Application of the risk management for industrial practice to control natural hazards

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Damage and loss by natural hazards is increasing due to climate change recently. However, establishing a comprehensive management tool to control the risk from natural hazards is challenging because areas affected by natural hazards are extensive and prediction of natural disaster occurrence has uncertainty. There have been efforts to improve risk management for natural hazards by new IT solution and geo-information platform; however, it used to contain fragmented information and sometimes fail to facilitate communication between decision maker and general public. Meanwhile, risk management tools and frameworks have been developed intensively in the industrial sector for decades. If we can systematically analyze such tools and use them for the management of natural disasters, it can be possible to minimize unwanted loss of people, property and environment. The objective of this study is to analysis the risk studies commonly used for the oil and gas industry, and to identify how it can be converted and applied as a tool to manage natural hazards. In general, risk studies for its management are classified into qualitative, semi-quantitative, and quantitative studies. To be more specific, there are examples of HAZID, HAZOP, SIL, QRA, and audits. HAZID is an abbreviation of Hazard Identification, and what natural hazards exist can be found through brainstorming in qualitative way based on a predefined check list. This is a useful tool to initiate discussion and to quickly convey information. HAZOP is a semi-quantitative study and can be helpful to identify the cause & effect scenario following each physical parameter with changes of guide words. This can be constructive method especially for seeking potential multi-hazard risk unidentified. SIL is an abbreviation of Safety Integrated Level, and it provides probability measurements of performance required for safety instrumented system to meet a risk reduction factor. This study can be applied to plan temporal monitoring activities to reduce risk below target level. Also, it can be used for checking flaw of engineering mitigation. The QRA is a systematic quantitative approach to estimating risk exposed to a study area. Determination of spatial criteria can be performed to avoid people and property exposed to higher risk than a tolerable level during regional planning. These studies can be organically connected to form a comprehensive management framework, and the results of analysis can be input data for the other studies. For instance, credible cause & effect scenarios from HAZOP study will be basis to conduct SIL and QRA studies. It can be a powerful tool to communicate with stakeholders when multidisciplinary party participate in the brainstorming meeting and reflect their opinion through the process. Written procedures and worksheet format can enhance cascading of information at the each stage of project life cycle to next. As a case study, the risk studies are applied for landslide risk management, and sample worksheets were presented. The analysis of this study can be useful information to improve the risk management for natural hazards enhancing systematic contexts and promoting communications.