tsunami, they died due to physical conditions or chronic diseases worsened exposure to the earthquake and tsunamis (Reconstruction Agency, 2013) [2].

Progress in processing rubble and tsunami deposits was 96% as of March 2014 three years after the earthquake, excluding evacuation zones in Fukushima affected by the nuclear plant meltdown (Ministry of the Environment, 2014) [3] and decontamination of houses in Fukushima affected by the nuclear plant meltdown had reached 44.2% (Ministry of the Environment, 2014) [4]. As of February 13, 2014, three years after the earthquake, 267,419 victims still living in evacuation centers nationwide accounted for over half of the 470,000 evacuees at the peak three days after the earthquake. As of January 2014, 67% of planned public disaster restoration housing has been begun but only 4% has been completed (Ministry of the Environment, 2014) [5]. Although the recovery of affected lands and infrastructures has proceeded, housing recovery for victims is still under way, considering that victims have not been able to return and make a living in areas adversely affected by the disaster.

It is conjectured that housing recovery has been delayed compared to the 1995 Great Hanshin Awaji (Kobe) earthquake. The 1995 earthquake occurred directly beneath a Japan port city, leaving 6,437 dead or missing, 104,906 totally collapsed houses, and 144,274 half-collapsed houses (Fire and Disaster Management Agency, 2014) [6]. The number of evacuees in evacuation centers peaked at 316,678 six months after the earthquake, but all evacuation centers closed as of September 30, 8.5 months after the earthquake. At the end of 1997, three years later, 37.3% of planned restoration housing had been completed [7], residents of temporary housing decreased, and some temporary housing began to be demolished [8]. Life recovery among victims of the 2011 earthquake and tsunamis and the nuclear power plant in-

cident continues to be delayed and appears to be going to take a long time.

1.2. Long-Term Life Recovery Processes and Research Three Years After the Earthquake

This paper defines “recovery” as restoration from the status affected by a disaster to that comparable to before a disaster and as improvement from that before a disaster. “Recovery” and “restoration” are used interchangeably in this paper. Tatsuki 2007, Hayashi 2007, and Tamura 2007 conducted social research targeting victims of the 1995 Kobe earthquake using the “life recovery” concept. This paper also uses the term “life recovery” because it involves social research on victims based on the same meaning [9-11].

In a huge disaster that affect victims and areas for a long time afterward, processes in which victims and affected societies adapt to new environments created by the earthquake and recover their lives should be clarified and the status and issues of victims and areas should be monitored to understand better and support these victims and areas – processes called life recovery processes or disaster processes and consisting of the following five stages, e.g., Kimura et al., 2006 and 2010, Kimura, 2012 [12-14]. The behavioral patterns of victims appear to change in five time phases divided by four time criteria – 10 hours (the day of the disaster), 10^2 (100) hours (2-4 days after the disaster), and 10^3 (1,000) hours (two months after the disaster), and 10^4 (10,000) hours (one year after the disaster). In other words, victims reconstruct their lives passing through five stages following an earthquake. These five stages are defined as follows (Fig. 1):

- I. Disorientation phase – a period in which victims suffer from the disaster impact so severely that they have difficulty in objectively understanding what is going on and suffer from narrow vision.

- II. New reality acceptance phase – a period in which victims accept damage rationally as the extent of damage become clear and undertake to adapt themselves to the “new” society based on a “new” order.
- III. Disaster utopia phase – a period in which lives form based on social values different from those of ordinary times because of the physical destruction of infrastructures and the paralysis of social functions thus far such as lifeline services.
- IV. Everyday-life reentry phase – a period in which victims undertake to reconstruct their lives and affected society is due to restoration of social flow systems such as lifeline services.
- V. Creative recovery phase – a period in which infrastructure services such as water, sewage, and city-gas systems are recovered and victims no longer see themselves as victims but pursue sustainable advances toward a new social environment.

A questionnaire was sent to 3,000 survivors to clarify status and issues remaining three years after the earthquake. Questions included their status up to three years after the earthquake, current feelings, their basis for life in the future, and local recovery considering that respondents had been forced to live the lives of evacuees in the three years following the earthquake.

Research by Tatsuki (2007) and Tamura (2007) measured individual recovery processes based on a life restoration scale and investigated causes of the observed value of the scale using seven elements critical to life recovery [9-10].

This paper shows the extent of the recovery process for victims and affected areas based on a measurement method called the life recovery calendar, developed for monitoring the condition of victims as an aggregate of, rather than individual, recovery processes. Issues of life recovery processes in the case of 2011 earthquake victims were studied by comparing them with existing disasters such as the 1995 earthquake.

2. Method

2.1. Circumstances of Research

Data used in this research were obtained from a questionnaire three years after the 2011 earthquake conducted by the news department of the Japan Broadcasting Corporation (NHK) from January 6 to February 5, 2014. NHK has tried to continue raising the voices of victims since immediately after the 2011 earthquake by conducting both qualitative research such as interviews with victims and quantitative research using questionnaires. Seven questionnaires were conducted two weeks, one month, two months, three months, six months, one year, and two years after the 2011 earthquake, before this research. Aggregation and analysis results have been reported in news

or in special programs on NHK. Results of previous large-scale research two years after the 2011 earthquake focused on houses and social network compiled in an academic paper (Kimura et al.) [15]. After reviewing questionnaire results thus far, we decided to perform a questionnaire for understanding current status and issues of victims three years after the 2011 earthquake. This research incorporated the life recovery calendar based on research results for huge earthquakes hitting modern Japan, including the 1995 earthquake.

2.2. Research Subjects and Period

Research subjects were respondents who lived in Iwate, Miyagi, and Fukushima prefectures during the earthquake. Note that while random sampling from basic resident registers or voter registers might have been ideal, it was difficult to determine where some victims were using basic resident register seven three years after the earthquake because many victims still led lives as evacuees in and out of the three prefectures. This research used a list of victims who were interviewees by NHK reporters and informed them of their addresses or contact information (n : 2,780). Questionnaires were distributed and collected by mail from 1,103 victims (response rate: 39.7%). Questionnaires were also distributed and collected by meeting 98 victims who had agreed in interviews to fill out questionnaires. The number of valid responses for addresses (prefectures) before the earthquake was 1,201-1,103 by mail and 98 in meetings. The research period was from January 6 to February 5, 2014.

In research methods other than random sampling, questionnaire results are biased toward particular groups as seen in respondent characteristics described in the next section. It should thus be noted that research results based on obtained samples do not necessarily reflect correct extent of 2011 earthquake victims and cannot be compared directly to existing random sampling results. The significance of this research is that it reflects the reality of particular groups at the moment when random sampling was difficult to perform after the earthquake.

2.3. Research Items

Research asked 27 questions, concerning those on the following six items:

- (1) Personal attributes – name, age, gender, and occupation
- (2) Status up to that time
- (3) Feelings at that time
- (4) Basis of life in the future
- (5) Local recovery
- (6) Feelings three years after the earthquake

Questions were arranged to help respondents recall what happened in chronological order from the earthquake and tsunami. This paper first describes the characteristics of (1) personal attributes and analyzed life recovery calendar results regarding (2) status up to that time and (5) detailed local recovery.

- The calendar is made up of questionnaires for affected people to put marks on it regarding 12 significant events that they think become a milestone in rebuilding their life in past disasters.

- ① I understood the extent of the damage.
- ② I felt safe.
- ③ I was prepared to have an uncomfortable life for a while.
- ④ Business offices resumed operation.
- ⑤ Problem of housing was finally settled.
- ⑥ Disaster does not affect household economy any more.
- ⑦ Everyday life settled down.
- ⑧ Local activity has been restored.
- ⑨ I did not define myself as a disaster victim.
- ⑩ Local economy was no longer influenced by disaster.
- ⑪ Local roads have resumed.
- ⑫ Local schools resumed operation.

Fig. 2. Life recovery calendar details.

The life recovery calendar is explained assuming that recovery is completed little by little over time, not all at once. This is a “linear” rather than a “punctuate” concept, so the recovery calendar was developed as a measurement for clarifying the extent of life recovery processes in individual victims. This index was developed by Kimura et al. (2004) and Kimura (2007) to understand the recovery status of victims and affected areas [16, 17]. Specifically, responses in the questionnaire form were compiled when events occurred as milestones in their life recovery.

Questions were accompanied by remarks such as “little is known about how victims recover. Please think about how your feelings and behaviors have changed over time since the earthquake and circle the time period that fits you best.”

The 12 items used were as follows (Fig. 2):

1. I understood the extent of damage.
2. I felt safe.
3. I was prepared to have an uncomfortable life for a while.
4. Business offices resumed operation.
5. Problem of housing was finally settled.
6. Disaster does not affect household economy any more.
7. Everyday life settled down.
8. Local activity has been restored.
9. I did not define myself as a disaster victim.
10. Local economy was no longer influenced by disaster.
11. Local roads have resumed.
12. Local schools resumed operation.

