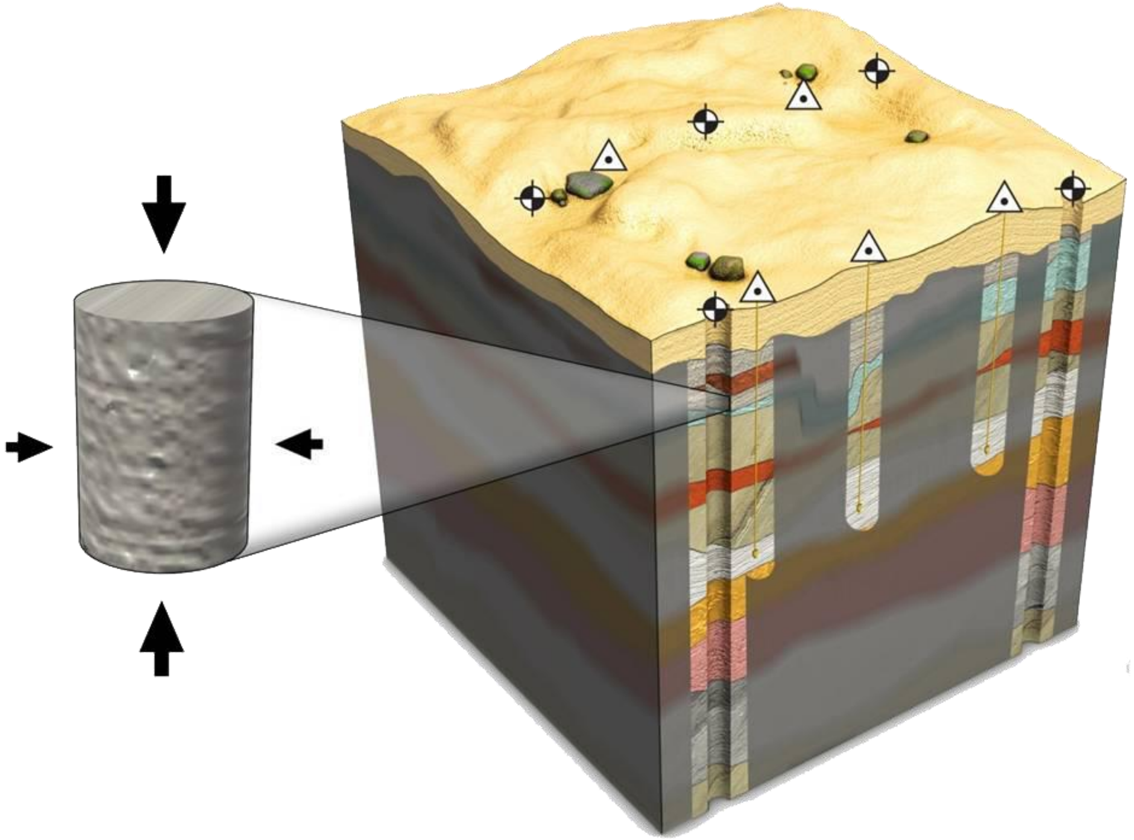
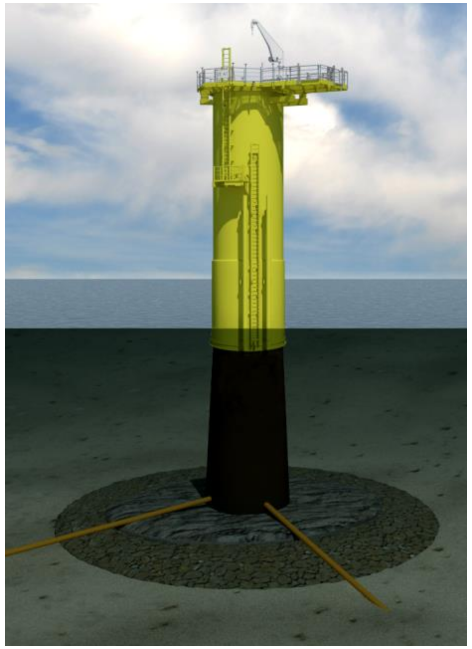


Geotechnical Characterisation for FEA

FEA-Based Design

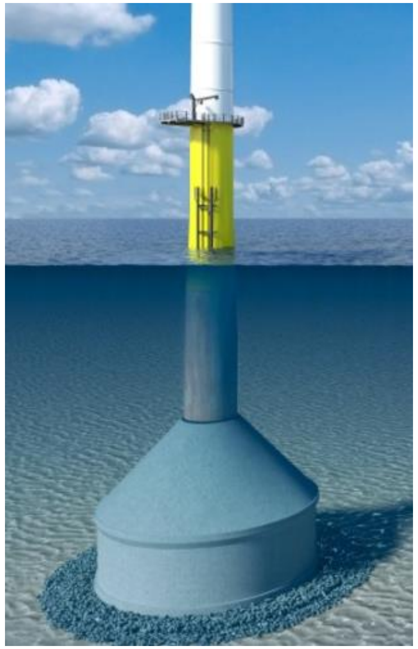
Benefits of FEA-based design for wind turbine foundations are well understood



