13

Enhancement of the Resilience of Building Continuity - Development of "Independently Secured and Highly Protected Business District"

Yukihiro Masuda
Toyohashi University of Technology
Japan

1. Introduction

With the progress of economic globalization, as well as the current industrial structure in which the interruption of company activities could have a worldwide impact, preparations to maintain the operation level of important business tasks in the event of a disaster have become increasingly important. The business continuity plan (BCP) to ensure continuing business activities even in the event of a disaster is markedly different from the traditional concept of contingency and disaster prevention planning by a company's administration with the aim of reducing human and material damage. The central concept underlying BCP is the management of human and material resources, money, and information with special emphasis on measures to prevent interruption of core business activities even in a crisis, such as in the event of a disaster or accident.

Specifically, BCP is designed to maintain important core business activities even after a disaster, without allowing the operation capacity to drop to 0%, as shown in Figure 1, and to recover the operation level within the target restoration time. Both the government sector and private enterprise in Japan have stated that it is important to develop business continuity plans (BCPs) to enable important business to proceed in the event of earthquake disasters. Measures should be implemented in Japan to minimize risk and secure utilities, such as electricity, water, and gas, in the event of an earthquake. Countries around the world are currently in the process of developing regulations to meet the formalized standards defined by the International Organization for Standardization (ISO) under ISO/TC233.

The regulatory agencies in Japan also require companies to take immediate actions to address the requirements for BCP. The enforcement of related measures defined in BCP along with the execution and operation of such measures are known collectively as business continuity management (BCM).

Disaster prevention measures give top priority to life saving, and the focus to date has been on the hardware required for this purpose. However, measures that can be implemented in buildings or to maintain business activities after a disaster have not been given full consideration. In the near future, crisis management for buildings will change drastically with a shift in focus from "guarding" to "sustaining." (See Yukihiro MASUDA (2008) for a related discussion of this issue.)

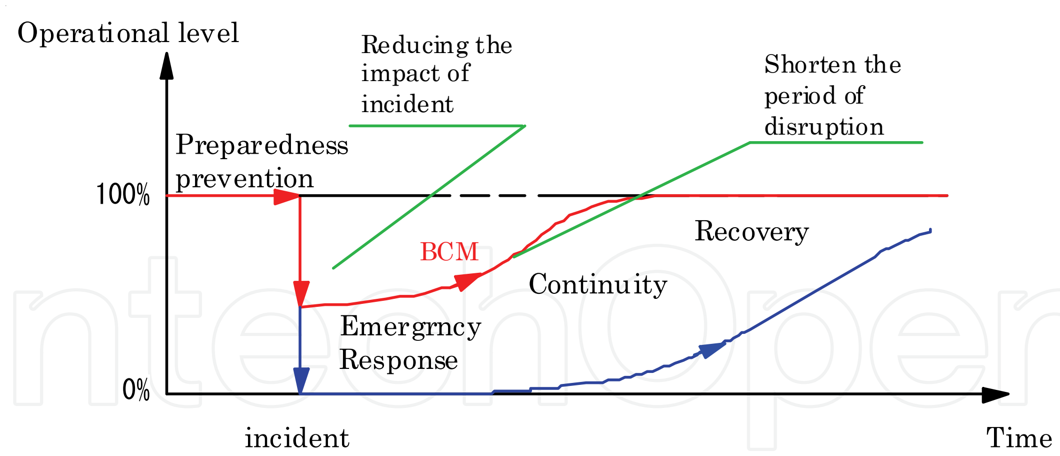


Fig. 1. Purpose of Business Continuity

2. Concept of building continuity

An earthquake with the epicenter beneath a country's capital city, which is the political and economic center of the country, is expected to result in both large-scale direct and indirect damage, which may lead to functional building loss. However, as BCP is concerned mainly with business contents from the management side, measures regarding the physical basis of the business may often be overlooked. For example, measures to be taken in the event of the death of the CEO or when the supply chain is cut are considered first, with considerations regarding the buildings—which are the business and production base—often limited to determination of earthquake resistance.

With regard to risks related to facilities and equipment, for example, ensuring the safety and reliability of air conditioning and power supply systems, a methodology for diagnosis and evaluation of a business facility from the viewpoint of maintenance of building functionality has yet to be established. An approach that is not limited to the framework of traditional disaster prevention is required to contribute to BCP. However, as different businesses have a wide variety of circumstances depending on a number of factors, such as the particular industry and condition of the business, it is difficult to classify them into a general pattern.

It is necessary to understand the state of the building as a system as a concept that ties the requirement for needs to be met for business continuity with efforts toward individual disaster prevention plans. We propose a concept of Building Continuity (maintenance and operation of functionality of a building) that combines the concepts of traditional disaster prevention and current BCP. As shown in Figure 1, operation capacity focuses more on building availability. There have been a number of studies of us to develop a methodology for maintaining suitable functionality of a building in the case of an emergency, and can be summarized as follows based on clarification of the performance requirements for the building and the correspondence of the building facility system:

1. Evaluation of the facility system and examination of management solutions considering an emergency situation.
2. Fault tree analysis of performance requirements on the building side and the correspondence of the building facility system with business continuity as an event.
3. A method of sending social information regarding reliability after measures through engineering reports.

3. A natural hazard index for megacities

Megacity*	Population* (millions)	Total risk index	Risk index components		
			Hazard	Vulnerability	Exposed values
Tokyo-Yokohama	34.9	710	10.0	7.1	10.0
San Francisco Bay	7.3	167	6.7	8.3	3.0
Los Angeles	16.8	100	2.7	8.2	4.5
Osaka-Kobe-Kyoto	18.0	92	3.6	5.0	5.0
Miami	4.1	45	2.7	7.7	2.2
New York	21.6	42	0.9	5.5	8.3
Hong Kong-Pearl River Delta	14.0	41	2.8	6.6	2.2
Manila-Quezon	14.2	31	4.8	9.5	0.7
London	12.1	30	0.9	7.1	4.8
Paris	11.0	25	0.8	6.6	4.6
Chicago	9.4	20	0.8	5.6	4.4
Mexico City	25.8	19	1.8	8.9	1.2
Washington-Baltimore	7.9	16	0.6	5.4	4.4
Beijing	13.2	15	2.7	8.1	0.7
Seoul	21.2	15	0.9	7.2	2.2
Ruhr area	9.6	14	0.9	5.8	2.8
Shanghai	14.2	13	1.1	7.0	1.7
Amsterdam-Rotterdam (Randstad)	8.0	12	0.9	5.6	2.3

