



Fidic Emerald Book

For Non-Recourse Financed Hydropower Projects

Øyvind Engelstad – SVP Execution, Hydropower Portfolio



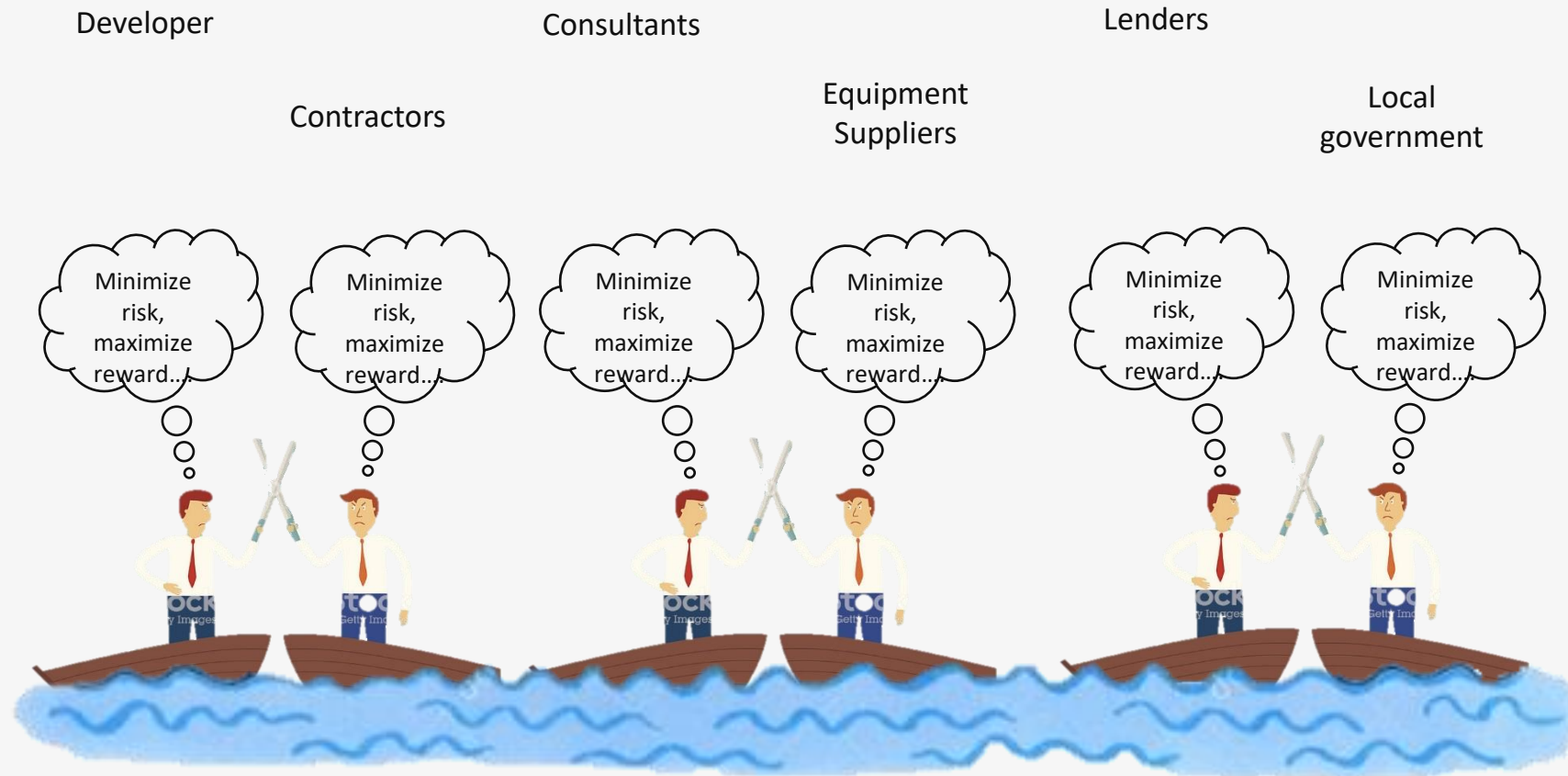


Construction Environment - Norway vs. International

Factor	Norway	International
Market transparency	Open and regulated	Relationship driven
Communication	Direct (rude?)	Indirect
Organization structure	Flat (unpredictable?)	Hierarchic and with sub-hierarchies
Labour competence	Highly skilled multifunction workers with decision making power	Low skilled single function workers with no decision making power.
Design approach	Observational and flexible experience based Rock mass as the building material	Teoretical (calculation based), Pre-determined, rock classes, limited flexibility, rock mass as a problem, lining where initial support is disregarded
Business relationships	Based on proven competence and experience	To a large degree based on friendship and family relationships (favour driven)
Business language	English/Norwegian	Local
Contractual issues	Standards (NS8405 or similar) Solution orientated (??)	Bespoke (or based on Fidic) Rigid and lawyer driven
Business processes	Predictable	Slow and unpredictable
Governmental processes	Predictable and rather efficient	Bureaucratic, and sometimes un-transparent
Trust between parties	trust ("blue eyes"?)	lack of trust
Corruption risk	Low	Often high
Contractor environment	Objective driven (traditionally) and PoA to the site organisation	Profit driven and centralised decision making
Trade barriers	Few and transparent	Many and hidden



“Tradisional Approach...”