Monopile

Suction Bucket Jacket

Mono Bucket

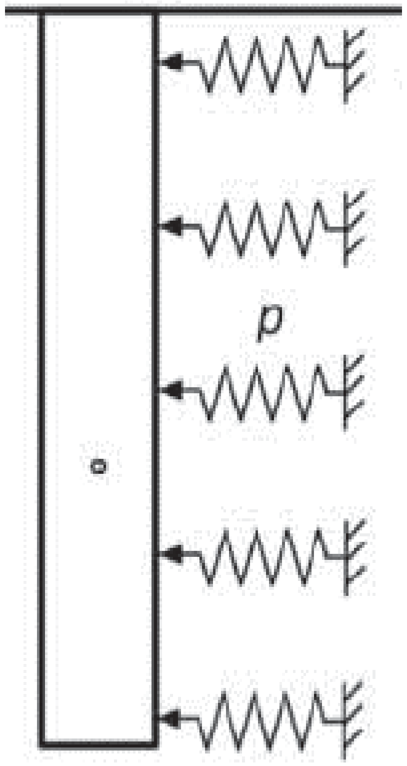


Monopile

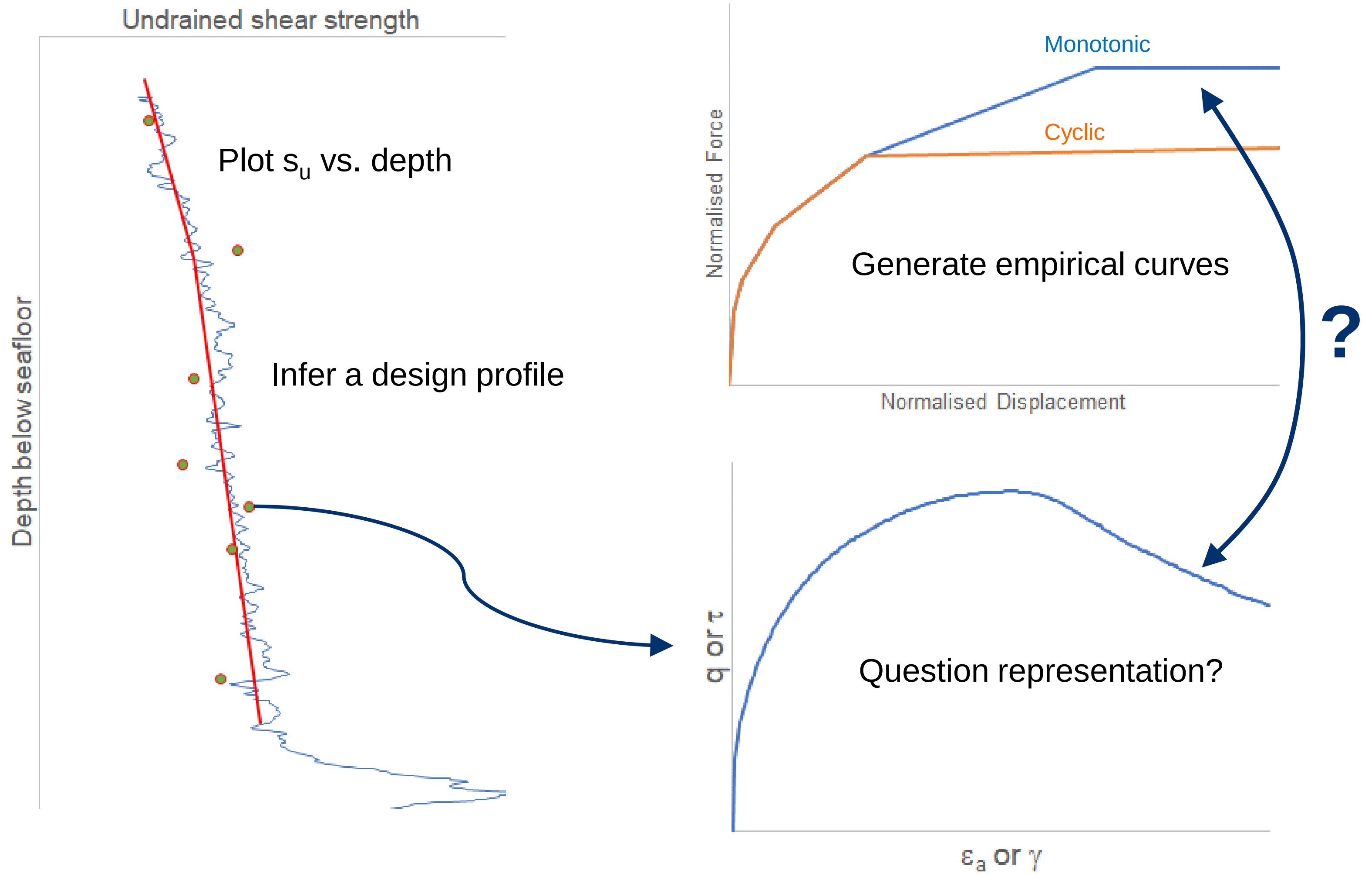
Is our approach to geotechnical characterisation effectively addressing FEA requirements?

