SH3/P19/ID165 – INCREMENTAL INTENSITY AMPLIFICATION RELATED TO GEOLOGICAL PROVINCES IN YOGYAKARTA SPECIAL PROVINCE, JAVA

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Earthquake hazard and risk in Indonesia has been conspicuous in recent years, dramatically brought into the public eye by the great tsunami earthquake (Acer 2004, 9.0 M_W), collapse of public buildings and hotels (Padang 2009, 7.5 M_W) and by extensive destruction of private dwellings caused by the relatively smaller magnitude Bantul, Yogyakarta 2006 (6.3 M_W) earthquake. The 2006 Bantul earthquake occurred on 27 May at 05.33a.m. (local time or 22.54 on the 26th UTC). Dwelling collapse rates reached 60% with over 60,000 houses destroyed, 5,700 fatalities and 37,000 injured, over 200,000 homeless and heavy damage at more than 300 school buildings. Yogyakarta has a history of strong earthquakes, for example, 10 June 1867, 27 September 1937 and 13 March 1981. It is also reported that a devastating eruption of Merapi was induced in 1006 by an earthquake similar to that of 2006. The Yogyakarta community is vulnerable to major geophysical hazards and a vital step towards community empowerment and resilience is the identification of disaster prone areas. This earthquake underlines the need for better understanding and simple display of the factors that may influence variations in strong ground shaking.

Earthquake strong ground shaking hazard is influenced by many factors. These obviously include earthquake size and proximity but also include more subtle influences, for example, predominant rock type, thickness of sedimentary cover and water table depth. These latter influences provide a means to map spatial variation of intensity enhancement attributable to spatially known and fixed geological features. The existing detailed geological mapping of Yogyakarta Special Province (YSP) is used to identify eight characteristic geological formations and further lithologic units. The early Miocene Nglanggran Formation (andesitic intrusion and basaltic lava) has high S-wave velocity and density, hence highest seismic impedance of the characteristic geological formations and is adopted as the reference unit. Following approaches attributable to Thomson and Evernden, intensity increments relative to the Nglanggran base level, for a uniform intensity field, are determined for all representative geologies. The results are collectively shown as a map of intensity increment relative to the igneous base

Nglanggran throughout the YSP. Results can be extended further to, for example, superimposition of expected increments onto a spatially non-uniform intensity field e.g. of a predicted isoseismal map, or to commensurate PGA maps.