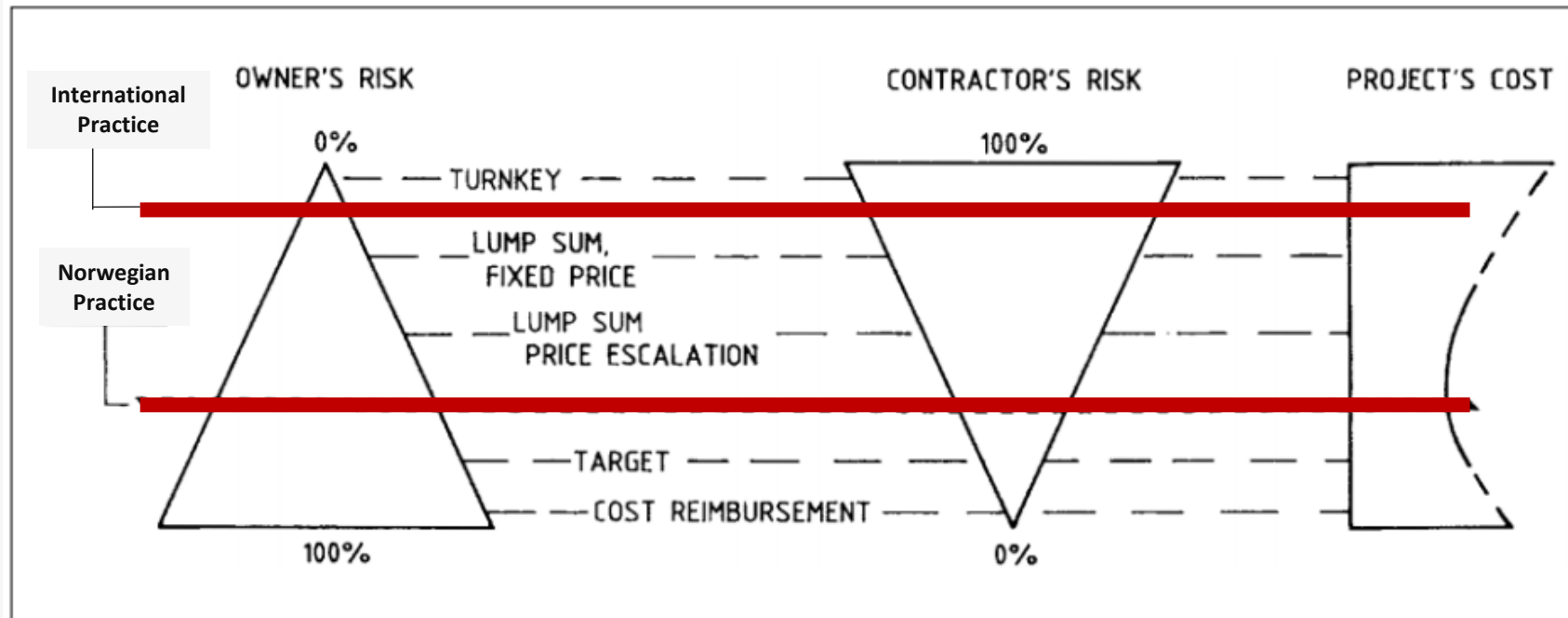


Should we keep on fighting...?

"Tunnel Wars" in La Confluencia



☀ Traditional risk sharing mechanism in the Norwegian vs International Market



Norwegian practice: Geotechnical risk stays with the owner and the contractor holds the production capacity risk (equivalent time and cost). Adjustment based on Equivalent Time Budget based on BoG. Limited use of GBR, but definition of Unforeseen in CoC. (similar to Fidic Emerald, but less formal.

International Practice: Turnkey or LS contract with significant transfer of geotechnical risk to the contractor. Continuous fight related to what is considered as foreseen vs unforeseen conditions → Huge claims



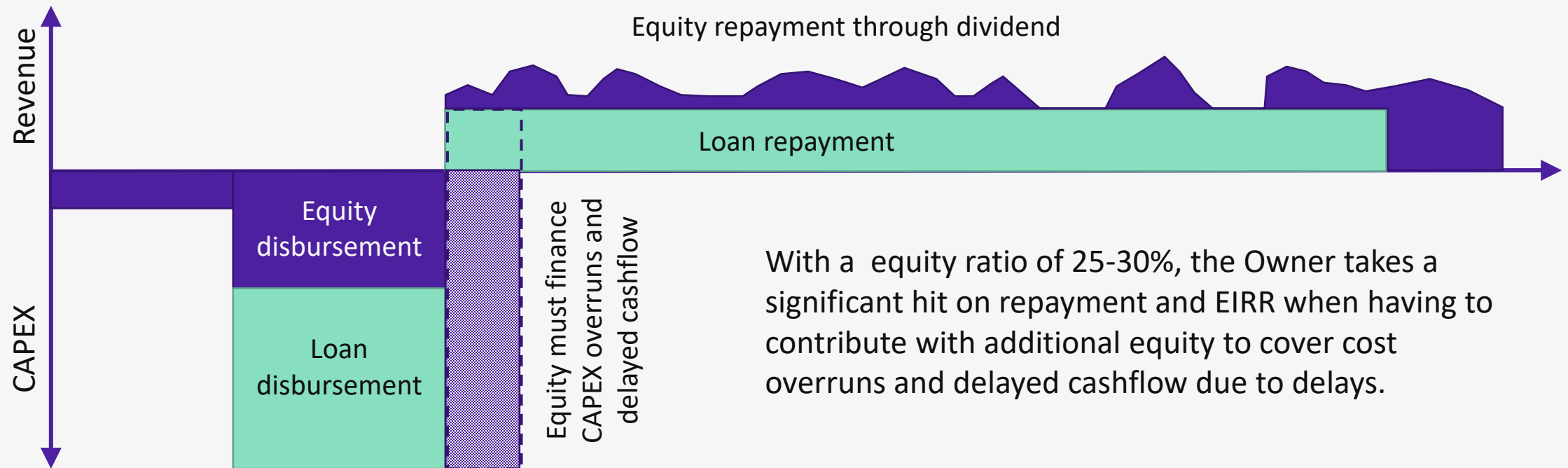
Challenges in Non-recourse finance

Scatec



What is non-recourse finance

- A loan secured by the revenue of the project the loan intends to fund, and nothing else
- Non-recourse finance does not allow the bank or other lending institution access to the borrower's other assets in the event of default. The payment is secure by first right of repayment and DSCR criteria on the future revenue cashflow.
- High-risk form of financing; projects that utilize non-recourse finance generally have uncertain revenue streams and long loan periods.





Lenders' perception of construction risk in Hydropower projects

Lenders are neither able nor willing to take unknown risk for construction of hydropower.

Lenders need to see someone with financial capabilities standing behind the risk of delays and cost overrun. Who can that be?