Events marking milestones to recovery that many victims experienced were selected from ethnography interview results targeting the 1995 earthquake and the 2004 Mid-Niigata Prefecture earthquake.

3. Result 1 – Characteristics of Respondents

Respondent characteristics included gender, age, address before the earthquake, residence type, injury or death of family members, and housing damage. Percentages assume the number of valid responses of 1,201 to be 100% unless otherwise specified. Male respondents accounted for 58.8% ($n = 700$) and female respondents 41.4% ($n = 497$) (missing value: 4). Respondents ranged from 10 to 91 years of age (average: 61.0 years old ($SD = 13.5$)) (missing value: 20). 63.0 years old for males and 58.0 years old for females were derived in the relationship between age and gender, indicating a statistically significant difference ($t(897.2) = 6.14, p < .01$).

Some 31.5% of respondents lived in Iwate ($n = 378$), 34.1% in Miyagi ($n = 410$), and 34.4% in Fukushima ($n = 413$). Research results thus uniformly reflected situations in the three prefectures with no imbalance in response ($\chi^2(2) = 0.77, n.s.$). This is, however, a proportion of respondents among the three prefectures, and results do not reflect victim populations of individual prefectures.

The rate of status of areas where respondents had lived before the earthquake was as follows: hazardous areas were 32.9%, areas requiring bulk-up (because of ground sinking by earthquake) were 12.2%, evacuation instruction areas (including restricted areas, difficult-to-return zones, restricted residence areas, zones in preparation for the lifting of the evacuation order, deliberate evacuation areas, and specific spots recommended for evacuation) were 24.3%, areas subjected to decontamination by local governments were 4.1%, and habitable areas requiring no special care were 22.9% (3.6% of respondents did not answer). The fact that 80% of respondents had lived in areas requiring special care affects analysis results using the life recovery calendar.

Results for housing damage of respondents were as follows: 59.5% were totally collapsed, 3.2% were large-scale half collapsed, 5.2% were half collapsed, 20.5% were partly collapsed, and 10.9% were not damaged (0.7% of respondents did not answer). Some 20.5% of respondents were living in their own houses in the same areas as before the earthquake, 8.7% of them in their own houses constructed in other areas; the rate of those who were living in temporary housing were 49.1%, that of in deemed rental housing were 9.2%, that of in recovery and earthquake housing were 0.9%, that of in housing that they had rented by themselves were 5.4%, that of in houses of relatives or acquaintances were 1.0%, and that of in other housing were 4.7% (0.5% of respondents did not answer). 40% of respondents whose houses had been partly collapsed and 30% of respondents whose houses had not been damaged were living in temporary housing or deemed rental housing, suggesting that some victims could not return to their own houses regardless of degrees of housing damage.

Some 20.3% of respondents had family members who had died or were still missing. Note that results of this research include many respondents who had significant injury or death and/or were living in temporary housing be-

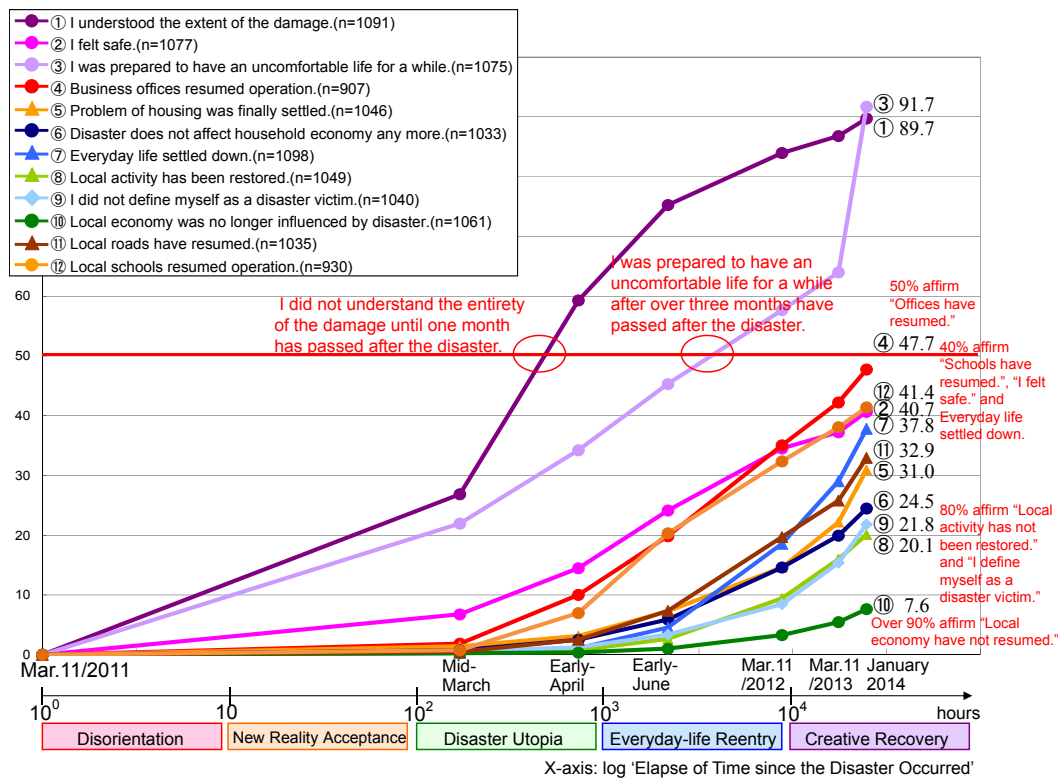


Fig. 3. Life recovery calendar of the 2011 earthquake (January 2014).

cause it is based on a database constructed through NHK interviews.

4. Result 2 – Extent of Life Recovery Processes Using the Life Recovery Calendar

4.1. Life Recovery Calendar of the 2011 Earthquake (Collective Recovery Consciousness of Victims who Suffered from a Serious Earthquake as Seen from Present Research Results)

The life recovery calendar of the 2011 earthquake is shown in Fig. 3. The horizontal axis shows the logarithmic time lapse after the earthquake and tsunami; 10⁰ at the left end of the horizontal axis indicates one hour after the earthquake, then 10 hours, 10² hours (10 hours: 2-4 days after the earthquake), 10³ hours (1,000 hours: two months after the earthquake), 10⁴ hours (10,000 hours: one year after the earthquake), and 10⁵ hours (100,000 hours: ten years after the earthquake). The vertical axis shows the rate of respondents who answered “feelings, actions, or circumstances related to each questionnaire item occurred up to the corresponding point of horizontal axis.” Each questionnaire item is indicated by accumulation lines and the timing at which “feelings, actions, or circumstances related to each questionnaire item occurred” was defined as that when the rate exceeded 50% (except for nonresponses). Note that respondents in this research were significantly affected by the earthquake as understood from respondent characteristics (60% of respondents were living in temporary or what was deemed temporary housing

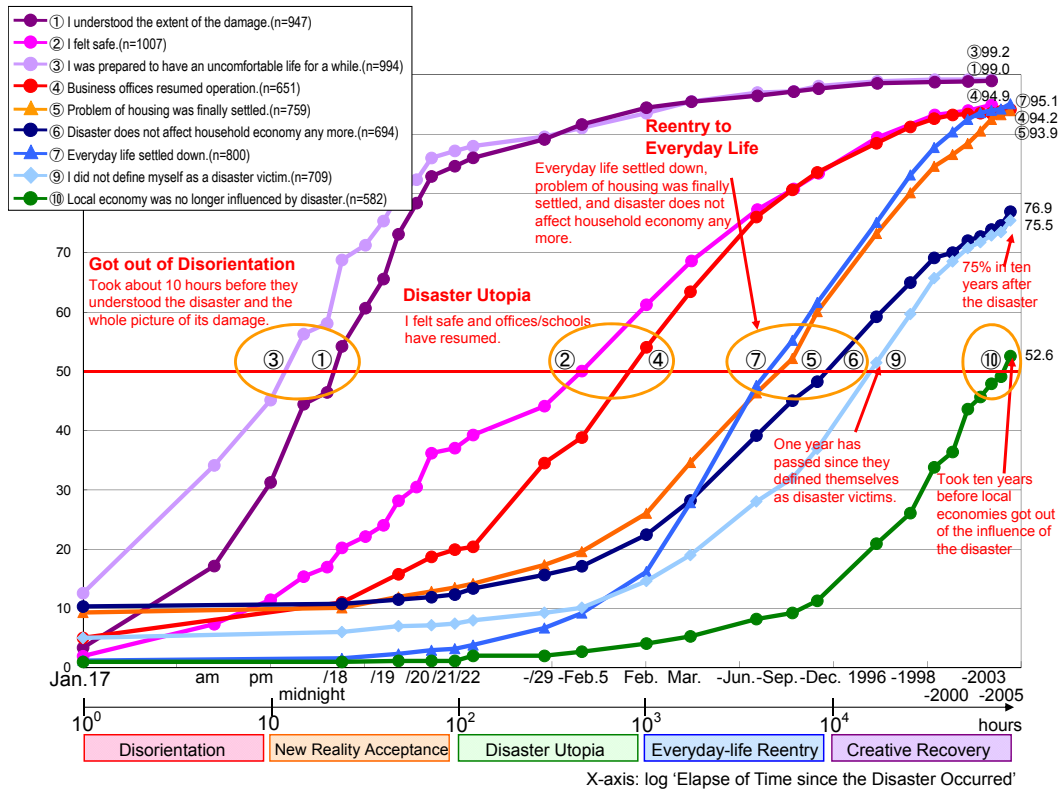
and the rate of totally collapsed houses was the same). Responses reflect these characteristics.