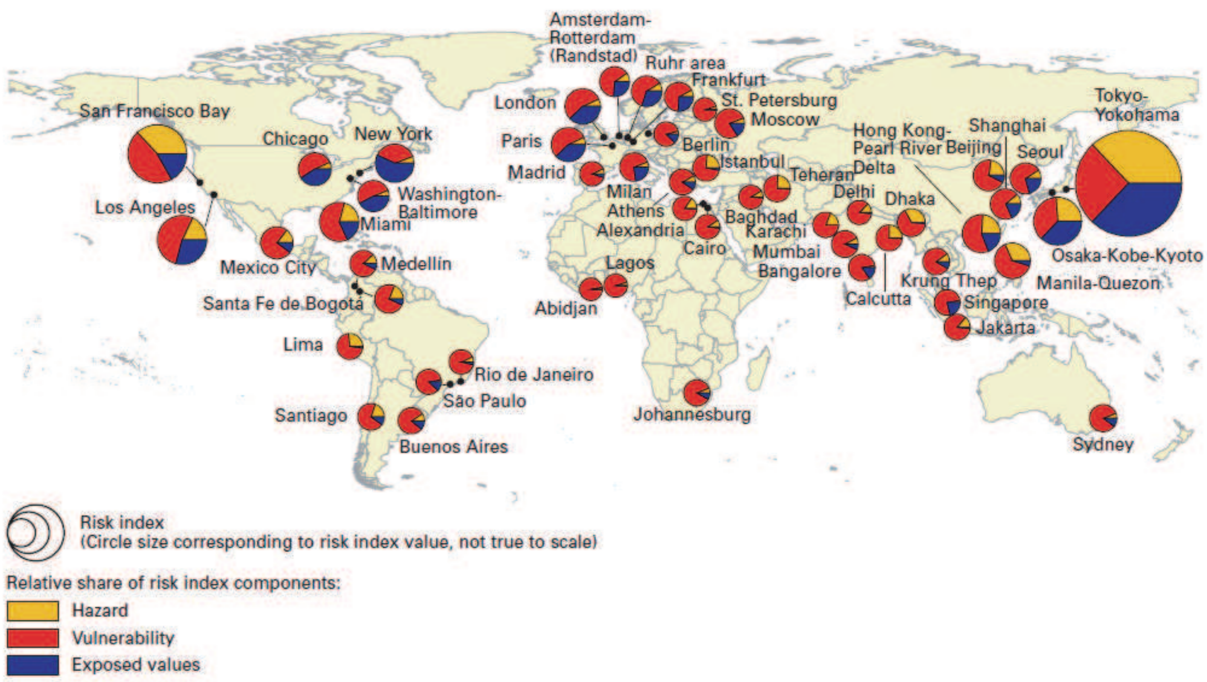


Fig. 2. A natural hazard index for megacities
(Munich Re Group)

One example of the evaluation of Japanese cities from the viewpoint of a foreign country is "A natural hazard index for megacities" published in 2002 by Munich Re Group, one of the world's major reinsurance companies. (Figure2) The report "Topics, Annual Review: Natural Catastrophes 2002" presents the "natural hazard index for megacities" in publications by Munich Re Group. Among 50 large cities from around the world that were evaluated, only the region of Tokyo and Yokohama showed an exceptionally high score of 710 by the natural hazard index. (See Munich Re Group (2003) and Munich Re Group (2004) for a more detailed discussion of this issue.) It is necessary to consider such a report as a warning regarding the safety measures in Japan, to behave responsibly as the world's second leading economic power. However, this index has several technical drawbacks regarding evaluation process and the fact that only natural disasters are considered, and it should be noted that the content of the evaluation is limited. (See Yukihiro MASUDA, et al. (2009) for a more detailed discussion of this issue.)

If Tokyo is recognized as a city that is not safe, foreign countries may unfairly evaluate the safety of the Tokyo metropolitan area. If this prevents these foreign countries from investing in Japan, this would be a great loss. Alternatively, requests by such foreign investors for excessive safety specifications from building owners or their business partners would represent an overwhelming financial burden. In this era where cities are constantly competing against each other, we believe that it is important for Japan to provide the world with assurances, backed up by convincing empirical evidence, regarding safety. By mainly assuming an earthquake immediately below Tokyo, and by establishing measures at both the regional level and the building level after specifying safe districts within downtown Tokyo utilizing the idea of new "urban-type ring levee", we believe that the potential for damage could be greatly reduced.

We propose measures at regional and building levels to realize building continuity, i.e., to maintain appropriate functions of a building, in the event of a disaster. By maintaining a high specification district and buildings, we aim to reduce rational/scientific risks. This concept will be discussed in more detail in the following section.

The goal of this concept is to avoid building insufficiency and to maintain proper function in the event of an emergency, such as a natural disaster, accident, or other such incident.

4. Development of independently secured and highly protected business district (measures at the regional level)

The idea of new "urban-type ring levee" is to construct an independently secured safety business district. This section introduces the development of an Independently Secured and Highly Protected Business District as a measure at the regional level.

The purpose of "The independently secured safety business district project" is to propose a new city lifeline for the urban renewal area of Tokyo, which would create a city that is both more eco-friendly and safer. A highly reliable and sustainable regional energy and water supply system that contributes to both the eco-friendliness and safety of the city in the event of earthquakes is organized in the safety district. Information-related and telecommunications functions will also be strengthened. Accommodation facilities for key people and evacuation facilities and space for temporary refugees are also in consideration.The following advantages can be reasonably expected. The buildings in the Independently Secured and Highly Protected Business District are resistant to earthquakes.

1. The buildings in the independently secured safety business district could take out loss-of-profit insurance against earthquake damage and lifeline seismic disasters.

2. The buildings in the independently secured safety business district could receive higher evaluation in the reinsurance market and in the real estate investment market (in the process of Due Diligence).