- **EPC contractor** – if the balance sheet is acceptable and the competence can be documented
- **Sponsor** – if the balance sheet is big enough and the long-term commitment is unquestionable
 - This is not for everyone!
- **Offtaker** – if the PPA has a mechanism of absorbing the cost overrun / delay consequences (this will allow for more loans if the costs go up)
- **A combination of the above** – if the contracts are well structured
 - I do believe we can get paid for taking limited controllable risk.

History has too many examples of construction going bad.

The big theoretical difference is that when you take the EPC responsibility, you are **obligated to complete without access to additional benefits** while Sponsor have the opportunity to assess if the **future value covered the additional investment** required to complete the construction.

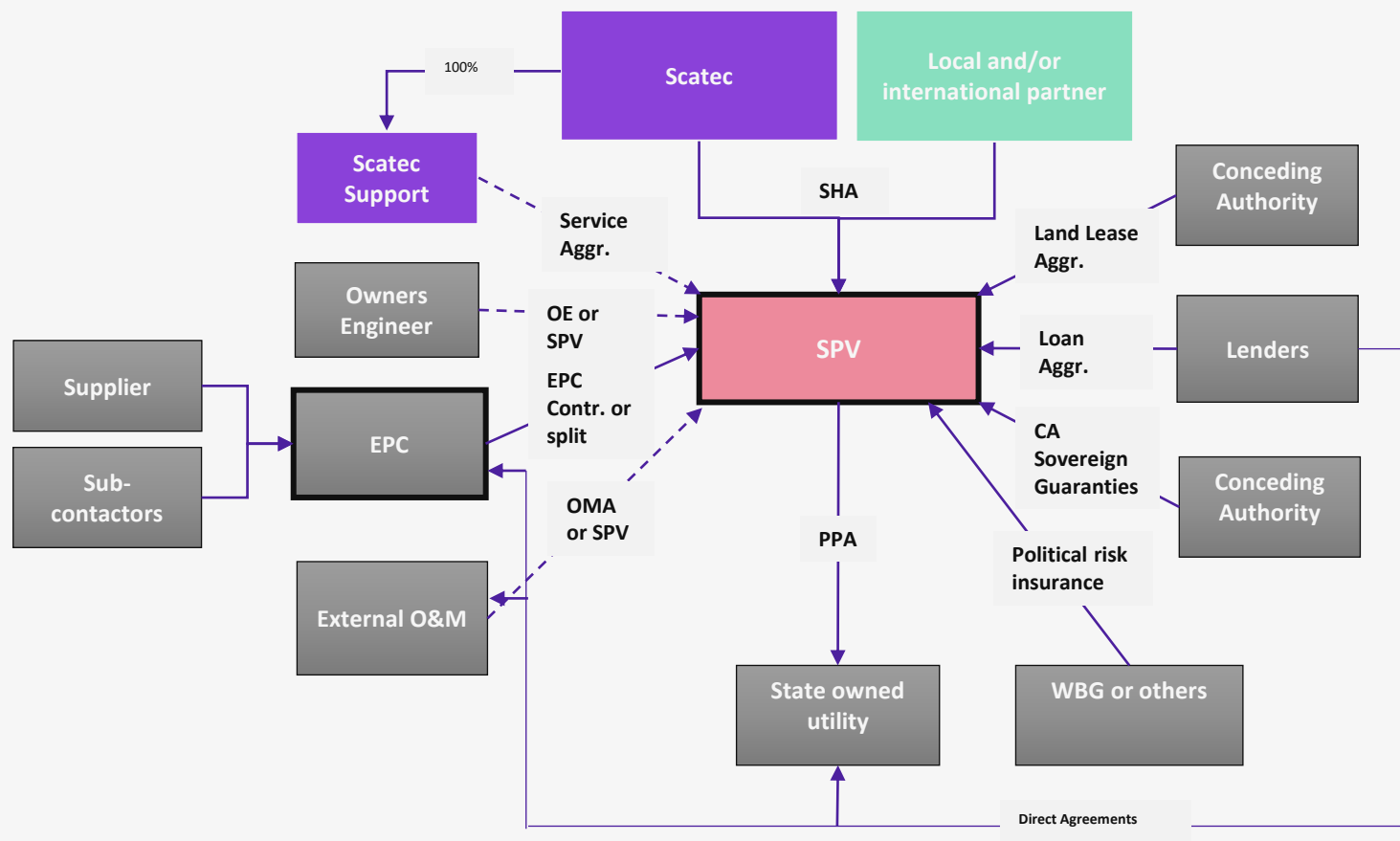


Impact of Non-recourse financing on the balancing of geotechnical risk

- Fidic Emerald Book seek to keep the risk of the geological conditions with the Owner and the design and production risk with the Contractor.
- In Non-recourse financed projects this puts a significant risk on the owner who is stuck with obligations to pay the contractor, service the debt to the lenders keeping relevant DSCR but has a fixed PPA with the Offtaker
- As the lenders do not take risk all risk is transferred to owner
- Owner normally has limited balance sheet to support a stand by equity facility he needs to transfer the residual risk to;
 - Offtaker (through PPA)
 - Contractor through EPC contract
 - Insurance (for adverse events)



Normal contract structure for Non-Recourse Financed Hydropower Project



- SHA between SPV partners
- Service Agreement between partners and SPV
- Concession Agreement with Conceding Authorities
- PPA with Offtaker (if not deregulated market exposure)
- Land Lease Agreements
- Political Risk Insurance
- Loan Agreements with Lenders
- **EPC or Construction Contracts with Contractors and Suppliers**
- Owners Engineer Agreement
- Direct Agreements between Lenders and EPC
- Bridge Agreements between Contractors in case of split contract