The graph shows that the item “I understood the extent of damage ①” first exceeded 50%. Victims understood the extent of damage only after one month after the earthquake. They “prepared to have an uncomfortable life for a while ③” three months after the earthquake.

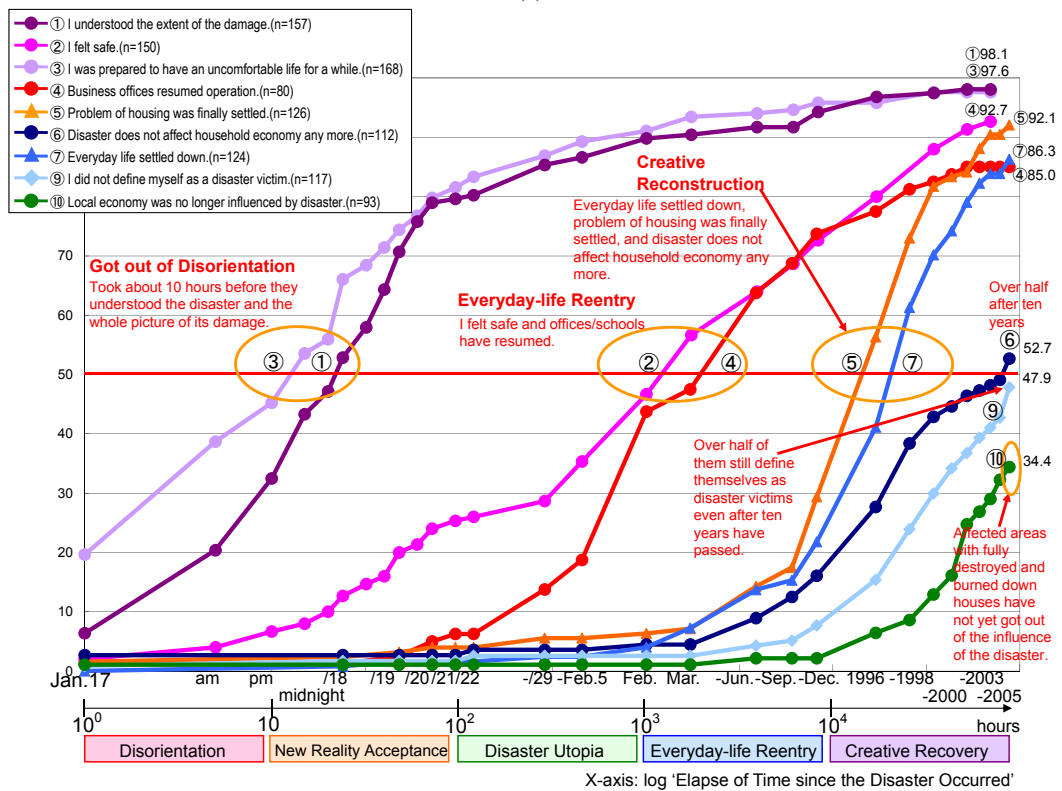
Two years and 10 months after the earthquake, rates of all items except for the above two were below 50%. 40% of respondents answered “local schools had resumed operation ⑫,” “I felt safe ②,” and “everyday life settled down ⑦” (⑫: 41.4%, ②: 40.7%, ⑦: 37.8%); 30% of respondents “local roads have resumed ⑪” “housing issues had all been dealt with ⑤” (⑪: 32.9%, ⑤: 31.0%); one fourth of respondents “the earthquake no longer affects family finances” (24.5%). They “no longer defined themselves as victims of earthquake ⑨” (21.8%), and “local activity has been restored ⑧” (20.1%). This means that 80% of respondents felt “local activities had not restored to their original states” and “themselves as victims.”

4.2. Comparison to Random Sampling Research Results of the 1995 Earthquake

Figure 4(a) shows the life recovery calendar of the 1995 earthquake. This is the result of a randomly sampled questionnaire for areas hit by a shock with an intensity of six on the day of the earthquake (Kimura, 2007) [17]. Over half of victims “prepared to have an uncomfortable life for a while ③” on the afternoon of the day of the earthquake and “understood the extent of damage ①” by the night of the same day. They “felt



(a)



(b)

Fig. 4. (a) Life recovery calendar of the 1995 earthquake. (b) Life recovery calendar of the 1995 earthquake. Victims whose houses were fully destroyed or burned down. (Nos. in ①, ③ and ④ are based on survey in 2003 (eight years after the earthquake) and Nos. in the others are based on survey in 2005 (ten years after the earthquake)).

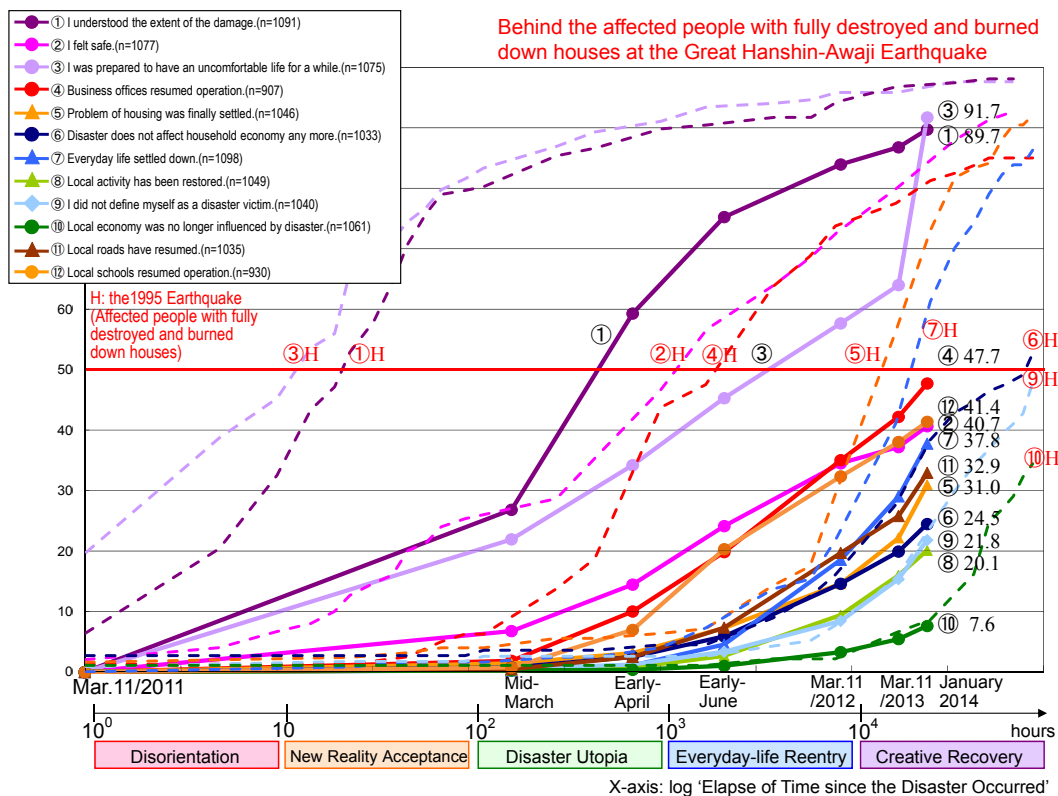


Fig. 5. Life recovery calendar (victims whose houses were fully destroyed or burned down) (comparison of 1995 earthquake (dotted lines) and 2011 earthquake (bold lines with markers)).

safe ②” three weeks after the earthquake and “offices and schools resumed operation ④” one month after the earthquake. They “got everything sorted out ⑦” and “housing issues had all been dealt with ⑤” six months after the earthquake. “The earthquake no longer affects family finances ⑥” and they “no longer defines themselves as victims of earthquake ⑨” one year after the earthquake. Meanwhile, it took ten years for slightly over half of respondents to feel “the local economy is no longer influenced by the earthquake ⑩.” Some 20% of respondents still defined themselves as victims even 10 years after the earthquake. Fig. 4(b) is the extracted result of victims whose houses had completely collapsed or burned down. Recovery was delayed compared to the result of all victims. Ten years had passed until half of respondents felt “the earthquake no longer affects family finances ⑥” and they “no longer defines themselves as victims of earthquake ⑨,” while only 34.4% of respondents felt “local economy is no longer influenced by the earthquake ⑩” ten years after the earthquake.

