

## **ABSTRACT**

Keywords/key concepts: Dolomite, Dolomitic ground, Disaster Risk Management, Physical Vulnerability, Low-income settlements, Housing Policy, Services delivery, Responsibility, Living with risk, Human Behaviour, Basic Human Rights

Ground underlain by dolomite may be hazardous to development due to the potential occurrence of subsidence and sinkholes. These potentially disastrous occurrences are in many instances caused by human interaction with the soil through the ponding of water or leaking of wet infrastructure such as water and sanitation services. Construction materials and techniques, as well as effective maintenance of waterborne services have traditionally been acknowledged as having a significant bearing on the level of risk that communities face when living on such potentially dangerous land.

The spatial distribution of settlements on dolomite in the Gauteng City Region (GCR) is already widespread and expected to increase as urbanisation intensifies. Similarly, the challenge of considering the physical vulnerability of low-income settlements is expected to intensify. Well-defined procedures and guidelines govern the development of human settlements on dolomitic ground. However, the classification and characterisation of low-income and informal settlements are not as advanced as that of formal residential developments. In addition, the guidelines regarding management of settlements on dolomite focus significantly on geotechnical interventions, leaving a gap in the influence that human behaviour can play in possible disaster risk reduction on such ground.

The thesis considers the significance of different low-income settlement types on dolomite, relative to perceived human behaviour in association with principles of disaster risk reduction. It hypothesizes that an understanding of settlement type in relation to human behaviour and a stronger emphasis on monitoring via official channels could address some of the conflicts in the development-on-dolomite debate and thereby reduces settlement vulnerability. The research methods included quantitative and qualitative components, commencing with a literature review that spanned multiple disciplines and sectors. Fieldwork included spatial investigation and consideration of low-income settlement types with regard to, for example building material use, dwelling size and dwelling layout, and wet services infrastructure provision and location.

The thesis subsequently identify and explore low-income settlement types in the study area. The research explores a number of sample settlements to consider the physical vulnerability and potential key areas of intervention and risk reduction, outside of the traditional geotechnical arena. The evaluation then applies the Analytical Hierarchy Process (AHP), a form of Multi Criteria Analysis (MCA), to identify important variables and indicators related to human behaviour and the physical vulnerability of settlements on dolomite that can be harnessed to intervene in the debate, and possible improve the safety of communities living with this risk.

Although not affecting the research outcome directly, a specific observation during the course of engagement with specialists across disciplines was that experts in even closely related practice areas view low-income settlement development and upgrading on dolomite differently. The differences in viewpoints result in contradictions in approaches between housing officials, disaster managers, socio-environmental practitioners, engineers and geologists. Even small differences in approach have been shown to have significant effects on the practicalities surrounding decision making related to low-income settlements and especially informal settlement relocation or upgrading.

The outcome is a set of prioritised indicators that could enable specialists, officials and the public to consider different elements of low-income settlements based on its physical vulnerability. By focussing on the indicators most likely to result in reduced vulnerability, actions that drive settlement development, upgrade and resettlement could be prioritised. Interestingly, one of the findings of the research is that it is not so much the settlement type based on informality that makes a difference in the exposure to risk – physical vulnerability is deemed to be significantly affected by official (municipal-sphere) actions, monitoring and awareness. Finally, the research enables the integration of technical knowledge with behavioural considerations when living on dolomite, thus highlighting opportunities to bring technical and non-technically skilled stakeholders in the debate closer together.