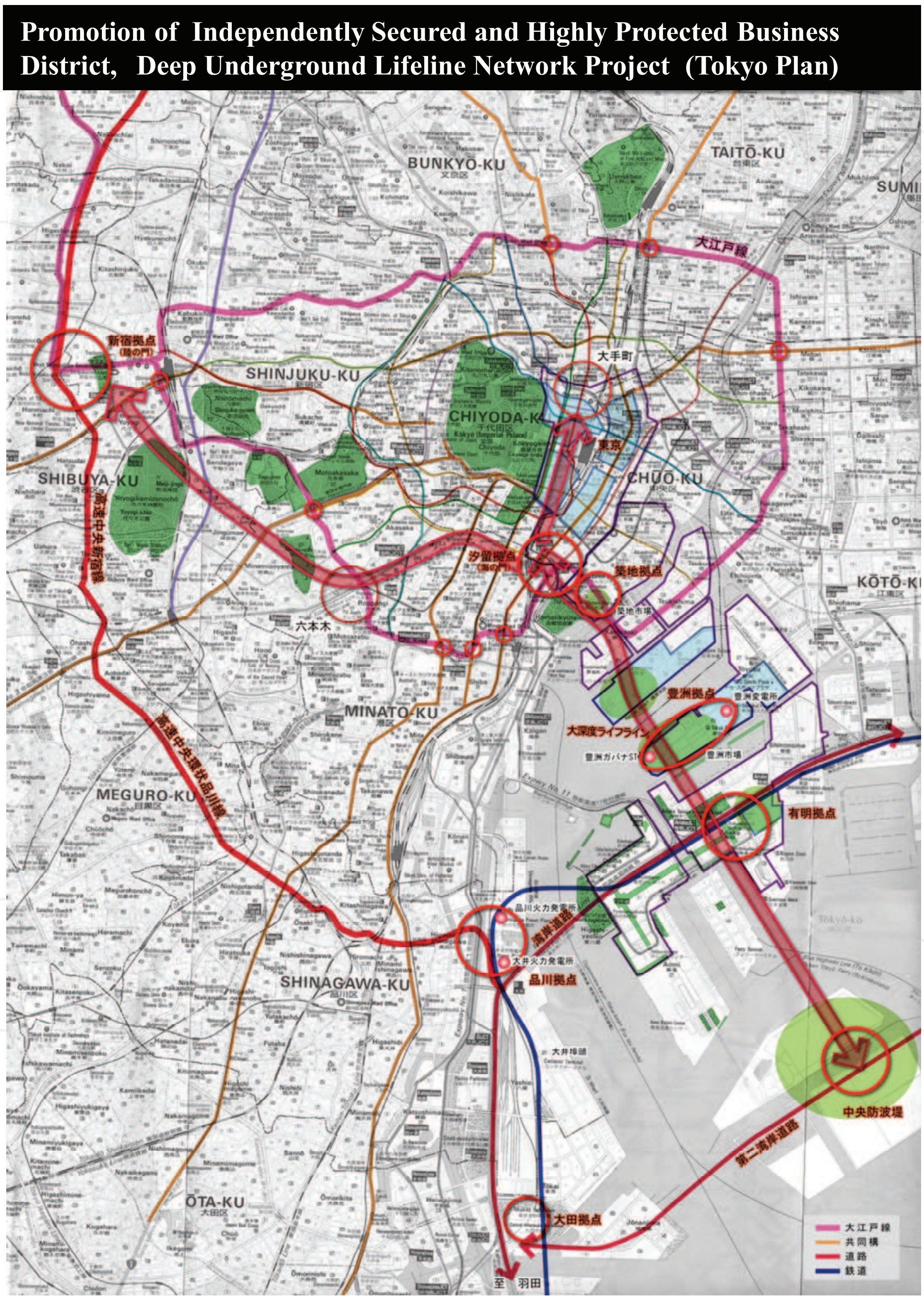


Fig. 3. Independently Secured and Highly Protected Business District and its Networks (Tokyo plan)

There have been some noteworthy case examples of higher evaluation in the real estate and reinsurance market for countermeasures against facility risks of buildings against lifeline seismic disasters.

The Independently Secured and Highly Protected Business District is an area of approximately 100ha in part of the Tokyo metropolitan area where urban functions are highly integrated and are specifically maintained to continue important business functions in the event of an earthquake.

This district is safe and highly reliable, and will be capable of maintaining necessary core functions even during a disaster covering a large area, such as a large-scale earthquake. This district, which is capable of supporting the establishment and enforcement of each company's BCP, is a special area where safety of the buildings and infrastructure is ensured, and in which BCP is considered for the district as a whole. The buildings within the Independently Secured and Highly Protected Business District as well as "Life-spots" in the form of new city facilities that are under consideration for development to have the properties of both independence and endurance as follows:

- Independence: Durability of the structure and facility.
- Endurance: Continuity of supply or function.

Therefore, we believe the following are important functions of the Independently Secured and Highly Protected Business District :

1. Stable supply of energy and water.
2. Maintenance of functionality of the telecommunications system.
3. Secure data center and related technicians capable of data backup and system recovery.
4. Accommodations for VIPs.
5. Measures for people who cannot reach home after disaster.

In Japan, where the risk of earthquake disasters is relatively high in contrast to the USA where concerns are focused more on terrorism and other artificial disasters recently, it is effective to work as a region to establish measures against earthquakes as a common likely disaster in the region. The core of BCP is examination of the contents of businesses from the management viewpoint, and thus measures for buildings that are the base for business and production are sometimes overlooked, or only considered from the aspect of earthquake resistance. When discussing BCP, measures regarding software in combination with those regarding hardware, such as building facilities or reviews of regional infrastructure, must be considered to facilitate the continuity of business functions during disasters.

5. Field survey of the emergency power supply related to business continuity

Enforcement of Building Continuity (i.e., maintaining the appropriate functions of the building) can be strongly supported when lifeline and secure energy infrastructure are viewed as issues for the region rather than each company focusing on actions that are feasible for them to perform on an individual basis. Here is an example of the actual condition of electrical power. (See Yukihiro MASUDA, et al. (2009) for a more detailed discussion of this issue.)

