



Original paper

Increasing the Resilience of Japanese Companies to Address Multi-hazard Risks

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Abstract The risk environment surrounding companies has become increasingly complex because of unexpected high-magnitude earthquakes, frequent extreme weather events, adverse effects of climate change, COVID-19, and the impact of the recent Ukraine crisis. Unless companies adequately adapt to the changes in their business environments with their business continuity management (BCM) to address a multi-hazard, they may suffer severe impacts on their business performances and may not survive. Japan is one of the most natural hazard-prone countries with the most corporate assets in the world. However, it currently has various challenges in developing and implementing BCM. This study provides a method to increase the business resilience of Japanese companies for effective management of current and future risks against multi-hazards. This study reviews the hazards faced by Japanese companies and their effects. The recent progress of and challenges to BCM and the related policies in Japan are assessed because a more effective BCM can form the foundation for increasing business resilience. Moreover, this study considers how business resilience can be increased to tackle current and future multi-hazards. The results show that the Japanese companies' BC plan (BCP) currently tends to focus on single or some particular hazards considering less on fund procurement. Thus, more comprehensive approaches to address unexpected consequences regardless of the hazard type should be highly promoted in the political and practical aspects, and financial strategies should be more mainstreamed on BCM because these improvements will lead to increased business resilience and corporate value.

Keywords: Resilience, Multi-hazard, Business Continuity, BCM, BCP, Financing

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1. INTRODUCTION

The business environment surrounding companies has changed and become increasingly complex with new risks. According to the guidelines on risk management provided by ISO 31000:2018, a risk is defined as the “effect of uncertainty on objectives,” and risks include the internal (*e.g.*, vision, governance, strategy, culture, *etc.*) and external (*e.g.*, social, cultural, political, legal, regulatory, financial, technological, economic, environmental, *etc.*) factors of companies. These factors may vary depending on the types of industry, scale, business, and operation process (ISO 2018). These risks may be generated by typical hazards that have been addressed (*e.g.*, earthquake, hurricane, flooding, *etc.*); however, various global hazards that have emerged in recent years (*e.g.*, the adverse effect of climate change, COVID-19, the impact of the Ukraine crisis, *etc.*) can increasingly diversify depending on various factors such as the complexity of the social system and set of values, technological development, and so on.

In terms of disaster risk reduction, given recent compound disasters, a multi-hazard risk should be managed as a whole rather than dealt with individually (United Nations 2015). A multi-hazard is defined as “(1) the selection of multiple major hazards that the country faces, and (2) the specific contexts where hazardous events may occur simultaneously, cascadingly or cumulatively over time, and taking into account the potential interrelated effects,” including “biological, environmental, geological, hydrometeorological and technological processes and phenomena” (United Nations 2020). Therefore, companies must strengthen their business resilience to adequately adapt to changes in their business environments during a multi-hazard. Otherwise, they may suffer severe consequences in terms of business performance and, in the worst-case scenario, may not survive. However, comprehensive reviews and discussions have been insufficient in determining effective ways to increase business resilience to approach a multi-hazard from disaster risk reduction and business administration perspectives. Japan is one of the most natural hazard-prone countries, experiencing hazards such as earthquakes and typhoons. It is also the leading country with the most corporate assets in the world. However, Japan currently has various challenges in developing and implementing business continuity management (BCM) of companies.

Therefore, this study provides a method for increasing the business resilience of Japanese companies to address current and future multi-hazards effectively. The hazards that Japanese companies face and their effects are examined. In addition, the progress and challenges to BCM and related policies in Japan are examined. This study also considers how business resilience could be increased to address current and future multi-hazards. The importance of the impact-based approach and the financial strategies is emphasized which has been overlooked for improving business resilience.

2. BUSINESS AND HAZARDS IN JAPAN

2.1 Overview of Japanese companies

Japan has the second highest number of any-sized enterprises, after Turkey, according to data from the Organisation for Economic Cooperation and Development (OECD) on enterprises by business size in 2020 or later. Considering large companies, Japan ranks fifth after Canada, the United States, Germany, and Russia (OECD 2022). Japan had 3.6 million companies as of 2016, with “wholesales & retail” and “manufacturing” accounting for the majority of sales (The Small and Medium Enterprise Agency of Japan 2022). In addition, according to the World Bank (2022), the total market capitalization in the world in 2020 was 93.69 trillion US dollars, with Japan being the third largest country, accounting for 7% of the total, after the United States and China.

2.2 Risk environment surrounding Japanese companies

Historically, various incidents, such as earthquakes, heavy rainfall, and pandemics, have significantly impacted Japanese companies. For example, in response to the 6.8 magnitude Niigata Chuetsu Offshore Earthquake that struck the northwest Niigata region of Japan on July 16, 2007, Riken Corporation’s Kashiwazaki Plant, which holds the top domestic market share position in piston rings, operating as critical functional parts in an internal combustion engine, halted production due to damage. As a result, major automakers such as Toyota, Honda, and Nissan temporarily halted production (Reuters 2007). Concerning the 2009 H1N1 pandemic, the total number of infected people in Japan was 21 million (as of the 13th week of 2010), with 198 deaths (as of March 31, 2010) (National Institute of Infectious Diseases Japan 2010). The pandemic significantly impacted the tourism-related industries in the Kinki and Chubu regions, resulting in a wave of trip and event cancellations (Japan Tourism Agency 2009). The Great East Japan Earthquake struck on March 11, 2011, with a magnitude of 9, causing widespread damage to the eastern coastal region of Japan and unexpected compound disasters such as earthquakes, tsunamis, and nuclear accidents. This had the most serious consequences for BC, as the suspension of production and provision for parts, materials, and services by affected companies in the Tohoku and northern Kanto regions reduced production of domestic and overseas companies through the supply chain, in addition to power and fuel shortages in Japan’s eastern region (Maruya 2011). The heavy rain in late June through early July 2018 included record rainfalls in the western part of Japan, resulting in river flooding and landslides, as well as lifeline damages (such as water outages and telephone disconnection) and traffic problems (such as train service suspensions across Japan) (Japan Meteorological Agency 2018). There were several temporary suspensions in production due to delays in supplying goods to retailers (*e.g.*, Mitsubishi Heavy Industries, IHI, *etc.*) and a shortage of parts supply at automobile plants (*e.g.*, Mazda, Daihatsu, *etc.*) (Bloomberg 2018; The Sankei Shimbun 2018).

