Some remarks from practice

Facts in practical work:

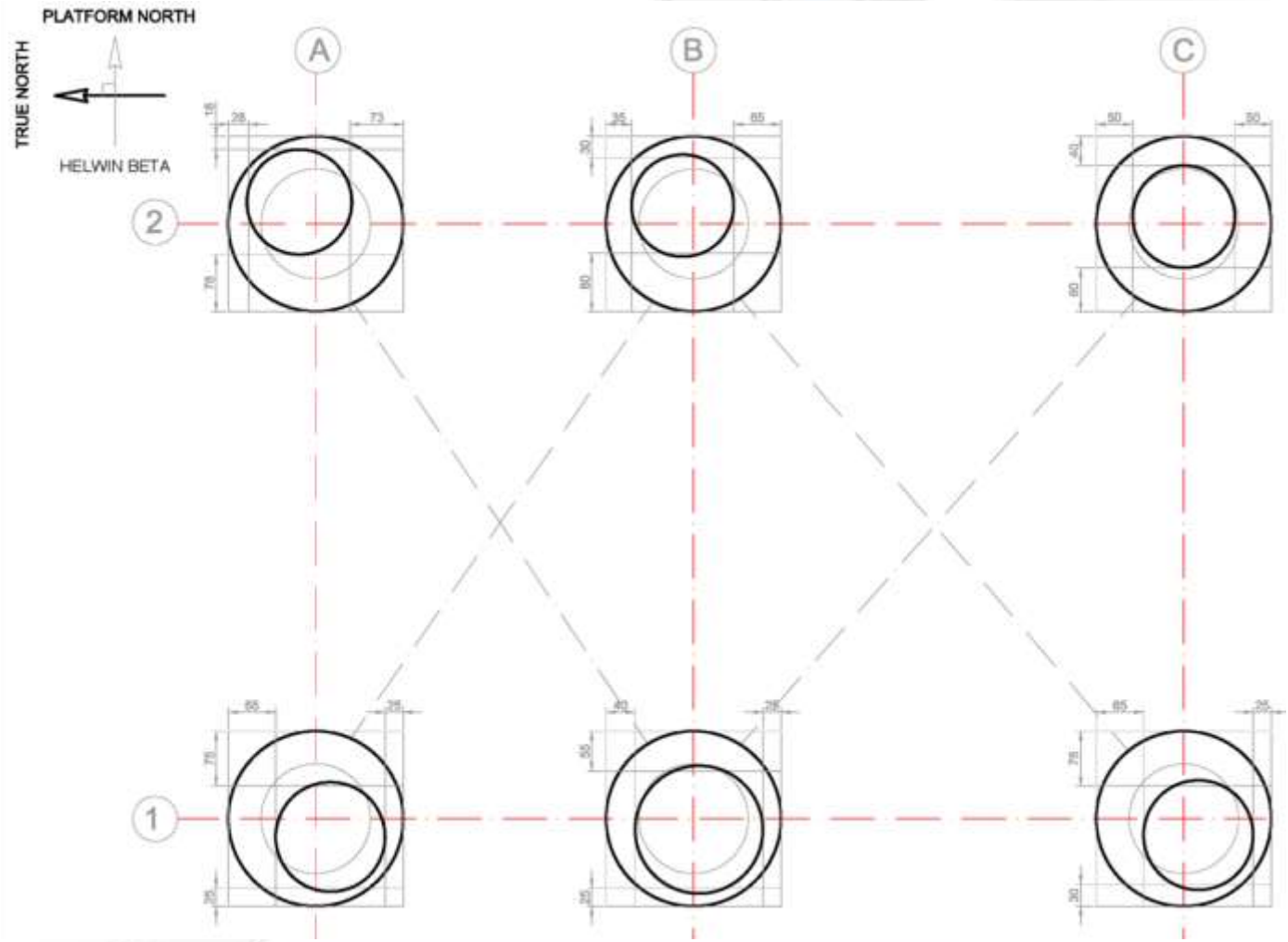
- We have to explain our approaches and results to asset owners
- Civil Engineering is still 99% deterministic
- The data we have or get are less than 50% of what we desire
- The quality of data is not what really helps