The most important system that must be secured to ensure business continuity in an emergency situation is the electric power source. Almost all building utility equipment uses electricity, and therefore if the power supply is interrupted by an infrastructure failure and insufficient emergency power supply, it would be impossible to achieve business continuity.

It is necessary to secure two types of power load in an emergency, such as an earthquake or a power supply failure for commercial use: disaster prevention load and security load.

1. Disaster prevention load:
   In the case of power failure due to a fire, the load to supply power to disaster prevention equipment/systems installed in the facility (automatic fire alarm systems, escape guiding systems, fire alarm apparatus, extinguishers, smoke control equipment, emergency use power outlet, etc.).
2. Security load:
   The load to supply power to maintain the functionality of a facility during a general power failure.

In Japan, the legal minimum time for power supply in an emergency situation is set based on the disaster prevention load by appropriate regulations, such as the Building Standards Law and the Fire Protection Law. These regulations stipulate the requirements for in-house power generators, storage battery systems, and incoming electricity power receiving system exclusively for emergency power, and buildings subject to these laws must comply with the legal minimum time for power supply in an emergency situation. However, as the disaster prevention load is calculated and designed based on the load necessary for fire extinguisher equipment, escape facilities, etc., the electrical power load required for business continuation is not considered. Therefore, it is necessary to take the security load into consideration in designing disaster prevention facilities to preserve building functionality in an emergency.

A sampling survey on office buildings indicated that mid- to small-sized office buildings cannot secure sufficient security load either because of insufficient financial capacity or because of cost reduction measured in the design phase. The security load capacity was limited to powering computer servers and building security systems during a power failure. BCPs are in place for large-scale, luxury or higher class buildings and those used as the headquarters of major corporations as well as buildings with important uses such as financial institutes. These buildings had both BCPs and measures to ensure security load to allow continuation of important business tasks to a certain degree. Even if the measures were insufficient, management were aware of the requirements and were trying to work toward these goals.

Therefore, in the present study, this survey was limited to the major business districts of Tokyo and Osaka, which are the major commercial centers of Japan, and a field survey on emergency power supply facilities was conducted with regard to emergency power supply in buildings. Previous studies provided statistical data on emergency power supply after completion of construction. However, there have been few studies in which the area of survey was limited to major business districts representative of those in Japan to determine the capacity of the emergency power supply facility, including the capacity for security load in buildings with higher performance requirements and buildings of higher grade. This is an important distinction of this study.The findings of this study can be summarized as follows.

There was no proportional relationship with maximum operation time using only the emergency power supply (Fig. 4), but the operation time was less than 24 h in most of the buildings included in the analysis. Therefore, if a power failure continues for longer than 24 h, business continuity may become impossible. Most of the companies with a maximum operation time using only the emergency power supply of over 24 h are financial institutes, disaster prevention facilities, company headquarters, infrastructure companies, and those considered important facilities.

The results regarding the percentage of capacity of the emergency power supply in contract demand indicated a specific trend for each type of facility. The percentage of emergency power supply in corporations of importance, such as data centers, broadcast/IX companies, disaster prevention facilities, and financial institutions was 40% or greater. Two government-related disaster prevention facilities showed a value of approximately 90%. The values in offices in Tokyo were around 20% regardless of total floor space, while those in Osaka were around 40–50%. These relatively low and limited capacities of the emergency power supply in offices in Tokyo were thought to be because they were designed only to supply power for common spaces.

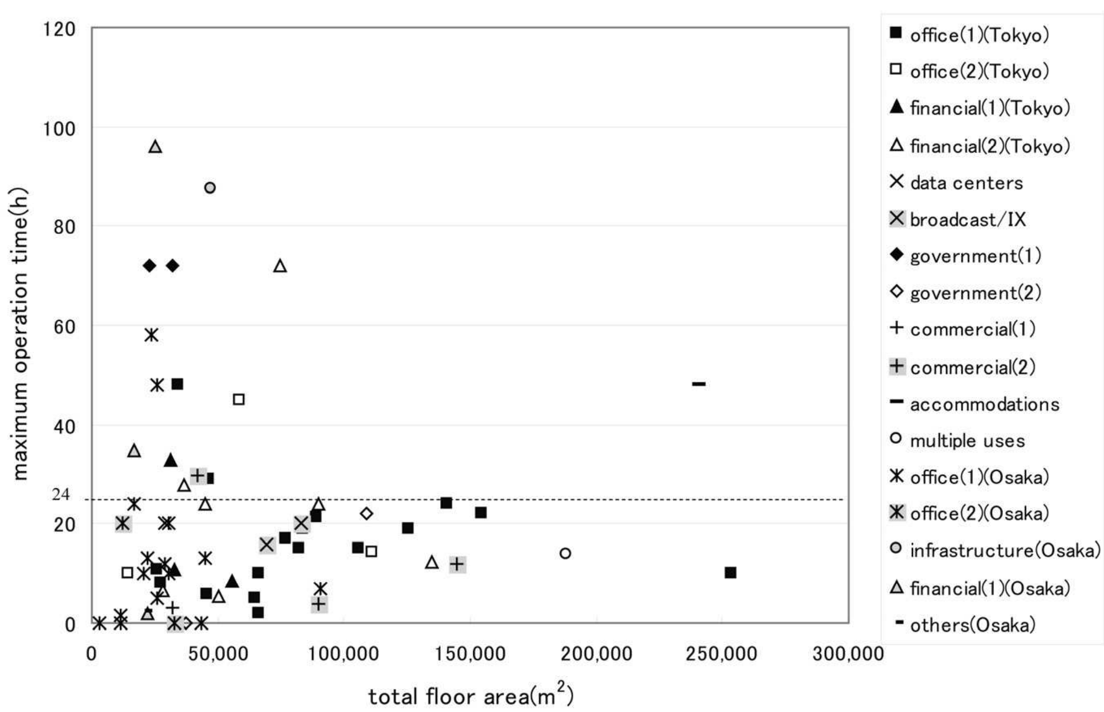


Fig. 4. Maximum operation time

The corporations with relatively large emergency power supply capacities of above 50% of contract demand and that have secured long maximum operating times on emergency power supply were disaster prevention facilities, buildings for infrastructure companies in Osaka, financial institutes in Osaka, and headquarters of financial institutes in Tokyo. Other facilities considered to be highly important also have relatively large capacities of over 50%. However, some important facilities, such as a data center located in the area around Tokyo station, had shorter maximum operation times despite the large percentage of emergency power supply in contract demand. In such cases, business continuity may not be possible if the electrical infrastructure is obstructed for over 24 h.