FUGRO

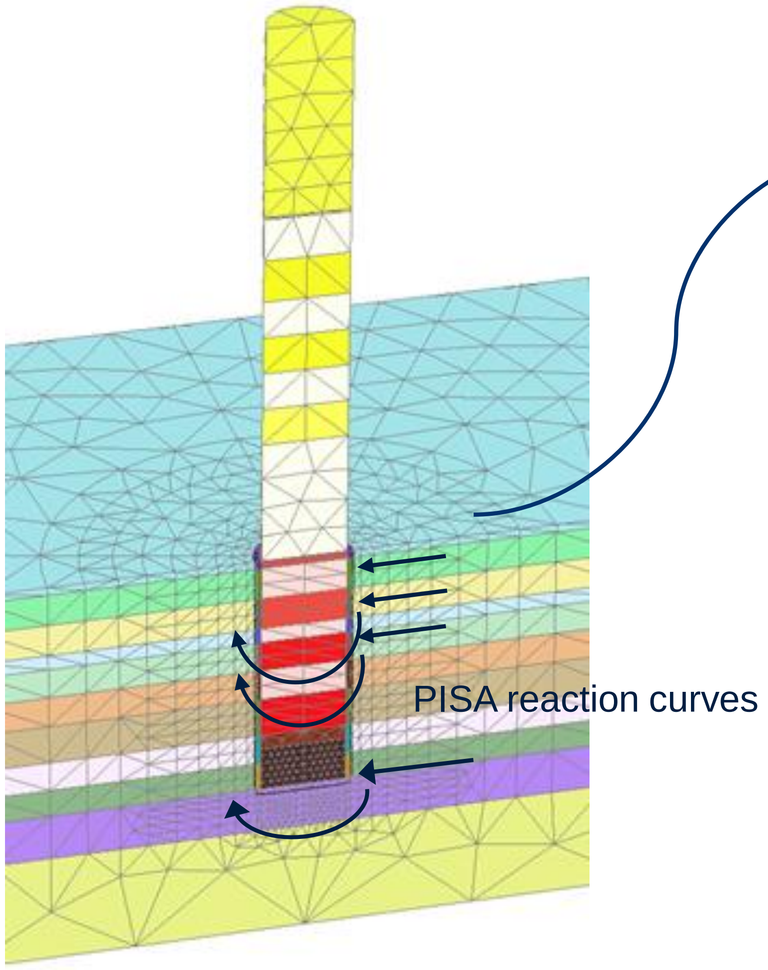
Characterisation Approach, Code-Based



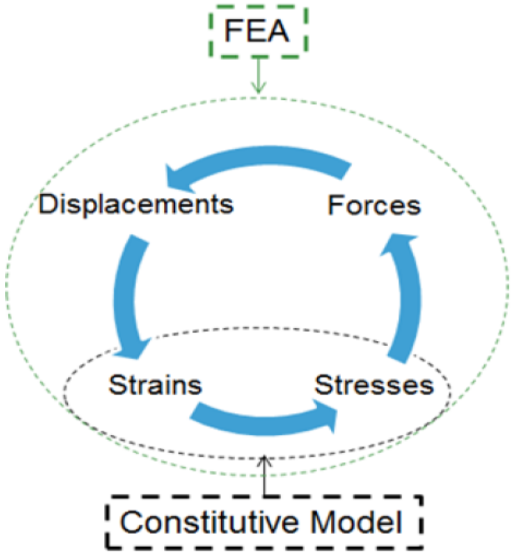
1D model

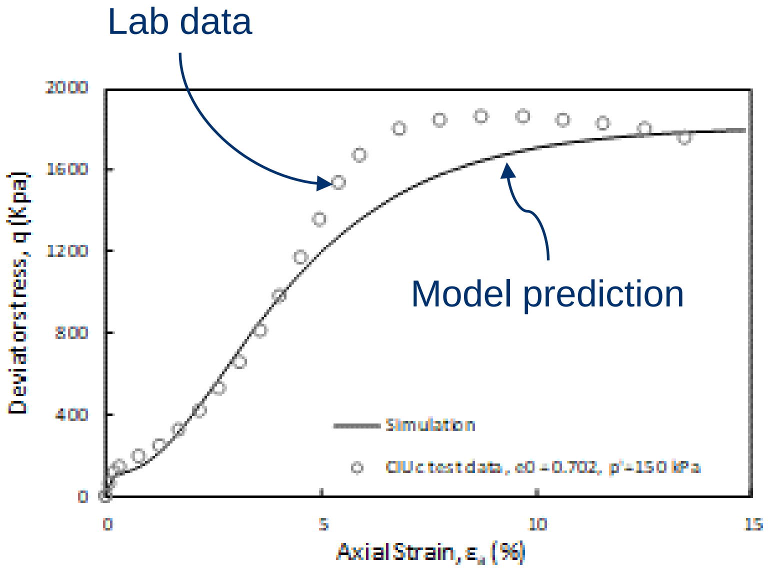


Characterisation Approach, FEA-Based



Every single element in the FEA model needs a response model





The constitutive model controls the response of the FEA prediction

Characterisation Requirements

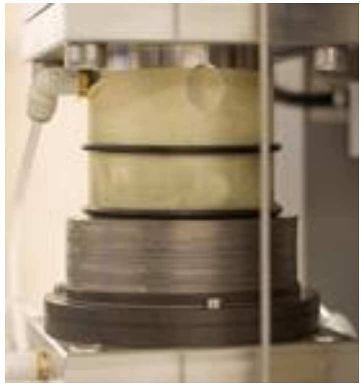
Code-Based (Clay)

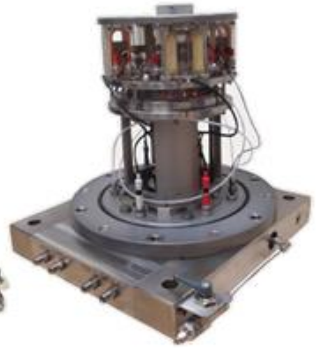
IN SITU	LABORATORY	PARAMETERS (3)
Cone Penetration Test	Density Determination	Unit Weight
	Triaxial Test (UU)	Undrained Shear Strength
		Strain Parameter e_{50}

FEA-Based (Clay)

IN SITU	LABORATORY	MODELS (No. PARAMS)
CPT	Classification	HV-MCC (15) SANICLAY-B (11) NGI-ADP (11) B-SCLAY1S (11) FUGRO-PIMS (6)
Seismic CPT	Triaxial undrained compression	
Pressuremeter	Triaxial undrained extension	
	Triaxial drained compression	
	Triaxial drained extension	
	Local strain + bender elements	
	Oedometer	
	Direct simple shear	
	Resonant column	

