

Digital Data for Engineering Geology: Disaster or Benefit

Robert Hack

Section Engineering Geology
Centre for Technical Geosciences
International Institute for Aerospace Survey and
Earth Sciences (ITC)
Delft, The Netherlands

are digital data for engineering
geology

a disaster or a benefit ?

Before the digital times:

- nobody had much interest in the accuracy of data interpolation and interpretation (however, strange enough, accuracy of data was always regarded as important)
- nobody had much interest in the accuracy of geological maps

consequently for the average site investigation in engineering geology:

- accuracy geological model largely unknown
- accuracy of geotechnical model of the underground largely unknown

side effect:

nobody asked for the accuracy; the interpretation and modeling was done by hand and it was clear that calculating the accuracy was impossible

in the digital times:

- data interpolation and interpretation is regarded as of major importance
- consequently, the accuracy of geological maps and geological models become major topics

options to solve the accuracy problem:

more data

hence:

if modern digital modeling techniques are used it results for the average site investigation in more work and is more costly

are there benefits of the more
costly approach ?

not really

site investigations do not seem to become a
lot better if made with more data in a
computer model compared to the traditional
site investigations which are largely based
on geological interpretation

side effect:

**the clients (generally civil engineers)
start asking questions about
accuracy of the geological model:**

answer: it looks good !!

**this confirms then the existing ideas
about geo-fantasy
(and geologists in general)**

thus:

either:

more work and more costly

or:

we show that geological models cannot be justified mathematically and have to admit that often they largely depend on geological expertise

result: disaster

3D modeling totally useless in engineering geology ?

3D modeling techniques can only find a place in engineering geology if:

- the results are considerably better than the traditional hand-made interpretations and hence result in better site investigations (read: smaller site investigations) and lead to cost reduction for the total project
- have other benefits over traditional hand-made interpretations

still the accuracy problem:

mathematically justify geological model

and

quantify accuracy geological model

mathematically justify geological models

major task which is unlikely to be achieved
in due time

alternatively:

identify the expert knowledge which is
generally used for making a geological
model; store this in a database so that a
geological model can be referenced to a
general model rather than only the expertise
of a single geologist

quantify accuracy of geological model

if a widely accepted database exists the accuracy of the model can partly be referenced to the database (and is likely to be better accepted than just “it looks good”)

newly proposed project of Technical
University Delft, NITG, and ITC:

define expert knowledge in geology
and store this in a knowledge base
for use in interpretation of geology