



## RELATION BETWEEN CSR ACTIVITIES AND THE RESILIENCE OF LOCAL COMMUNITIES IN IWAKI CITY AFTER THE 2011 TOHOKU EARTHQUAKE

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### **Abstract**

The concept of resilience is widely used in the disaster management field. In the earthquake-engineering field, many studies have investigated the structural performance of buildings and seismic resilience in terms of performance-based earthquake engineering. However, there are a limited number of studies on the social aspects of resilience. This study focuses on social activities by private companies. A company's social activity is termed as its Corporate Social Responsibility (CSR). Further, this study also focuses on the relationships between the resilience of a community and the companies' CSR activities in a local area.

We conducted two questionnaire surveys for citizens and companies in Iwaki City, which suffered from the 2011 Tohoku earthquake. We hypothesized that social activities by companies would improve the resilience of the local community. In the questionnaire surveys, we set two types of respondents as follows: CSR staff of companies and citizens in the local areas. Using the questionnaire responses of the CSR staff, we analyzed characteristics of CSR activities using principal component analysis. Subsequently, using the local citizens' responses, we compared the differences in their life recovery in terms of economic circumstances and social aspects.

*Keywords: community resilience; recovery process; private company; corporate social responsibility*



## 1. Introduction

Tierney [1] noted that researchers studying the economic impacts of disasters have tended to focus on units of analysis larger than individual firms or companies, such as communities and regional economies. She indicated that the impacts of a disaster lead to business experiencing not only direct losses but also indirect losses and economic ripple effects. It is obvious that local companies are important in the recovery of local economies, and the strong connection between local economies and local communities means that the recovery of local companies is a key factor in the recovery of local communities. However, only a limited number of studies have focused on the relationship between company activities and the recovery of local economies and societies. Since local communities are among the most important stakeholders, companies must take responsibility for making positive contributions through their business activities, particularly through CSR activities.

The concept of resilience has been conceptualized in various research fields related to natural disasters, ecology, and sociology. The United Nations Office for Disaster Risk Reduction (UNISDR) [2] has defined the term resilience as “the ability of a system, community or society exposed to hazards to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.” Cutter et al. [3] reviewed several studies on community resilience and defined resilience as a set of capacities that can be fostered through interventions and policies, which in turn help to build and enhance a community’s ability to respond to and recover from disasters. Based on this literature, the concept of community disaster resilience can be defined as a community’s ability to limit the effects of disaster and achieve timely recovery. Bruneau et al. [4] and Bruneau and Reinhorn [5] defined a fundamental framework for evaluating community resilience without offering a detailed quantification or definition and outlined four properties of resilience (robustness, redundancy, resourcefulness, and rapidity) and four dimensions (technical, organizational, social, and economic). After the fundamental framework was developed, quantitative evaluations of resilience were attempted in a range of studies. Cimellaro et al. [6] quantified resilience by applying an analytical methodology using measures that included the probability of failure, consequences of failure, and time to recovery. This model was applied to the evaluation of the seismic resilience of health care facilities. The framework of existing performance-based earthquake engineering was incorporated into a resilience framework used to model recovery at the individual building and community scales [7].

A company’s social activity is termed its Corporate Social Responsibility (CSR), and it has a great role in current business situations. CSR includes various types of activities, such as sustainable management, business ethics, compliance, work–life balance, and philanthropy. It has been developed in different ways in different countries, reflecting cultural factors. Thus, there is no single definition of CSR. In broad terms, CSR is defined as a company’s sense of responsibility in resolving social and environmental issues. In the past, a company’s major responsibility was considered to be earning a profit (Friedman [8]). This recognition changed after the stakeholder theory was introduced by Freeman [9], and companies were held to be responsible for the welfare of their stakeholders. In the 1970s, CSR was identified with corporate philanthropy; further, the main CSR activities were volunteer work and financial donation. The role of CSR later shifted to risk management with the main focus on compliance. More recently, CSR has been viewed in terms of value creation. The creating shared value (CSV) approach suggested by Kramer [10] has had a significant impact on the business environment. CSV has been recognized as a business strategy that attempts both to increase profits and create social value. This concept changed the view of social contributions from philanthropic activities to strategic business activities. In relation to recovery from disasters, Takaura [11] surveyed the philanthropic activities of 225 Japanese companies listed on the Nikkei Stock Average Index after the 2011 Tohoku earthquake and found that 94.2% of the companies had given some form of support to the local communities affected by the earthquake. Most made contributions of money, human, or material resources through donations and volunteer activities. Therefore, it can be said that CSR has an important role in the recovery of local communities.

