

Geological reference model reliability variations according to study detail variability during the different design phases

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Abstract

The reference geological model (RGM) synthesises geological, structural, hydrogeological and geomorphological data of a definite lithosphere volume. The correspondence between what forecasted by the RGM and what effectively found determines the effective reliability of the model.

Reliability is a function of quality and quantity of data entered in the geological model, in addition to interpretation ability. Therefore RGM reliability, interpretation being equal, is directly proportional to the study and representation scale.

In civil works the geological model is always at the base of project choices and construction methods. Thus the reliability of the model can directly influence these choices and consequently provokes technical, economical and temporal effects.

Project choices and linked economical evaluation based on a geological model produced at a certain scale may result unreliable with respect to choices and evaluation based on a geological model produced at greater scale, without any significant technical mistake being made in the first case.

Design and construction choices and linked economical evaluation can be considered reliable if the reference geological model is simple or made of homogeneous and large geological elements that can be correctly described at small scale, and if the RGM has been produced following a coherent technical-scientific approach updated at the state of the art.

However, if the RGM is more complex and/or heterogeneous being equal the study scale, then the same design and construction choices might be much less reliable.

Therefore the study scale should vary together with the different project steps (preliminary, definitive, construction, detailed construction). The scale should be chosen as a function of model complexity to be described, and not following minima required by law in force.

Moreover, there can be borderline cases where the variability and heterogeneity of the Model are that large that even with great detail and scale studies the reliability is not satisfactory, and technical and economical consequences are difficult to forecast.

We will present a case study of RGM reliability varying with study scale, and technical-scientific consequences of this variation during planning and construction of some tunnels in Calabria, Italy (State road SS106 Ionica – Project DG21)