§ Fidic Suite of Construction Contracts

Simple
Design by
Owner

Construction
Design by Owner

Design/Build
Design by
Contractor

EPC Turnkey

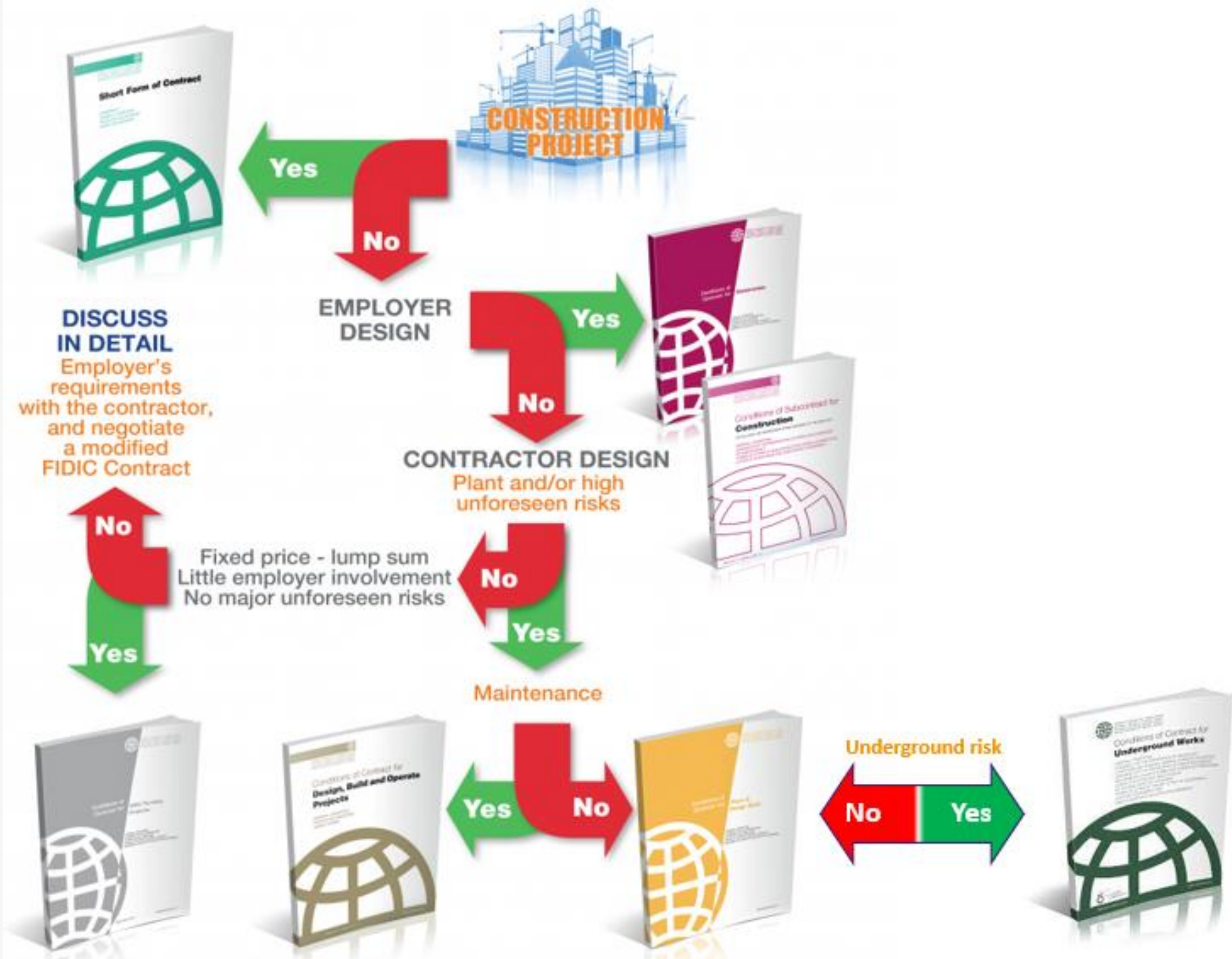
BOT



Aligned with DFI
requirements

DB Underground
Works

Choosing the Fidic Standard





Why Fidic Emerald Book was created?

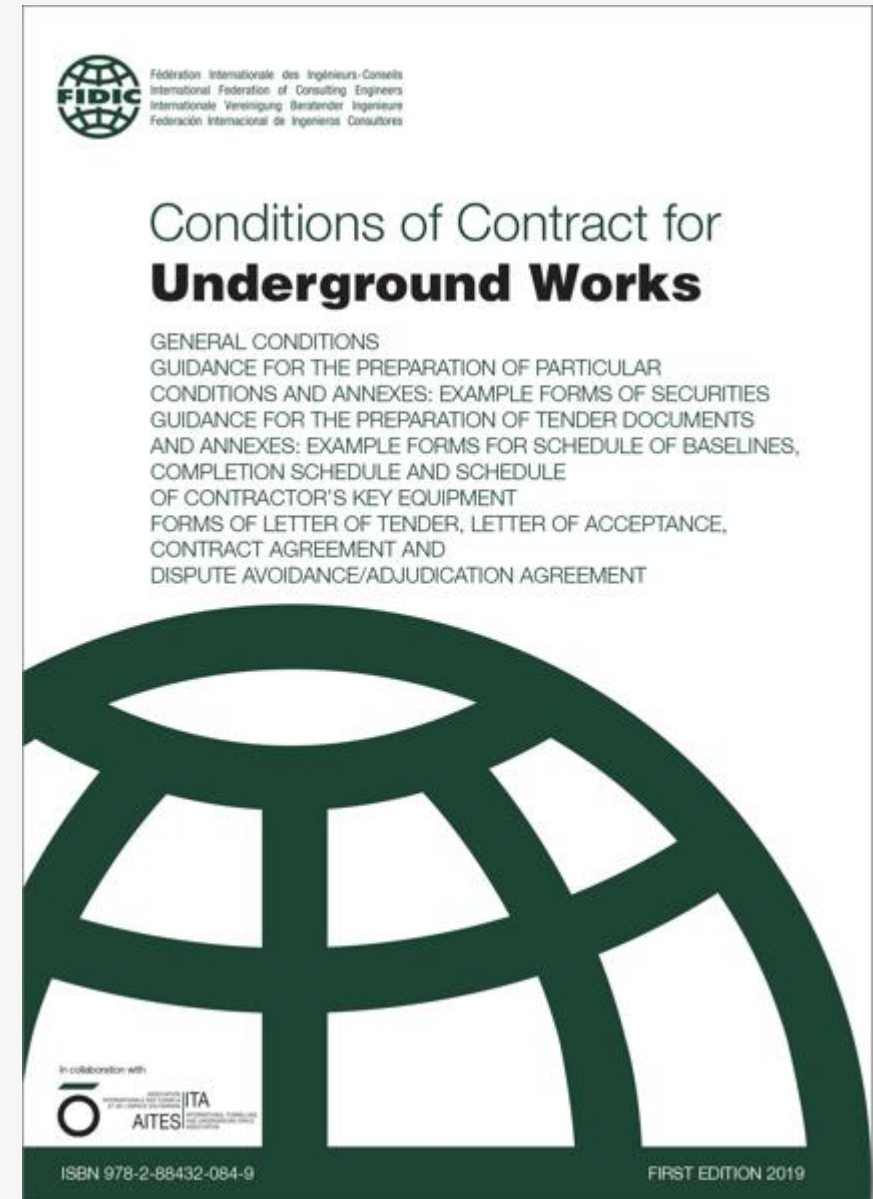
The Introduction to the new Contract identifies three “unique features” of underground work:

– the **method of excavation** and **ground support** are major factors for the successful realization of the project, and therefore part of the Works;

– **physical access** to the Works is often limited to just a few locations or even a single location, which places **serious constraints on construction logistics and the environment**;

– the **land**, beneath which the Works are to be constructed, typically belongs to a number of third parties.”

Laying on top of these three features is the difficulty in predicting, with any certainty, the **ground conditions** for the entirety of the underground works, => **maintain FIDIC’s fundamental principle of balanced risk sharing and/or allocation**





Key elements of Fidic Emerald Book

- Based on **Fidic Yellow Book 2017 edition** => Design / Build (EPC) where the contractor is responsible for design and construction methodology within the confinement of the Employers Requirements
- **Geotechnical Data Report (GDR)** => compilation of all data available
- **Geotechnical Baseline Report (GBR)**!
 - Describes the Employers interpretation of the geotechnical conditions
 - Defines the baseline for the baseline geotechnical conditions
 - Define the expected distribution of Foreseen Conditions
 - Defines the limits towards Unforeseen Conditions.
 - Defines the risk allocation between the employer and the contractor and the regulation mechanism for time and cost based on deviations from the geotechnical baseline and how to deal with Unforeseen Conditions
- **Schedules of Baselines** => Unit time and unit cost offered by the contractor
- **Completion Schedule** => Function of Baseline Geotechnical Conditions and Schedule of Baselines



TRACTEBEL ENGINEERING S.A.
Head Office (Gennevilliers)
Le Clever - 5, rue du 19 mars 1962 - 92622 Gennevilliers CEDEX - FRANCE
tel. +33 1 41 85 03 69 - fax: +33 1 41 85 03 74
engineering-fr@tractebel-engie.com
tractebel-engie.fr



Our ref. : VHPP-CC-GBR-001-FINAL
Entity : EFE
Imputation : P.015795

Client : Compagnie Générale d'Hydroélectricité de Volobe
Project : Upstream Volobe HPP
Country/State: Madagascar

Title : Geotechnical Baseline Report (GBR) for Dam & Infrastructure works (DIW) and Generation & Transmission Works (GTW)
Subtitle :
Author(s) : M. Puddu / M. Brown (PUD / MBR)
Date : November 5, 2020

Summary : -
Comments : -
Keywords : -
Nb pages : 58

REPORT

CONFIDENTIAL

GBR

G	2020-11-05	Update sections 1 and 2 following CGHV comments	Final	VDH	PLJ	JSA
F	2020-10-27	Update following CGHV comments and Schedule of Baselines details	Final	MBR	PLJ	JSA
E	2020-09-17	Update following MEH comments	Final	PUD	PLJ	JSA
D	2020-07-15	4th emission	Final	PUD / MBR	PLJ	JSA
C	2020-06-30	3rd emission - minor modifications	Final	PUD / MBR	PLJ	JSA
B	2020-06-17	2nd emission	Final	PUD	PLJ	JSA
A	2020-05-22	First emission	Draft	PUD / MBR	PLJ	JSA
REV.	YYYY-MM-DD	SUBJECT OF THE REVISION	STAT.	WRITTEN	VERIFIED	APPROVED

TRACTEBEL ENGINEERING S.A. - Registered Office: 5, rue du 19 mars 1962 - 92622 Gennevilliers CEDEX - FRANCE
with a capital of 3 355 000 euros - R.C.S. Nanterre 9 309 103 077 - BORN 309 103 077 - VAT: FR 82 309 103 077 - APE 7110B