From the viewpoint of disaster resilience, fostering business continuity after a disaster is one of the most important CSR activities. Usually, business continuity is discussed within each company so that considerations about the interactions and effects on the local communities are not sufficient. This study analyzed the relationship between CSR activities of local companies and the local communities’ recovery from disaster. We



conducted two questionnaire surveys of companies and local people, respectively, in Iwaki City, which suffered from the 2011 Tohoku earthquake. We hypothesized that social activities by companies would improve the local community’s resilience.

In the questionnaire surveys, we set two types of respondents as follows: CSR staff of companies and citizens in the local areas. In the questionnaire given to the company CSR staff, we compared types of CSR activities conducted by each company and analyzed the relationships to the seismic damage, business continuity, and downtime after the 2011 Tohoku earthquake. From the questionnaire given to local citizens, we compared the differences in their life recovery in terms of economic circumstances and social aspects. In addition, we combined the results of the two questionnaire surveys and analyzed the differences in the local community’s resilience and downtime after the earthquake across different communities with companies that have different types of CSR activities.

The Great East Japan Earthquake Disaster followed the 2011 Tohoku earthquake, which was one of the largest earthquakes in recorded history and caused catastrophic damage in the Tohoku region of Japan. According to Japan’s Reconstruction Agency [12], over 15,000 people were killed and over 2,500 are still officially reported missing. Over 124,000 buildings were totally destroyed, 274,000 suffered severe damage, and approximately 740,000 were partially damaged. The earthquake also had large impacts on the economy and society. The direct financial damage from the disaster was estimated at approximately 16.9 trillion yen, and many companies were forced to suspend or close their businesses permanently. There were also huge impacts on local communities. In several areas, disaster victims were forced to evacuate, and many are still unable to return to their homes because of the effects of the tsunami and the nuclear plant accident. As of 2016, Japan is still in the process of recovery from the disaster.

## 2. Questionnaire design

Iwaki City, Fukushima, Japan was selected as the target city, since it was one of the areas affected by the Great East Japan Earthquake Disaster. Two questionnaire surveys were administered to obtain data on the CSR activities of local companies and the local people’s recovery. One survey was given to local companies to explore their understanding of CSR and record their actual implementation of CSR. The second was administered to Iwaki City’s local people and was designed to explore their recovery from the 2011 earthquake. Table 1 shows the population of four major areas of Iwaki City in 2014, according to municipal data [13].

Table 1 – Population of Iwaki City in 2014

District	Households	Population		
		Total	Male	Female
Taira	38,629	93,071	45,457	47,614
Onahama	29,611	76,428	37,325	39,103
Nakoso	18,092	48,248	23,620	24,628
Joban	13,470	37,790	15,935	17,492

### 2.1 Questionnaire administered to companies

In the questionnaire administered to companies in Iwaki City, the personnel responsible for CSR activities were asked 11 questions about CSR, six questions about the seismic damage caused by the 2011 Tohoku earthquake, and five questions about business functionality after the earthquake. In this study, the results of the 11 questions about CSR were used for a principal component analysis. Table 2 lists the questions.  $Q_{C1}$  to  $Q_{C11}$  used a six-point Likert-type scaling: “Very high,” “High,” “Somewhat high,” “Somewhat low,” “Low,” and “Very low.”

### 2.2 Questionnaire administered to local people

The respondents were members of panels of an internet survey company. All of them were living in Iwaki City, and they were classified into the following two groups: company employees and non-employees, including the



self-employed, students, and retirees. Each of the respondents answered eight questions about the recovery of his or her living situation after the 2011 earthquake.

