CO-021

GEOGRAPHICAL PORTFOLIO MANAGEMENT FOR A STRATEGIC ENTERPRISE RISK MANAGEMENT

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1. Climate change and ERM (Enterprise Risk Management)

Climate change impacts on Japan and also on world wide recently. The days with maximum temperatures over 30 degree increased significantly, and the percentage of heavy rain in a year increase in Japan. Addition of this, Japan holds an unusual high risk of earthquake in the world as many researchers pointed out.

The natural disasters normally cause a huge damage in business circumstance. Companies should think about a safety of employees and should handle business issues such as their property damage, business interruption which are taken directly as considerable losses to their financial statement. Therefore personals in change of risk management, risk manager need to know and to estimate these damages to be occurred in future. We can't know when and how catastrophic disaster is occurred. So they should monitor their risks from data statistics; caracteristics of assets, exposures, losses information. And also they need analyze these statistics. With a result of analysis, they organize a recovery plan or more widely a business continuity plan: BCP. (*1)

In this paper, I suggest how manage a portfolio of corporate assets by a support of GIS tool: geographical portfolio management.

2. Information visualized

To review risks around a company, we need to collect varied data; geography, perils (windstorm, typhoon, flood, earthquake...), details of assets (contents and amounts, construction type, year of built, stories, etc.) and simulation results relating to estimated natural disasters. Risk manager, or more generally, analysts lead and understand what element(s) is important information by analysis with diver aspects. GIS as an observation tool gives a data geographically ordered and all diver data could be managed by layer. GIS permit us to see at once all information on the map. The cartographies present asset locations of company, and we understand it by an instant perception.

This method also permits us to communicate without language. Nowadays, company activities are developed often all over the world, or we find easily multi-national companies. Due to the multi-national business circumstance, we need in some cases many explanations to share company risks each other. Most of non-Japanese don't know naturally Japan geography. How we know many detail locations of exposure in non-resident county (even if we resident, we don't know many addresses where they are!). All detailed data should be useful once the analysts understand where they are located. At these points, GIS is useful to handle various categories of information in visible.

On the other hands, calculation such as a multidimensional statistic analysis is possible to study an impact of eventual losses to financial statement. We know that quantitative analysis from a data spreadsheet is a considerable method naturally, and results should be an output more accurate than a visualized analysis with GIS. Statistical calculation brings us an accurate “output” mathematically, and we see which risk is most important and urgent. But this output doesn’t tell us how we understand or how we interpret this output. A question isn’t what result could be obtained, but how should be provided a result (*2).