Consequence:

- We have to find ways to communicate the VoI
- We have to simplify our approaches
- We have to deal with the „Unknown Unknowns“

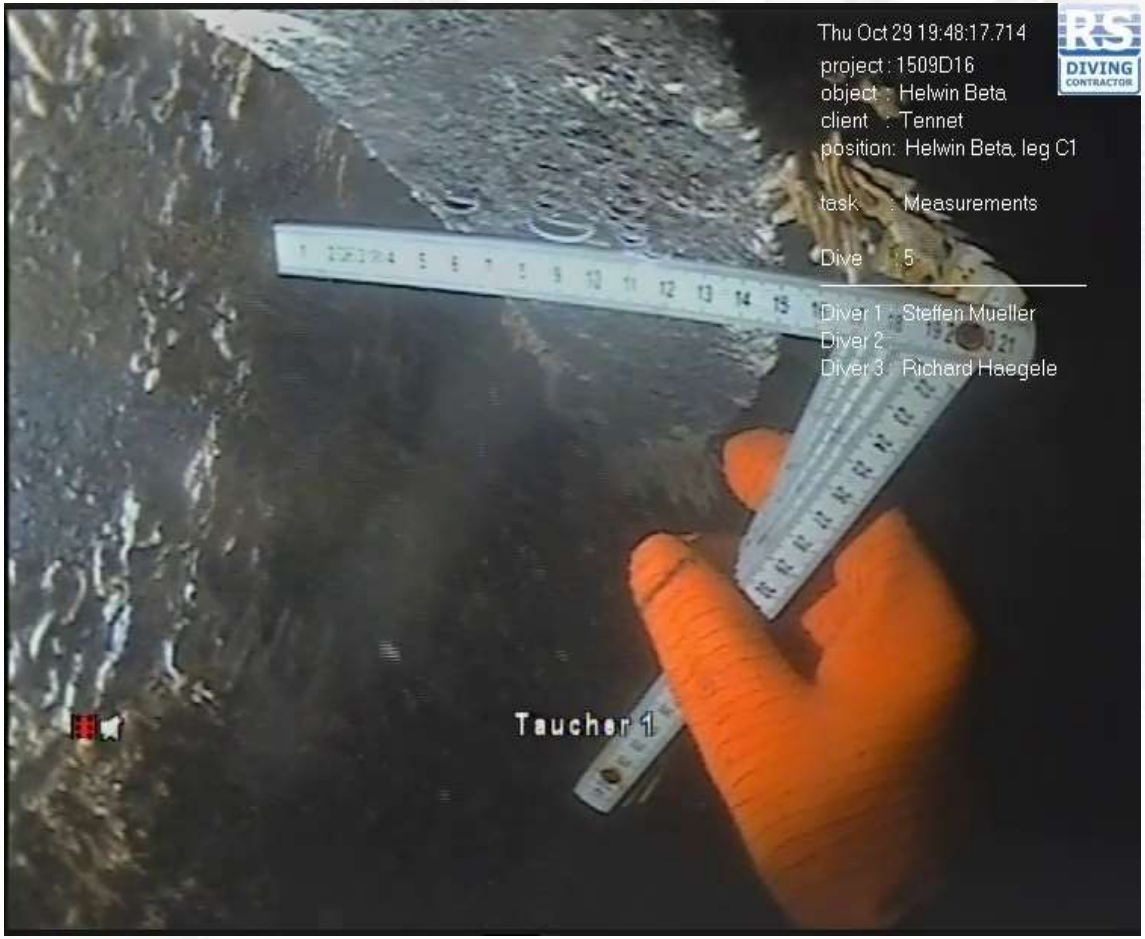
Offshore Platforms

Actual location of jacket and piles (found by divers)



North Sea Application Uncertainties ?

