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Introduction Of Business Continuity Plan For Small And Medium-Sized Local Construction Companies And Restoration Activities In Japan In The Event Of Natural Disasters

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Abstract. In recent years, Japan has suffered significant damage due to natural disasters such as major earthquakes and flood Construction companies are expected to play an important role during natural disasters and respond quickly and restore infrastructure. The first author runs a small local construction company in Okayama, JAPAN. During a flood in 2011 at Okayama, the embankment restoring site turned extremely dangerous for workers. At this juncture, the first author, in the capacity of a company manager, identified the safety and administrative issues, and in 2013, the company began to implement BCP. When there was heavy flooding in Okayama in 2017, they supported the administration in recovery operations based on their BCP. The impact of BCP is to be acknowledged as the emergency operations were safer and timelier. BCP of the company has been continuously improved, and they were invited to join infrastructure recovery activities in the disaster area of Great East Japan Earthquake in 2019. The area is not the usual business region of the company, but 1,000 km away. There is a high requirement for human resources and equipment for emergency and recovery activities immediately after a disaster. Most of the construction companies are small and locally based in Japan, and several resources available at the construction site itself for initial recovery activities. It is desirable to prepare a plan so that the affected companies themselves can respond. The main tasks are the training of personnel to provide guidance and support for BCP, and the development of systems and laws that can actively support activities. By capturing accurate information on resources of local construction companies, their capability and response speed during an emergency can be improved. It is also necessary to create a system to receive support from other companies or organizations in case self-help is difficult or insufficient.

1. Background Information and Objectives of This Study

1-1 Status of Emergency Events That Have Occurred

In recent years, natural disasters have inflicted damage across various regions of Japan. Examples of such disasters include the Tōhoku earthquake and tsunami in March of 2011 (Great East Japan

Earthquake), the Kumamoto earthquake in April of 2016, the Hokkaido Eastern Iburi earthquake in February of 2019, the torrential rain disaster in western Japan in July of 2018, the storm damage caused in the Kansai region by Typhoon Jebi in September of 2018, and the disasters that included such phenomena as torrential rain, wind storms, river flooding, and landslides that occurred primarily in eastern Japan in 2019. The frequency of localized heavy rainfall continues to increase each year. When examining data provided by the Japan Meteorological Agency for 10-year periods starting from 1976 and onward and 2010 and onward, and when comparing the number of instances where rainfall levels of 50 mm or more were reported for each of these periods, there were 226 and 327 instances of such reports for each respective period, indicating that such reports have increased 1.4 fold. Damage caused by such heavy rainfall is not just limited to river flooding, but it also includes damage caused by landslides and storm surges as well.

1-2 Social Impact of Infrastructure Loss

In recent years, rapid change is occurring in the way society is structured due to such factors as the increasing concentration of the population in urban areas, the establishment of factories, the development of supply chains and distribution networks, and the reduction of inventory. At the same time, the degree of social impact of infrastructure loss caused due to the interruption of traffic networks, suspension of electrical power, gas, and water and sewage services, as well as damages caused to facilities, etc., occurring as a result of such incidents as disasters continues to increase on a daily basis. Additionally, the number of cases where damage resulting from a disaster that occurs in one geographic region goes on to impact other regions due to the globalization of modern-day supply chains continues to increase as well, and in some cases the impact of such disasters can be felt on a global scale.

1-3 How the Construction Industry Responds in Emergency Situations

Since roughly around the year 2000, investment in public construction projects began to decrease, and local small and medium-sized construction companies, which are heavily dependent upon such public construction work, were forced to operate under difficult business conditions, thereby leading to an overall decrease in the number of construction workers. With the occurrence of the Great East Japan Earthquake in 2011, the Japanese government recognized the necessity of public infrastructure and adopted a policy of ensuring national resilience in order to facilitate recovery and reconstruction efforts, and in recent years, the importance of the role played by the construction industry in such efforts has increased. With that said, however, securing the necessary investment and preparing for such emergency situations, which can occur at any time, is indeed a difficult task. The need to enhance emergency response capabilities in order to promote regional maintenance and development is also increasing as well. With the declining birthrate and aging population that Japan currently faces, as well as its advancing shortage of workers in the construction industry, some issues that need to be addressed include making it easier to more efficiently respond and procure resources in the event of an emergency.