Laboratory Testing



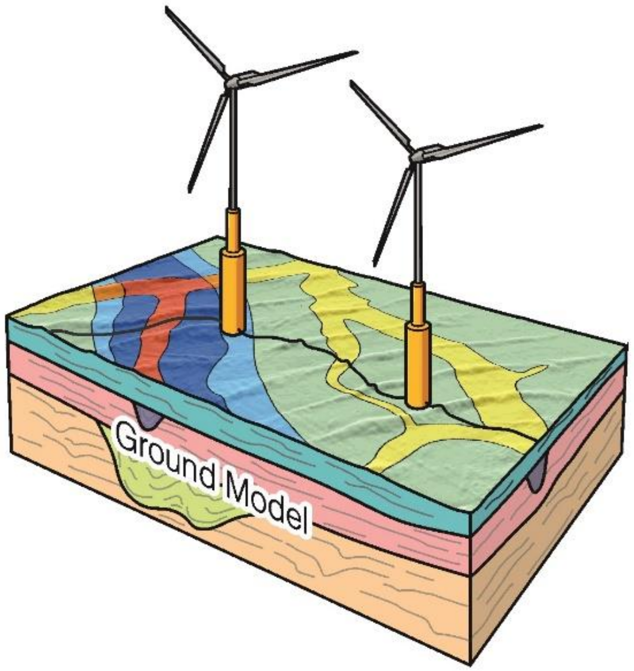


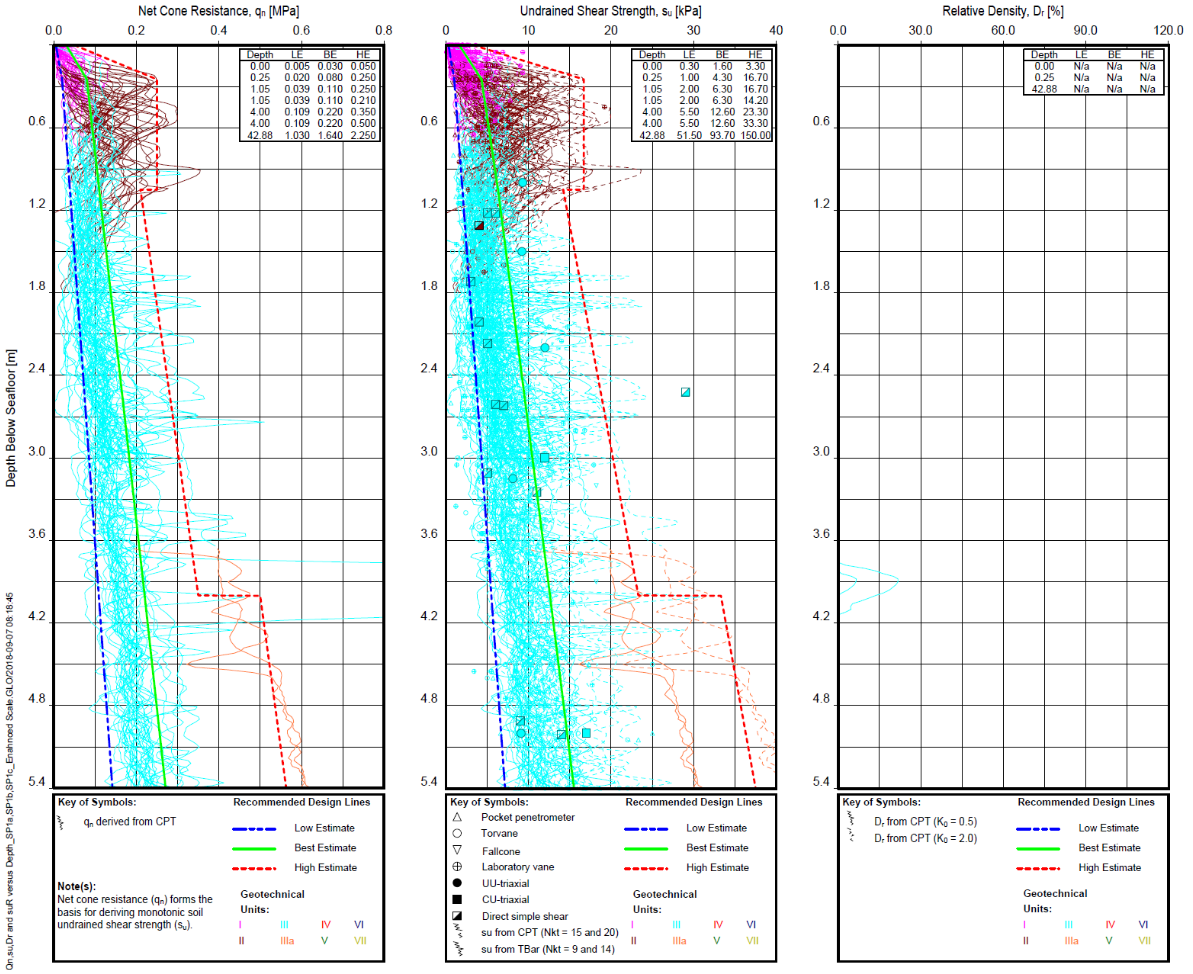
Laboratory testing provides the best dataset for constitutive model calibration, but