MD-04-01_Rapport_DIW_sous_pays_gauche_sous_ensemble_v05.10.18

With the trusted expertise of **COYNE ET BELLIER**
Engineering Consultants

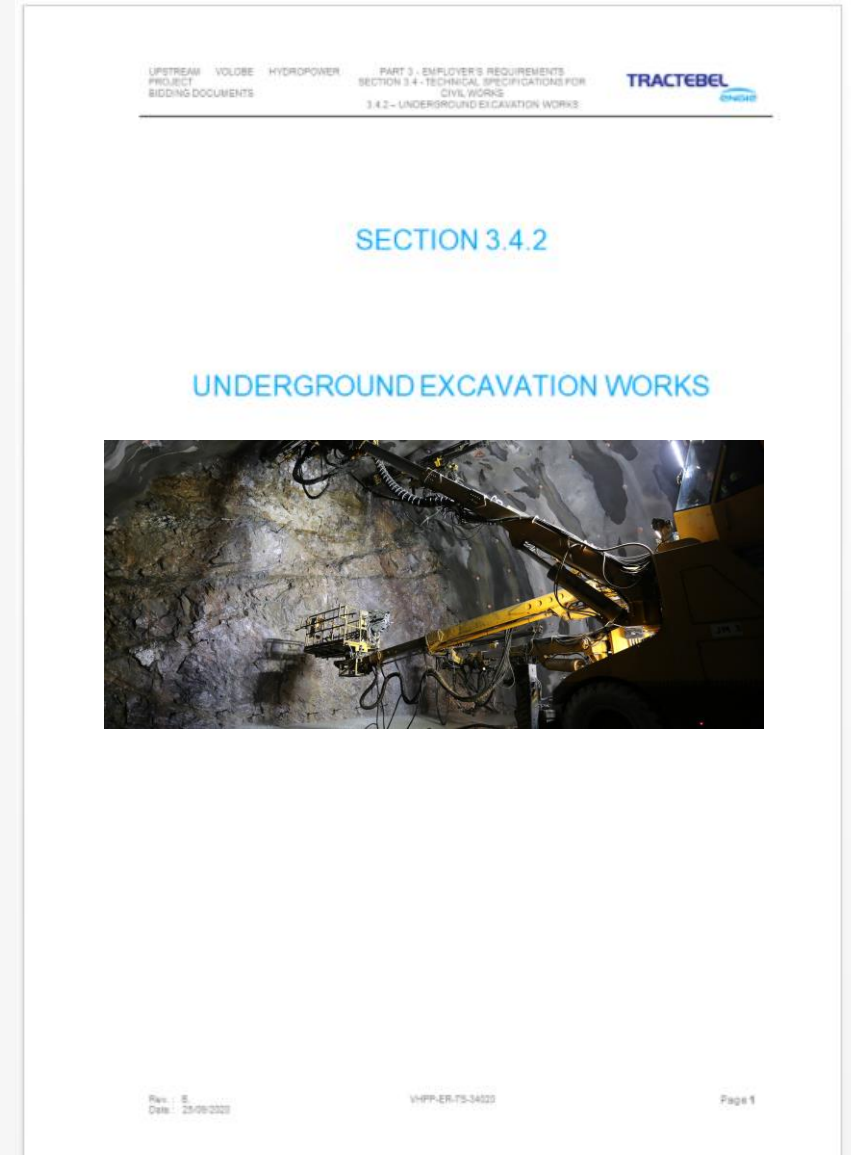


Adoption of Emerald Book for Non-Recourse Project Finance (NRPF) on Hydropower in Developing Countries

Emerald Book		Bespoke Contract based on Fidic Yellow Book 1999
Fidic Yellow Book 2017 (basis for Emerald Book) considered not bankable by the DFI's due to transfer of control from Employer and Lenders to Owners Engineer and DRBA	→	Apply Fidic Yellow Book 1999 with adoption of the principals of Emerald book including GBR, Baseline Geotechnical Conditions, definition of Unforeseen Conditions, Schedule of Baselines, Completion Schedule with adjustments based on observed conditions.
Administratively heavy and prescriptive	→	Adopting to the NRPF and our own Employers Requirements, Tools and routines
Prescribes the adoption of a “standing” DAAB which is considered costly and not fit for purpose giving the framing around	→	Preference for a “ad-hoc” DAB based on ICC framework fit for purpose based on the conflict/claim at hand. Under a NRPF the Employer PoA is limited by Loan Agreements ++.
Equivalent time and cost budget for adjustment based on deviations from baseline based on units of excavation and support measures (shotcrete, bolts, lattice girders etc)	→	Partial transfer of foreseen risk for variations from baseline to the EPC contractor based on Rock Class distribution (schedule of baseline capacities for each rock class).
Limit of foreseen conditions not clearly defined as deviation from baseline is adjusted	→	Limit for foreseen conditions clearly defined and price/time adjustment mechanism for handling unforeseen conditions included as options in the contract (subject to competition) to facilitate risk transfer to Offtaker.

Comprehensive Employer's Requirements

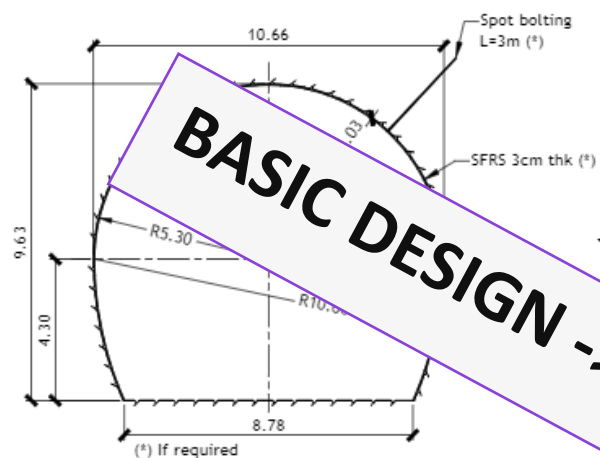
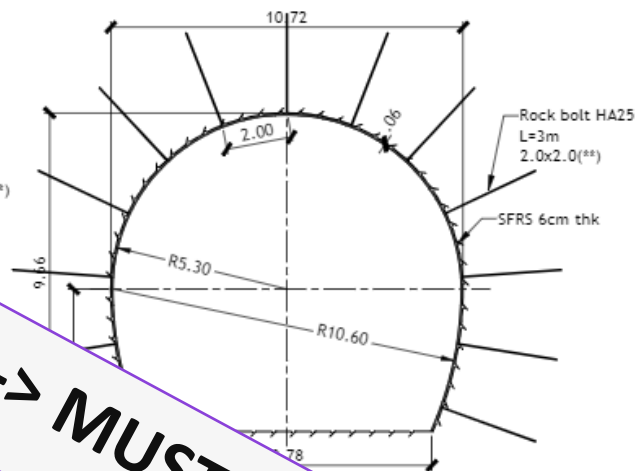
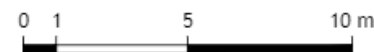
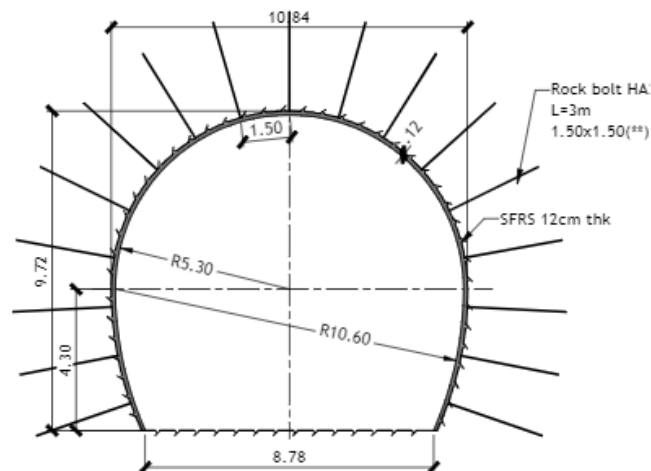
- Construction Methodology
- Investigations in front of the face of the tunnel
- Excavation methodology and requirements for smooth blasting
- Mapping, interpretation and application for tunnel support design and application
 - Competence requirements
 - Mapping methodology
 - MWD data collection and interpretation
 - High Resolution Scanning rock surface modelling
 - Photo documentation
 - Interpretation methodology related to Rock Mass Classification systems including methodology in case of mixed face conditions
 - Procedure for continuous alignment on Rock Class conclusion
 - Documentation, geological model update and active use for application and adjustment of rock support
- Rock support design and application methodology
 - Parameter based design not boilerplate based on Rock Class
 - Support approach under mixed face conditions
 - Initial and permanent support strategy including active use of geological model
- Handling of unforeseen geotechnical conditions
 - Specification for optional methodology statement, pricing and schedule adjustment