Table 2 – List of questions in the questionnaire administered to companies

No.	Question
Q <sub>C1</sub>	How much did your company understand about CSR before and after the 2011 Tohoku earthquake?
Q <sub>C2</sub>	How conscious was your company of stakeholders before and after the 2011 Tohoku earthquake?
Q <sub>C3</sub>	To what extent did your company systematically plan and perform CSR activities before and after the 2011 Tohoku earthquake?
Q <sub>C4</sub>	How much self-evaluation of CSR did your company perform before and after the 2011 Tohoku earthquake?
Q <sub>C5</sub>	How much external evaluation of CSR by third parties did your company use before and after the 2011 Tohoku earthquake?
Q <sub>C6</sub>	To what extent did your company engage in CSR activities concerning compliance before and after the 2011 Tohoku earthquake?
Q <sub>C7</sub>	To what extent did your company engage in CSR activities concerning business ethics before and after the 2011 Tohoku earthquake?
Q <sub>C8</sub>	To what extent did your company engage in CSR activities concerning work–life balance before and after the 2011 Tohoku earthquake?
Q <sub>C9</sub>	To what extent did your company engage in CSR activities concerning CSV before and after the 2011 Tohoku earthquake?
Q <sub>C10</sub>	To what extent did your company engage in CSR activities concerning participation in local community activities before and after the 2011 Tohoku earthquake?
Q <sub>C11</sub>	To what extent did your company engage in CSR activities involving volunteers and donations before and after the 2011 Tohoku earthquake?

Table 3 presents the questionnaire. Q<sub>L1</sub> to Q<sub>L8</sub> used six-point scales to compare recovery with the situation before the earthquake: “0%–20%,” “20%–40%,” “40%–60%,” “60%–80%,” “80%–100%,” and “100%.” These questions included six time dimensions: “Immediately after,” “1 week after,” “3 months after,” “6 months after,” “1 year after,” and “4 years and 8 months after” the earthquake. These factors were chosen based on the seven elements of happiness suggested by Layard [14], which are (1) family relationships, (2) household income, (3) employment situation, (4) community and friends, (5) personal health, (6) personal freedom, and (7) personal values.

Table 3 – List of questions in the questionnaire administered to local people

No.	Question
Q <sub>L1</sub>	How was your household income in comparison with the period before the 2011 Tohoku earthquake? [immediately, 1 week, 3 months, 6 months, 1 year, and 4 years and 8 months after the earthquake]
Q <sub>L2</sub>	How good was your mental health in comparison with the period before the 2011 Tohoku earthquake? [same as Q <sub>L1</sub> ]
Q <sub>L3</sub>	How good was your physical health in comparison with the period before the 2011 Tohoku earthquake? [same as Q <sub>L1</sub> ]
Q <sub>L4</sub>	How optimistic was your view of life in comparison with the period before the 2011 Tohoku earthquake? [same as Q <sub>L1</sub> ]




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Q <sub>L5</sub>	How much freedom did you have in comparison with the period before the 2011 Tohoku earthquake? [same as Q <sub>L1</sub> ]
Q <sub>L6</sub>	How good were your family relationships in comparison with the period before the 2011 To- hoku earthquake? [same as Q <sub>L1</sub> ]
Q <sub>L7</sub>	How many people who were able to provide mutual help did you have in comparison with the period before the 2011 Tohoku earthquake? [same as Q <sub>L1</sub> ]
Q <sub>L8</sub>	How often did you participate in activities in the local community in comparison with the period before the 2011 Tohoku earthquake? [same as Q <sub>L1</sub> ]

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Table 4 presents the questionnaire administered to people employed by companies. Q<sub>E3</sub> to Q<sub>E6</sub> used six-point Likert-type scales: “Very high,” “High,” “Somewhat high,” “Somewhat low,” “Low,” and “Very low.” Q<sub>E2</sub> was a multiple-choice question in which respondents were asked to select the CSR activities conducted by their companies. These included “Compliance,” “Business ethics,” “Work–life balance,” “CSV,” “Participation in local community activities,” and “Volunteers and donations.”

Table 4 – List of questions in the questionnaire administered to people employed by companies

No.	Question
Q <sub>E1</sub>	How many CSR activities is your company doing?
Q <sub>E2</sub>	Please select the specific CSR activities conducted by your company.
Q <sub>E3</sub>	How did you feel about your employment situation? [before the earthquake, immediately, 1 week, 3 months, 6 months, 1 year, and 4 years and 8 months after the earthquake]
Q <sub>E4</sub>	How did you feel about your working environment? [same as Q <sub>E3</sub> ]
Q <sub>E5</sub>	How did you feel about your work–life balance? [same as Q <sub>E3</sub> ]
Q <sub>E6</sub>	How much social satisfaction did you derive from your job? [same as Q <sub>E3</sub> ]

### 3. Results

Table 5 shows the total number of respondents in each area of Iwaki City. In this study, the Taira, Onahama, Nakoso, and Joban areas were considered for analysis because most of the surveyed companies are located in these four areas. In total, questionnaire responses from 332 local people (109 employed and 224 other) and 26 companies were used in the analyses.