Results for the 1995 earthquake were compared to that of the 2011 earthquake. This research is not necessarily comparable to random sampling research on the 1995 earthquake from the perspective of representativeness of respondents. Considering that many respondents in this research had serious damage, life recovery processes of victims suffering from serious damage were studied by comparing results of this research to that of victims whose houses had totally collapsed or burned down during the 1995 earthquake. Note that “completely collapsed or

burned down” is an expression appearing in a damage report (victim’s certificate), including cases of pancake collapsed houses. Comparison results are shown in Fig. 5, which superimposes the life recovery calendar of the 1995 earthquake in dotted lines with the letter H in item names onto that of the 2011 earthquake in a solid line. The figure also shows how 2011 earthquake recovery proceeded much more slowly than that for the 1995 earthquake. While over half of respondents had an understanding of “the extent of damage ①” and preparedness “to have an uncomfortable life for a while ③” in the case of the 1995 earthquake, the timing of these items in the 2011 earthquake was significantly later. Over half of respondents in the 2004 earthquake in a random sampling survey responded that they had prepared “to have an uncomfortable life for a while ③” on the day of the earthquake and understanding of “the extent of damage ①” four days after the earthquake (Kimura et al., 2010) [13]. The 2004 earthquake occurred in mountainous areas and it took time to determine damage to isolated communities. It is assumed that “recognition prerequisites for coping with earthquakes” developed late because devastating damage to entire community functions in widespread areas due to tsunamis and the entire picture of damage and effects of the nuclear plant meltdown had long been unclear.

Devastating damage in widespread areas affected the progress of recovery in other items. Over half of respondents answered they “felt safe ②” and “offices and schools resumed operation ④” in the “everyday-life reen-

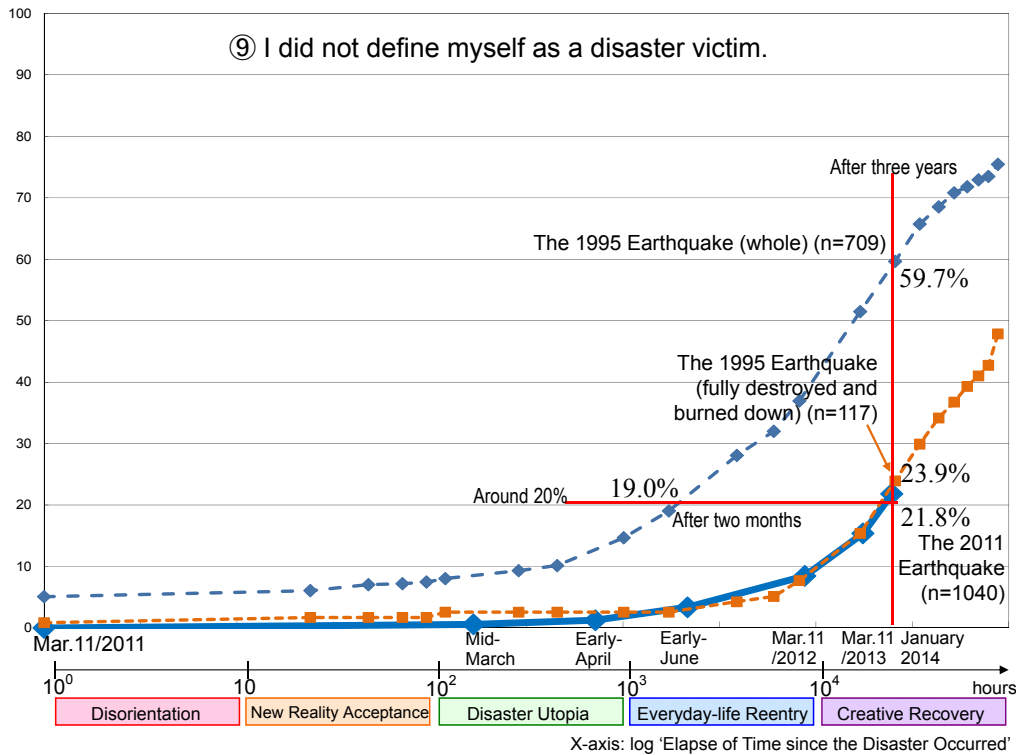


Fig. 6. Life recovery calendar (comparison of 2011 earthquake and 1995 earthquakes) (Ⓣ I did not define myself as a disaster victim.).

try phase” (two months – one year after the earthquake), whereas 40-50% of respondents answered so three years after the earthquake in the case of the 2011 earthquake. The rates of items they “got everything sorted out ⑦” and “housing issues had all been dealt with ⑤” exceeded 50% in the early creative recovery phase, one year after the earthquake in the case of the 1995 earthquake, but remained 30% three years after the earthquake in the case of the 2011 earthquake. The rate at which they “no longer defined themselves as victims of the earthquake ⑨” was 20% and the rate at which they felt the “local economy is no longer influenced by the earthquake ⑩” was 7.6% three years after the 2011 earthquake, indicating no significant differences from the case of victims whose houses totally collapsed or burned down during the 1995 earthquake.

The item for which they “no longer define themselves as victims of the earthquake ⑨” is strongly influenced by the final recovery feelings of victims. In the comparison between the 2011 and 1995 earthquakes (Fig. 6). The rate for this item was 59.7% in the case of the 1995 earthquake (as a whole), 23.9% in the case of the 1995 earthquake (totally collapsed and burned down), and 21.8% in the case of the 2011 earthquake. The line plot of the 1995 earthquake (housing totally collapsed and burned down) roughly coincided with that of the 2011 earthquake. Although there is a difference in selection methods of subjects, research results indicated that residents suffering from serious damage during the 2011 earthquake still consider themselves victims even three years after the earthquake and the degree of damage is as serious as in the

case of victims whose houses had been totally collapsed or burned down during the 1995 earthquake.

4.3. General Characteristics of Life Recovery Processes

The above section showed that the timing of recovery differed significantly depending on characteristics and scales of damage. The two recovery processes took basically the same course in the order of recovery items in the life recovery calendar (the order exceeding or approaching 50%). Life recovery proceeded in five phases:

- 1) Victims prepared to have an uncomfortable life for a while and understood the extent of the damage.
- 2) They felt safe and office and school resumed.
- 3) Everyday life settled down, the problem of housing was finally settled, and the personal financial situation was no longer influenced by the earthquake.
- 4) They no longer defined themselves as victims.
- 5) The local economy was no longer influenced by the earthquake.

This was the same order as in the 2004 earthquake (inland earthquake in mountainous areas), the 2007 earthquake (inland earthquake in local cities), and the 2011 heavy Kii Peninsula rain and flooding (heavy rain including large-scale collapse in mountainous areas) [13, 18]. Recovery processes for damaged areas and victims had

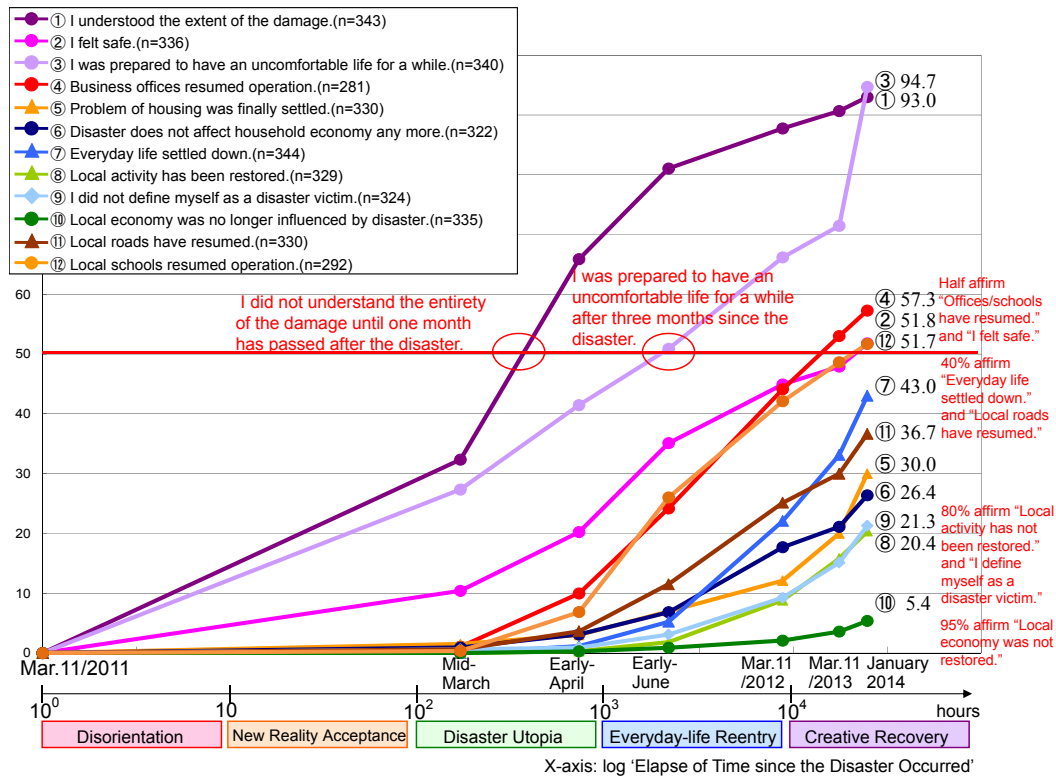


Fig. 7. Life recovery calendar of the 2011 earthquake (Iwate Prefecture) (January 2014).

general characteristics regardless of differences between subduction-zone earthquakes and inland earthquakes, earthquake tsunami disasters and heavy rain disasters, and urban areas and mountainous areas. The extent of recovery is derived from past disaster cases, and this can be used as a basis for considering effective responses at each timing after a disaster when local governments of affected areas planned recovery processes.