DOWNSTREAM SURGE TUNNEL - Section 80 m² - SUPPORT SYSTEM

Scale: 1/150

SECTION TYPE I FOR Q>40

SECTION TYPE II FOR $4 < Q < 40$ SECTION TYPE III FOR $0.4 < Q < 4$ 

The Contractor shall adapt the exact dimensions of the excavated areas to suit his excavation technique, and with the aim to reach the required hydraulic section.

L'Entrepreneur devra adapter les dimensions exactes des zones excavées en fonction de sa technique d'excavation, et dans le but d'atteindre la section hydraulique requise.

DETAIL LATTICE GIRDERS

Scale: 1/20

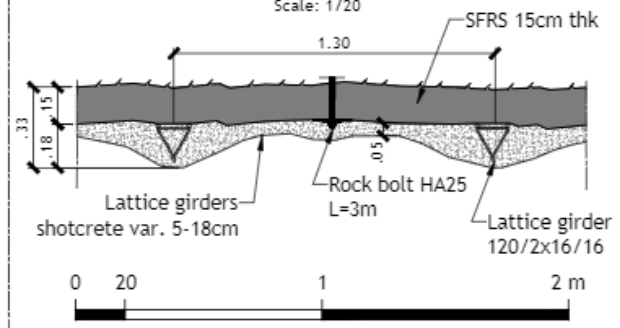
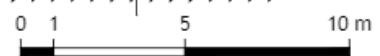
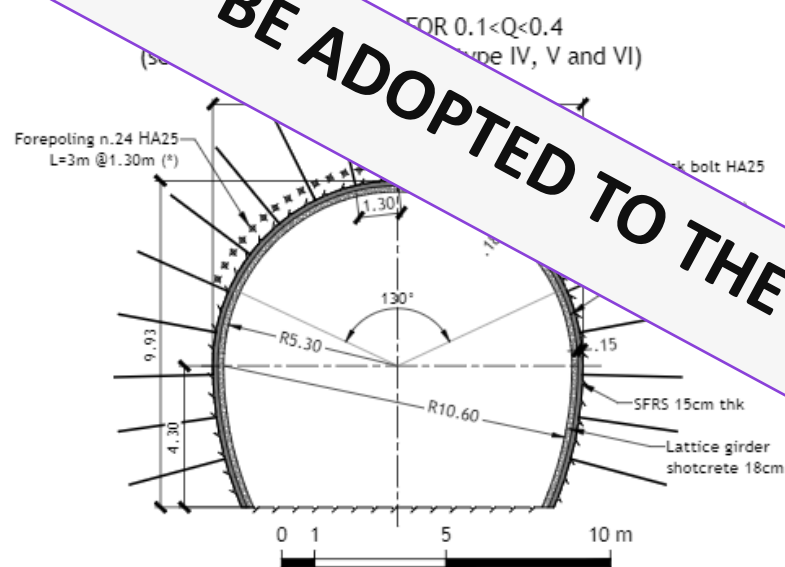
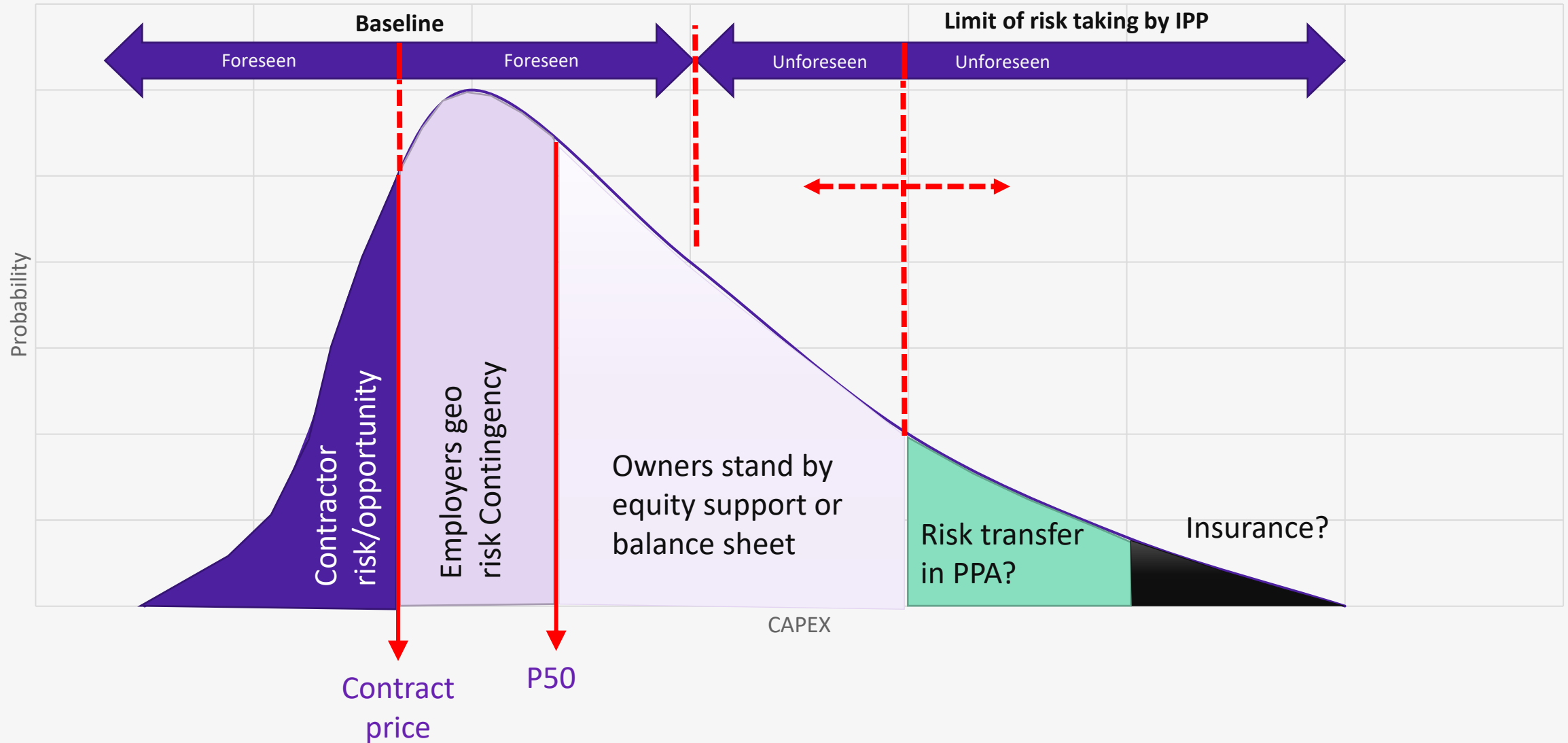