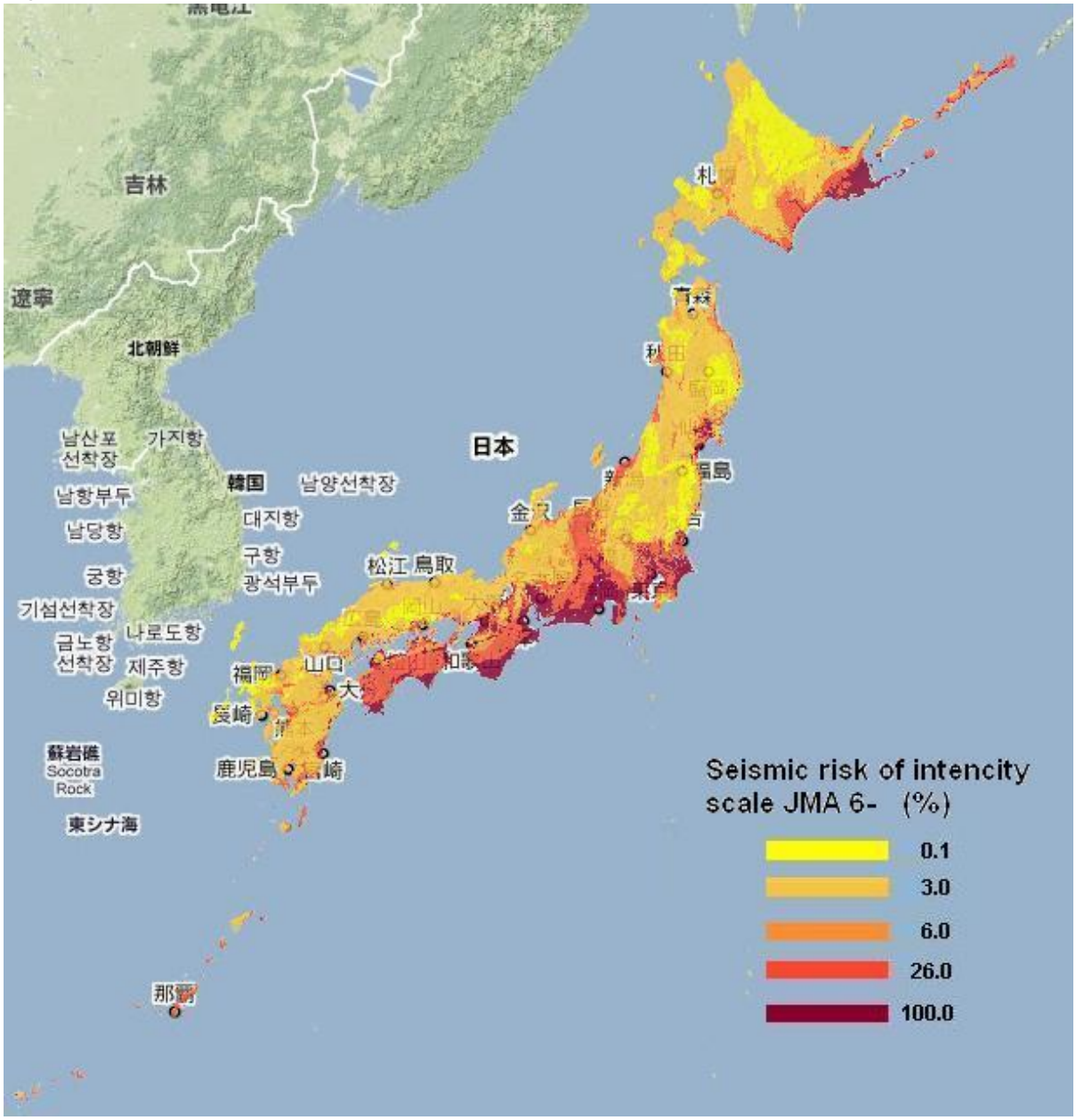
3. Mapping for an interpretation to understand in case for the earthquake risk in Japan

The Central Disaster Management Council: CDMC of Japanese government is a public organization to study the earthquake risk. And they recognizes that the earthquake risk is extremely high (*3). This is why Japan earthquake risk is focused as an example in this paper among other disasters; typhoon, snow, floods, etc.

The CDMC released already on web-site a hazard map: Figure 1. This shows a probabilistic seismic hazard map to be used for this paper (*4). The map shows different probabilities of seismic intensity 6-: six negative (*5) which would be caused by earthquake(s) within 30 years. The parts with dark red color mean that earthquake(s) of seismic intensity 6- would be occurred more than 26% of probability within 30 years in future. So, less earthquake resistant-buildings would be destroyed in these places. And, the parts in yellow color indicate more moderate probability than the parts in dark red. We see from Figure 1 high

risk of earthquake on the Pacific side (South-East side) of Japan, and in which area important cities or industrial areas are included, Tokyo, Osaka, Nagoya, Kobe.