As just described, implementation of building continuity is strongly supported by managing the lifeline and securing continuity of energy infrastructure as the problem in the land area and the district, not only by individual companies, exceeding its manageable level.

6. Practicing scientific facility management based on measurement (Measures at the building level)

The practice of scientific facility management based on measurement is the key to the development of new systems and devices at both the building and city levels. The availability of measurement data related to various conditions of the building is very important.

As the problems related to addressing global warming are becoming more widely recognized in the civilian sector, thorough energy management in buildings and the availability of supportive information technology, such as BEMS (Building and Energy Management System), are becoming increasingly important. Appropriate evaluation of the current condition from the viewpoint of energy saving, appropriate performance validation at the operational phase (commissioning), benchmarking, and scientific and rational discussion related to the setting of appropriate target values become possible based on the measurement information obtained using technologies such as BEMS.

The maintenance of important building functions, such as business base and production base, in an emergency such as an earthquake or accident is required. Therefore, risk management and Business Continuity Plan are becoming increasingly important. To maintain the building function, a system to provide stable function is necessary in addition to construction measures, such as those discussed previously from the viewpoint of seismic reinforcement. The aggregation of information that is important for crisis management therefore is necessary for facility and building management. In the event of a disaster, it is important to have an accurate understanding of what has happened and the current condition at an early stage. Scientific facility management based on measurement is important even in an emergency. However, this is not yet recognized fully under current conditions. Especially, it should be noted that standard center monitoring systems currently in use cannot always obtain information necessary for crisis management.

Information management technology such as BEMS used in daily facility management will not only contribute to maintenance of room environment quality, but can also be effective for crisis management in an emergency from the viewpoint of scientific facility management based on measurement. It is desirable to promote the upgrading of center monitoring systems and aggregation/visualization of facility and building management information measures, as such technology will contribute to both the global environment and to disaster prevention.

6.1 Contribution to the global environment through appropriate facility management

Systems that provide information related to energy consumption and room environments can lead to appropriate energy saving and maintenance of room environment quality. To implement such environment management continuously, it is important to improve business continuously by repeating the four steps of the PDCA cycle (Plan, Do, Check, Act). For this, it is essential to obtain data indicating current conditions. Without such data, it is usually difficult to determine current problems. This prevents investigation of appropriate handling measures and makes it difficult to determinate the effectiveness of these measures after their implementation. As various measures are required for interior environmental control in buildings, such as task-ambient air conditioning and lighting, appropriate sensing functions and measurements are required. On the other hand, with such detailed support, it is predicted that both initial and running costs may increase. Therefore, it is important to develop cost-effective processes. It is necessary to determine the best solution in each case by comparing the economic effects of energy saving and increases in productivity, by calculating the initial costs and running costs. With such processes, the value and competitive advantage of the building will increase, which may strengthen the organization. Furthermore, the importance of facility management, which optimizes the methods of retention, implementation, maintenance, and conservation of the building and equipment, and the enhancement of cost-effectiveness are attracting attention not only in the private sector but also at the level of local governments, which own many public facilities. In addition to items related to energy and the environment, total information management related to failure, deterioration, repair history, and daily maintenance and conservation are also becoming increasingly important. In addition, new businesses in such fields are attracting attention.

6.2 Contribution of appropriate facility management to disaster prevention

The importance of enforcing monitoring and facility management to save energy by gathering and managing energy-related data from various devices and equipment has been widely discussed in relation to the requirement for measures to counteract global warming and to save energy. On the other hand, there is less emphasis on the significance of scientific measurement-based facility management in the event of an emergency.

Although the highest priorities in the event of an emergency are the protection of human life and buildings to minimize direct damage, it is also important to avoid indirect damage caused by building insufficiencies. It is vital to maintain various functions of the organization and to maintain buildings for business continuity in the event of an emergency to protect the damaged area as well as people's lives and to facilitate prompt recovery. Functions such as those of public companies, physical distribution companies, data centers, and banking facilities should be maintained because all of these are necessary for recovery after a disaster in addition to the functions of government buildings and hospitals, which will act as bases in disaster recovery efforts.

Three items are discussed below as guidelines regarding how to obtain and handle information to promote building risk management.

The first item involves the type of information to obtain. A Business Continuity Plan (BCP) is a plan to be established with the clear target that the important operation of an organization should not be stopped regardless of what events occur. That is, implementation of business continuity involves measures and management of people, goods, money, and information to avoid fatal conditions, even under critical conditions due to a disaster or accident. It is important to maintain building function, as buildings are important resources used for business and production. Examples of clear targets would be that the data center in this area should remain active under all circumstances, or the function of the important business area and the server room on the 7th floor of the headquarters building should be maintained at all costs. It is questionable whether the building side can fulfill such requests from the viewpoint of the continuity of the organization or clear requests from the viewpoint of society or users.

Therefore, when an especially important work area is set as the target of a Business Continuity Plan, it is necessary to investigate, select, and systematically arrange the functions within the area that require continuous operation, the equipment required to support these functions, and related information to understand the conditions and operating situations of the equipment. It is desirable to aggregate the information necessary to achieve continuous function of an important workspace in an integrated manner in a central monitoring system. However, the information necessary for the BCP cannot be obtained using only the information obtained by normal central monitoring.

As the conditions differ among buildings, actions should be started from arrangement and confirmation of the following:

i. Information regarding operation conditions and quantities are controlled in real-time in the central monitoring system;
ii. Information regarding abnormal values are controlled in the central monitoring system;
iii. Information that is not currently controlled in the central monitoring system but is suitable for such monitoring on future segmentalization of measurement points to save energy in the future;
iv. Information that is the target of new sensor development in future and the target of monitoring by application of sensor technology in the construction field.