Japanese companies have recently faced global challenges; therefore, their business strategies should be fundamentally reviewed in light of the adverse effects of climate change,

such as an increase in the frequency and intensity of extreme weather events (*e.g.*, heatwaves, droughts, and extreme rainfall) that have disrupted the global supply chain; COVID-19, which caused sales to fall, particularly in the hospitality industry, as well as a shortage of workers due to infection; and the Ukraine crisis, which raised the prices of primary commodities such as food (*e.g.*, wheat) and energy (*e.g.*, oil and natural gas). Statistics show that the total number of bankruptcies related to COVID-19 was 4486 as of November 11, 2022 (Teikoku Databank Ltd. 2022). In addition, global companies must consider future global risks that may affect their business strategies. According to the Global Risks Report 2022 published by the World Economic Forum (WEF), the most serious global risks over the next 10 years include climate action failure, extreme weather, and biodiversity losses (WEF 2022).

2.3 How do hazards affect businesses?

Disasters can incur direct and indirect losses for businesses. Direct losses are “the immediate consequences of the disaster physical phenomenon,” while indirect losses can be output losses, “the reduction in economic production provoked by the disaster,” which include the cost of business interruption and can be caused by secondary effects rather than the actual hazard (Hallegatte and Przyluski 2010, p. 2-3). Ordinary and contingent characteristics characterize business interruption. Ordinary business interruption is defined as “the loss of revenue from the reduction of the flows of services (economic output or profit) from destruction of the capital stock (property damage) of a given firm,” and contingent business interruption arises from “disruptions to off-site sources, such as the supply chain or infrastructure, on which the firm depends” (Rose and Huyck 2016, p. 1896). Business interruption can occur when business resources are limited due to damage to properties, facilities, critical infrastructure, or workforce (Nocera and Gardoni 2019). Business resources can include human resources such as employees, physical resources such as inventories, network resources such as supply chains, financial resources such as cash flows, and information such as information technologies and know-how. Thus, regardless of the hazard type, business interruption is caused by resource constraints, not by the hazard itself (Fig. 1).