5. Result 3 – Life Recovery Calendar of the Three Affected Prefectures

5.1. Life Recovery Calendars

Life recovery calendars enabled a visual comparison in progress of recovery. Figs. 7-9 show life recovery calendars for Iwate, Miyagi, and Fukushima. Note that victims in Fukushima were those who were recovering their lives in affected areas of Fukushima during this research because many victims in Fukushima were living in temporary housing outside of original cities or prefectures.

Life recovery calendars of Iwate and Miyagi displayed the same trends in recovery processes up to three years after the disaster and situation three years after the earthquake. Fukushima (respondents living in Fukushima during this research) recovered much later than the other two prefectures. Victims “understood the extent of damage ①” in Iwate and Miyagi within one month after the earthquake and in Fukushima over one month after the earthquake, and “prepared to have an uncomfortable life for a while ③” in Iwate and Miyagi three months after

the earthquake and in Fukushima one year after the earthquake. The progress of recovery in other items was later in Fukushima than in Iwate and Miyagi (the slope of the line graph is more gentle) and 10 to 20% increases are shown in all items for Iwate and Miyagi, while about 10% of increases are indicated in Fukushima in two years from one year to three years after the earthquake (except that “the local economy was no longer influenced by the earthquake ⑩”). In the housing damage results for each prefecture (Fig. 10), respondents in Fukushima suffered from smaller housing damage than those in Iwate and Miyagi. This suggests that the nuclear plant meltdown delays the recovery of victims remaining in Fukushima from the first phase because the effects on their lives and damage of the incident had been unclear.

5.2. Comparison of Recovery Status Three Years After the Earthquake

Figure 11 shows results as of ten months and two years after the 2011 earthquake. The results as of three years after the 1995 earthquake are presented for comparison. Because houses of 85% of respondents in Iwate and Miyagi were totally collapsed or washed away by tsunamis, results as of three years after the 1995 earthquake for victims whose houses had been totally collapsed or burned down (15.2% of research subjects (n: 156)) are also indicated.

Considering the results of general characteristics of life recovery processes described in the previous section, the rate of the first phase of victims prepared to have an uncomfortable life for a while and understood the extent

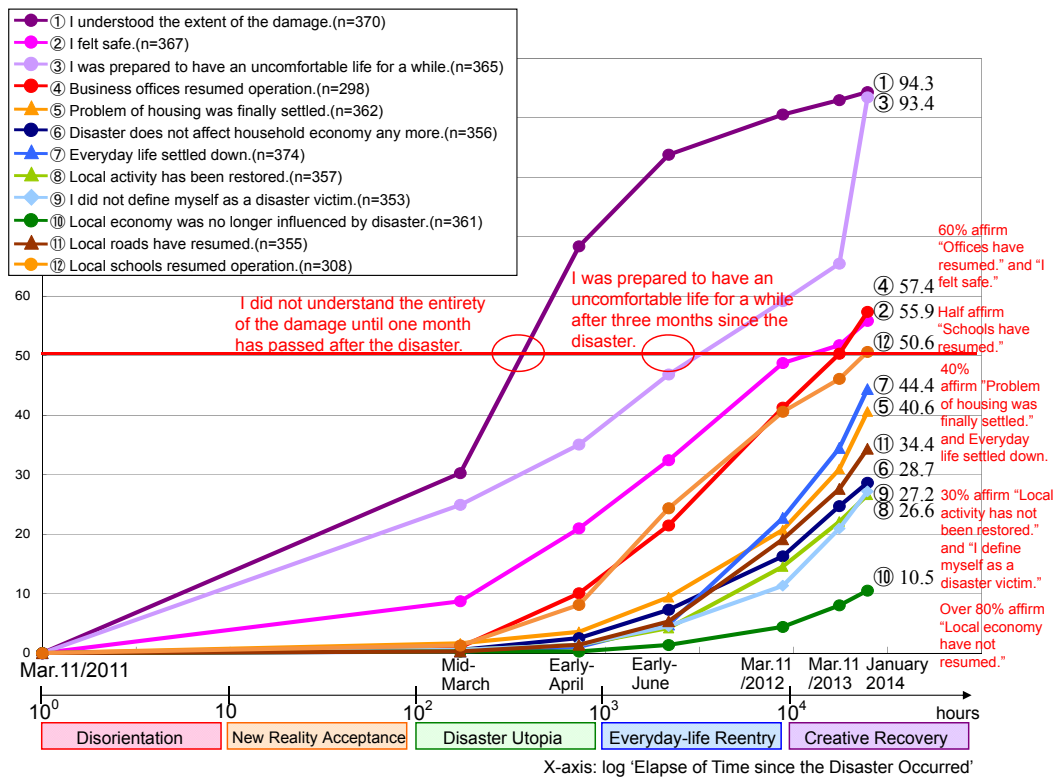


Fig. 8. Life recovery calendar of the 2011 earthquake (Miyagi Prefecture) (January 2014).

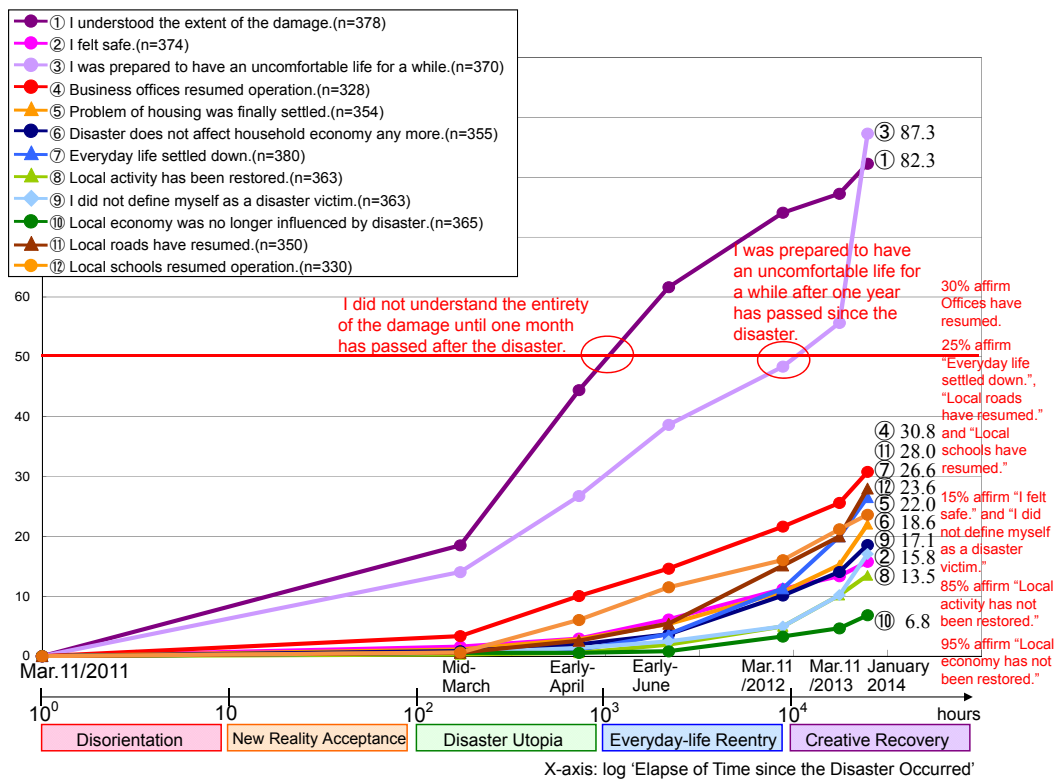


Fig. 9. Life recovery calendar of the 2011 earthquake (Fukushima Prefecture) (January 2014).

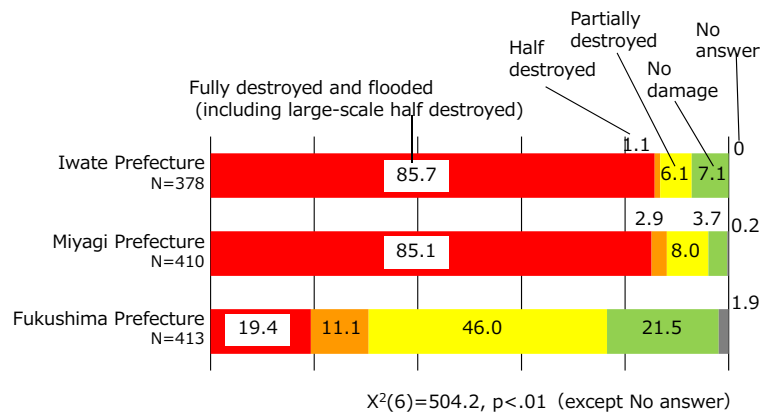


Fig. 10. Housing damage to respondents (prefecture).

