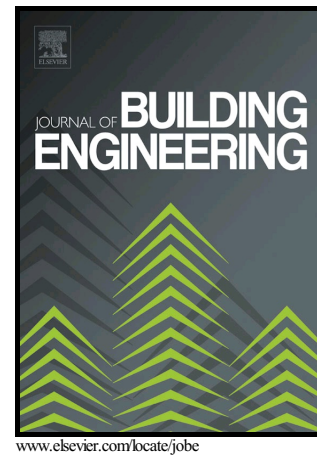


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PII: S2352-7102(16)30348-5
DOI: <http://dx.doi.org/10.1016/j.job.2017.11.022>
Reference: JOBE369

To appear in: *Journal of Building Engineering*

Received date: 4 December 2016
Revised date: 26 November 2017
Accepted date: 27 November 2017

Cite this article as: Dominik H. Lang, Amit Kumar, Sulaymon Sulaymanov and Abdelghani Meslem, Building Typology Classification and Earthquake Vulnerability Scale of Central and South Asian Building Stock, *Journal of Building Engineering*, <http://dx.doi.org/10.1016/j.job.2017.11.022>

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Building Typology Classification and Earthquake Vulnerability Scale of Central and South Asian Building Stock

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Abstract

The typology classification of any building is essential to understand its structural and architectural configuration, to empirically evaluate its vulnerability, or to provide the basis for creating a structural model and to analytically study its dynamic performance. A typology classification may help structural engineers, architects and urban planners to understand a building's behavior and response to any type of natural or man-made hazard as well as further assists in defining improvement techniques and long-term sustainable regional planning. The division of a building stock into distinct classes of building typologies and hence the definition of a thorough building classification scheme is a major prerequisite for any vulnerability or loss assessment study.

A building's typology largely depends upon the local geology and geography, climatic conditions, socio-economic status of the occupants or owners, and to a large extent the locally available construction skills as well as natural resources (with respect to construction materials). The type of natural hazards a region has experienced in the past may also influence its prevalent construction typologies, at least if these hazards frequently occur in a certain period of time. The introduction of new construction technologies, design codes and/or building byelaws have further implications on the question of which building typologies are prevalent in a certain region, given that these legal provisions are implemented in daily construction practice. Focusing on Central and South Asian conditions, large variations exist in above stated factors. The region the Disaster Risk Management Initiative programme (DRMI), led by the Aga Khan Development Network (AKDN), is focused on here comprises of the Central Asian countries Tajikistan and Kyrgyzstan as well as South Asian countries Afghanistan, India and Pakistan. As strong variations in the characteristics of a certain building typology may exist between different regions or even countries, the definition of building typology classes at a regional scale is a daunting task. The present article attempts to categorize the Central and South Asian building stock into a manageable number of regional building typologies based on extensive field studies in the different regions. It further includes a thorough review of the relevant building classification schemes, discusses empirical data collection, and defines the criteria for building classification. By reviewing the buildings' dynamic performances, a final building classification for the region and a customized visual screening-based vulnerability scale is presented.

Introduction

The categorization of buildings into distinct typology classes has become a major task for any earthquake loss estimation (ELE) study and should be preferably conducted at the study's very beginning. Defining a distinct number of building typology classes according to their expected vulnerability, i.e., damageability, during earthquake shaking definitely facilitates an easier conduct of ELE studies. The demand for building classification schemes in ELE stems from the fact that it is virtually impossible to consider each building with its individual structural and non-structural peculiarities for an area or region with hundreds, often thousands of individual buildings. Grouping buildings into a certain number of typology classes thus represents a compromise to allow a more manageable and efficient study while still maintaining the integrity of the study's results (Lang 2013). Another reason for this sort of categorization is to define a common terminology or taxonomy in order to document variations in building design and construction practices around the world (Brzev *et al.* 2012).

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