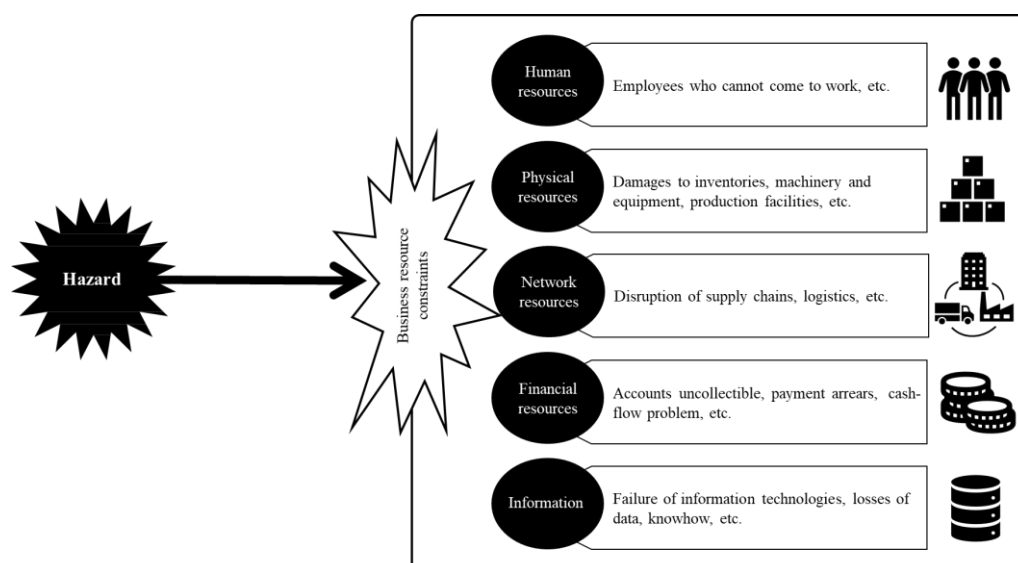


Figure 1. Pathway of business interruption

3. BUSINESS CONTINUITY IN JAPAN

3.1 Resilience and business continuity

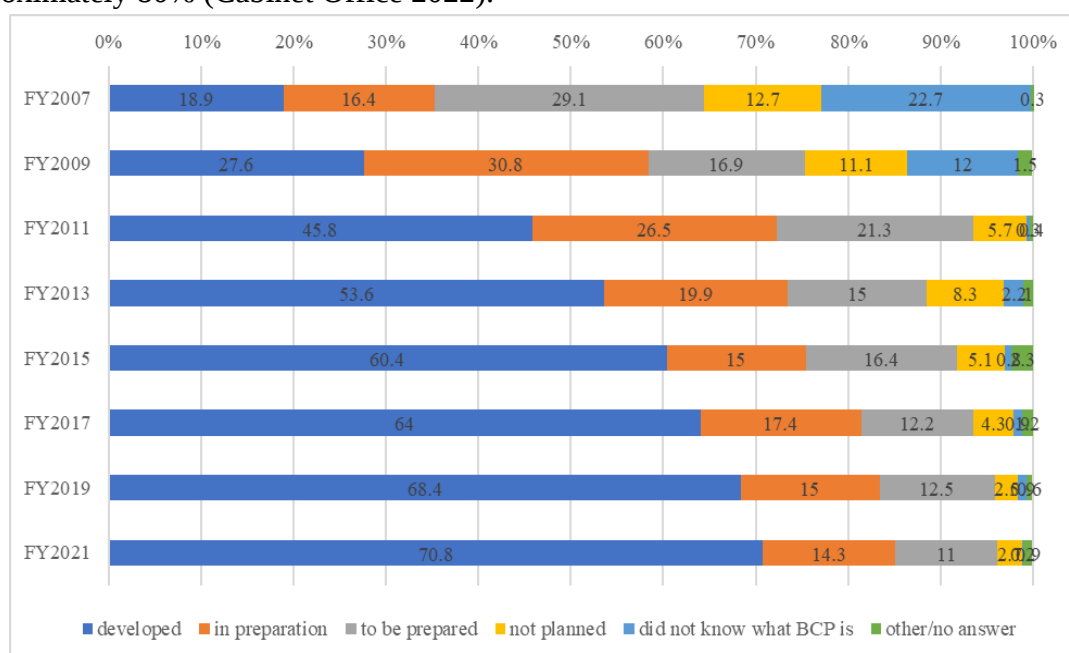
Business resilience is defined as “the ability of an organization to absorb and adapt in a changing environment to enable it to deliver its objectives and to survive and prosper” (ISO 2017), and it builds on the principles of business continuity (BC) (PwC 2022). Therefore, an increase in BC contributes to increased business resilience. The BC refers to the capability of an organization to continue delivering products and services within accepted time frames at a predefined capacity during a disruption (ISO 2021). The BCM, treated as a strategic management activity, should be well established to achieve BC in practical operations. BCM was standardized as ISO 22301 in 2012, a high-level standard of BCM that specifies the structure and requirements for implementing and maintaining a BCM system (Baba et al. 2013; ISO 2019). However, the implementation of BCM can be the subject of future study (Charoenthammachoke et al. 2020).

The “Business Continuity Guidelines,” published by the Cabinet Office, Government of Japan, are the widely recognized BC guidelines in Japan. The guidelines were initially published in 2005, with the most recent revision published in 2023. The guidelines demonstrate the importance of enterprises in Japan implementing good BC practices and describe what should be done to facilitate implementing BCM and create and improve BC plans (BCPs). This is primarily intended for private enterprises, which include all enterprises regardless of industry, business, or size. The BCP is defined as a plan describing the policy, systems, procedures, etc., by which enterprises can avoid suspension of their critical business or rapidly recover a critical business when interrupted, even when contingencies arise, including natural disasters such as major earthquakes, communicable disease pandemics, terrorist acts, serious accidents, disruption of supply chains, and abrupt changes in the business environment (Cabinet Office 2014a).

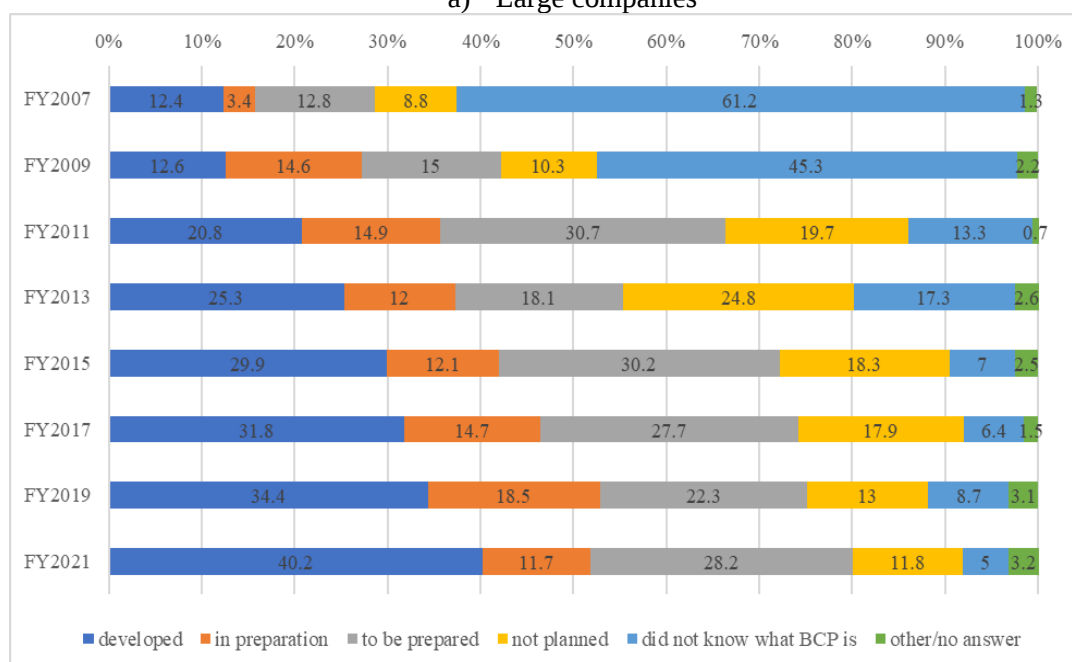
3.2 Current progress of business continuity in Japan

Since the fiscal year of 2007, the Cabinet Office’s Disaster Management has conducted surveys with a mail questionnaire on the current BCP status of companies. The most recent survey was conducted between January 7 and February 14, 2022, with a sample of 6026 companies randomly chosen from the Business Register, the Statistics Bureau’s database of companies all over Japan. In total, 1839 responses were received, including 608 large companies, 607 medium-sized companies, and 624 companies, of which capital and employee numbers are smaller than large and medium-sized companies, called “other companies” in Figures 2 and 3. The distribution of industry segments that have more than 100 responses is 104 for construction, 480 for manufacturing, 103 for information and communications, 208 for wholesale, 232 for retail trade, 102 for real estate and goods rental and leasing, 121 for services, and 127 for scientific research, professional and technical services (Cabinet Office 2022). Figs. 2–6 depict survey results sourced from Cabinet Office (2022) and translated by the authors.