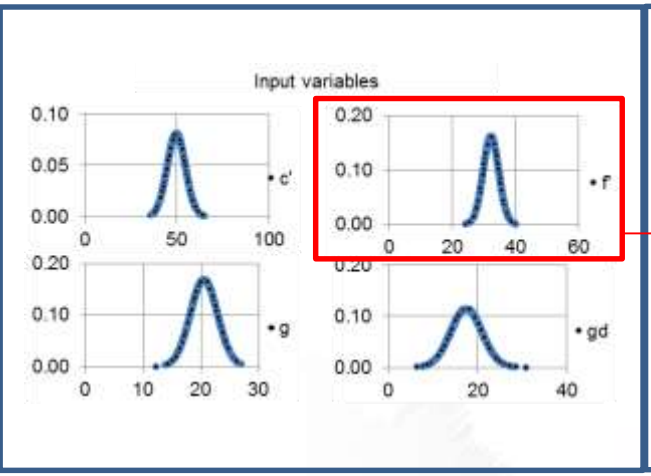
Sea Bed Survey Information



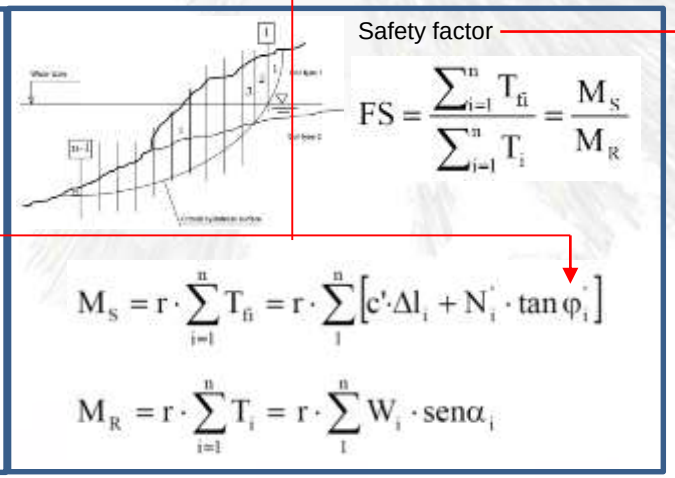
Example: Parameter, Model, Representation of Safety

- Propagation of the uncertainties.
- Input are random within the range **avg ± st.dev**
- Many simulations
- It works only if the physics behind is known

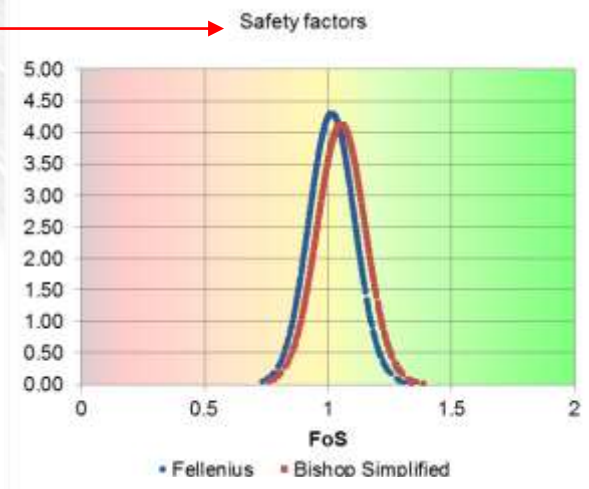
Input parameters					Fix	μ	σ	σ (%)
γ	=	20.3	*KN/m³*	wet sand	☐	20.5	2.3	11.2
γ_d	=	17.3	*KN/m³*	dry sand	☐	17.5	3.5	20.0
γ_w	=	10.0	*KN/m³*	water	☑	10	0	0.0
c'	=	59.2	*KN/m³*	cohesion	☐	50	5	10.0
ϕ'	=	31.6	*deg*	angle of internal friction	☐	32.5	2.5	7.7
a_g	=	0.0	*m/s²*	horiz. seismic acceler.	☑	0.0	0.8	#DIV/0!
a_{vg}	=	0.0	*m/s²*	vertic. seismic acceler.	☑	0.0	0.6	#DIV/0!
g	=	9.806	*m/s²*	gravity	☑			