	Iwate	Miyagi	Fuku-shima	After 2 years from 1995 EQ	After 2 years from 1995EQ -fully dmg & burned
③ I was prepared to have an uncomfortable life for a while.	94.7	93.4	87.3	99.2	97.6
① I understood the extent of the damage.	93.0	94.3	82.3	98.8	97.5
④ Business offices resumed operation.	57.3	57.4	30.8	91.2 (Offices/schools)	81.3 (Offices/schools)
⑫ Local school have resumed.	51.7	50.6	23.6	91.2 (Offices/schools)	81.3 (Offices/schools)
② I felt safe.	51.8	55.9	15.8	93.2	88.0
⑦ Everyday life settled down.	43.0	44.4	26.6	83.1	61.3
⑪ Local roads have resumed.	36.7	34.4	28.0		
⑤ Problem of housing was finally settled.	30.0	40.6	22.0	80.1	73.0
⑥ Disaster does not affect household economy any more.	26.4	28.7	18.6	65.0	38.4
⑨ I did not define myself as a disaster victim.	21.3	27.2	17.1	59.7	23.9
⑧ Local activity has been restored.	20.4	26.6	13.5		
⑩ Local economy was no longer influenced by disaster.	5.4	10.5	6.8	26.1	8.6

Fig. 11. Life recovery calendar as of January 2014.

of the damage was 80% only in the case of Fukushima, showing that the nuclear plant meltdown hindered the achievement of the first phase. The rate of the second phase that they felt safe and office and school resumed was over 90% in the case of the 1995 earthquake and over 80% in the case of victims whose houses totally collapsed or burned down, but 50% or slightly more in Iwate and Miyagi, and 30% or slightly more for work, 20% or slightly more for school, and 10% or slightly more for safe, in Fukushima. The difference between victims whose houses totally collapsed or burned down and those in Iwate and Miyagi during the 2011 earthquake was 30%.

Differences by item appeared in the third phase of everyday life settled down, the problem of housing was finally settled, and the personal financial situation was no

longer influenced by the earthquake. The rate of “getting everything sorted out ⑦” was 80% or slightly more in the case of the 1995 earthquake and 60% or slightly more in the case of victims whose houses totally collapsed or burned down, but 40% or slightly more in the case of Iwate and Miyagi, 20% or slightly more in the case of Fukushima. The rate of “housing issues all dealt with ⑤” was 80% or slightly more in the case of the 1995 earthquake, and 70% or slightly more in the case of victims whose houses totally collapsed or burned down, but 40% or slightly more in the case of Miyagi, 30% or slightly more in the case of Iwate, and 20% or slightly more in the case of Fukushima. Difference in progress is large in the “housing issues” that is a key of human lives. Some 70% of victims whose houses had been totally collapsed

or burned down during the 1995 earthquake solved their housing issues three years after the earthquake. In the 2011 earthquake with greater affected areas and populations, progress in housing issues was late because recovery of municipal housing was late in construction and policy on return to original regions had not been decided for a while in areas affected by tsunamis and the nuclear plant meltdown. The rate at which “the earthquake no longer affects family finances ⑥” was 60% or slightly more in the case of the 1995 earthquake, and 30% or slightly more in the case of victims whose houses totally collapsed or burned down, but 20% or slightly more in the case of Miyagi and Iwate, and 10% or slightly more in the case of Fukushima. The effect of losing houses on family finances was significant and remained three years after the earthquake in the case of both earthquakes. Over half of victims whose houses had been totally collapsed during the 1995 earthquake answered that “the earthquake no longer affects family finances” ten years after the earthquake, indicating the necessity of dealing with victims for over ten years.

The rate of the fourth phase in which they no longer defined themselves as victims was 50% or slightly more in the case of the 1995 earthquake, and 20% or slightly more in the case of victims whose houses totally collapsed or burned down, and 20% or slightly more in the case of Miyagi and Iwate, and 10% or slightly more in the case of Fukushima. Some 70% of victims whose houses totally collapsed felt themselves as victims three years after in both earthquakes. Some 47.9% of respondents whose houses totally collapsed during the 1995 earthquake answered they “no longer are victims” in research ten years after the earthquake, requiring long-term observation.

The rate of the fifth phase “local economy is no longer influenced by the earthquake” was 20% or slightly more in the case of the 1995 earthquake, and 10% in other areas, and the rate of Iwate was especially low, 5.4%. One factor of this is the fact that support and investments for Iwate have been relatively small compared to Miyagi with large population and economy and Fukushima that has nuclear power plants. Over half of respondents in the case of the 1995 earthquake answered “local economy is no longer influenced by the earthquake” ten years after the earthquake, requiring a positive and continuous economic measures for achieving life recovery.

6. Result 4 – Classification and Structuralization of Life Recovery Process

6.1. Classification and Structuralization of Life Recovery Process Three Years After the Earthquake Using Cluster Analysis for Respondents of This Research

The previous sections investigated recovery processes centering on seriously damaged victims three years after the 2011 earthquake using the life recovery calendar. This section classifies and structuralizes the life recovery processes of respondents of this research three years after

the earthquake by analyzing the relationship among items in the life recovery calendar using a statistical analysis method.

First, items of the recovery calendar are classified using a cluster method (the Ward method). Cluster analysis is multivariate analysis that divides response trends so that similar ones are included in the same group and different ones are separated from each other. A cluster is a group or gathering. This method is frequently used for clarifying target customers in marketing and planning brand strategies because it allows for classification of elements using objective statistical processing. **Fig. 12** shows a dendrogram of a cluster analysis. In a dendrogram, the closer to the left elements are connected, the closer is their relationship: e.g., items of they “understood the extent of damage ①” and they prepared “to have an uncomfortable life for a while ③” on the bottom are in closer relationship and they are in the most distant relationship with the other ten items because the connecting points are at the right end.

In **Fig. 12**, the items in the life recovery calendar for respondents in the case of the 2011 earthquake are divided into five clusters. From the bottom of the figure, the first cluster include they “understood the extent of damage ①,” and they “prepared to have an uncomfortable life for a while ②,” corresponding to the first phase out of five phases of life recovery processes described in the previous section. The response trends of this cluster is significantly different from that of other clusters. Next, a cluster of “offices resumed operation ④,” “local schools resumed operation ⑫,” and they “felt safe” are formed, corresponding to the second phase out of five phases of life recovery processes. The response trends of this cluster is also different from that of other clusters. Following this, a cluster of “disaster does not affect household economy any more ⑥,” they “got everything sorted out ⑦,” and “problem of housing was finally settled ⑤,” corresponding to the third phase out of five phases of life recovery processes. The item “local roads have resumed ⑪” forms a separate cluster. This item was not used in research of the Hanshin-Awaji earthquake in 1995 but used as a milestone in research of the 2004 Mid-Niigata Prefecture earthquake in which the isolation issue of community was focuses on. This item cannot be replaced with other items. Lastly, a cluster of “local activity has been restored ⑧,” “local economy was no longer affected by the earthquake ⑩,” and they “no longer defined ourselves as victims of earthquake ⑨,” corresponding to the fourth and fifth phase out of five phases of life recovery processes. Item ⑧ was not asked in the case of the Hanshin-Awaji earthquake. The twelve items are thus classified into five clusters. This result corresponded to the five phases described in the above section, statistically showing that victims recover their lives through these phases. However, differences among items classified into the third, fourth, and fifth clusters are barely indicated in the cluster analysis because respondents who were living in temporary housing responded they “have not returned yet,” three years after the earthquake and re-