1-4 Objective of This Study

For this study, we will examine some model case examples of emergency response work conducted as part of a framework for maintenance and management construction work and the history of support activities carried out under the framework of disaster relief agreements. From there, we will analyze the current situation surrounding the issues faced by construction companies that are engaged in on-site activities at the front lines during emergency situations, as well as the current state of on-site management work being performed, and we will attempt to provide some recommendations for achieving resiliency on both a local and a national level by identifying what kind of efforts should be carried out within the construction industry by individual companies in order to enhance their capabilities to respond to emergencies.

2. Past Efforts

2-1 Efforts to Improve Emergency Response Capabilities

Some methods that can be employed by companies and organizations to enhance their capabilities to respond to emergencies include the establishment and implementation of emergency response manuals and BCPs. According to a survey conducted by the Small and Medium Enterprise Agency of Japan, the smaller the scale of a company, the less likely it is that they have made progress toward establishing their own BCP[1]. One reason for this lack of progress toward establishing a BCP is the lack of human resources that possess the knowledge and experience needed to establish and implement a BCP. According to a definition provided by the Business Continuity Advancement Organization (a specified non-profit corporation) [2], "Business Continuity (BC) refers to the ability of a company or organization to take its critical work operations that have been ranked in order of their priority and to resume them within a target recovery time in the face of any and all degrees of adversity (minor, major, or catastrophic) by making use of a business continuity strategy so that it can continue its business operations. Business continuity (BC) enables such companies and organizations to fulfill their responsibilities, thereby making it possible to survive and further evolve even when faced with such unexpected incidents." BCPs are defined as a "(documented) plan that allows for the achievement of business continuity, and it also refers to the act of investigating what systems and response measures, etc., can be prepared to ensure business continuity and early-stage recovery, as well as examining what preemptive measures can be taken to minimize damage and the impact of such damage." Our assertion is that effective utilization of such plans can be made possible through future efforts to enable us to arrive at a common understanding on the concept of BCP and by further ensuring that this concept becomes more widely recognized by the general public.

2-2 Past Research

For this study, we have examined existing studies and research papers that have been published in making our recommendations aimed toward enhancing the capacity of the construction industry at the regional level to respond to emergencies. Takeya, et al. [3], conducted an analysis on the results of a questionnaire carried out on companies in the Tōhoku region regarding the swiftness of support activities carried out by the local construction industry in response to the Great East Japan Earthquake, and they identified that the more equipment, materials, and human resources possessed by the construction industry in the locale in question, the more rapid they were in their response, and they further assert that it is necessary to engage in investigations in advance of such emergencies in order to rectify such regional disparities identified. Yamaguchi, et al. [4], examined the capacity of local construction industries to perform tasks on their own without the aid of outside assistance (hereinafter referred to as "business operational receptivity"), and they focused on identifying the relationship between the scale of disasters and recovery related expenses incurred in terms of the maintenance capacity of the region in cases where a disaster occurred. They further go on to state that it is possible to establish and maintain the support systems needed to respond in the event of such emergencies by periodically conducting assessments in advance to identify the "business operational receptivity" of such local communities. Torii, et al. [5], examine how the popularization of BCPs within local construction industries have helped to promote the advancement of BCPs throughout all industries by touching on efforts being carried out in the Shikoku region, and they further explore how private citizens, industries, and governmental bodies (national, prefectural, and local municipalities) are coordinating their BCP related efforts. They assert that it can be expected that such coordination being carried out within regions where there is a high probability that such partnerships will be formed during times of disaster will not only prove to be useful when carrying out preparations in advance, but when actually responding to real-life emergencies as well, and that it can be expected that such coordination will further spread throughout more regions in the future. Kawasaki, et al. [6], focused on investigating the role assumed by local construction industries during times of disaster, and they further examined the time period spanning from the onset of disaster up until the time of recovery in order to identify factors and to classify and analyze such individual factors.

They also conducted interviews and analyzed such interviews of individuals linked to companies, governmental bodies, and local communities to identify what measures were taken to deal with the torrential rain disaster that occurred in Yamaguchi Prefecture in 2009. Under the strained conditions arising during the emergency situation, each of the organizations and individuals in various positions were faced with a wide range of issues, and they go on to mention the difficulties encountered in resolving such problems, as well as separate issues related to the sharing of information and in coordinating efforts. Morizane, et al. [7], examine the conditions related to disaster relief agreements, which are designed to enable governmental administrations to coordinate their efforts with the construction industry to allow for the rapid and reliable execution of emergency recovery efforts in the face of large-scale disasters. They further state that the various issues identified during such emergency recovery efforts carried out in response to natural disasters occurring in recent years have been solved, and that in many cases, contracting, work instructions, and deliberations carried out during such emergency situations are now being carried out at an increasingly rapid pace.