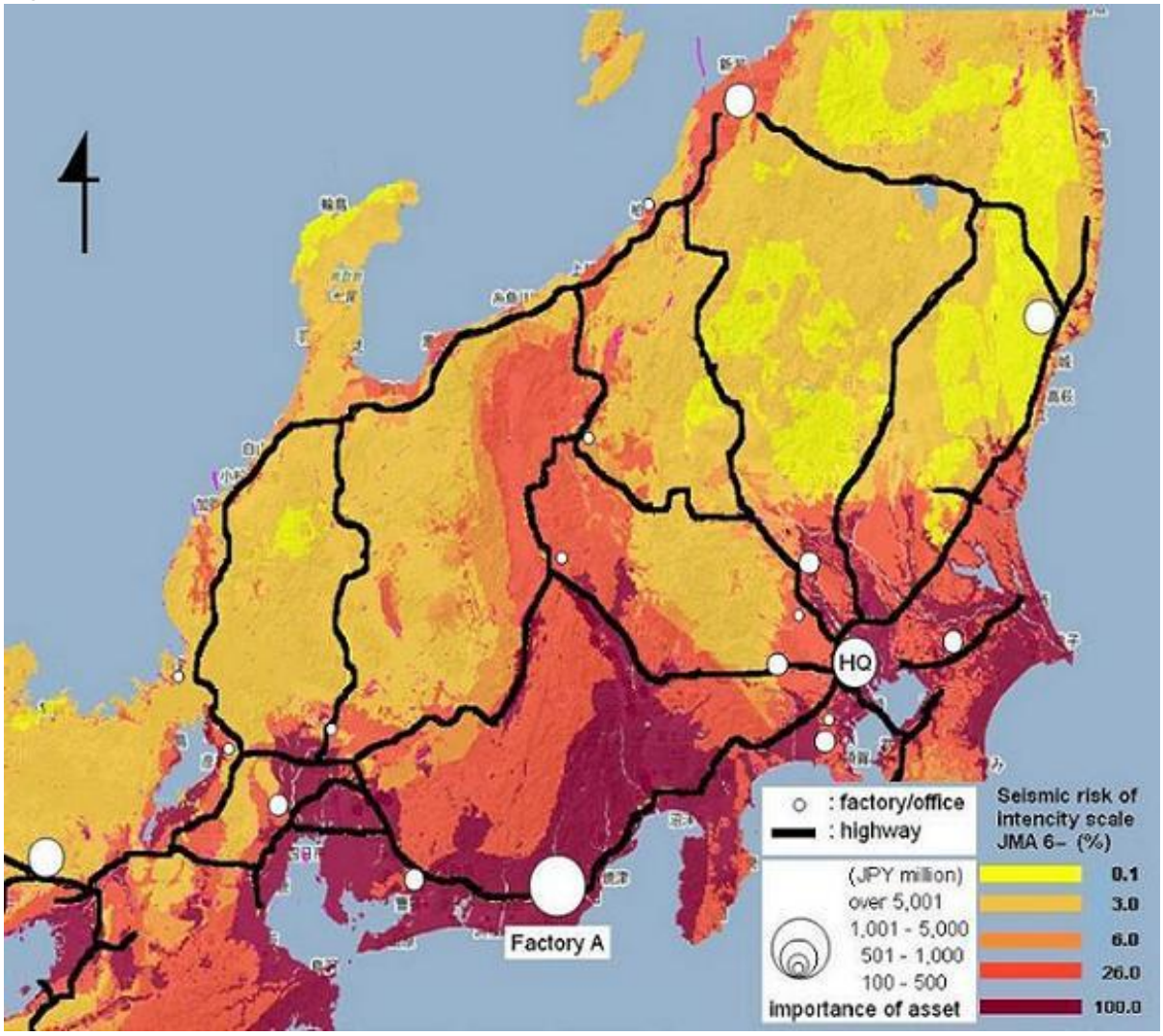
Figure 1



Now, a fabrication company is supposed here. This company develops mainly their business between Tokyo and Osaka. All information: seismic hazard map, highway map, location of factories/offices, values are integrated to visualize (Figure 2). From this mapping, observers could understand which factories or offices are important for this company from economic view and also which are exposed in high seismic risk area. Factory A is obviously a critical asset. The value is most important, and this factory on hazardous area of earthquake. Therefore the company could easily understand to take a necessary plan with which company recover their business as quickly as possible. A highway route along the coastline in south is the shortest route between Tokyo and Osaka. But this route located in areas where high seismic risks are observed (indicated by dark red in map). Then, this route would not be an appropriate one for the transport. At the same time, it would be easy to find an emergency alternative route by using north side highway route where seismic hazard shows lower probability. These kinds of information could be found promptly by every observer. It isn't matter if observer knows the geographic of Japan or not. This visualization permits all observers to have a homogeneous quality of decision making. As this example of mapping, it is possible to manage corporate risks by GIS; showing varied information at once and to giving to observers interpretations for a decision making without language issues. Through this example,

visualization of risk information shows their capability of analysis and its presentation. This visualizing might be a tool for a geographical portfolio management.

Figure 2



4. Historical simulation and real time observation

The mapping shows us essential elements from varied information layered by GIS; locations, assets, value, perils. It is normally too difficult to handle (receive, analyze, understand) these multi-information provided numerically by a spreadsheet which contain huge number of data. Because, it takes a time to lead all figures in the spreadsheet, and analyst need to integrate in their mind relations between each figures (In case of the example above, if all data is provided by spreadsheet with figures, we need much more time to understand what relation is exist between "Address", "Highway Route" and "Hazard Area". It would be difficult to find an alternative emergency route at north side of Japan).