As conditions differ according to the usage and scale of the building, it is necessary to select information carefully at each site and to confirm how to respond to each request from the user.

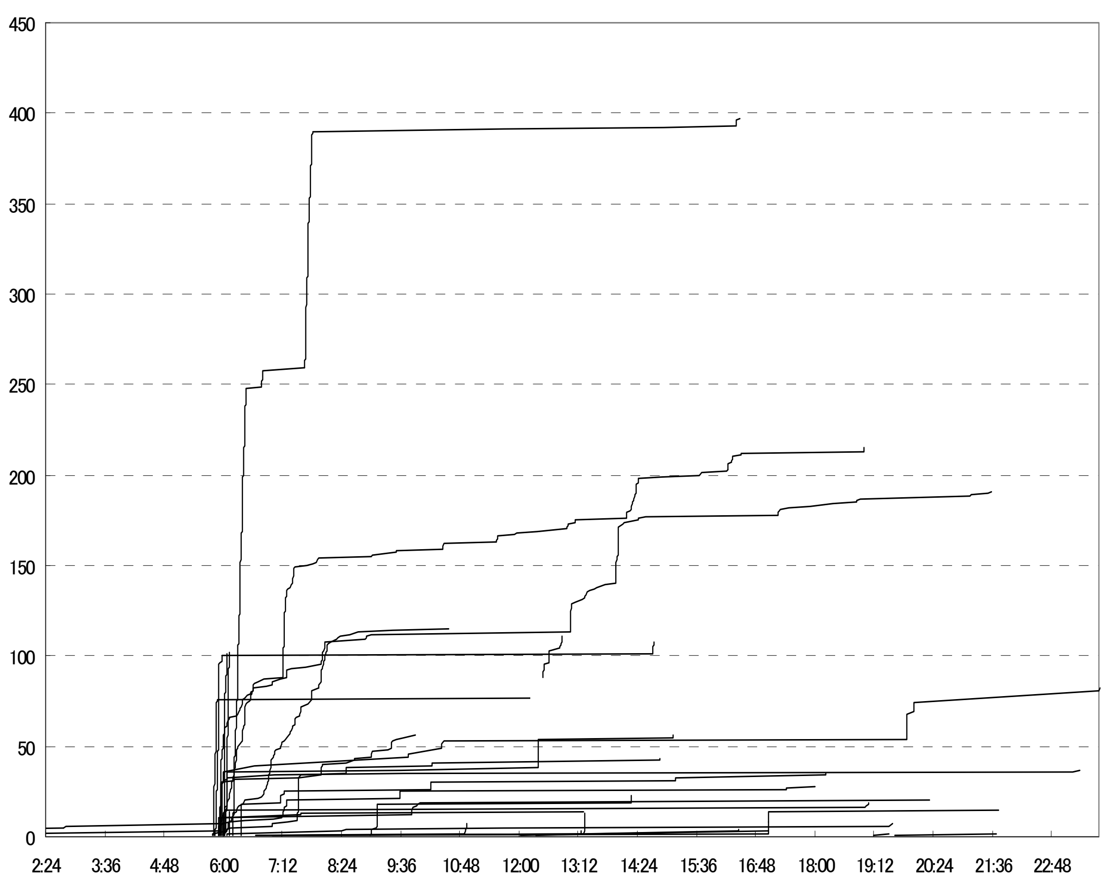


Fig. 5. Relation between amount of information in the log file of the central monitoring system and the occurrence time in the Great Hanshin-Awaji Earthquake

The second item is related to how information should be obtained and managed. (See Yukihiro MASUDA (2009) for a more detailed discussion of this issue.) Investigations related to alarm information of the central monitoring system at the Great Hanshin-Awaji Earthquake and verification from the viewpoint of information management (obtaining, utilizing, and recording information) to accurately determine building condition in an emergency clarified several points as follows.

In the event of a large widespread disaster, various abnormal conditions will occur in the building and a number of alarms will sound simultaneously, which may disrupt the person in charge. Fig. 5 shows the corresponding relations between the amounts of information from multiple buildings and the timing of the information issued by extracting alarm information from the log file, which is considered especially important to gain an understanding of the condition of the building in an emergency. As shown in Fig. 5, many alarms sounded around 5:46 a.m. when the Great Hanshin-Awaji Earthquake occurred. (Occurrence of many alarms)

Furthermore, a great deal of information was announced immediately after the disaster, and normal operation of the system could not be assured under conditions in which so much information flows into the central monitoring system at once.

Therefore, in this case, it was suggested that some information may have been dropped. Measures should be taken for emergency situations to ensure that information can be obtained and recorded securely even under abnormal conditions, such as an inrush of a huge amount of information at once. In addition, there are problems associated with controlling the time stamps of alarm information. The system that controls the timing of alarm information when the information enters the central monitoring system, the actual occurrence time of the alarm event, and the time stamp of the alarm information may not coincide in an emergency. Therefore, it should be noted that it is not possible to obtain full information to validate the event in an emergency in chronological order by simply verifying the log file of the central monitoring system.

The third item is related to handling the obtained information. If only the number of measurement points is increased to improve crisis management response capability, the amount of information produced would be huge. Therefore, it is important to prioritize necessary information by grading its importance to obtain the information required for continuous operation of the work space. Furthermore, a system to change such important information gathered every second into the information required by the user and to display it in an understandable way will be necessary, to act as an interface between building information and the person in charge. The development of such a system will allow the facility manager to survey the information of the whole building at once, which in turn will facilitate decision making.

At the same time, it will be necessary to train personnel as highly competent facility managers, capable of handling such issues as maintenance of the effectiveness and safety of the building function based on scientific measurement. It is also important to strengthen cooperation between the disaster countermeasures office, priority operation area, maintenance control operation contractors, security contractors, etc., to achieve unified facility management in an emergency.