3. The Situation Surrounding Small and Medium Local Construction Companies and How They Respond to Emergencies

3-1 Initiatives Led by Private Institutions to Promote the Establishment of BCPs

The National Construction Industry Association has established a "Guide for Business Continuity During Times of Disaster," and they are calling upon their member companies to establish their own BCPs. The Japan Federation of Construction Contractors has also established its own "Construction BCP Guidelines," and while it has called upon individual companies to rely on their own judgment in establishing their own plans, in light of the extremely high social demand placed on construction companies in providing disaster recovery construction work activities, especially in the event of wide-area, large-scale disasters, such as earthquakes, etc., these guidelines focus on providing its readers with direction on what role BCPs should play for individual construction companies.

3-2 Efforts Conducted by Public Institutions to Promote the Establishment of BCPs

In regards to certification systems introduced by public institutions to assess continuity capabilities for establishing BCPs, the Kanto Regional Development Bureau of the Ministry of Land, Infrastructure, Transport and Tourism has initiated a system to evaluate and certify the business continuity capabilities of construction companies in order to prompt them to establish their own BCPs. At the same time, starting from October of 2012, the Chugoku Regional Development Bureau initiated its "BCP Certification System for Local Construction Companies in the Chugoku Region," and as of April of 2022, 205 companies have been certified. As an incentive for certification, it has established certification items related to "regional contribution (certification for business continuity capabilities during times of disaster)," which it assesses companies with scores for, thereby allowing companies to gain an advantage when placing bids for projects where comprehensive scores based on price, technical capabilities, quality, and other factors are taken into account. With that said, however, since there is the issue that this system only acts as an incentive for companies that actively place bids for directly controlled construction projects, the increase in the number of companies that are certified by this system has effectively plateaued, and while this system has led to the overall popularization of the establishment of BCPs, it is currently still necessary to assess whether the standards being used for certification can be said to be sufficiently effective for both clients and contractors.

4. Efforts Conducted by the Construction Industry Itself to Enhance its Capacity to Respond to Emergencies

4-1 Construction Work for Performing River Maintenance Management

In this chapter, in order to provide some observations on what is needed to achieve enhanced emergency response capabilities, we will attempt to identify the issues that typical small and medium-sized local construction companies face when trying to engage in emergency response efforts, and we

will do this by taking a closer look at actual emergency response efforts of small and medium-sized construction firms in regional cities in chronological order.

Company O is a general construction firm that focuses on civil engineering projects, and it was established in 1946 and it is located in an urban area of Okayama City, Okayama Prefecture. The company has 18 employees and it primarily serves clients, such as national institutions like the Ministry of Land, Infrastructure, Transport and Tourism and the Ministry of Agriculture, Forestry and Fisheries, as well as local government offices. Some examples of the projects the company has completed in the past include construction projects for roads, rivers, coasts, forests, railroads, water and sewage systems, etc., and the company acts as a primary contractor and receives orders from the national government and local government offices for construction and management work for such projects. Since the year 2002, the company has received orders for year-round river maintenance, management, and construction work from the Ministry of Land, Infrastructure, Transport and Tourism. The area that the company is tasked with managing covers a stretch of land that extends approximately 17.5 km from north to south, and for this project the company is responsible for performing river maintenance and management, levee maintenance and inspections, weed removal, repairs of river related facilities, and emergency response work.

4-2 Construction Work for Engaging in Emergency Response

The Great East Japan Earthquake occurred in March of 2011. Located 1,000 km from the disaster affected areas in the Tōhoku region, Company O was not mobilized for these efforts. In September of 2011, record-breaking rainfall occurred across a wide area of western Japan. Amidst such conditions, Company O received a request from the Ministry of Land, Infrastructure, Transport and Tourism asking it to mobilize its resources to engage in emergency response efforts. The company was primarily asked to engage in patrols and emergency response activities for the river maintenance and management areas, as well as to engage in transportation work for vehicles equipped with drainage pumps and to perform work to install, operate, and ultimately remove the drainage pumps. The work carried out on the drainage pumps involved extremely dangerous work performed at night under conditions of zero visibility on a swollen riverbank. The drainage pumps were heavy and the extremely demanding work involved manual transportation of the pumps over a wet slope, as well as work that required the workers to submerge themselves underwater in order to install the pumps.

