

Rational and efficient ground investigations for industrialised construction of new railways

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To complete a new Swedish railway line in a much shorter timeframe than today, alternatives to the traditional methods need to be explored. One option is the use of prefabricated concrete slabs elevated on piers, analogous to the concept used in China for building new railways in record time (He et al., 2017). The method has the advantage of directly tackling the barrier effects exhibited by traditional methods and can be built following an industrialized production process. But the pre-investigation process for such a method needs to be put into a Nordic perspective.

A new methodology is being developed to localize optimal pier locations, determine the foundation type in each location and to provide estimated uncertainties. The method relies on archived data migrated to a database within a GIS and Python environment with high potential for automation. A combination of machine learning techniques and analytical hierarchical process are used to get a first estimate of pillar locations, foundation types and uncertainty. If the database is insufficient, new data is gained and incorporated by the use of self-piloted UAV:s equipped with radar and piloted UAV:s equipped with an inductive EM device. The database can then be updated and further refined by ground-based geophysics. With this stepwise implementation, a drastic decrease in geotechnical ground surveys can be achieved (Baynes & Parry 2022) and decisions can be made continuously.

The predictive machine learning models of ground uncertainty and archaeological sites complements the method by providing a risk-based approach to the final decision-making process on pier locations prior to the geotechnical field campaign.

References

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