Finally, it is necessary to consider the cost-effectiveness of introduction of such crisis management measures. In the event of an earthquake, it takes time to determine whether there has been any damage to the building itself and any equipment it may contain, and therefore it takes some time until function can be restored. On the other hand, the person in

charge may tend to escape at once from the area before the extent of the damage is known. Figure 6 shows the time course from the time at which the disaster occurred until restarting work, indicating the availability and degree of operation of the building on a vertical scale. If no measures are taken, the degree of operation becomes zero as soon as a disaster occurs and restoration takes a long time. However, if measures are taken to continue building function, the degree of operation does not drop to zero even in the event of a disaster, and the time until restoration of full function may be reduced. Costs related to disaster prevention are likely to be considered as expensive outlays. However, cost-effectiveness is an important consideration; it should be emphasized that disaster prevention measures can yield significant returns on investment if necessary building function can be secured in the event of a disaster, allowing business to continue. Such approaches may lead to beneficial social investment in new construction. Based on this background, building performance capable of withstanding a disaster is now called resilience, which means the ability of the building to be restored to full capability from functional failure in the event of a disaster. This is expected to be used as a new performance index to measure the functional continuity capability of buildings or as a scale to evaluate the degree of building continuity.
To date, we have studied issues regarding means of obtaining and handling information necessary to promote future crisis management in buildings, and items that should be considered related to the direction of new system development and new performance evaluation indexes, as a guide for appropriate facility management in the event of an emergency.

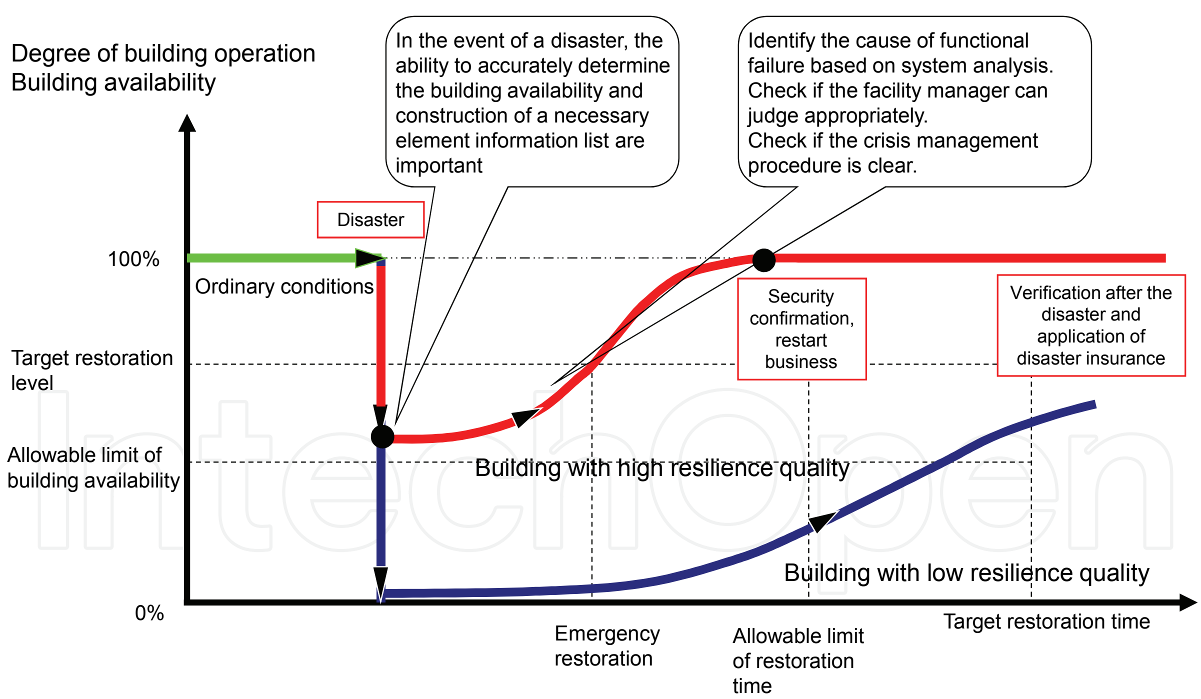


Fig. 6. Resilience of Building Continuity

6.3 Images of facility management in the future by visualizing information related to environment and disaster prevention

Finally, we will discuss the future of facility management by visualizing information related to the environment and disaster prevention promoting investigation in the redevelopment area of Tokyo, Japan. The area located in the center of Tokyo, is currently undergoing complex redevelopment combining high-rise housing, low-rise housing, commercial facilities, nursery schools, etc., in an area of 3 ha. This area has prioritized life continuity requirements of local residents. In this area, the living environment and local area community are highly valued, which is a very new type of city redevelopment. In such areas, the facility management system that can aggregate and visualize information related to the environment and disaster prevention in the area shown in Fig. 7 is now under consideration. With regard to system design, Fig. 7 shows the multi-monitor type system. Information such as energy consumption conditions, three-dimensional building information, event information in the area, and safety/watching aged person information can be displayed in addition to information monitored at the normal central monitoring system and disaster prevention center. Moreover, especially important information is aggregated and displayed in an emergency, and information regarding building availability and causes of functional failures will be displayed promptly and in an easy to understand manner.