The colors differ from those on the original charts. In terms of BCP development, the government has set targets of 100% for large companies and 50% for medium-sized companies until 2025 (National Resilience 2021). According to the survey, 70.8% had developed, and 14.3% were preparing in large companies in 2021, while 40.2% had developed and 11.7% were preparing in medium-sized companies (Fig. 2). This implies that the BCP development rate of medium-sized companies is considerably lower than that of large companies. In terms of industry, the Finance and Insurance industry has the highest rate of BCP development, at approximately 80% (Cabinet Office 2022).



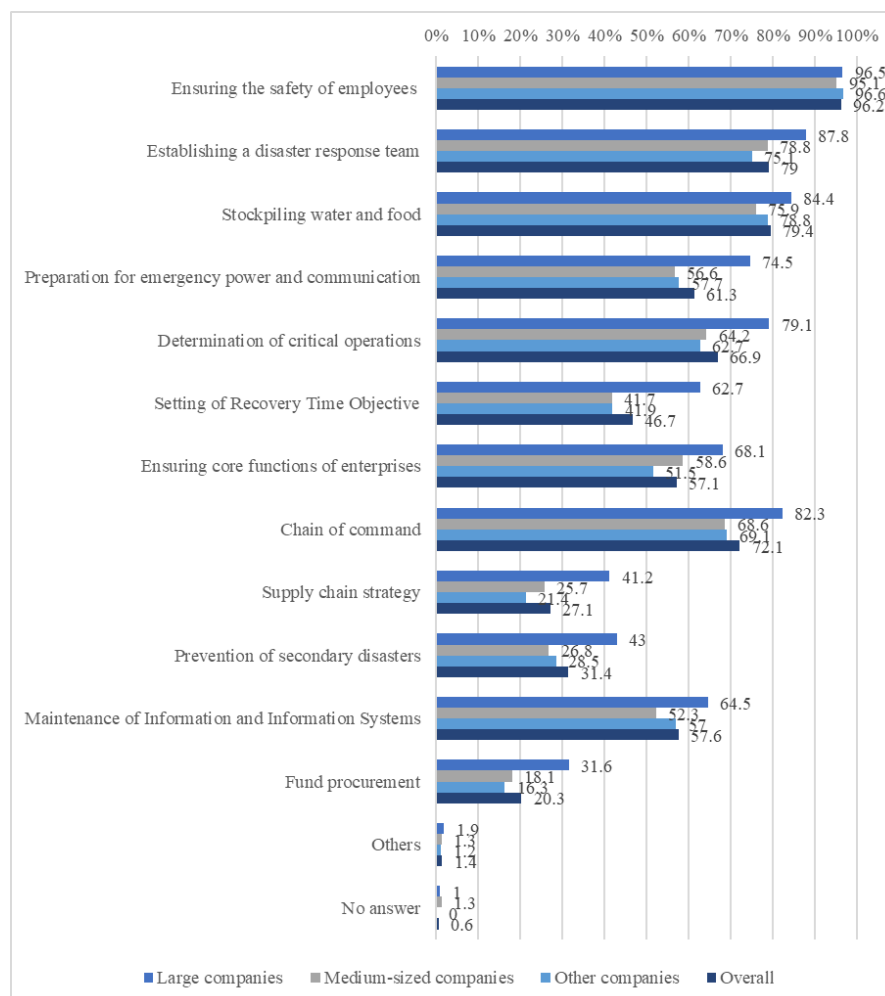
a) Large companies



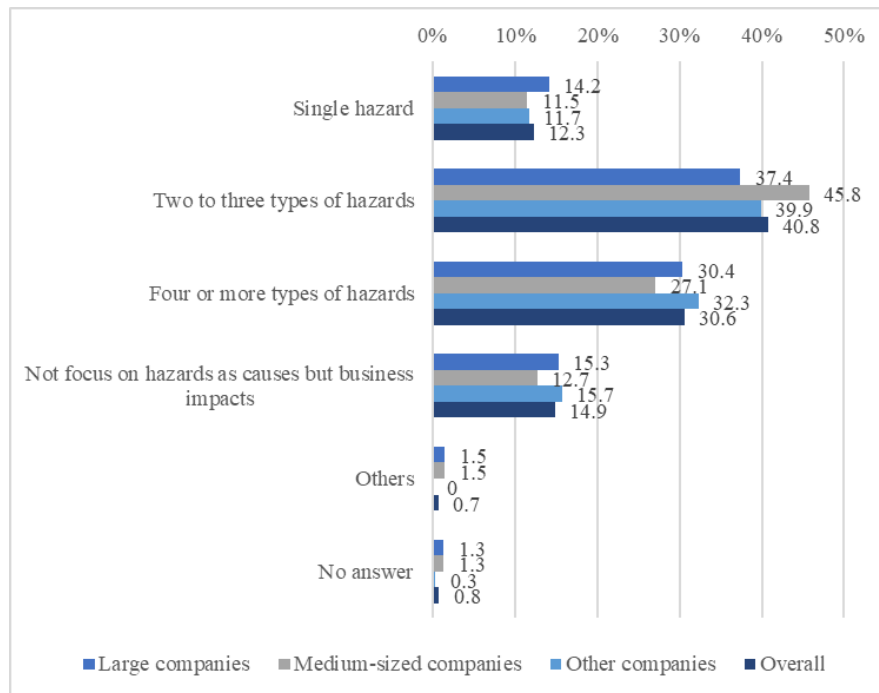
b) Medium-sized companies

Figure 2. BCP penetration rate by company size

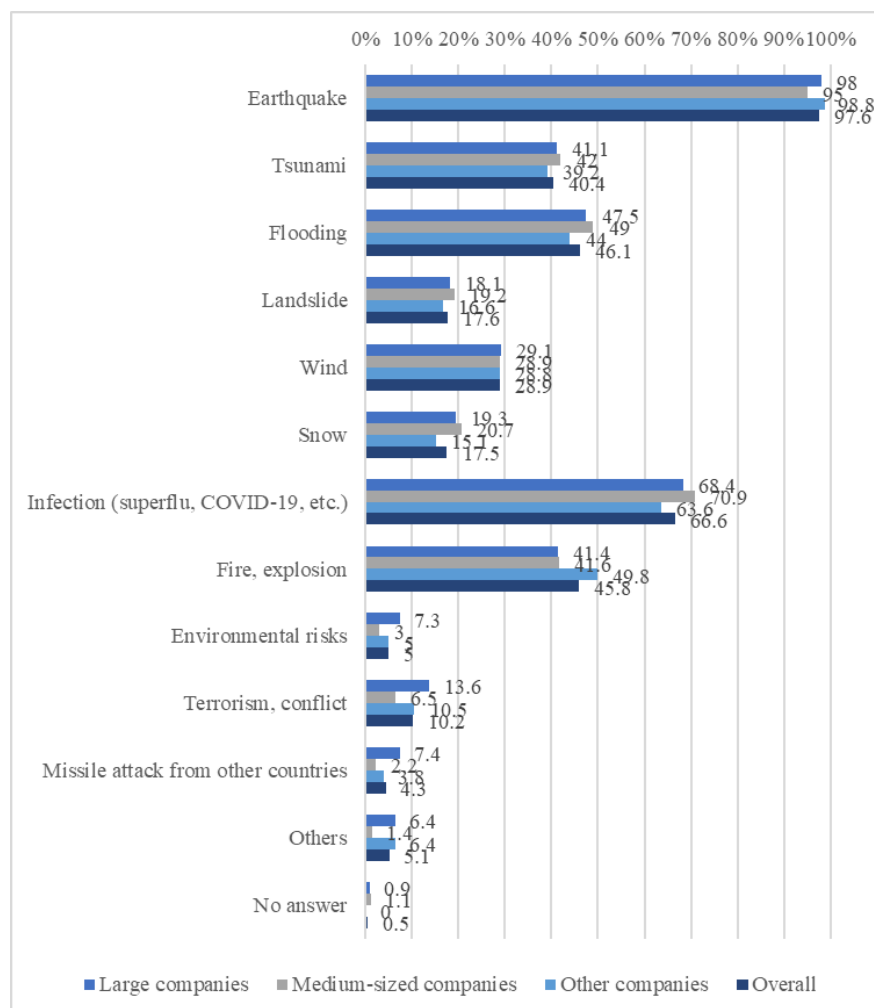
In terms of the BCP strategies and measures, there was considerably more content related to disaster prevention measures than BC strategies, such as ensuring employee safety (96%), establishing a disaster response team (79%), and stockpiling water and food (79%) (Fig. 3a). “Ensuring the safety of employees” was selected by 95% of large and medium-sized companies. The least common, at 20%, was “fund procurement.” Concerning the hazard covered by BCP, there was a tendency in the BCP to focus on single or some specific hazards rather than business impacts, regardless of the hazard type; “2–3 types of hazards” were most frequently covered, and “earthquake” was the most common hazard at 98%, followed by “infection” at 67% (Figs. 3b and 3c). In terms of problems and challenges in developing or promoting BCP in companies, the “difficulty of coordination between departments” was the most common (34%), followed by “difficulty of securing manpower for BCP preparation” and “lack of BCP awareness on-site” (Fig. 3d). The “difficulty of coordination between departments” was the most common for large companies (46%), and the “lack of BCP awareness on-site” was the most common for medium-sized companies (39%). This implied that companies were less likely to consider BC as part of their strategic business activities and that BCM, including BCP, were not adequately mainstreamed in their operations.