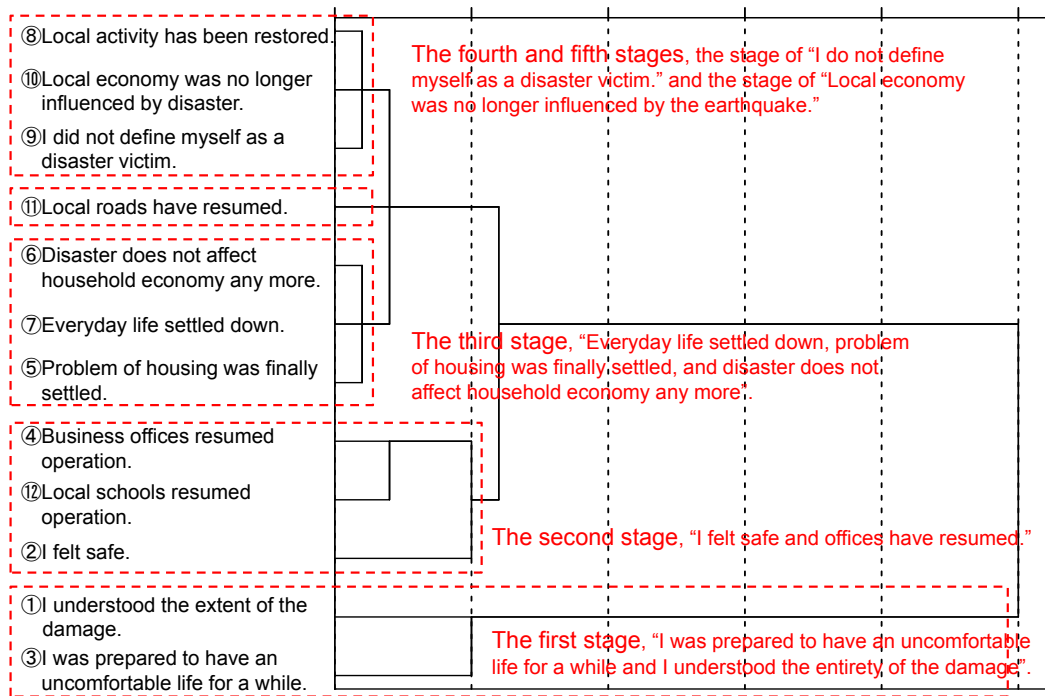


Fig. 12. Cluster analysis results (Ward method) for life recovery calendar items.

sponse tendencies were similar. Classification of the third, fourth, and fifth clusters should be examined after recovery progress.

6.2. Structuralization of Life Recovery Process Three Years After the Earthquake Using Decision Tree Analysis for Respondents of This Research

Next, structuralization of life recovery process three years after the earthquake is conducted using decision tree analysis for respondents of this research. A decision tree analysis is a multivariate analysis for drawing the classification or hierarchical relationship of the most rational data for explaining an item using a tree-like drawing method called decision tree based on a statistical algorithm. This method is used in data mining and prediction models. Fig. 13 shows the decision tree analysis (CTR method) result. In the life recovery calendar, respondents who responded they “no longer defined ourselves as victims of earthquake ⑨” three years after the earthquake was defined as “persons who achieved life recovery by transferring from a victim mode to a new everyday mode.” This figure also explains what kind of people are “those who no longer defines themselves as victims” and “those who still defines themselves as victims.”

The figure showed that the most influencing factor to “those who no longer defines themselves as victims” (21.8% of respondents) was whether they “got everything sorted out ⑦” or not. The top and second top layers of the decision tree (Fig. 13) indicates that 43.6% of those who “got everything sorted out” “no longer defines themselves as victims,” while 91.1% of those who did not get “everything sorted out” still “defines themselves as victims.”

Respondents who “no longer defines themselves as victims ⑨” in this research three years after the earthquake typically “got everything sorted out ⑦,” and felt “local economy was no longer affected by the earthquake ⑩,” or, “got everything sorted out ⑦,” and did not feel “local economy was no longer affected by the earthquake ⑩’,” and felt “disaster does not affect household economy any more ⑥.” Similarly, respondents who still “defines themselves as victims ⑨” in this research three years after the earthquake typically did not get “everything sorted out ⑦’,” did not feel “problem of housing was finally settled ⑤’,” did not feel “local roads have resumed ⑪’,” and did not understand “the entity of damage ①’,” or, did not get “everything sorted out ⑦’,” housing issues have not “all been dealt with ⑤’,” felt “local roads have resumed ⑪,” and did not feel “local schools resumed operation ⑫’.” As a response trends of seriously damaged victims in this research, factors forcing victims to live as victims are expected to be: infrastructure such as roads and schools had not recovered, housing issues had not solved, and economic situations had not improved. Those who left the victim mentality behind achieved life recovery because economic problems of family finances or local economy were solved and this relieved them.

This structure can be compared to the recovery structure of the 1995 earthquake when considering how to support victims in the future. According to Hayashi (2007) and Tamura (2007), the importance of economic recovery was recognized as a process of recovery in the 1995 earthquake because the vibrant city would not be restored simply by recovering infrastructure. The term “human recovery” was new because the damage scale and the number of victims were tremendous. The third recovery tar-

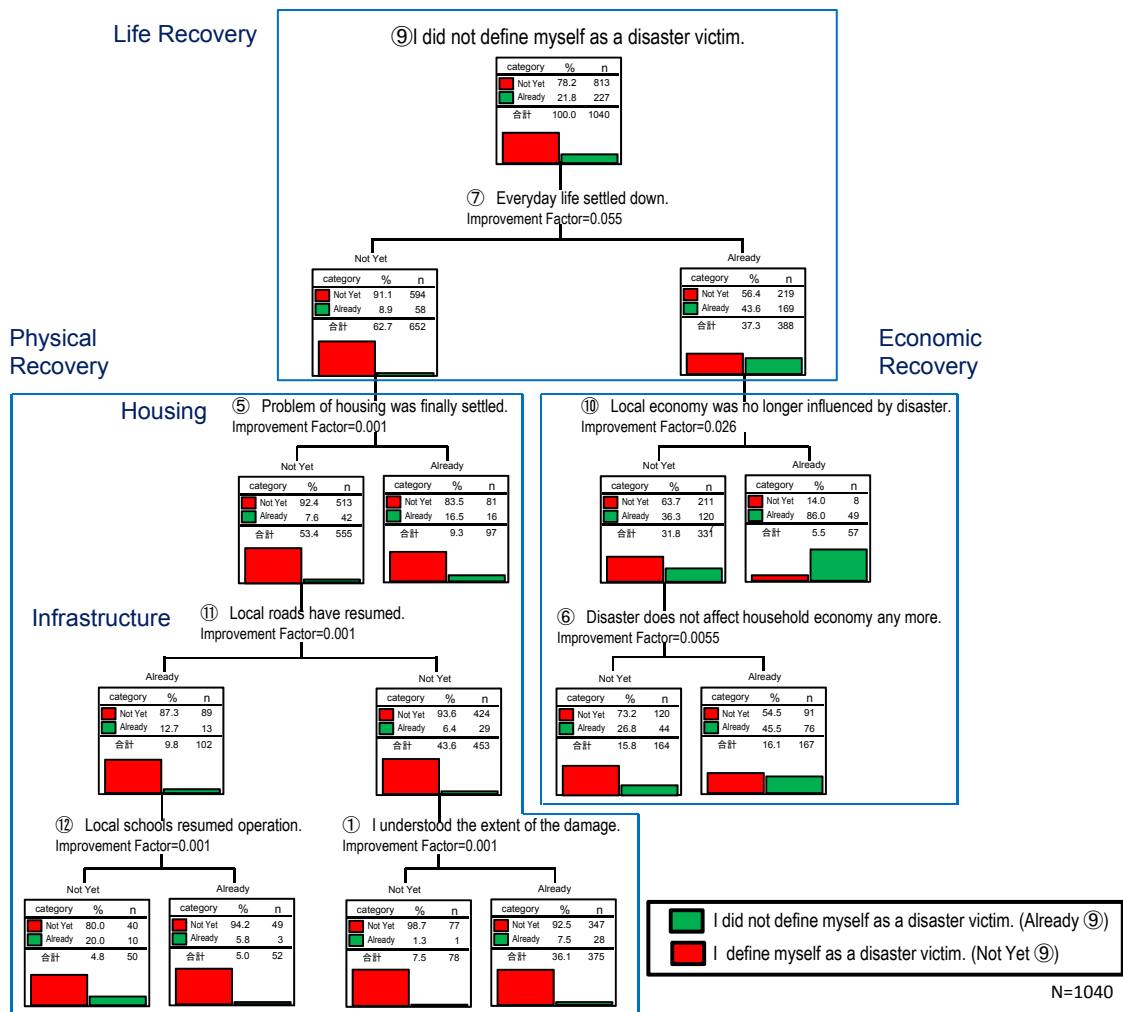


Fig. 13. Decision tree analysis of structured life rebuilding process two years after the earthquake.

get was “life recovery” for recovering the lives of victims. This is called the “three-layer recovery model” [10, 11] (Fig. 14) in which recovery processes are structured on the first layer “recovery of infrastructures” as a base for recovery with three targets of “city recovery,” “economy recovery,” and “life recovery.”

The three-layer recovery model is effective in considering long-term supports for victims seriously damaged in this research result in the future. Life recovery will not be achieved as long as physical recovery such as infrastructure recovery, house recovery, and community recovery have not completed. Even after these elements are achieved, life recovery will not be achieved before the resolution of economic issues. Those who experienced physical recovery such as infrastructures and houses and economic recovery can only achieve life recovery and transfer from victim mode to a new everyday mode. Some characteristics are common in the long-term support in the cases of the 2011 earthquake and the 1995 earthquake. It is predicted and proposed that life recovery in the areas affected by the 2011 earthquake takes the course of infrastructure reconstruction at first, and then physical recovery in local areas by supporting house recovery and land uti-

lization, on parallel with economic supports. To achieve them, a long-term plan from a long perspective ranging at least 10 years as in the case of the 1995 earthquake is required.