Table 5 – Total number of respondents

Area	Local people			Companies
	All	Employees	Others	
Taira	134	40	94	8
Onahama	95	38	57	9
Nakoso	60	19	41	4
Joban	43	12	31	5

#### 3.1 Results of principal component analysis

As discussed before, CSR has various dimensions and no established definition. In this subsection, we analyze characteristics of CSR activities using a principal component analysis with our survey data from companies. Table 6 shows the weights for each question of the two components. Table 7 identifies two major principal



components, which together explain 81% of the data. These values can be calculated as the eigenvalues, representing the weights of each question.

Table 6 – Question weights

No.	Question	PC1	PC2
Q <sub>C1</sub>	Understanding of CSR	<b>0.305</b>	-0.192
Q <sub>C2</sub>	Stakeholder consciousness	<b>0.308</b>	0.184
Q <sub>C3</sub>	Systematic planning of CSR	<b>0.314</b>	-0.192
Q <sub>C4</sub>	CSR evaluation by oneself	0.290	<b>-0.346</b>
Q <sub>C5</sub>	CSR evaluation by third parties	0.238	<b>-0.491</b>
Q <sub>C6</sub>	Compliance	<b>0.335</b>	-0.075
Q <sub>C7</sub>	Business ethics	<b>0.333</b>	-0.060
Q <sub>C8</sub>	Work–life balance	<b>0.330</b>	-0.004
Q <sub>C9</sub>	CSV	<b>0.330</b>	0.182
Q <sub>C10</sub>	Participation in local community activities	0.242	<b>0.536</b>
Q <sub>C11</sub>	Volunteers and donations	0.270	<b>0.480</b>

Table 7 – Importance of components

	Principal component 1	Principal component 2
Standard deviation	2.7303	1.2258
Proportion of variance	0.6777	0.1366
Cumulative proportion	0.6777	0.8143

Principal component 1 (hereafter, PC1) was named the “CSR score” because all the questions had approximately the same value. The weights of Q<sub>C4</sub>, Q<sub>C5</sub>, Q<sub>C10</sub>, and Q<sub>C11</sub> were smaller than 0.3. They represent offensive CSR activities that were considered less important than other CSR activities before the 2011 Tohoku earthquake. Principal component 2 (hereafter, PC2) was named the “voluntariness score” because the weights of Q<sub>C4</sub> and Q<sub>C5</sub> had negative values and absolute values greater than 0.3, whereas the weights of Q<sub>C10</sub> and Q<sub>C11</sub> had positive values and absolute values greater than 0.3. These values of PC2 suggested that there was a trade-off between the evaluation of CSR activities and voluntary CSR activities. In other words, a company performing voluntary CSR activities is relatively unconcerned about evaluations and the reputation of their CSR activities, whereas a company that places greater weight on evaluations and the reputation of its CSR activities has little interest in voluntary CSR activities because these activities cannot directly lead to profits.

### 3.2 Results of comparative analysis

Figure 1 shows the average values of the principal component scores for PC1 and PC2 in the four areas of Iwaki City. Nakoso has higher CSR scores than the other areas, while Joban has higher voluntariness scores than the other areas. The reliability of these results must be treated with care because the sample sizes from Nakoso and Joban were only four and five, respectively.

