A critical appraisal of regional geotechnical mapping in South Africa

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A critical appraisal of regional geotechnical mapping in South Africa

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SINOPSIS

Die behoefte na en die voorsiening van vinnige en akkurate ingenieursgeologiese inligting vir grootskaalse beplanning en ontwikkelingsdoeleindes, sal altyd bestaan. Die identifisering van land op 'n regionale skaal word derhalwe genoodsaak, ten einde aan die vereistes van 'n groeiende infrastruktuur en die ontwikkeling van huise oor groot areas te voldoen. Dit is dus belangrik om land te identifiseer wat geologies of geotegnies geskik is vir koste effektiewe dorpsontwikkeling, omgewings volhoubaar is, relatief vry van risiko's geassosieër met natuurlike rampe, asook van hulp sal wees in die soeke na konstruksie materiaal reserwes ten einde te voorkom dat sterilisering van hierdie hulpbronne sal plaasvind.

Die hoeveelheid en tipe van inligting benodig vir die prosessering van 'n ingenieursgeologiese kaart sal hoofsaaklik afhang van die doel, inhoud en skaal van die kaart. Regionale ingenieursgeologiese kaarte kan in terme van gebruik beskryf word as spesiaal of meervoudig. Waar spesiale gebruik kaarte verteenwoordigend is van inligting geevalueer in terme van 'n spesifieke komponent van ingenieursgeologie soos byvoorbeeld die graad van verwering van rots of 'n spesifieke behoefte, en algemene gebruik kaarte verteenwoordigend is van inligting wat voorsien word van 'n hele aantal aspekte van ingenieursgeologie vir 'n verskeidenheid van beplanning en ingenieurs gebruike.

Die akkuraatheid van inligting ingesamel, volgens die land faset benadering, vir regionale ingenieursgeologiese doeleindes, sal van die volgende faktore afhang: 1) Die skaal waarop inligting ingevorder is; 2) Die gekompliseerdheid van die karteringsterrein in terme van geologie en landvorme; 3) Die skaal van die kaart waarop inligting voorgestel word.

Faktore wat in ag geneem moet word gedurende regionale ingenieursgeologiese kartering, is gedefinieër en beskryf in terme van veld en laboratorium identifisering, as ook die implikasies wat verband hou met hierdie faktore. Die doel hiervan was om die verskillende klassifikasie sisteme voorheen en tans in gebruik in Suid Afrika, gebasseer op hierdie terrein evaluasie kriteria, beter te verstaan.

Die ontwikkeling van ingenieursgeologiese klassifikasie sisteme en hul geassosieërde voorstellings op 'n kaart, wat in gebruik is of gebruik word in Suid Afrika, asook die toepassing van hierdie verskillende sisteme, is hersien in terme van doel, klassifikasie en voorstelling van data. Die voorstelling van verskillende ingenieursgeologiese sisteme is met mekaar vergelyk deur gebruik te maak van dieselfde ortofoto (2528CD08). Nadat elke klassifikasie sisteem en die saamstel van elke sisteem op 'n kaart hersien is, was dit duidelik dat sisteme geklassifiseer kon word van baie eenvoudig tot baie kompleks. Geen klassifikasie sisteem kan beskou word as beter as 'n ander, weens die feit dat elk van hierdie sisteme vir 'n spesifieke doel ontwerp is. Alhoewel daar gedurende die toepassing en vergelyking van die verskillende geotegniese klassifikasie sisteme gevind is, dat die sisteem ontwikkel deur Partridge *et. al.* (1993) die mees eenvoudigste en praktiese metode bied vir die klassifikasie van 'n terrein vir beplanning en ontwikkelings doeleindes.

'n Sistematiese benadering word gevolg gedurende die gestandardiseerde prosedure en metode vir regionale ingenieursgeologies kartering en kan in die volgende fases verdeel word: 1) Lessenaar studie; 2) Verkenningsondersoek; 3) Veld kartering; 4) Uitvoering van laboratorium analises; 5) Samestelling van die ingenieursgeologiese kaart; 6) Die skryf van 'n verslag waarin die metodiek en die rede vir die spesifieke kaart uiteen gesit word, asook die beskrywing van toestande gevind gedurende die studie.