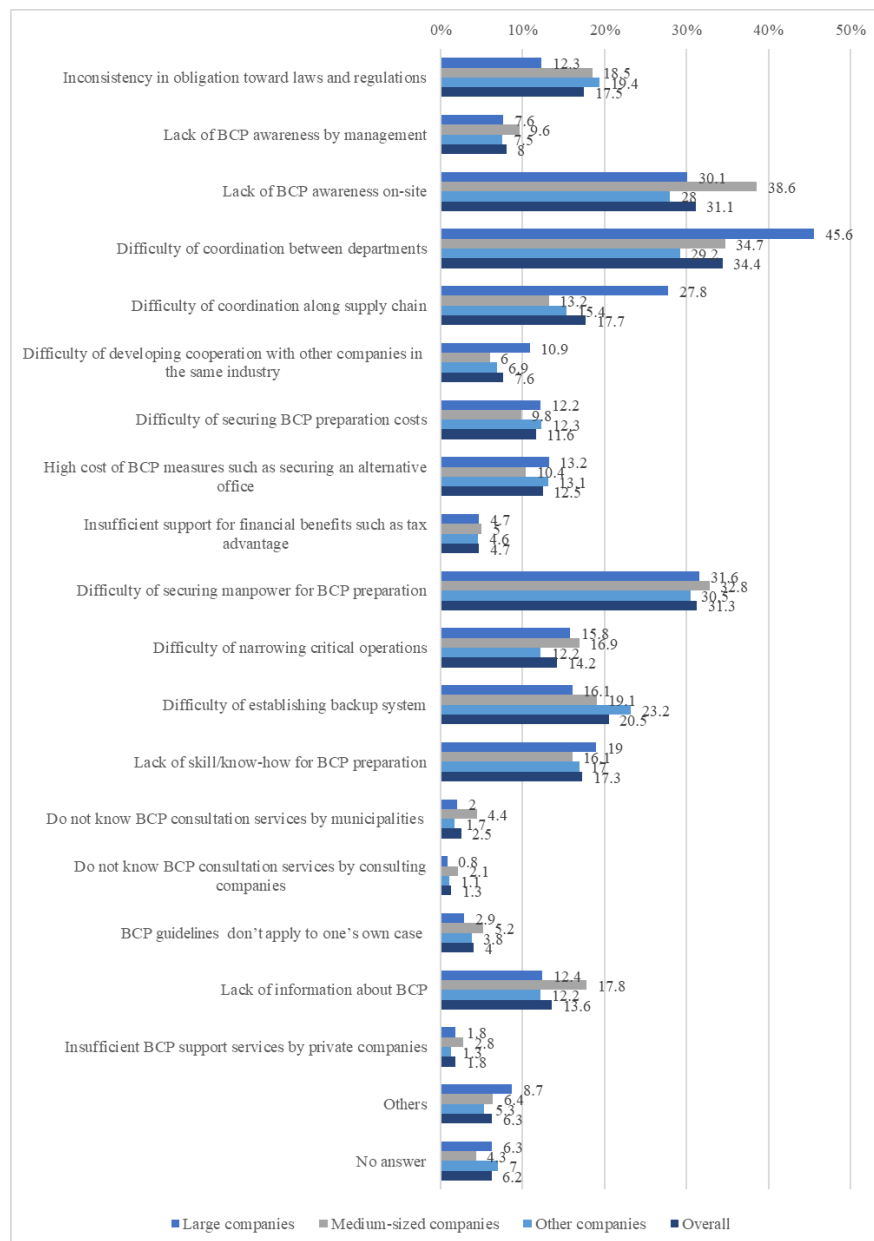
a) Strategies and measures listed in BCP



b) Number of hazards covered by BCP



c) Types of hazards covered by BCP



d) Problems and challenges in developing or promoting BCP

Figure 3. BCP contents and challenges in developing BCP

4. DISCUSSIONS

4.1 An effective approach for increasing business resilience

To enhance business resilience to effectively manage a multi-hazard like the 2011 Great East Japan Earthquake, more comprehensive BC approaches that can deal with unexpected consequences, regardless of hazard type, should be highly promoted from both, a political and practical perspective. A road map is to transition from “a cause-based approach,” which companies have traditionally used, to “an impact-based approach” (Maruya 2011; Watanabe

2015). The importance of the impact-based approach is more likely to be recognized gradually in the context of BCM, which has been hardly emphasized in the context of enhancing business resilience, even though these are closely related, as more effective BCM can form the foundation for increasing business resilience.

The impact-based approach examines BC strategies and measures for the situation faced by an enterprise given the consequences of constrained business resources, regardless of hazard type. For example, what if a critical site of an enterprise cannot be used, a key person cannot come to work, or a major supplier cannot continue its business (Cabinet Office 2014b). This approach assumes it can work even if an enterprise suffers unexpected damage. Conversely, the cause-based approach examines strategies and measures based on the predicted damage and focuses on a specific hazard that represents the cause (for example, an earthquake, typhoon, COVID-19, *etc.*).

The impact-based approach is in line with the government recommendations. The BC guidelines 2023 mention that BCM aims to “continue critical operations even if an enterprise faces a critical incident” and then recommends that BC strategies and measures should be examined given the impact-based approach but the cause-based approach. However, the guidelines note that the processes of business impact analysis and risk assessment in BCM, which are conducted before examining BC strategies and measures to determine critical operations, examine the recovery time objectives and clarify the necessary business resources, should be examined both in view of business impacts regardless of hazard type and a priority risk as the specific hazard to be addressed (Cabinet Office 2023).

However, the survey by the Cabinet Office (2022) shows the current implementation rate of the impact-based approach is low. The impact-based approach can be an effective alternative because it applies to many different types of hazards rather than just one and works for unexpected damages. Management decisions are likely to prioritize the possibility of business interruption in terms of business impact over the cause (*i.e.*, hazard). The impact-based approach can reduce operational burdens associated with BCP preparation because it only requires the development of a single BCP for many hazards; in contrast, the cause-based approach necessitates the development of multiple BCPs for each hazard.