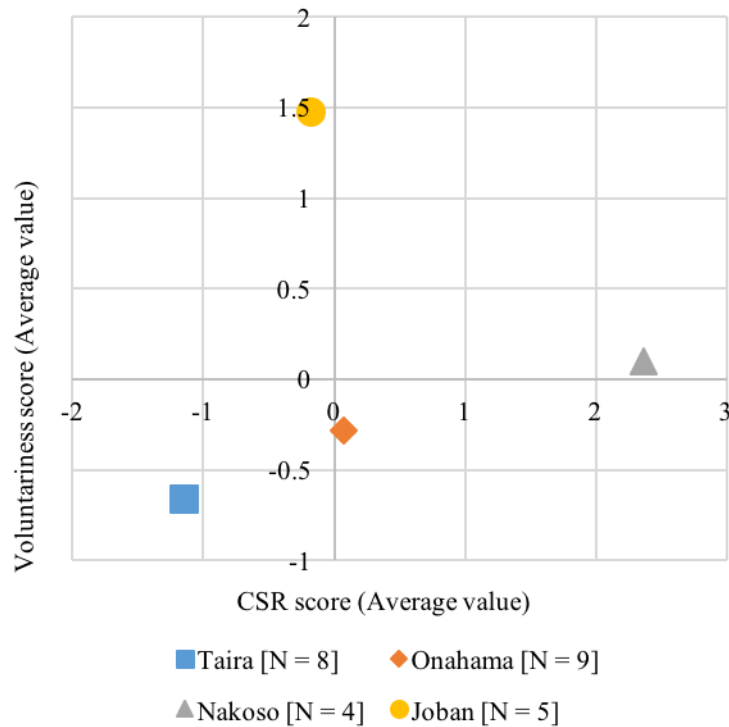


Fig. 1 – Principal component scores of PC1 and PC2

According to Fig. 1, companies in Nakoso area and Joban area have a higher CSR score and voluntariness score, respectively. The CSR score represents a company's performance on basic CSR activities, such as compliance, business ethics, work-life balance, and CSV. On the other hand, the voluntariness score represents a company's performance on voluntary CSR activities, such as local community participation, volunteers, and donations.

Figures 2 to 9 show the results of the questionnaire administered to local people. As the results in Figs. 2 to 5 show, Nakoso area has higher values. Particularly in Fig. 3, the values for mental health in Nakoso area are relatively higher than the values of other areas. One's mental health has strong relationships with the surrounding environment, such as human relations, work environment, and free time. This result implies that CSR activities related to compliance, business ethics, work-life balance, and CSV have good effects on employees' mental health.