As described in Section 2.2, the result of this research should be treated with a care for the fact that samples of this research was not randomly sampled from the population of the 2011 earthquake. In the future, the validity of the present research should be studied using samples more representing population.

7. Conclusions

This paper clarified the recovery status of affected areas and life recovery process based on subjective estimate three years and 10 months after the 2011 earthquake. More specifically, a questionnaire was conducted for 3,000 victims to indicate the status and issues of them. The entire picture of the recovery process was obtained using a measurement method called “recovery calendar” and the general structure of the recovery process was compared to existing earthquakes such as the 1995 earthquake.

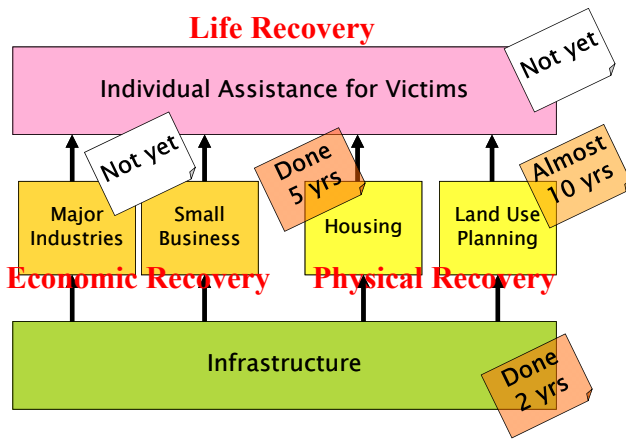


Fig. 14. Three-layer recovery model for 1995 earthquake verified nine years after the earthquake.

As a result, it was shown that recovery was late in the case of the 2011 earthquake compared to the case of the 1995 earthquake. Almost 80% of respondents “defined themselves as victims” three years after the earthquake. This is twice as many as the case of the 1995 earthquake. Delay in recovery or life environments and economy negatively has affected the mentality of victims.

General characteristics of life recovery process were also investigated through a comparison to other earthquake and water disasters. Life recovery proceeded in the following five phases: 1) “victims prepared to have an uncomfortable life for a while and understood the extent of the damage,” 2) “they felt safe and office and school resumed,” 3) “everyday life settled down, problem of housing was finally settled, and personal financial situation was no longer influenced by the earthquake,” 4) “they no longer define themselves as victims,” and 5) “local economy was no longer influenced by the earthquake.” These phases were also classified using a cluster analysis.

As a result of the decision tree analysis conducted for predicting the causes of “no longer define themselves as a victim ⑨” in an attempt to structuralize life recovery process, it was shown that the three-layer recovery model is effective in considering long-term supports in the future. In this model, physical recovery such as house and community recovery and economic recovery are achieved based on recovery of infrastructure, and life recovery is finally achieved on top of them.

Free descriptions in this questionnaire research tells us the harsh reality of victims. “I had strong will and hope to make a recovery immediately after the earthquake, but these thoughts have become thin and almost been vanishing in three years” (Iwate, female in her 50s). “A house have not found, and it will take another 2-3 years to use our land for housing. We are getting older. I would like to return to the original life” (Miyagi, female in her 50s). “Feel alienation in evacuation cite, and in Fukushima. There is no way to go back to my place” (Fukushima, male in his 30s). “I had a chance to rebuild my house, but feel sorry for people in temporary housing. It took too long for migration. I’m irritated because things are going

beyond our control” (Iwate, male in his 30s). It is required to develop infrastructures and houses as a first step to life recovery as soon as possible. Then, a process such as the “three-layer recovery model” for having victims no longer identified themselves as victims should proposed as a long-term plan over ten years as accomplished in the Hanshin-Awaji earthquake. Courses to life recovery and options suitable for circumstances of each victim should be established in detail and modified as appropriate in the processes.

References:

- [1] Fire and Disaster Management Agency, Japan, “The 2011 Earthquake Off the Pacific Coast of Tohoku (the Great East Japan Earthquake).” Vol.149, March 7, 2014 (in Japanese).
- [2] Reconstruction Agency, “The Number of Disaster-related Deaths in the Great East Japan Earthquake (as of September 30, 2013).” December 24, 2013 (in Japanese).
- [3] Ministry of the Environment, “The Progress of Disaster Waste Management, Three Coastal Municipalities (except evacuation zones),” 2014 (in Japanese).
- [4] Ministry of the Environment, “Decontamination Situation as of the End of February, 2014 in Decontamination Zones of Municipalities in Fukushima Prefecture,” 2014 (in Japanese), http://josen.env.go.jp/zone/details/fukushima_progress.html [accessed April 1, 2014]
- [5] Reconstruction Agency, “Current Situation of Reconstruction (as of March 10, 2014),” 2014 (in Japanese).
- [6] Fire and Disaster Management Agency, Japan, “The Great Hanshin-Awaji Earthquake (Final Report),” May 19, 2006 (in Japanese).
- [7] Ministry of Land, Infrastructure, Transport and Tourism, “Stability Security of Rental Housing Residents at Disaster (Document distributed at The Fourth Meeting of Subcommittee of Disaster-related Land and Building Leases and Sectional Ownership of Building,” Legislative Council of the Ministry of Justice (held on November 12, 2012), 2012 (in Japanese).
- [8] Hyogo Prefecture, “Recovery and Reconstruction Situation of The Great Hanshin-Awaji Earthquake,” 2014 (in Japanese).
- [9] S. Tatsuki, “Long-term Life Recovery Processes Among Survivors of the 1995 Kobe Earthquake: 1999, 2001, 2003, and 2005 Life Recovery Social Survey Results,” *Journal of Disaster Research*, Vol.2, No.6, pp. 484-501, Dec. 2007.
- [10] K. Tamura, “Defining Recovery: 7-Element Model,” *Journal of Disaster Research*, Vol.2, No.6, pp. 475-483, Dec. 2007.
- [11] H. Hayashi, “Long-term Recovery from Recent Disasters in Japan and the United States,” *Journal of Disaster Research*, Vol.2, No.6, pp. 413-418, Dec. 2007.
- [12] R. Kimura, H. Hayashi, K. Tamura, S. Tatsuki, T. Noda, K. Yamori, A. Kuromiya, and Y. Urtata, “Developing Victims’ Life Reconstruction Indicators by Social Survey – Ten Years Monitoring in the Great Hanshin-Awaji(Kobe) Earthquake Disaster –,” *Journal of Social Safety Science*, No.8, pp. 415-424, 2006 (in Japanese).
- [13] R. Kimura, K. Tamura, and H. Hayashi, “Development of the Method of Clarifying the Life Reconstruction Process Based on the Random Sampled Social Surveys of the Victims – Recovery and Reconstruction Calendar –,” *Proceedings of the International Emergency Management Society (TIEMS) 17th Annual Conference*, pp. 168-178, 2010.
- [14] R. Kimura, “Psychology in Disaster and Society, *Encyclopedia of Disaster in Japanese History*,” pp. 72-77, Yoshikawa-Kobunkan, 2012.
- [15] R. Kimura, Y. Yajima, Y. Matsui, and R. Suzuki, “Conditions of the Disaster Victims of Two-Year after the 2011 off the Pacific Coast of Tohoku Earthquake – How do the Disaster Victims Feel in the Process of Life Reconstruction,” *Journal of Disaster Information Studies*, No.12, pp. 114-123, 2014 (in Japanese).
- [16] R. Kimura, H. Hayashi, S. Tatsuki, and K. Tamura, “Psychologically Defined Life Reconstruction Processes of Disaster Victims in the 1995 Hanshin-Awaji Earthquake,” *Journal of Social Safety Science*, No.6, pp. 241-250, Nov. 2004 (in Japanese).
- [17] R. Kimura, “Recovery and Reconstruction Calendar,” *Journal of Disaster Research*, Vol.2, No.6, pp. 465-474, Dec. 2007.
- [18] R. Kimura and S. Ohtomo, “Life Reconstruction Processes of Flood Disaster Victims in Semimountainous Area – A Case Study of Kii Peninsula Flood Disaster (the Typhoon No.12 in 2011) in Japan –,” *Journal of Social Safety Science*, No.21, pp. 137-147, Nov. 2013 (in Japanese).



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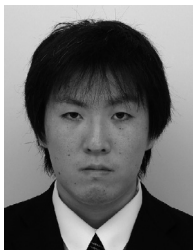
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(IJ), Special Issue Vol.1, Issue 1, pp. 834-840, Dec., 2013.

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293-303, 2014.
• "Proposing Analysis Method of Psychology and Behavior about
Tsunami Evacuation Using Victims' Experiences Recorded in Qualitative
Data: Application to the 1944 Tonankai Earthquake," Historical
Earthquake, No.29, pp. 173-182, 2014 (in Japanese).
• "Analyzing Dissemination Processes of Mail-based Disaster Information
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