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A Country-by-Country Building Inventory and a Building Vulnerability Index for use in different Natural Disaster applications

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The need for a worldwide building inventory has been seen for analysis of rapid losses from any natural disaster worldwide. A significant first step was made by PAGER in producing a global building inventory encompassing the World Housing Encyclopedia (WHE), research studies, some census data and some United Nations data in 87 HAZUS classes for residential and non-residential inventories.

In this study, a country-by-country global building inventory has been produced for 244 nations using individual country studies. The global building inventory produced presents a new advancement for the rapid estimation of socio-economic losses as more accurate estimates are possible using a building inventory based on first-order building typologies for each country than building inventories based with regionalized assumptions as in PAGER.

Over 1500 individual census reports and statistical yearbooks from over 200 countries were audited, with a review of possible parameters to be used for building inventories as per the OPAL project. In addition, demographic and health surveys, WHE-PAGER reports, United Nations data, individual government reports, energy building stock reports and many other sources were utilized on a country-by-country basis to create an urban and rural building inventory.

Parameters in the residential building database include building typologies (houses, apartments, single family and multi-family living arrangements, etc.), wall and roof type (in terms of HAZUS classes), age of the buildings (8 classes of year ranges), number of floors, number of rooms, building quality, number of buildings, building cost data and household size (occupancy). From the census dataset survey alone, 157 countries contain wall type information and 118 countries contain roof type information. The building typologies were classed into the same 87 HAZUS classes as in PAGER.

The urban building inventory shows that a majority of 1.2 billion out of 3.45 billion worldwide urban population (or 44.2%) are living in various adobe, mud and brick buildings; 837 million people (or 30.8%) in concrete typologies; and the remainder in wood (15.9%), stone (3.6%), steel (3.3%) and other mobile homes and makeshift inferior building types (2.2%). In rural settings, more adobe/brick and wood are used.

The relative urban and rural population of each country from 1900-2011 has been compiled from a combination of sources including the CIA Factbook, UN Census Round information and other population estimation sources (CIESIN, worldgazetteer and urbaninfo). In addition, the labour force statistics produced in CATDAT from a combination of World Bank and UN information were incorporated.

A general building practice factor has been created using a combination of socio-economic indices such as corruption, relative income and other parameters. For earthquakes, a review of the various seismic resistant codes around the world has been undertaken and these have been subjectively ranked in comparison to the relative hazard of a particular country. At least 150 countries (out of 244) have some form of seismic resistant code (even if in many cases these are not enforced). A case study has also been undertaken for the entire Asia-Pacific region in terms of a physical and socio-economic risk index for floods and earthquakes using this building inventory and other socio-economic indicator information. The results of these additional studies will be discussed.

This dataset provides a useful tool for rapid natural disaster loss estimation on a country level and a useful first step in country exposure as seen through the case studies. For detailed natural disaster analysis, further levels of regional data must be used, as various regional practices, economics, cultural influences and natural materials vary across a nation.