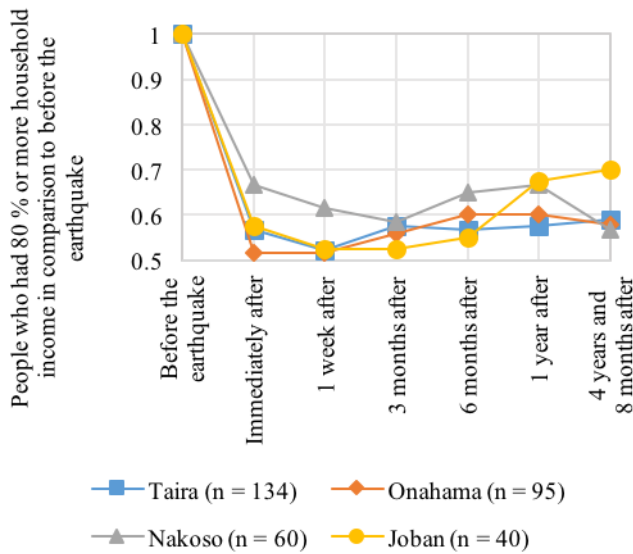


Fig. 2 – Results of QL1  
Household income

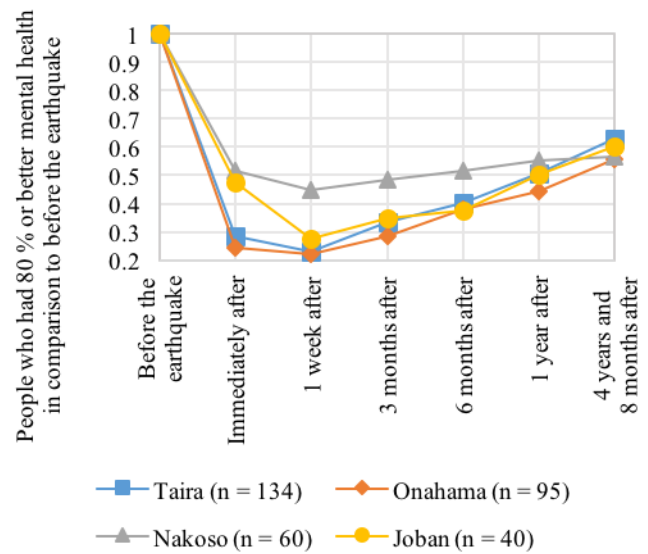


Fig. 3 – Results of QL2  
Mental health

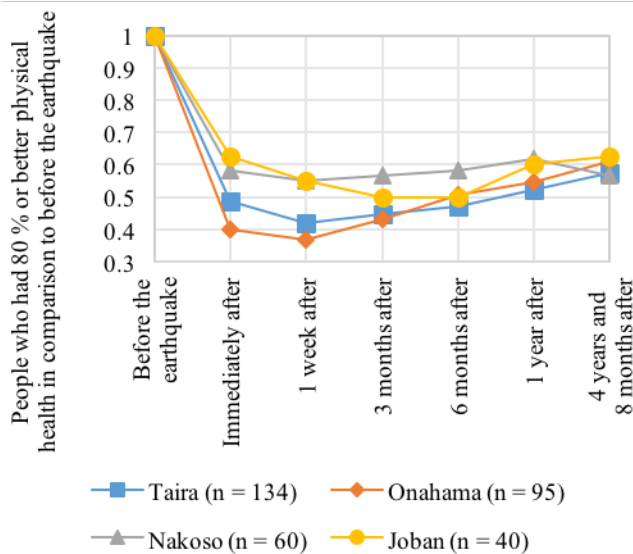


Fig. 4 – Results of QL3  
Physical health

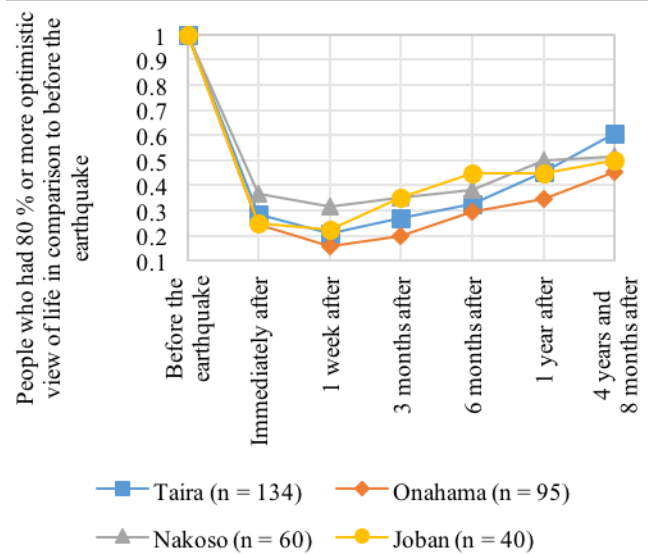


Fig. 5 – Results of QL4  
Optimistic view of life

In Figs. 6 to 9, the values of Joban area are higher than those of other areas. As shown in Fig. 1, Joban area has a higher voluntariness score, which includes participation in local community activities, volunteers, and donations. These factors have good effects on one’s human relations, as can be confirmed from the results of Figs. 6 to 9.