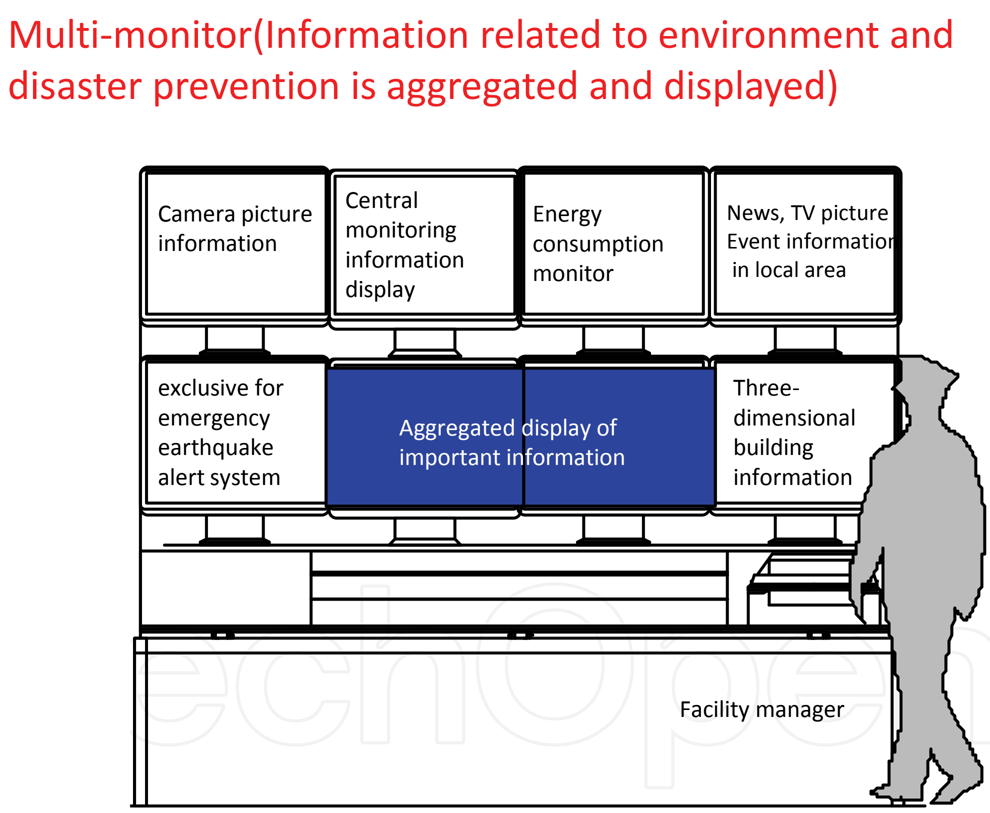


Fig. 7. Example of new facility management system visualizing information related to the environment and disaster prevention

Such systems may be set in the central monitoring room or disaster prevention center for the local area. Although great care should be taken in accessing and handling such information, energy consumption information and image information will also be displayed through monitors in public spaces and lobbies in the local area. Necessary information can also be accessed through the intranet at home. Such systems are intended to function as a platform to aggregate information regarding buildings and the local area. We plan to construct a new model to enhance quality of life and activity in local areas by aggregating various types of useful information for living and local businesses. It is necessary to comprehensively address various issues, including the environment, disaster prevention, and other related issues at the global level, rather than by restricting investigations of the environment or disaster prevention separately.

This concept will maximize cost-effectiveness in a synergistic manner, and will therefore increase the value of the local area. In the course of such investigations, issues related to the environment and disaster prevention, as well as other related issues, will be integrated.

7. Conclusion

Construction is an indispensable foundation for modern life and social activities. Needless to say, for people living and working in buildings, they can be considered as far more important and familiar than industrial products, such as electrical products and vehicles for common family use.

Each building is unique, and they have special positions as real estate, although the social value of buildings is not as well recognized as that of mass-produced goods. People in various positions in industries related to construction and in the academic community should make greater outreach efforts to reduce the distance between buildings and users. As discussed in this paper, information management and information supply will become increasingly important from the viewpoint of users of these buildings. In the future, systems to build a bridge between the user and the building with regard to both the environment and safety will be implemented as both hardware and software in new construction projects and equipment.

It will be very important to enhance building and district quality in the future global market with mature societies where high-level environmental characteristics and safety/security are required. Building and district quality may be enhanced through competition. Thus, the environment and disaster prevention will be considered as important added value of the buildings and district. This concept may upgrade the value of the buildings and district, and is expected to create a new assurance system and businesses utilizing data regarding buildings and district credibility as described in this paper. In this way, the reliability of buildings and district will be enhanced and increase in global market evaluation.

8. References

Munich Re Group: topics, ANNUAL REVIEW: NATURAL CATASTROPHES 2002, pp.32~39, 2003

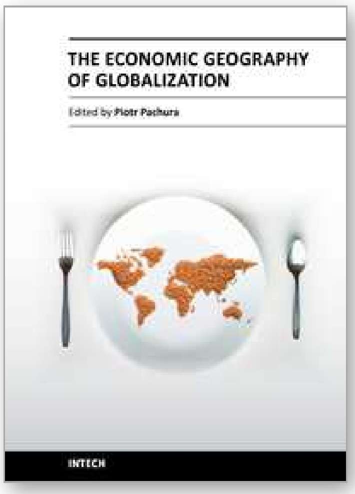
Munich Re Group: Knowledge series, Megacities – Megarisks, Trends and challenges for insurance and risk management. pp.40~42, pp.76~77, 2004

Yukihiro MASUDA, Eisuke HORI, Nobuyuki TAKAHASHI, Toshio OJIMA (2008). Research toward the development of Building Security Recorder, *5th International Symposium of Asia Institute of Urban Environment, Proceedings*, 2008.11, p.174-178

Yukihiro Masuda, Eisuke Hori, Nobuyuki Takahashi, Toshio Ojima (2009). Field Survey of the Emergency Power Supply related to Business Continuity. *Journal of Asian Architecture and Building Engineering*. vol.8, no.1, May 2009, p.259-266

Yukihiro Masuda (2009). Investigative Research on Warning Information from the Central Supervisory System in the Event of a Wide-area Disaster, Fundamental subjects for developing building forensics. *Journal of Environmental Engineering*. AIJ, No.644, 2009.10, p.1155-1161

Yukihiro MASUDA, Eisuke HORI, Hiroki KAWAI, Satoru SADOHARA, Kozo NAKAJIMA, Toshio OJIMA(2009). Disscussion about "A Natural Hazard Index for Megacities", *AIJ Journal of Technology and Design,* Vol.15, No.31. 2009.10. p.833-838



The Economic Geography of Globalization

Edited by Prof. Piotr Pachura

ISBN 978-953-307-502-0
Hard cover, 264 pages
Publisher InTech
Published online 27, July, 2011
Published in print edition July, 2011

Very often the process of globalization is referred the word economy evolution. Often we measure and study globalization in the economic relevance. The economy is possibly the most recognized dimension of globalization. That is why we see many new phenomena and processes on economic macro levels and economic sectoral horizons as well as on specific â€œgeography of globalizationâ€. The book The Economic Geography of Globalization consists of 13 chapters divided into two sections: Globalization and Macro Process and Globalization and Sectoral Process. The Authors of respective chapters represent the great diversity of disciplines and methodological approaches as well as a variety of academic culture. This book is a valuable contribution and it will certainly be appreciated by a global community of scholars.