

## WP 7: Networking databases site and station characterization

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### Keywords

Site characterization, quality grading, standardization, performance of site condition proxies

### Figure

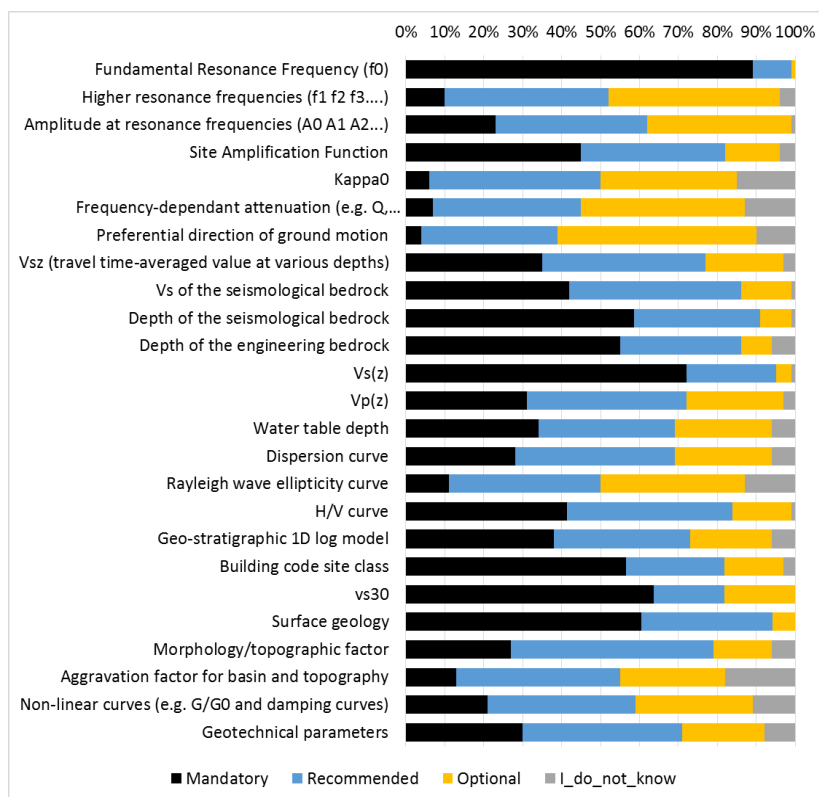


Figure 1. Results of an international questionnaire: importance ranking (mandatory, recommended, optional) of site condition indicators that should be indicated in site characterization databases

### Main Results

Seismic site characterization of rock and soil properties has a large impact on earthquake ground motions and engineering seismology, especially for the evaluation of local site amplification, calibration of strong-motion records and realistic shaking estimates at seismic stations, site-specific hazard assessment, estimation of ground motion models, and soil classification for building code applications. However, there is not yet a common way to exchange site characterization information, whereas setting-up standard practices and quality assessment are becoming very important to reach high-level metadata. WP5 networking activity is leading to the definition of a European strategy and standards for site characterization of seismic stations in Europe. Based on the results of an international online



questionnaire, we defined a list of indicators considered as mandatory for a reliable site characterization: fundamental resonance frequency, shear-wave velocity profile ( $V_s$ ), time-averaged  $V_s$  over the first 30 m, depth of seismological and engineering bedrocks, surface geology, EC8 soil class. We proposed a summary report for each indicator, containing the most significant background information of data acquisition and processing details, and a quality metrics scheme. This requires the evaluation of both (i) reliability of the site characterization indicators provided by different methods, and (ii) consistency among the indicators according to the current knowledge of the scientific community.

In addition, we have investigated the applicability, at a wide scale, of broad site condition indicators or proxies to correlate with measured local seismic amplification based on an extensive database comprising more than 1000 instrumented sites in Switzerland and Japan. Sensitivity of local amplification to the collected sets of site indicators highlight that proxies derived from in-situ geophysical measurements ( $f_0$ ,  $V_{s30}$ , etc.) perform better than parameters derived from local topography or geology. Furthermore, parameters derived from local geological models or databases generally show a stronger correlation with site amplification when compared to indicators from global models/databases. Prediction performance of various site condition parameter sets to predict frequency-dependent site amplification is assessed using neural networks. The most relevant direct proxy to predict local amplification over a wide frequency range is the quarter-wavelength parameter. Predictions based on  $V_{s30}$  only give satisfying results in intermediate frequency bands (1.67 – 6.66 Hz) while all direct site condition indicators except the quarter-wavelength parameters performs well in low and intermediate frequency bands ( $\leq 6.66$  Hz). For indirect proxies (topography, geology, etc.), the prediction performance at all frequency bands shows best results when using all information that is available. This study also clearly outlines the importance of common geological classification from maps with different origins and scales.

## List of Publications

- Riga, E., Ptilakis, K., Argyroudis, S., Fäh, D., Cultrera, G. & Cornou, C. 2019. Deliverable D7.1 Standard for site condition metadata, 27 pages
- Di Giulio, G., G. Cultrera, C. Cornou, P.-Y. Bard, B. Al Tfailly, 2019. Deliverable D7.2 - Best practice and quality assessment guidelines for site characterization, 75 pages
- Cornou, C., P.-Y. Bard, 2019. Deliverable D7.3 European strong ground motion characterization road map, 25 pages
- Bergamo, P., Hammer, C. & Fäh, D. 2019. Deliverable 7.4: Towards improvement of site condition indicators, 104 pages.

## Access to Data and Services

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