4.2 Consideration of financial strategies for increasing business resilience

It is also imperative to incorporate financial strategies into BCM to enhance business resilience. In terms of business administration, financial resources are one of the most crucial business resources, and these can be used as final criteria to determine whether a business will survive or not. Thus, companies that run out of cash go bankrupt. However, the importance of financial strategies has been overlooked for improving BCM and business resilience, and these have not been well incorporated in implementing BCM. Cabinet Office (2022) reveals that neither large nor medium-sized companies prioritize fund procurement in their current BCPs. This is because they might have regarded BCM as part of disaster prevention and a different matter than a business strategy while considering fund procurement as part of business

strategies to be undisclosed. Hence, financial strategies should be candidly disclosed in BCP to enhance the effectiveness of BCM, leading to an increase in business resilience and corporate value. Furthermore, it may be considered in a Japanese-specific manner that they cover financial losses from business interruption using their capital rather than fund procurement, such as purchasing natural disaster insurance. Regardless of company size, the most common way to deal with cash flow shortages caused by natural disasters is to combine equity capital and bank financing or disaster insurance and equity capital (Sawada et al. 2017). Natural disaster insurance is not widely purchased by companies (Risk Finance Committee for Increasingly Severe Large-Scale Natural Disasters 2017; Sawada et al. 2017).

5. CONCLUSION AND WAY FORWARD

This study reviewed the hazards that Japanese companies face and the effects of those hazards. More effective BCM can form the foundation for increasing the business resilience of companies. The current progress of and challenges to Japan's BCM and related policies were examined, along with how business resilience can be effectively improved to address current and future multi-hazards. The results revealed that Japanese companies' current BCPs tended to focus on single or some specific hazards, and neither large nor medium-sized companies emphasize fund procurement in their current BCPs. Therefore, more comprehensive approaches to dealing with unexpected consequences, regardless of the hazard type, should be promoted from political and practical perspectives to enhance business resilience. The importance of the impact-based approach should be emphasized in increasing business resilience since this approach can be an effective option because it can be applied to any hazard type and work for unexpected damages. Management decisions are more likely to be based on the business impact, and the impact-based approach can reduce operational burdens in developing BCPs. In addition, financial strategies should be more mainstreamed on BCM to enhance business resilience, as financial resources are one of the most crucial business resources and the final criteria for determining whether a business is sustainable. To accomplish this, it is essential to more openly disclose financial strategies in BCP to enhance the effectiveness of BCM, which leads to an increase in business resilience and corporate value and gaining a deep insight into a Japanese-specific method for covering financial losses from business interruption using capital.

Although the findings are specific to Japan, readers may find them applicable to similar situations in other countries. Furthermore, this study is based on the findings of a government survey conducted by the Disaster Management division of the Cabinet Office. Future research should include sector-specific case studies to thoroughly evaluate the progress of and challenges to BCM and quantitative evaluations of the effectiveness of BC options for a more detailed analysis of how business resilience could be improved to address multi-hazards.

REFERENCES

- Baba, H., Adachi, I., Takabayashi, H., Nagatomo, N., Nakasone, S., Matsumoto, H., and Shimano, T. (2013) Introductory Study on Disaster Risk Assessment and Area Business Continuity Planning in Industry Agglomerated Areas in the ASEAN. *IDRiM Journal*, 3 (2): 184-95.
- Bloomberg. (2018) 西日本豪雨で企業の生産停止相次ぐーマツダや三菱重、IHI など影響 (Companies such as Mazda, Mitsubishi Heavy Industries and IHI have halted production due to the heavy rain of July, Heisei 30) (In Japanese) <https://www.bloomberg.co.jp/news/articles/2018-07-09/PBKT2A6JIJUP01> (Accessed November 13, 2022).
- Cabinet Office, Government of Japan. (2014a) Business continuity guidelines — Strategies and responses for surviving critical incidents — Third Edition, Cabinet Office, Tokyo. https://www.bousai.go.jp/kyoiku/kigyoku/pdf/guideline03_en.pdf
- Cabinet Office, Government of Japan. (2014b) 事業継続ガイドライン第三版 — あらゆる危機的事象を乗り越えるための戦略と対応 — 解説書 (Description of business continuity guidelines — Strategies and responses for surviving critical incidents — Third Edition), Cabinet Office, Tokyo. (In Japanese) https://www.bousai.go.jp/kyoiku/kigyoku/pdf/guideline03_ex.pdf
- Cabinet Office, Government of Japan. (2023) 事業継続ガイドライン — あらゆる危機的事象を乗り越えるための戦略と対応 — (令和5年3月) (Business continuity guidelines — Strategies and responses for surviving critical incidents —), Cabinet Office, Tokyo. (In Japanese) <https://www.bousai.go.jp/kyoiku/kigyoku/pdf/guideline202303.pdf>
- Cabinet Office, Government of Japan. (2022) 令和3年度企業の事業継続及び防災の取組に関する実態調査 (FY2021 Survey on business continuity and disaster prevention by companies), Cabinet Office, Tokyo. (In Japanese) https://www.bousai.go.jp/kyoiku/kigyoku/pdf/chosa_210516.pdf
- Charoenthammachoke, K., Leelawat, N., Tang, J., and Kodaka, A. (2020) Business Continuity Management: A Preliminary Systematic Literature Review Based on ScienceDirect Database. *Journal of Disaster Research*, 15 (5): 546-555.
- Hallegatte, S., and Przyluski, V. (2010) The economics of natural disasters: Concepts and methods. Policy Research working paper; no. WPS 5507, The World Bank, Washington DC. <https://openknowledge.worldbank.org/handle/10986/3991>
- ISO. (2017) ISO 22316:2017(en) Security and resilience — Organizational resilience — Principles and attributes <https://www.iso.org/obp/ui/#iso:std:iso:22316:ed-1:v1:en> (Accessed November 13, 2022).
- ISO. (2018) ISO 31000:2018(en) Risk management — Guidelines <https://www.iso.org/obp/ui/#iso:std:iso:31000:ed-2:v1:en> (Accessed November 13, 2022).
- ISO 22301:2019(en) Security and resilience — Business continuity management systems — Requirements <https://www.iso.org/obp/ui/#iso:std:iso:22301:ed-2:v1:en> (Accessed March 8, 2023).

