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Adverse effects of Matale ground subsidence in residential housing

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Since few years back, there have been several cases reported on construction failures and sink holes in Matale due to a possible gound subsidence. Villagers have been living with a belief of an under ground river flowing in some areas of Matale. National Building Research Organization (NBRO) has been consulted in investigating the existing siutation. Initially, some studies were done and it was evident that a geological phenomenon uncommon to Sri Lanka is present in the area. Primarily, a few possibilities for this situation, such as inappropriate construction technologies, presence of expansive soils, consolidation of soft clay layers and variaion of ground water table, collapse of mines and cavities, other factors such as vibration, chemical attack on foundation materials, soil softening, effect of nearby trees and other unidentified factors, etc. Expansive (soil) test results clealry indicated that the non-availability of expansive soils in the area contributing to this problematic situation is an unlikely possibility.

Garnet silimanite biotite gneiss and crystalline limestone are found to be major rock types in the said area confirming a karstic geomorphology with caverns spread in a vast area. With the help of drilling and tube well records, and geophysical survey results, hazard zonation mapping has been initiated. 2900 houses from 24 GN divisions were found to be affected in a risk scale from high to very low. A survey was carried among 89 housholds of severely affeced houses to investigate the extent of the damages and also to summarise civil engineering technologies and architectural designs adopted in their house construction. It was found that the construction basics had been overlooked due to lack of awareness among the residents in the said vulnerable area. Adverse effect of using marble in foundation construction was not clearly observed during the questionnaire survey. It is recommended to investigate it in further studies. Plinth beams are recommended since there is a very high percentage of houses having cracks in the foundations and walls which did not have plinth beams. Foundation is always to be constructed on a good soil having a high bearing capacity. Large burnt bricks do not have sufficient compressive strength and hence should be avoided in future constructions until a good quality in manufacturing is maintained. Tie beams and lintels should be included since the underground condition gives a problematic situation. Small-burnt bricks and a good mortar are recommended for the construction. Concreting of floor having more than 50 mm thickness is recommended. Prior to concreting, proper compaction of the ground or fill soil is required.

This paper summarises basic geology of the area, mapping procedure and neglected construction basics which are vital for house construction, especially in this kind of high risk area.

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