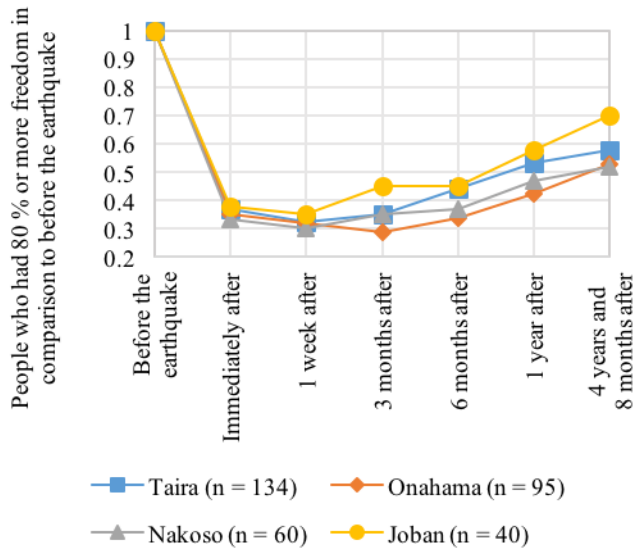


Fig. 6 – Results of QL5  
Personal freedom

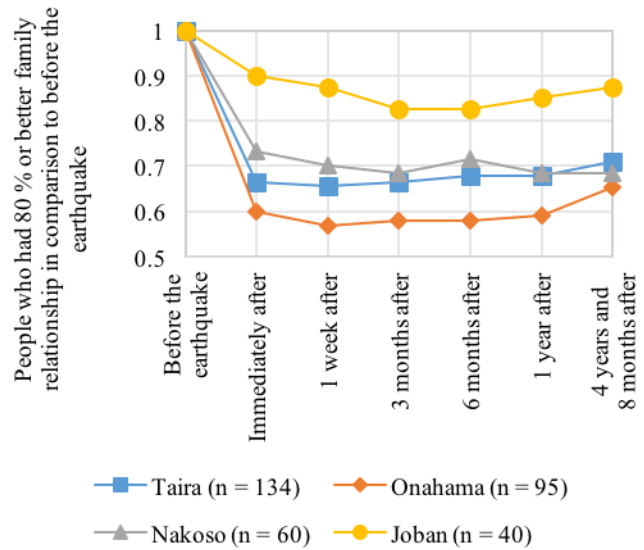


Fig. 7 – Results of QL6  
Family relationship

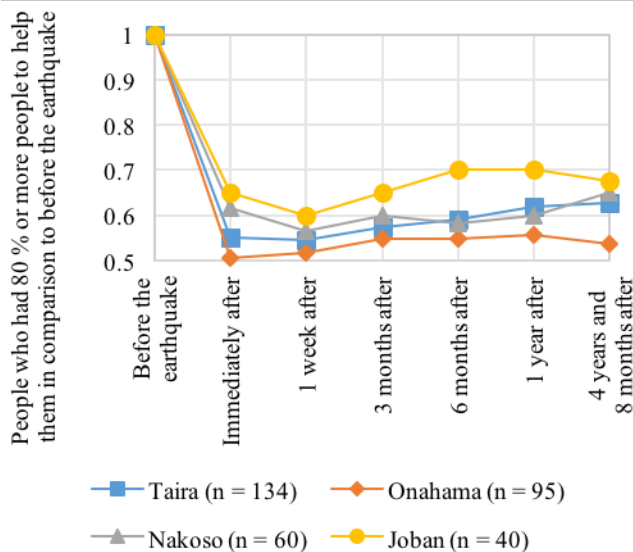


Fig. 8 – Results of QL7  
People to help them

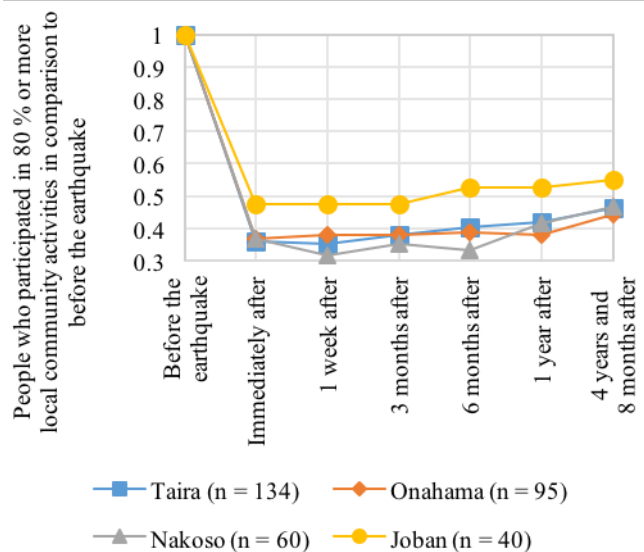


Fig. 9 – Results of QL8  
Participation in local community activities

In Figs. 10 to 13, Nakoso area has higher values. It is confirmed that the area with a high CSR score has high values in the recovery of factors related to the work environment. On the other hand, Joban area has lower values in each figure, although it has a higher voluntariness score. It can be said that basic CSR activities and voluntary CSR have trade-offs in the performance. Thus, it is important for companies to consider the allocation of business resources for each CSR activity.