Laboratory testing must be scheduled with model(s) in mind

The Ground Model Approach

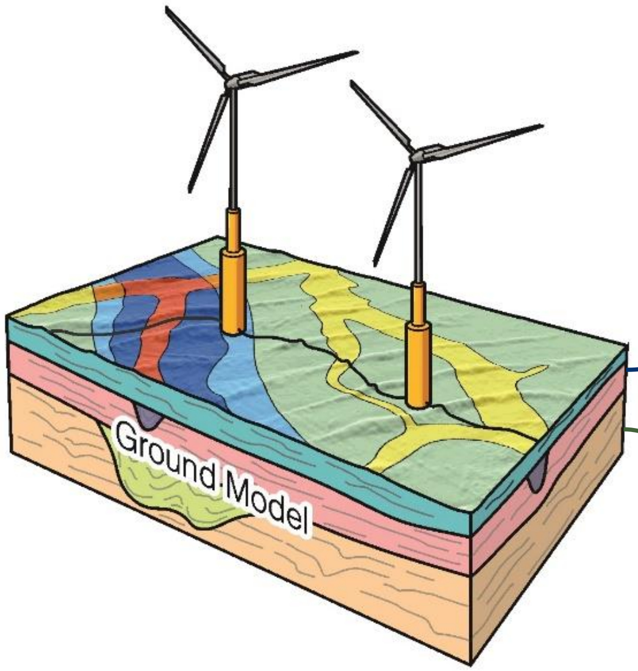
We're good at doing this:

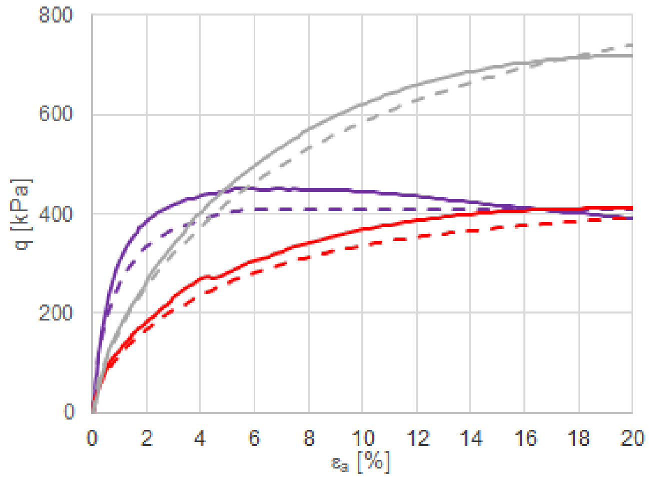


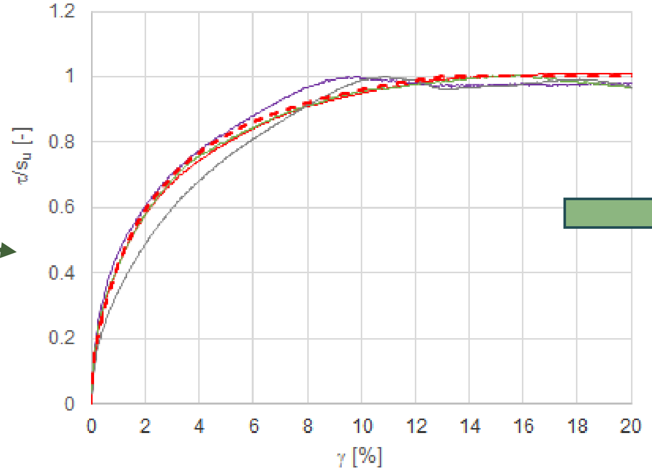


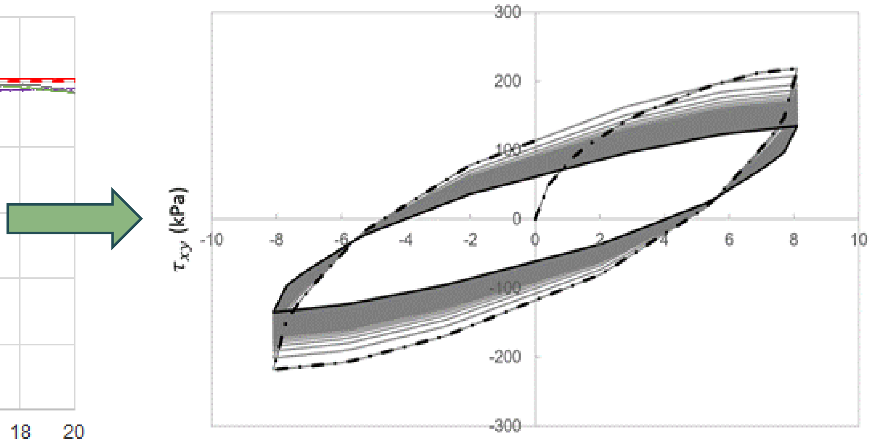
The FEA-Ground Model Approach

We need to start doing this:

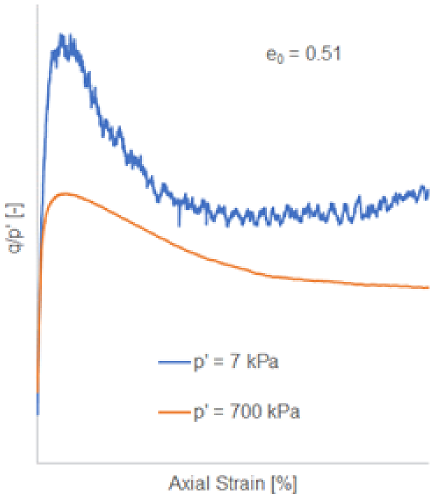






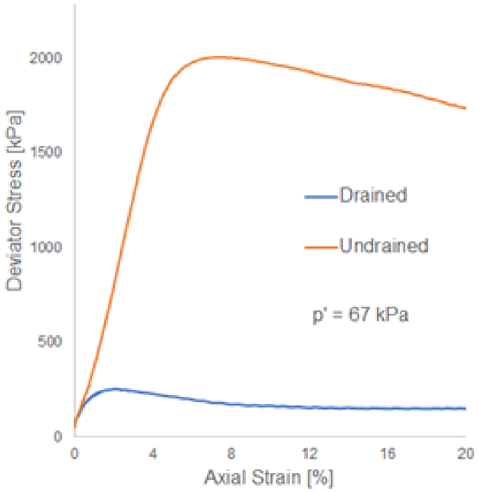


The Complexities of Soil Response



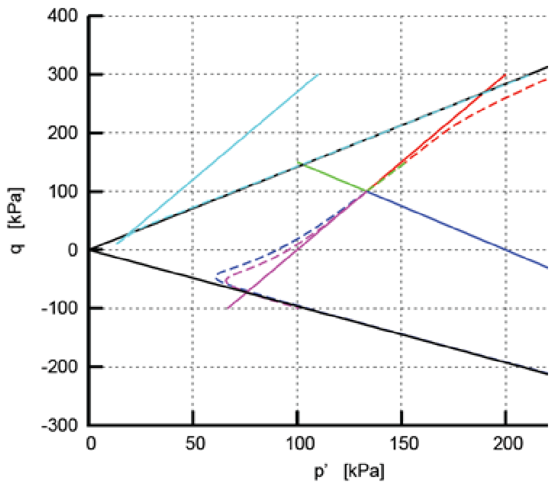
Soil State

- In situ
- Induced



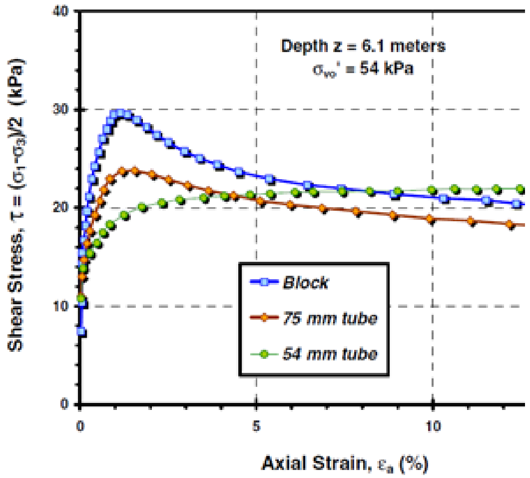
Drainage Condition

- Drained
- Undrained



Anisotropy

- Induced
- Inherent

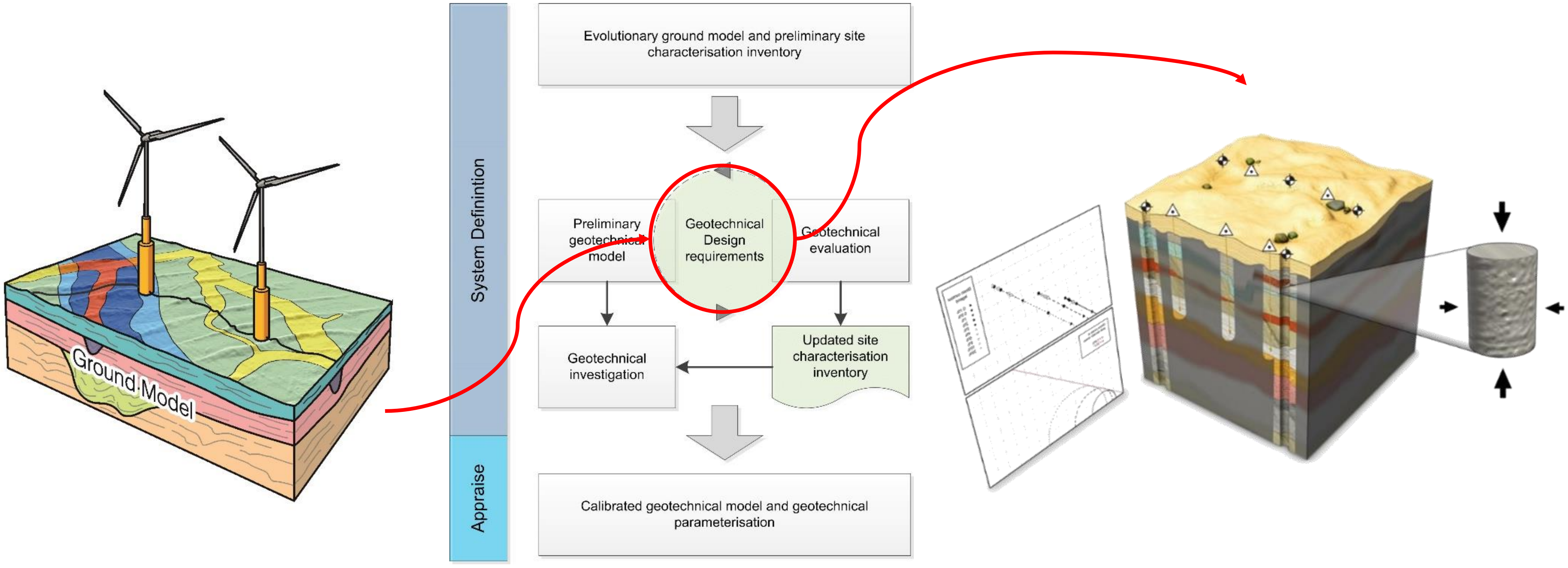


Disturbance

- Sampling
- Reconstitution

Planning for FEA-Based Design

So, before investigating the soil units we need to consider how best to model them



