EGU22-7779, updated on 25 Aug 2022
https://doi.org/10.5194/egusphere-egu22-7779
EGU General Assembly 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

# The Rock Mass Quality Index (RQI): a quantitative tool for the quality evaluation of near-surface rock masses

**Enrico D'Addario**, Leonardo Disperati, Gianni Lombardi, and Lorenzo Marzini
University of Siena, DSFTA, Dipartimento di scienze Fisiche, delle Terra e dell'Ambiente, Siena, Italy
(enrico.daddario@unisi.it)

The knowledge of rock masses behaviour is an important information in various fields such as civil engineering, land use planning and hazard/risk zoning. Different rock mass classification methods, initially aimed at assisting underground excavations (Hoek, 2007), are widely used nowadays for preliminary design procedures (Bieniawski, 1989; Hoek, 2007), like the RMR (Bieniawski, 1976) and the Q (Barton et al., 1974) and their modifications. These methods incorporate geological, geomechanical and geometric parameters in order to obtain a quantitative estimation of the rock mass quality, but, on the other hand, their implementation is time-consuming. Despite the dominance of these two methods, further rock mass classifications systems have been proposed in the last decades and, among these, the Geological Strength Index (GSI) classification system is currently widely used as it allows to estimate the strength of rock mass through empirical semi-quantitative evaluation (Hoek, 1994; Cai et al., 2004), based on both rock mass structure and condition of the joints (Hoek et al., 1995). Estimating the GSI is straightforward and fast, but it comes at the cost of a certain degree of subjectivity. Moreover, the index does not adequately account for the lithology of the rock mass matrix. Hence, for the above reasons, these classification methods are not fully suitable to collect rock mass data over wide scale areas for engineering geological mapping. The Rock mass Quality Index (RQI, Disperati et al., 2016; Mammoliti et al., 2018) is a rock mass classification system developed for cartographic purposes and it is based on the systematic fieldwork measurement and processing of sets of the Schmidt hammer rebound values (R). Each representative rock mass outcrop is analysed by collecting ca. 20 R values at the 15-25 nodes of a regular grid conceived to investigate the typical features of the rock mass. This allows to perform statistical analyses and to calculate the RQI, a quantitative indicator of the global strength and quality of the rock mass. In the last decade, a dataset of ca 1100 outcrops sites spreading over a large area (ca. 12000 $km^2$) were acquired in Tuscany (Italy), according to different lithology, weathering, jointing conditions. The dataset consists of both RQI measurements and GSI estimations for the main different lithological groups (flysch, limestones, marls, magmatic rocks and schists) of the Northern Apennines (Italy), as well as the laboratory determinations of the Slake Durability Index (Id2; Franklin & Chandra, 1974) obtained by testing representative outcrop rock samples. The large dataset has allowed to analyse the correlation among RQI, GSI and Id2 and to perform an in-depth critical analysis of the relationships among RQI, lithology, rock mass structure, as well as the suitability of the RQI as reference index for engineering geological mapping of near-surface rock mass quality.