

Research Highlights

Anticipating the Big One in The Philippines

Azul, Kristian M.

University of the Philippines Diliman

[Email: ce.kristianazul@gmail.com; kristian_up@yahoo.com]

Abstract: Metro Manila is the second most populous and the most densely populated region of the Philippines. As the ninth most populous metropolitan area in Asia and the fifth most populous urban area in the world, Metro Manila is exposed to multiple natural hazards such as earthquakes, floods, and typhoons. It is surrounded by active faults including the Marikina Valley Fault System. This paper is intended to study the JICA model 08, that is an earthquake generated by the West Valley Fault. A catastrophic devastated area is expected if the earthquake happens in the fault line where Metro Manila is located. Therefore, a proper design process includes building retrofitting and road design should be able to help in making sure that structures will not fall in a destructive manner. Current land use and urban plan/situation studies, including frequent awareness programs and drills can be used as well to better prepare for potential problems derived from the earthquake hazards for Metro Manila.

Keywords: Metro Manila, earthquake, West Valley Fault, high population.

INTRODUCTION

There is major threat that a big earthquake is expected to occur in the West Valley Fault (WVF) that passes through parts of Metro Manila, the national capital region of the Philippines. According to JICA (2004), two to four large surface-rupturing events have happened since 600 AD, based on trenching excavation surveys in the West Valley Fault and East Valley Fault. The recurrence interval is less than 500 years; if no earthquakes had occurred in the WVF since the 16th century, then it is very likely that the WVF is close to generating an earthquake again (JICA 2004). Among the models studied in JICA (2004) is model 08, that is an earthquake generated by the WVF. Based on the maps provided in the JICA final report, the WVF has three segments and model 08 with a magnitude of 7.2. With this in mind, a lot of effort is put into trying to address the problems it could pose, should it happen.

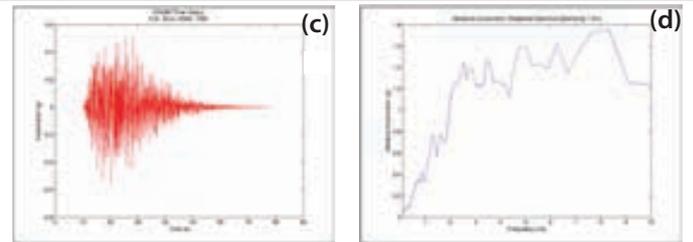
APPROACH

The areas immediately affected are the cities surrounding the fault. One of the main concerns is the effect on a highly populated Metro Manila which, being the national capital region of the country, has a lot of structures where many people live and work (JICA 2015). With their proximity to the fault, it is guaranteed that they will be the most affected by the vibrations from the earthquake; it puts all the structures at risk (Miura et al. 2008). As seen in Fig.2, the fault passes right through Metro Manila and will affect it severely. Expected effects on the areas are destruction of structures; outbreak of fires, injuries and deaths related to it; breakdown of communication lines and roads affecting inflow and outflow of help; and transport of items like relief goods, fire trucks to put out fires, ambulances to transport victims. The threat of an earthquake itself is not preventable. As we have no way to control the stresses built up on the faults, we have no control as to when it will rupture, resulting in an earthquake. The destruction of structures like buildings, roads, flyovers and the like can be minimized. A proper design process or retrofitting design should be able to help in making sure that structures will not fall in a destructive manner. Roads must be designed properly such that there is a big chance that it will still be available for use during a calamity, as evacuability of a city is a very important factor. The threats of fire hazard is minimizable too, if we make sure everyone knows how to properly store flammable materials. Also, the breakdown of communication lines; if the telephone and communication companies build their systems in a more earthquake-resistant manner such that, at the very least, a critical line of communication is still available.

However, there is much to be desired in a lot of studies like this since data needed for certain earthquake simulation methods are not easily available and are usually patterned after data available in other countries similar to the conditions present; as well as not being able to fully validate such studies since there are no records from previous earthquakes from the West Valley fault. A comprehensive study had been done by Japan International Cooperation Agency (JICA), Metropolitan Manila Development Authority (MMDA) and the Philippine Institute of Volcanology and Seismology (PHIVOLCS) back in 2004 where they studied several earthquake scenarios, and the effects of some of it and what can be done to prepare for these scenarios. They have identified possible casualties and amount of damages in the -



(a) Fig.1. Above is the map of the Philippines with the blue trace being the West Valley Fault. (b) Fig 2. The figure above shows the trace of the three segments of the West Valley Fault and markers for Metro Manila and the University of the Philippines Diliman (UP Diliman).



(c) An example of a time history of an earthquake from one of the many studies done using synthetic earthquake simulation based on parameters of the West Valley Fault. (d) An example of an acceleration response spectrum that is used by civil engineers to design structures against earthquake effects.

cities as well as plans for said scenarios. Research and studies in relation to the threats accompanying the earthquake are also being done such as earthquake studies to simulate the possible earthquake, possible methods to design structures against it, and an overall better understanding of earthquake phenomenon and effects. Current land use and urban plan/situation studies can be used as well to better prepare for potential problems. Aside from all these plans, it's important to do information drives and evacuation drills. The minimization of damage and casualties can only be achieved if the technology we use is appropriate, plans are well designed, and more importantly, the population knows what to do and cooperates. There have been several large earthquakes in the past years affecting highly populated places. We can study the responses and experiences of each of the governments and the places affected, so that we can apply it to the plans we are making and get ahead of the potential problems. An improvement in the plans made by others before is always better and will help us get the best possible results when the time comes.

REFERENCES

- Japan International Cooperation Agency (2004) Earthquake impact reduction study for Metropolitan Manila, Republic of the Philippines. Metropolitan Manila Development Authority (MMDA) and Philippine Institute of Volcanology and Seismology (PHIVOLCS).
- Japan International Cooperation Agency (2015) Country report Philippines: natural disaster risk assessment and area business continuity plan formulation for industrial agglomerated areas in the ASEAN Region. OYO International Corporation Mitsubishi Research Institute, Inc. CTI Engineering International Co., Ltd.
- Miura H, Midorikawa S, Fujimoto K, Pacheco B M, Yamanaka H (2008) Earthquake damage estimation in Metro Manila, Philippines based on seismic performance of buildings evaluated by local experts' judgements. Soil Dynamics and Earthquake Engineering 28 (10-11):764-777.