Input variables



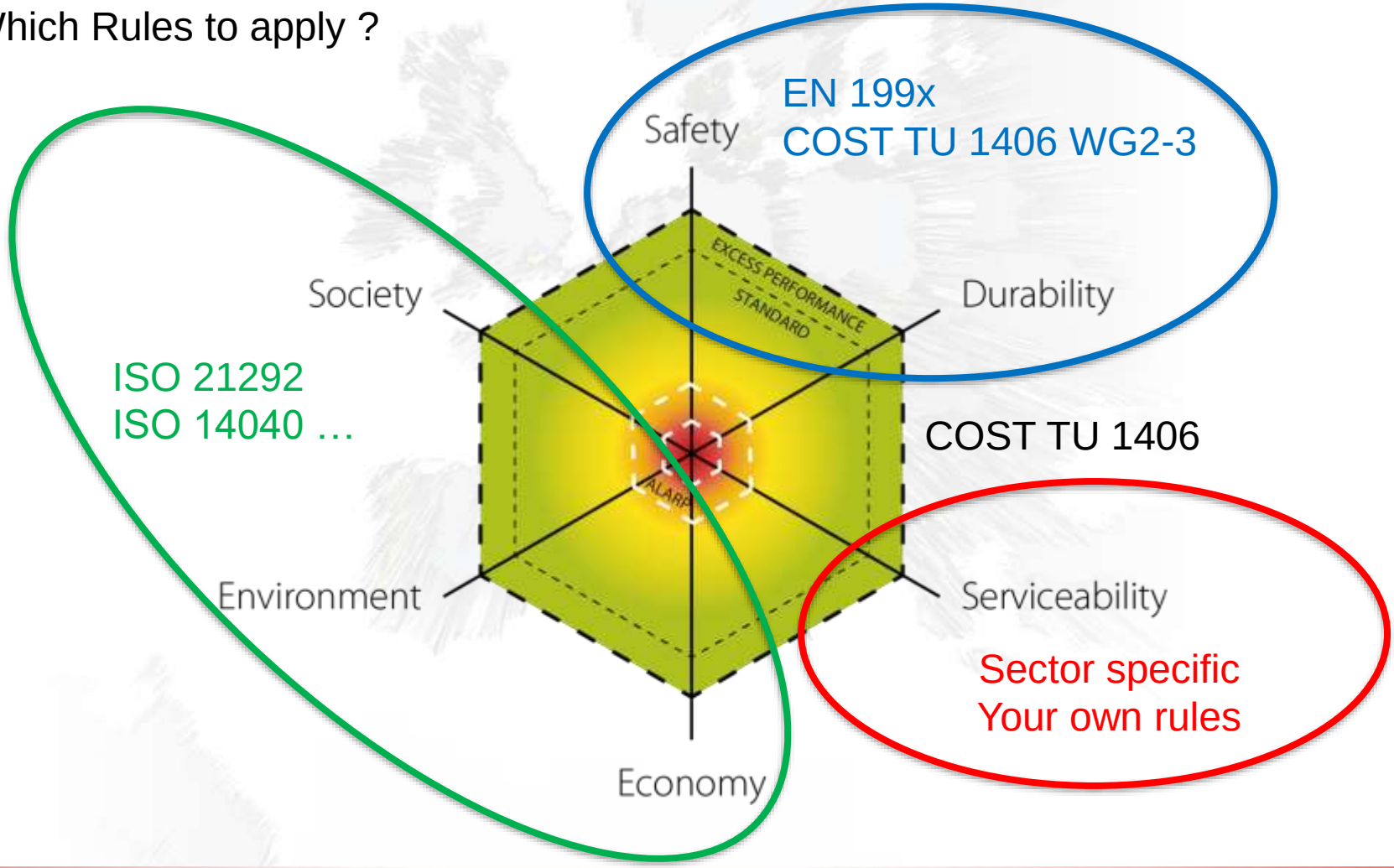
Deterministic set of equations descr. the phenomenon



Result:
Risk of failure:
$NS_{positive}/NS$

Example Risk based Asset Management

Which Rules to apply ?