In conjunction with the rising water levels of the river, the number of irrigation canals and low-lying areas that became flooded also increased, and requests for mobilization were also submitted from prefectural and municipal governmental bodies other than the Ministry of Land, Infrastructure, Transport and Tourism, from which the company originally received its contract to provide management services. The company also responded to requests received from prefectural and municipal administrative offices, while primarily focusing on carrying out the work that it was instructed to perform by the Ministry of Land, Infrastructure, Transport and Tourism. Water levels increased at numerous locations and there was even a case where the company mobilized its resources to respond at a site located more than 40 km away. The disaster related response efforts continued over a span of 3 days. The work was both mentally and physically demanding, and involved long hours of continuous labor. Fortunately, no damage was caused that resulted in human casualties that would have involved highly demanding emergency or first-aid response efforts, and while it was able to safely carry out the work it was tasked with performing, it did however encounter the following issues:

- The system used for communications and for reporting information was inadequate.
- An ad-hoc approach was used to respond to requests received from the administrative governmental offices.
- The site supervisor and person in charge of communications were forced to work on consecutive days.
- There was no designated location or facility at which the workers could take their breaks or be placed on stand-by.

● Supplies to be prepared in advance and stockpiled goods were not adequately organized.

● Not enough thought was placed into carefully considering how to go about performing response work in dangerous locations, and such information was not properly disseminated.

● The distance traveled to perform work was long and travel was time consuming.

In order to solve such issues, we took a closer look at what kind of organizational structure and system would be necessary for construction companies like our own in order to better respond to emergency situations.

4-3 Establishing and Carrying Out Operations Under BCPs

In October of 2011, Company O began investigating various BCP materials and performed research on related case examples. By receiving guidance from specialists in carrying out operations under BCPs, it was able to proceed with efforts to establish and implement its own BCP. It also conducted study groups involving all of its company employees to enable them to participate in the process of establishing its BCP. It engaged in efforts to identify which of its business areas could be considered "mission critical businesses," or in other words, business areas of the highest importance that are vital to the survival of the company. This selection process requires one to assume different perspectives by conducting a separate quantitative analysis and qualitative analysis. For the quantitative analysis, it was able to draw the conclusion through analysis that disaster response work is not profitable when analyzing its rate of return based on past experience. From a qualitative point of view, the analysis showed that for Company O, which had primarily focused on performing public infrastructure construction and maintenance work, such efforts to rapidly engage in emergency response work and infrastructure recovery efforts were found to hold great social significance, and through such work, it would be able to earn the trust of its customers and local communities. As a result of such investigative efforts, it was able to designate disaster response work as one of its critical areas of work to be performed, and it was able to incorporate this into its BCP. Business impact analyses (hereinafter referred to as BIA), refers to a process where one verifies the flow of work for one of the mission critical business areas it has selected. By employing this process to identify bottlenecks in its work flow, it was able to also consider what personnel, materials, and equipment would be needed to alleviate such issues.

It was then able to enact and engage in various measures and efforts in accordance with its BCP strategy by carrying out a continuous process of establishing, updating, and submitting its BCP for certification. As part of its major efforts, it focused on enhancing its facility maintenance abilities in order to strengthen the capabilities of its head office. It engaged in efforts to create an environment in which it could perform backups of data, such as any relevant documents. It also performed work to renovate its material warehouse to act as an alternative hub for its operations. By installing solar panels on the roof of its warehouse, it was able to secure a supply of power to prepare itself for such incidents as black outs, etc. It was also able to further enhance equipment and facilities that could be expected to be useful during times of emergency. By conducting periodic training exercises and at the same time identifying issues in actual work processes, it was able to continuously update its BCP. By participating in events to share information, study groups, and training drills with companies from other industries and other geographics locations, even during periods of normalcy, it was able to further enhance its ability to locally source such things as materials, as well as its response capabilities.

4-4 Western Japan Torrential Rain Disaster

In July of 2018, record-breaking levels of rainfall were recorded in Okayama Prefecture. Starting from July 5th, Company O began engaging in patrol work and work performed late at night to drive and transport pump trucks, as well as to install, operate, and remove the pumps, and it performed such work while receiving orders from the Ministry of Land, Infrastructure, Transport and Tourism, as it engaged in repeated work to install and remove the pumps.