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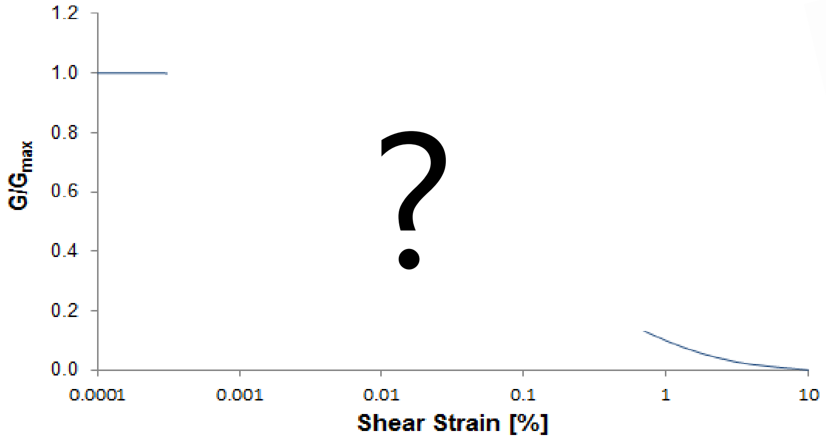
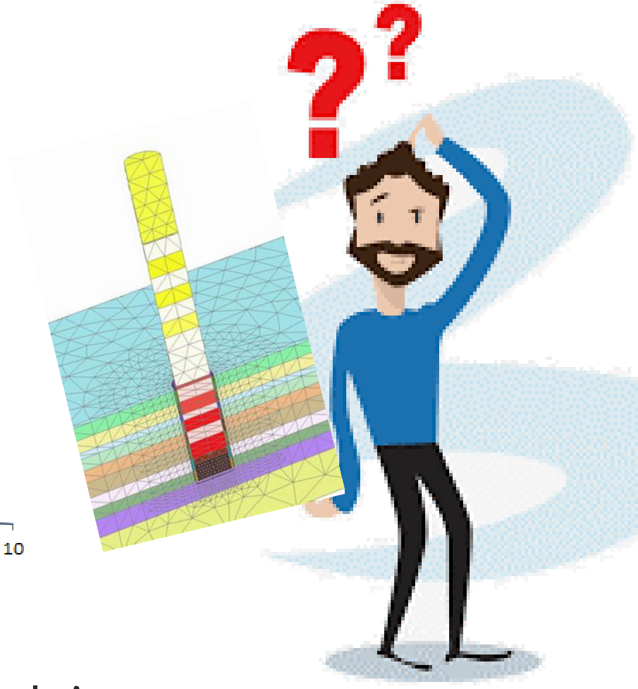
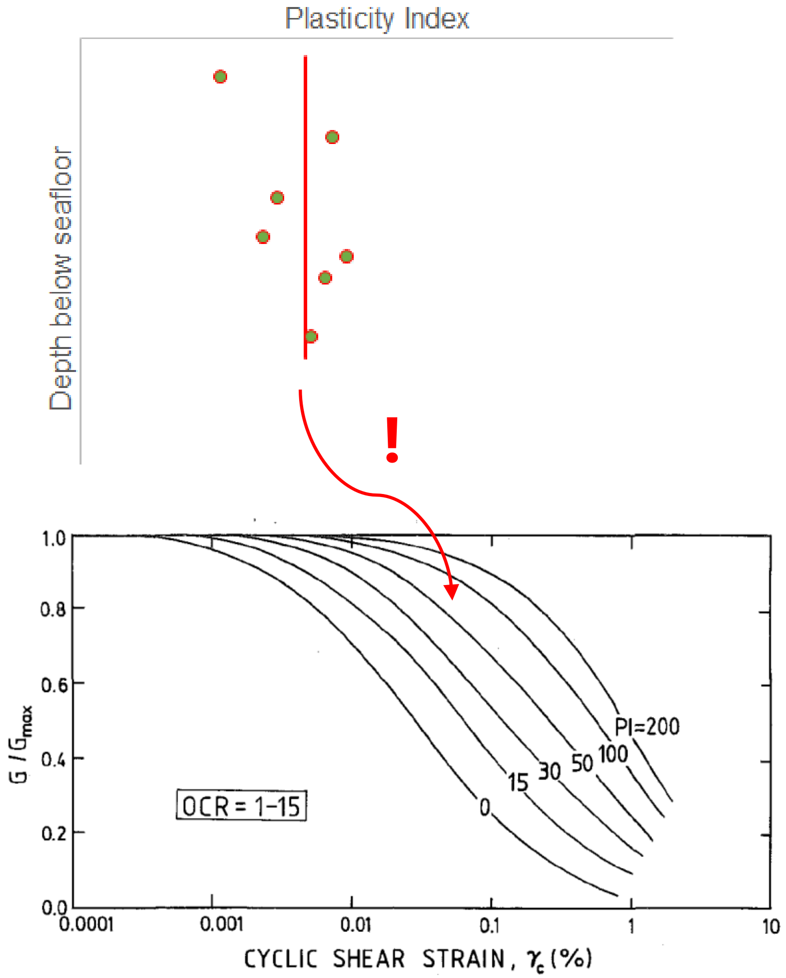
Conclusions

FEA-based design can reduce empiricism in design

But without the right data







The empiricism starts creeping back in...

Thank you

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