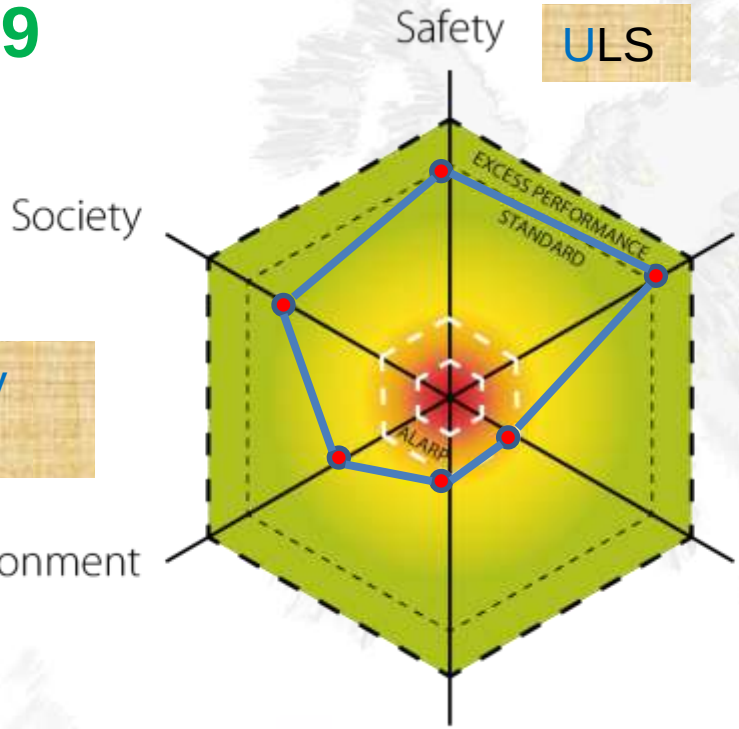


Risk = Effects of Uncertainty on Objectives

Quantification of Risk

ISO 21929

Reliability



ULS

DLS

OLS

Costs

Sustainability Factors

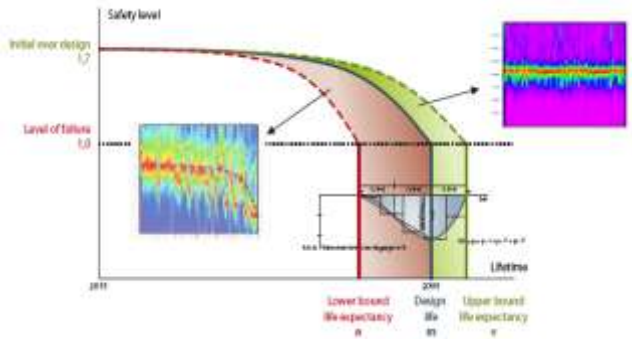
Your Rules

Risk Assessment Algorithm

Application to define Aging (Degradation)

Examples
from practice

EN 16991:2018



/TC

Date: 2012-06

prCWA 63:2012

/TC

Secretariat: ON

Ageing behaviour of Structural Components with regard to Integrated Lifetime Assessment and subsequent Asset Management of Constructed Facilities —

Alterungsverhalten von Bauteilen in Bezug auf ganzheitliche Lebenszyklusbewertungen und weiterführendes Erhaltungsmanagement von Infrastrukturbauten —

ICS:

Descriptors: Draft version May 16th, 2012