It was able to fully demonstrate the fruits of its labors that were based on the various challenges and issues that it faced when it engaged in emergency response construction work back in 2011, which originally enabled it to establish and implement its own BCP. By developing its human resources by repeatedly drilling them in the driving and operation of pump trucks, thereby allowing them to gain solid proficiency in these skills, it was able to more swiftly engage in installation/removal work when compared to before. It was also able to further refine its procedures for actively using tools, such as social media and email, etc. By allowing its workers to even make use of their break time to respond to inquiries related to various conditions that could not be checked in real time, it was able to significantly reduce the amount of workload. By consolidating information related to the various requests submitted by the administrative governmental offices, it was able to carefully consider the current status of the resources it had allocated while engaging in such response efforts. Since the workers were able to work in shifts, this allowed for them to work in a safer and more relaxed environment than before. The lack of a space or facility at which workers could take breaks or be placed on standby at was addressed by more thoroughly organizing the supplies that needed to be prepared while at the mobilization point and by carrying them into the work site, and such improvements were made based on past experience and training, which allowed it to make better assumptions on what supplies would actually be needed. Since the response activities being carried out on this occasion, were not being performed at a distant location, it was possible to allocate personnel in a way where more careful consideration was given toward such things as accommodations and the amount of time required for transportation between company facilities and the workers' homes.

Individuals involved in such efforts at the company came to the realization that it was necessary to continually make efforts toward more thoroughly organizing and deploying such supplies and stockpiled goods that were to be prepared in advance. Although its workers were forced to engage in even longer hours of work on this occasion to install, operate, and remove the pumps when compared to 2011, fortunately, no accidents occurred and none of the workers became ill.

4-5 Wide-Area Support Activities

In October of 2019, Company O engaged in disaster recovery assistance work in a location 1,100 km away in the Tōhoku region. The work it was requested to perform involved practically the same kind of tasks, which included the dispatching of pump trucks, as well as the installation, operation, and removal of the pumps. For a company that had not performed work outside of its own home prefecture

before, some aspects of this work were unfamiliar as it was being carried out at a distant location. It was forced to once again engage in careful consideration to assess how it should approach such things including the allocation of personnel and the preparation of supplies. As it was not handled as emergency response construction performed as maintenance construction work, this work was carried out under a request made in the form of an advance activity agreement established with the Ministry of Land, Infrastructure, Transport and Tourism.

For the personnel structure used for this project, the company focused on placing its own company staff in key positions and placing workers from its subcontractors to serve a supporting backup role wherever possible. Since there were a large number of disaster recovery construction projects being ordered at the time, there was a shortage in personnel, and for this reason, personnel were dispatched from the sites where construction was being carried out. A focus was placed on maintaining reasonable conditions in terms of on-site staffing, and consultations were carried out with the client to determine how personnel were to be allocated. Since the destination to which personnel were to be dispatched was unknown until the time of departure, arrangements were made to secure accommodations in the vicinity of the work site while enroute to the destination. Additionally, the company also reached out to contact familiar individuals at a construction company near the work site who were willingly able to provide additional support.

Different preparations needed to be made to ensure that the company could safely and effectively engage in response efforts in such a remote location. As the company had not anticipated performing work in such remote locations, it was faced with the need to revise its own employment regulations. The company recognized that it would be necessary to clearly establish what its policies would be on such things as dangerous work performed in remote locations and compensation and other allowances.

4-6 Enhancing Emergency Response Capabilities

As a result of taking the enhancement of its emergency response capabilities through its river maintenance construction efforts and designating it as a critical part of its business management policy, Company O was able to prepare the necessary resources in order to further strengthen its capabilities to respond during times of emergency. In accordance with the company's own plans, it carried out such things as renovations on its alternative hub, maintenance work on its machines and tools, and work to maintain and allocate stockpiled goods, materials, and equipment used for responding to emergencies. The training and education of human resources played a critical role in this and it was necessary to ensure that company employees and the individuals providing their cooperation were well aware of the risks involved in engaging in such dangerous relief activities during emergency situations, while also equipping them with highly sophisticated levels of knowledge and skills to ensure their own safety. Although the company had placed great importance on seeking out profitability, at the same time, it was also able to develop its own raison d'etre, as well as a system that would enable it to better contribute to society. Adequate preparation and investment are elements that are needed to enable one to respond to emergencies, and for this reason, it will be necessary for the company to persistently

maintain a stable business management and financial structure. By demonstrating its capabilities to respond to emergencies, the company was able to enhance its own corporate value, while at the same time earning high praise from its customers and the local community.

