Building Information System Based on GIS Seamlessly Between Daily Operations and Disaster Operations

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ABSTRACT

The Great East Japan Earthquake occurred on March 11 2011. Tohoku region along the Pacific Ocean were severely damaged by the tsunami. Torrential and guerrilla rains have recently happened frequently and City of Uji, Kyoto caused damage on August 13 2013. City of Soma, Fukushima and City of Uji had big efforts regarding to supporting victims’ recovery by using spatial information and GIS. This paper describes lessons learned from efforts at disaster affected area and suggests generic strategy for building information system based on GIS seamlessly between daily operations and disaster operations, and introduces new challenges of city of Kitakyushu for society, Fukuoka using spatial information based on cloud computing network.

Introduction

The Great East Japan Earthquake occurred on March 11 2011. Tohoku region along the Pacific Ocean were severely damaged by the tsunami. Affected by the disaster area spread into a broad-based, became a national crisis. Torrential and guerrilla rains have recently happened frequently in Japan and City of Uji, Kyoto caused damage on August 13 2013. City of Soma, Fukushima and City of Uji had big efforts regarding to supporting victims’ recovery and various kind of disaster operations by using spatial information and GIS. These great efforts ware results of efforts from the usual. It means that we cannot implement new tools in disaster situation if we are not implementing daily operations by common tools. This paper describes lessons learned previous efforts at disaster affected area and suggests generic strategy for building information system based on GIS seamlessly between daily operations and disaster operations, and introduces new challenges for society of city of Kitakyushu, Fukuoka using cloud computing and spatial information.

Efforts with Spatial Information and GIS at Disaster Affected Area

Issuing damage certificates to victims was the most important concern of local responders because these certificates are as the basis for subsequent services. Damage assessments had to be traceable both from property tax IDs and from household and individual IDs because we must
identify victims as precisely as possible, find buildings that victims lived in when disaster occurs, and know damage building levels and recognize the type of relief victims are eligible to receive in recovery process. Because government restricts using or publishing core databases in daily situation on personal privacy, it means preventing direct connecting two core databases.

City of Soma, Fukushima was suffered severe damage by Tsunami on March 11 2011 and also had big influence by nuclear power plant accident. Especially, they had to implement disaster operations without various kinds of supports outside cities because they were affected by diffusion of radioactive material. In this situation, they implemented for themselves the issuing of damage certificates to victims by using spatial information and GIS [1]. The database for effective victim’s support was built and it contains only damage assessment results, but was linked to Property Tax and basic resident register databases. They have prepared linking to Property Tax and basic resident register databases for daily operation effectively. They almost could implement issuing of damage certificates to victims, but it spent much time how to process data errors and we developed an application to solve them as shown Figure 1. Figure 2 also shows the total number of accepting and publishing damage certificates. They used effectively spatial information and GIS not only the issuing of damage certificates, but also various kinds of disaster operations, such as decision making for mayor, land-use restriction, publication of survey results regarding to density and distribution of radioactive material and decision of the site for public housing for victims. Especially, they decided to restrict land-use of damage area by Tsunami first in others.

City of Uji, Kyoto caused damage by Torrential and guerrilla rains on August 13 2013. They also implemented the issuing of damage certificates to victims by using spatial information and GIS with research team and many responders used information processing for creating spatial information effectively for their disaster response. Figure 3 shows standardized information processing to create spatial data that City of Uji has introduced and they used for daily operations effectively[2]. In standardized information processing, first step was to determine common and cross-sectional address information based on core databases such as resident registry database and property tax. Local government responders input normalized address information and other items they needed using spreadsheets to automatically convert address information in Japanese to numeric address codes. Spreadsheet had drop-down lists to input address information in Japanese to avoid typing errors. Point data with location information (X,Y) and address code had to be prepared. Address matching was then implemented between spreadsheets and point data, so responders could create layers quickly and easily. Layers also connected core databases using
address codes. It costs too much to prepare highly accurate point data with address codes, so accuracy was set at about 70%. The information processing was utilized various kinds of disaster response for each section shown Figure 4. Figure 4 shows houses that disinfection has been completed after flooding.

New Challenges of City of Kitakyusyu for Society Utilizing Spatial Information

I could define system requirements above form lesson learned and tried creating practical example in cooperative with city of Kitakyushu, Fukuoka. City of Kitakyushu is secondly biggest city in Fukuoka prefecture, have about one million citizens. I introduce new challenges of city of Kitakyushu using cloud computing and spatial information. New challenges consist of 4 main goals and objectives to obtain building information system based on GIS seamlessly between daily operations and disaster operations bellow:

1. Introducing and management of the enterprise GIS
2. Building and management of the regional GIS community around cities
3. Implementing Government to Government (G to G) services using cloud computing
4. Implementing Government 2.0 by community participation proactive

These 4 main goals and objectives are focused daily operation, but once disaster occurs, these elements can have functions and frameworks to implement effective disaster response and management. City of Kitakyusyu has already introduced the enterprise GIS and utilizing information processing as I mentioned above. I describe the challenge for Gov2.0 in this paper [3]. Gov 2.0 is the adoption of Web 2.0 social platforms and tools inside government to help improve citizen engagement and collaboration between government and citizens. When disaster occurs, how citizens inform government various kind of disaster information for society? Many citizens complain claims for themselves, but there must be no sense to inform valuable information to government. Gov 2.0 by ICT is to rebuild community to the trend of the current time and it will be influenced when local society faces the situation in disaster. Japanese government strongly take care of citizens who raise the big voice “YES” or “NO”, but we recognize that they are minorities. We might have new collaboration with “Silent Majorities” who do not have the other or at least in favor of the most of things. Gov 2.0 is to build platform where many citizens can participate in ICT Platform. They will hope that they can contribute for society as long as their time is permitted. Figure 5 shows the platform named “Town Navigation INOU-Kun” derived from TADADAKA INOU who is geographical surveyor. “INU-Kun” is an application for search local information consisted of data from citizens, government and private sectors. A mobile version has the GPS function. This application is allied to application
of “Maps by Citizens“ in cloud computing network. “Maps by Citizens“ are prepared the data entry application that are many contents such as “Vending Machine of Soft Drink“, “Sightseeing Information “, “Sightseeing Information“, “Spot of "Firefly “and so on.

Figure 5 ICT Platform “Town Navigation INOU-Kun”

Figure 6 shows an application of “Our Story-Map”. Data from citizens are stored in cloud server and can be presented as shown Figure 5. Data entry in disaster situation is an extension of daily relationships between citizens and government.

Figure 6 “Our Story-Map” Application

Conclusions

This paper was shown the importance of building information system based on GIS seamlessly between daily operations and disaster operations thought cases of City of Soma, Uji. Especially, standardized information processing using point data and spreadsheets need not to implement emergency response and management effectively but also to implement daily operations effectively. New challenges of City of Kitakyusyu for society utilizing spatial information will be showed new framework between “Public Support”, “Mutual Support” and “Self Support”.

References