Spesiale verwysing word gemaak na die geotegniese klassifikasie sisteem ontwikkel deur Zawada (2000) vir die Raad vir Geowetenskappe. Hierdie sisteem is toegepas op die Rietvlei Dam 2528CD kaart, ten einde die toepaslikheid van hierdie sisteem vir gebruik as regionale ingenieursgeologiese kartering te bepaal. Daar kan verklaar word dat die klassifikasie sisteem voorgestel deur Zawada (2000) toegepas kon word vir regionale geotegniese kartering. Sekere tekortkominge is geidentifiseer gedurende die evaluasie en toepassing van die sisteem en aanbevelings word gemaak ten op sigte van veranderings wat moet plaasvind ten einde die geotegniese klassifikasie sisteem te vereenvoudig en meer gebruikersvriendelik te maak.

Bogenoemde veranderings aan die geotegniese klassifikasie sisteem ontwikkel deur Zwada (2000), het tot gevolg dat die sisteem meer vereenvoudig en verstaanbaar is. As ook voorsien die verandering op kaart meer nuttige inligting aan die ingenieursgeoloog, stads beplanner en/of ontwikkelaar. 'n Addisionele kaart gesoneer volgens ontwikkelings potensiaal vir omgewings sensitiewe areas is aangebring, ten einde dit moontlik te maak om dadelik goeie of swak areas te eien.

ABSTRACT

A need for the provision of rapid and accurate engineering geological information will always exist for broad planning and development purposes. The identification of land on a regional scale is necessary, to satisfy the growing demand for infrastructure and housing development over large areas. It is therefore important to identify land that is geologically or geotechnically suitable for cost effective urban development, environmentally sustainable, relatively risk free from natural hazards as well as to assist in targeting reserves of construction materials to prevent sterilisation.

The amount and type of information required to produce a geotechnical map, will depend on the purpose, content and scale of the map. Regional scale geotechnical maps can be divided into special purpose or general purpose maps. Special purpose maps refer to maps on which information is evaluated in terms of a specific purpose or only one aspect of engineering geology such as the weathering grade and general purpose maps are maps providing information on many aspects of engineering geology for a variety of planning and engineering purposes.

The accuracy of information for regional geotechnical purposes, based on the principals of the land facet approach will depend on the following factors: 1) The scale on which information has been gathered; 2) The complexity of the terrain mapped, in terms of geology and land form; and 3) The scale on which data is represented on map.

Factors that should be taken into consideration during regional geotechnical mapping are defined and explained in terms of the identification in the field and laboratory and the implications of these factors on development. This was done in order to understand the different classification systems previously and currently used in South Africa.

The development of geotechnical maps and their associated classification systems, previously and currently used in South Africa and the application of these different systems, was reviewed in terms of there purpose, classification and presentation of data. Orthophotograph 2528CD08 was used to represent all the different engineering

geological classification systems, which aided in comparing each system and the representation of information on a map. After revision of each classification system and the compilation of maps based on the associated classification systems, it was clear that these classifications systems range from simple to very complex. No classification system can be regarded as better than another, based on the fact that each of this classifications systems was designed for a specific purpose. Although it was found during the application and comparison of the different geotechnical classification systems, that the geotechnical classification system developed by Partridge *et. al.* (1993) was the most simplified and practical method to use for the classification of terrain for planning and development purposes.

The standardised methodology and procedures of regional geotechnical mapping proposed by the Council for Geoscience follows a systematical approach and can be divided into the following phases: 1) Data gathering or desk study; 2) Reconnaissance survey; 3) Field mapping; 4) Laboratory analysis; 5) Compilation of the engineering geological map; and 6) Report writing.

Special reference was made to the geotechnical classification system developed by Zawada (2000) of the Council for Geoscience and was applied to the Rietvlei Dam 2528CD map sheet in order to determine the applicability of this system for regional geotechnical mapping. It could be stated that the classification system proposed by Zawada (2000) can be applied to regional geotechnical mapping. Certain shortcomings were identified during the evaluation and application of the system and recommendations are given on how the system could be modified to simplify the geotechnical classification system and how to improve the utilization of the geotechnical map. After the above mentioned modifications to the geotechnical classification system of Zawada (2000), the system is much more simplified, understandable and provide more useful information. This map is now of use, not only to the engineering geologist but also to the town planner and/or developer, regarding poor and good areas for potential development (zonation map) and areas with environmental constraints.

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