We could manage again more information by GIS. The perils; typhoon, snow, floods, etc are easily incorporated by layer. The data base for these kinds of natural disasters would be available to analyze. And so far, for companies developed in all over the world, this visualized analysis permit to understand for all employees multi-national. It would be required to have a communication tool such as GIS in actual business circumstance.

In this paper, the earthquake hazard map of CDMC provides us only a map of probability of seismic intensity 6- in next 30 years for all over Japan. But by a development of information technology, we also do simulate loss amounts with some important earthquake events for each location of company assets. The analyst could have loss simulation results for each earthquake event by event from all historical earthquake events and possible events to be occurred (*6). Analyst could estimate their eventual loss amount of the company more locally and in detail.

And, we also do simulate loss amounts caused by disasters for coming in real-time updating on web-base. Real-time updating tool would permit us to take a place necessary equipment counter to the disasters on time. Especially for typhoon or windstorm risks, if we are provided an estimated typhoon route in real-time based or in advance, the companies estimate their losses in detail before this typhoon comes (*7).

5. Development for future

For the future plan, this method would be applied to the insurance industry. As one of risk management, company normally arranges some insurance according to their risks. The insurance companies issue an insurance policy to the companies, and they cover eventual losses of companies. The insurance companies should handle their portfolio of exposures to be able to pay claims and to manage appropriate corporate operation of themselves. The insurance companies' issues are due to having a more widespread portfolio than any company, and due to an importance of insurance function. The insurance is considerable as a support of economy and society. Then the portfolio should be analyzed and monitored correctly and periodically.

Firstly, a key of management is the accumulation of risks. Increasing of insured clients at any one area impose a possibility on the insurance company to increasing of client loss amounts by just one event of disaster; earthquake, typhoon, flood, etc. There is no effect of portfolio in such cases. This aggregate loss impacts directory to the solvency of insurance companies. According to results of analysis, the insurance companies decide how much they retain the risk and how much exposure they arrange a reinsurance (*8).

Second point is for reinsurance companies. The major reinsurance companies develop their business with insurance companies in all over the world. Therefore, it is not evident that reinsurance company knows well all address of risk in the world. At this point, this visualized location information by GIS could be again useful. There is no need to explain in written.

For third point, this visualization method might support the underwriters for their underwriting risks to understand geographically an impact of new risk to their portfolio. When the underwriters have a new client, they could recognize an impact of new client's risk to their exist portfolio

This risk based map might show us a different value of land use with actual evaluation of land pricing. In future, this map would leads to develop a different economy indication for business circumstances.

*1. Business continuity planning (BCP) is a planning to recover the company counter to internal or external threats. And this provides also an effective prevention.

Federal Emergency Management Agency, U.S. Department of Homeland Security <http://www.fema.gov/about/org/ncp/coop/index.shtm>

Business Continuity Institute, UK <http://www.thebci.org/>

Small and Medium Enterprise Agency, Minister of Economy, Trade and Industry, Japan <http://www.chusho.meti.go.jp/keiei/antei/index.html>

*2. Jacques Bertin ; [1977] "La graphique et le traitement graphique de l'information" p11, p252.

*3. Central Disaster Management Council; http://www.cao.go.jp/en/importantcouncil.html

*4. The hazard map is provided in web-sit of J-SIS; http://www.j-shis.bosai.go.jp

*5. Seismic Intensity Scale is determined by the Japan Meteorological Agency. There are 10 scales according to strength of shaking on surface of the land. Therefore, this scale must be different with Magnitude which is used to understand a scale of earthquake energy underground. (Reference; http://www.jma.go.jp/jma/kishou/know/shindo/shindokai.html) Seismic intensity 6- could be described generally: difficult to stand, moving heavy furniture, can't be open doors, buildings and wall are damaged, non-quakeproof houses are collapsed, break of infrastructure (gas, electricity, water supplies), etc. The Great Hanshin Earthquake in 1995 was recorded as seismic intensity 7, for example.

*6. All earthquakes events are studied from historical earthquake data. We could find some service providers regarding natural disasters modeling such as RMS, EQE or AIR released simulation software of each.

*7. In some countries, a metrological institute provides any time the essential information on web site. Japan Meteorological Agency: JMA is for Japan. http://www.jma.go.jp/jma/indexe.html

*8. Reinsurance is insurance for insurance companies. The insurance company arranges normally reinsurance agreement with reinsurers with respect to the capital capacity and to the stabilization of portfolio.