5. Future On-Site Management to Enhance Emergency Response Capabilities

5-1 Enhancing the Emergency Response Capabilities of Companies

In this study, we were able to cover everything from how the company engaged in response efforts tied to contractual emergency response construction work, its operations carried out under its BCP, as well as everything leading up to its execution of a disaster relief agreement. In the process, we were able to clearly identify the challenges that local construction companies face in providing the necessary resources when performing on-site work in emergency situations. In this chapter, we provide a recommendation on how "on-site management" should be carried out from the perspective of construction company management and on-site managers being placed at the front lines to engage in activities at the work site.

By carrying out its operations under a BCP, construction companies can effectively enhance their own capabilities to respond in emergency situations. By reviewing and verifying its own corporate objectives and policies and identifying its own business priorities, a company can efficiently engage in response efforts in emergency situations where there is a drastic shortage of resources. Additionally, a BIA can be used to prioritize and verify the details of critical business work flows. By performing such analytical processes to once again identify which resources are needed for the company's business operations, it is possible to enhance the efficiency of such processes during times of normalcy, while also generating the momentum needed to encourage further investment in facilities and the will to create new business plans, and this can further have the impact of enhancing the capabilities of a company to internally share information and to elevate corporate values tied to such things as revolutionizing the way that we work.

One issue that must be addressed is the fact that investment planning and business management can be greatly impacted by a company's financial condition. Companies will become reluctant to invest in businesses that are not expected to be profitable. It must also be recognized that companies with little specialized knowhow or knowledge related to establishing and conducting its operations under a BCP will inevitably face great difficulty toward this end. It is also problematic that there is only a small number of specialists capable of providing such guidance support and it is imperative that we foster the growth of such specialists.

5-2 Enhancing the Capacity of Local Communities to Respond to Emergencies

In order to make it possible to quickly respond to such crises and restore public infrastructure during emergency situations, it will be necessary for us to increase the number of construction companies that take the act of engaging in local emergency response efforts and designate it as a critical component of their business operations. Company BCPs can be used to prioritize critical business areas, and based on this, it is possible to clearly identify which resources are needed. By investigating and planning in advance to decide what measures are to be taken during emergency situations, it is possible to effectively elevate a company's corporate value.

This approach can be extremely effective in cases of emergency where the company is capable of matching the resource related needs of that region. Through the offering of incentives, such as government-led programs to certify BCPs and bidding systems, there has been an increase in the number of companies that are actively engaging in the establishment of their own BCPs. By encouraging companies to share information on the resources they possess, it is possible to take such information and utilize it for drafting regional public policy.

It is desirable that the resources companies possess during times of normalcy be efficiently allocated to their necessary locations during times of emergency. As local construction companies operate on a small, medium, or even a micro-level, when looking at individual companies, the amount of information and resources they possess is limited. With that said, however, since the vast majority

of such companies are focused on their local communities, as long as local government offices and industry groups are capable of obtaining accurate information on what resources are available and such information is efficiently utilized, it is possible to enhance the speed and abilities of such companies to respond in times of emergency.

In order to ensure efficient public-private coordination during emergency situations, it is imperative that we take the opportunity during times of normalcy to establish a platform to facilitate such efforts. By increasing the number of companies that can rapidly respond during times of disaster or emergency while coordinating efforts with various stakeholders, the construction industry can effectively fulfill the role of establishing the organizational infrastructure needed to enhance the resiliency of local communities and Japanese society at large.

6. Conclusion

In this study, we examined the process through which local construction companies in Japan have been able to resolve the issues they identified during maintenance and repair related construction work and activities carried out under various disaster relief agreements, and through this, we have shed light on how such construction companies have been evolving and how they can better coordinate their efforts in the future. As an issue that requires future research, we assert that there is a need to further explore the subject from a much broader perspective since construction companies come in many sizes, are situated in a variety of locales and industries, and involve a large number of stakeholders. We hope to conduct future research by further analyzing ways of enhancing the response capabilities of construction companies through means such as creating indices to numerically quantify the response capabilities of such companies in order to enable us to engage in comparisons and measurement. Additionally, we hope to further examine which resources should be maintained at a local level, and which stakeholders should be responsible for watching over such resources. In the future, we hope to take an even closer look to identify methods that can be employed to enable companies to better coordinate their efforts in sharing the resource related information that is in their possession.

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