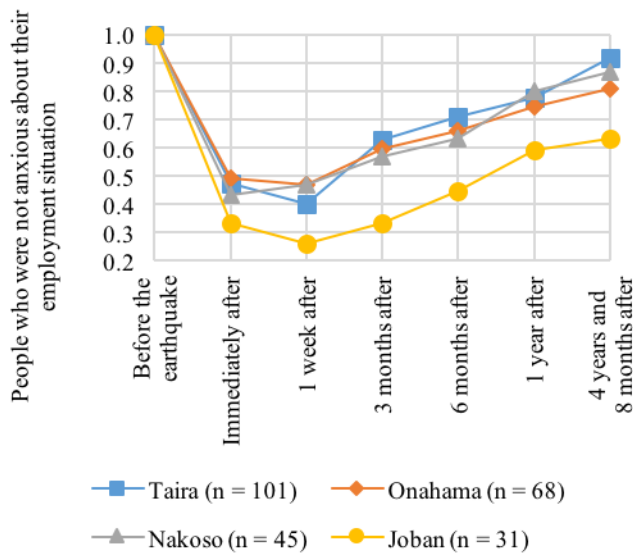


Fig. 10 – Results of QE3  
Employment situation

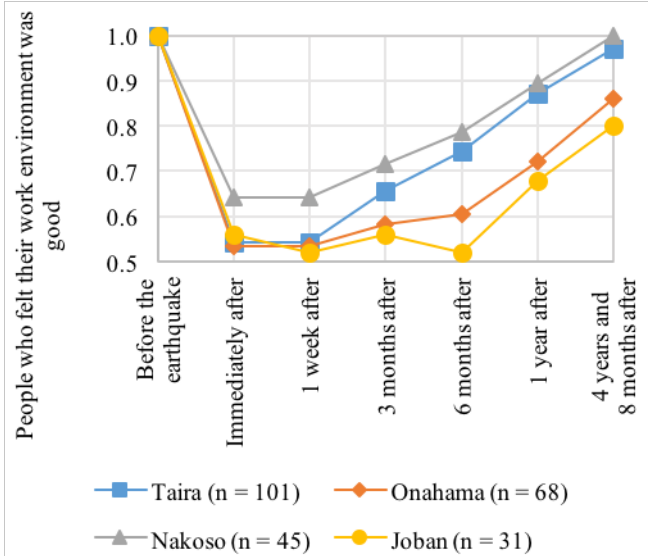


Fig. 11 – Results of QE4  
Work environment

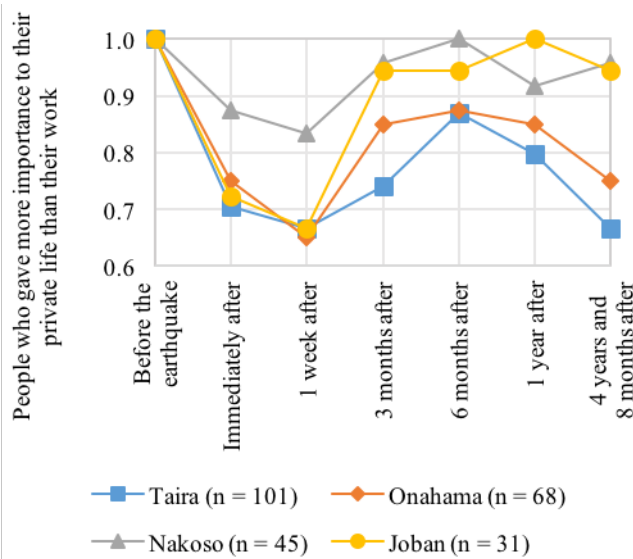


Fig. 12 – Results of QE5  
Work-life balance

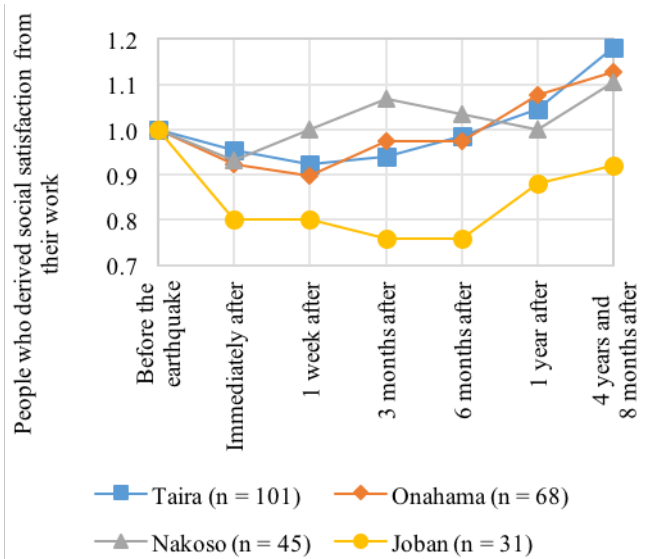


Fig. 13 – Results of QE6  
Social satisfaction derived from one's work

#### 4. Conclusion

In this study, two surveys were conducted in Iwaki City, Fukushima, Japan. One examined the CSR activities of local companies. The other investigated the recovery of Iwaki City's inhabitants from the Great East Japan Earthquake Disaster. The results confirmed that CSR activities help advance recovery in local communities. The findings are as follows:



- Basic CSR activities, such as compliance, business ethics, work–life balance, and CSV, could help advance the recovery of mental health for local people.
- Voluntary CSR activities, such as participation in local community activities, volunteers, and donations, help advance the recovery of human relations, particularly in the local community.

In the future, similar surveys should be conducted in other disaster areas. Further, it is important to reveal the effects of specific CSR activities. Simulation studies can also be used to identify optimal activities for supporting both business recovery and community recovery in the aftermath of a disaster.

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