- ISO. (2021) ISO 22300:2021(en) Security and resilience — Vocabulary
<https://www.iso.org/obp/ui/#iso:std:iso:22300:ed-3:v1:en> (Accessed November 13, 2022).
- Japan Meteorological Agency. (2018) 西日本を中心に全国的に広い範囲で記録的な大雨。
(The heavy rain of July, Heisei 30) (In Japanese)
<https://www.data.jma.go.jp/obd/stats/data/bosai/report/2018/20180713/20180713.html>
(Accessed November 13, 2022).
- Japan Tourism Agency. (2009) 新型インフルエンザの影響に関する調査の結果について
(About the survey results on the impact of the pandemic H1N1) (In Japanese)
https://www.mlit.go.jp/kankocho/news06_000029.html (Accessed November 13, 2022).
- Maruya, H. (2011) Proposal for improvement of business continuity plan (BCP) based on the lessons of the Great East Japan Earthquake. *Journal of Japan Society of Civil Engineers, Ser. F6 (Safety Problem)*, 67 (2): 1-10.
https://www.jstage.jst.go.jp/article/jscejsp/67/2/67_2_I_1/_pdf/-char/ja
- National Institute of Infectious Diseases Japan. (2010) パンデミック (H1N1) 2009 発生から 1 年を経て (One year after the outbreak of pandemic (H1N1) in 2009) (In Japanese)
<http://idsc.nih.go.jp/iasr/31/367/dj3671.html> (Accessed November 13, 2022).
- National Resilience Promotion Office, Cabinet Secretariat of Japan. (National Resilience) (2021) 国土強靱化年次計画 2021 (Action plan for national resilience 2021), National Resilience, Tokyo. (In Japanese)
https://www.cas.go.jp/jp/seisaku/kokudo_kyoujinka/pdf/nenjikeikaku2021_02.pdf
- Nocera, F., and Gardoni, P. (2019) A ground-up approach to estimate the likelihood of business interruption. *International Journal of Disaster Risk Reduction*, 41: 101314.
- OECD. (2022) Enterprises by business size (indicator). doi: 10.1787/31d5eeaf-en (Accessed November 13, 2022).
- PwC. (2022) Operational resilience, crisis and continuity.
<https://www.pwc.co.uk/services/risk/operational-resilience-crisis-continuity.html>
(Accessed November 13, 2022).
- Reuters. (2007) トヨタ、リケン生産停止による減産規模 2.6 万台 (Toyota's reduction in production due to suspension of Riken production is 26,000 units) (In Japanese)
<https://jp.reuters.com/article/idJPJAPAN-26959220070719> (Accessed November 13, 2022).
- Risk Finance Committee for Increasingly Severe Large-Scale Natural Disasters, Disaster Management, Cabinet Office of Japan. (2017) 我が国経済の災害リスクマネジメント力向上にむけて (Improving disaster risk management of Japanese economy), Risk Finance Committee, Tokyo. (In Japanese)
<https://www.bousai.go.jp/kaigirep/gekijin/pdf/honbun.pdf>
- Rose, A., and Huyck, C. K. (2016) Improving catastrophe modeling for business interruption insurance needs. *Risk Analysis*, 36 (10): 1896-1915.
- Sawada, Y., Masaki, T., Nakata, H., and Sekiguchi, K. (2017) 日本企業における災害時リスクファイナンスの現状と課題 (Current status and challenges of disaster risk financing

- by Japan companies). The Research Institute of Economy, Trade and Industry (RIETI) Policy Discussion Paper Series 17-P-002, Tokyo. (In Japanese) <https://www.rieti.go.jp/jp/publications/pdp/17p002.pdf>
- Teikoku Databank, Ltd. (2022) 新型コロナウイルス関連倒産 (Bankruptcies related to COVID-19) (In Japanese) <https://www.tdb.co.jp/tosan/covid19/index.html> (Accessed November 13, 2022).
- The Sankei Shimbun. (2018) 企業活動に大きな悪影響 物流網は寸断、コンビニ休業や工場操業停止も (Significant negative impacts on corporate activities, such as disruption of logistics, closure of convenience stores, and suspension of factory operations) (In Japanese) <https://www.sankei.com/article/20180709-IKSISQLA2NIIVPWHWLHWOHVRIA/> (Accessed November 13, 2022).
- The Small and Medium Enterprise Agency of Japan. (2022) 2022 年版 中小企業白書 (HTML 版) (2022 White Paper on small and medium enterprises in Japan (HTML version)) (In Japanese) <https://www.chusho.meti.go.jp/pamflet/hakusyo/2022/chusho/index.html> (Accessed November 13, 2022).
- The World Bank. (2022) *Market capitalization of listed domestic companies (current US\$)*. https://data.worldbank.org/indicator/CM.MKT.LCAP.CD?end=2020&most_recent_value_desc=true&start=1975 (Accessed November 13, 2022).
- United Nations. (2015) Sendai framework for disaster risk reduction 2015 – 2030, United Nations, Geneva. <https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030>
- United Nations. (2020) Hazard definition and classification review (Technical Report), United Nations, Geneva. <https://www.undrr.org/publication/hazard-definition-and-classification-review-technical-report>
- Watanabe, K. (2015) Diversifying risks and the importance of public-private partnerships in business continuity management (BCM). *Journal of Real Options and Strategy*, 7 (2): 17-20. https://www.jstage.jst.go.jp/article/cjaros/7/2/7_17/_article/-char/ja
- World Economic Forum. (WEF) (2022) The global risks report 2022 17th edition, WEF, Geneva. https://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2022.pdf