Acquisition, Analysis and Advice on underground infrastructure
Our planet is extremely complex and continuously changing
And what does Fugro do?

Where

What

How
Access and understanding geo-data is the key to design, build & operate any structure

- Geophysical data
- Global positioning data
- Metocean data
- Geospatial data
- Geohazard data
- Geochemical data
- Geodynamic data
- Geotechnical data
Understanding the complexity of the earth is essential

Expertise from 200 tunnelling projects in 66 countries
The impact on bottom line project result

CONSTRUCTION PROJECTS UNDERPERFORMING

- Typically 10% contingency, little time to identify overall risk
- Subsurface has a large impact (up to 25% of project result)
- Global problem
- Low adoption rates of new technology
- New developments always under time pressure

SITE INVESTIGATION IMPROVEMENTS

- Pre-feed SI only 10% being used for RFQ, not re-used for final FEED
- Techniques used not optimal, split by procurement
- Improve scope, adjust scope or iterate
- Too little attention for dynamic ground component
- Sole focus on CPT/Drill logs, no full coverage (geophysics)
- Wrong interpretation or available information not fully utilized

KMPG Global Construction Survey 2015, Gupta/EC and Fookes
Factual data
Geotechnical site investigation
Scale  1 km tunnel →  1.8 mln m³ subsurface impact
hydrology is > 10 x
< 100 m³ soil volume investigated
Agile → Iteration and detail
  Field → Lab → Baseline report

Interpretations and advice: deal with known unknowns...

FEHMARNBELT
Submersed Tunnel, Germany
Dynamic ground behavior

- Independent data acquisition
- Intensive monitoring (1 bn. measurements / month)
- Soil structure interaction
- Validation of design assumptions
- Mitigate ground risk

"Gaia Insight allows us to get fast, real time insight at any wanted moment. In addition, insight is provided in the influence of our construction works on the adjacent environment. Literally at a glance, we can check and validate if we are in control."

Project Manager, Rotterdamse Baan.

Rotterdamsebaan
Bored Tunnel – The Hague
Actionable Intelligence

- The use of algorithms and decision support
- Real time risk register
- Factual reporting vs key decision KPIs
- Validation of design assumptions

“In the engineering for such works as tunnels, many variables, such as the degree of continuity of important strata or the pressure conditions in the water contained in the soils, remain unknown. Therefore, the results of computations are not more than working hypotheses, subject to confirmation or modification during construction.”

Karl von Terzaghi

Rotterdam CS
Kruisplein Parking and underground space
Our strategy is based on 3 objectives

1. Capture the upturn in Energy & Infrastructure
2. Differentiate by integrated digital solutions
3. Leverage core expertise in new growth markets
Differentiate through digital solutions = changing the way we work

Resulting in differentiating value propositions

DIGITAL
DIGITALLY TRANSFORMING FUGRO
Transforming the way we work

INTEGRATED
FUGRO DIGITAL FOUNDATION
Transforming our relationship with our clients

REMOTE OPERATIONS
ROBOTICS
AUTONOMOUS
ADVANCED ANALYTICS
CONNECTED DATA
CLIENT INTERFACES

ACQUISITION
ANALYSIS
ADVICE
SCALE

From detail  To 3D comprehensive overview
Next step

Digital platform, crowd sourcing and open development