TABLE : SECTIONS TYPE IV,V and VI

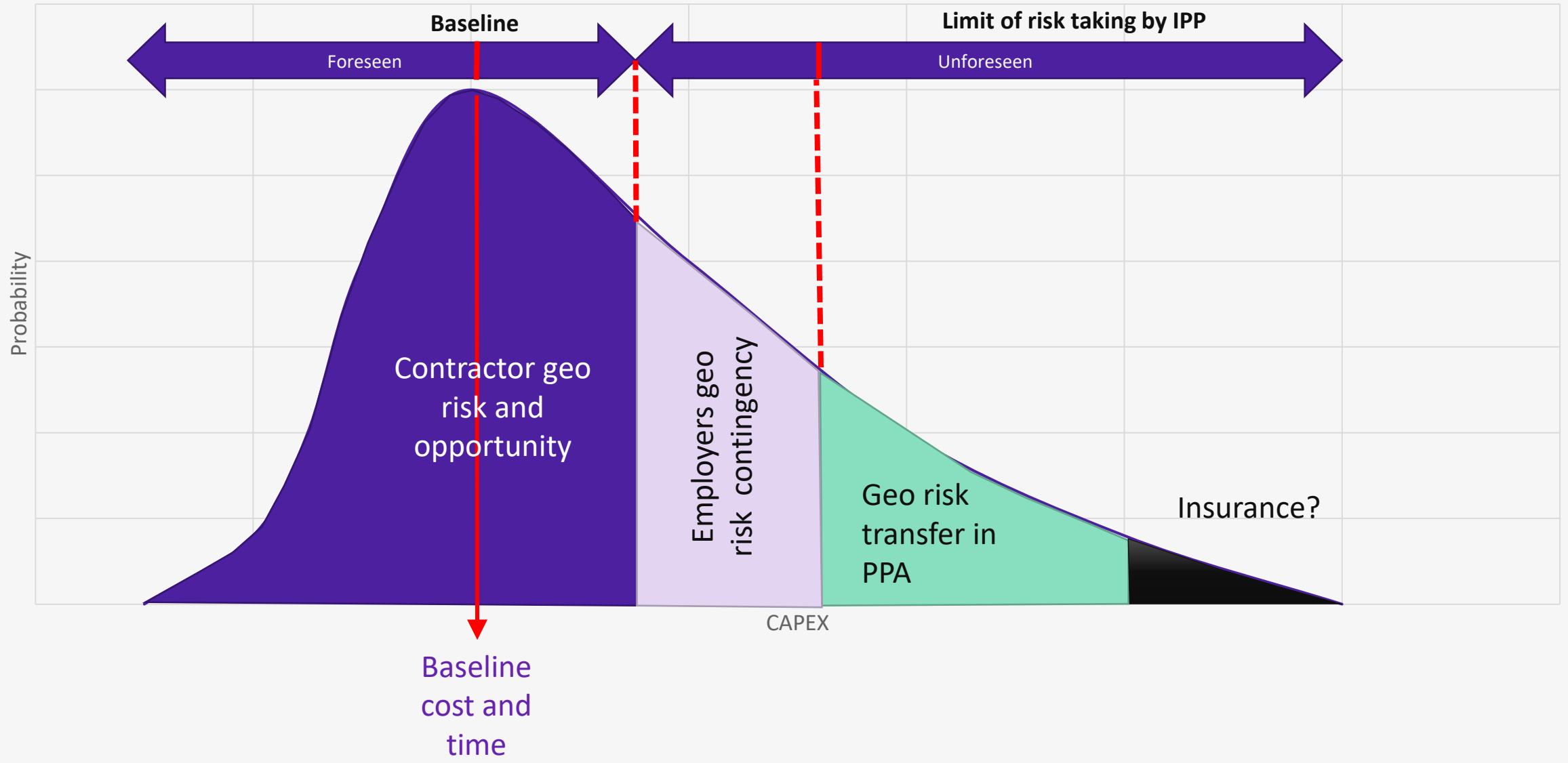
Section type	Q	SFRS thk (cm)	Bolt spacing (m)	Bolt length (m)	Lattice girders	Lattice girder spacing (m)	Lattice girder shotcrete thk (cm)	Total rib thk (cm)	Forepoling	SFRS on tunnel face (cm)	Note
IV	$0.1 < Q < 0.4$	15	1.3 x 1.3	3	120/2x16/16	1.3	18	33	n. 24 HA25, L=3m @130cm (*)	3	(*) If required
V	$0.01 < Q < 0.1$	25	1 x 1	3	130/2x18/26	1	20	45	n. 24 HA25, L=3m @100cm (*)	5	(*) If required
VI	$Q < 0.01$	30	0.8 x 0.8	3	160/2x28/28	0.8	25	55	n. 24 R25, L=3m @80cm	5	



S Normal risk allocation using Fidic Emerald



Bespoke risk allocation for Non-Recourse Finance



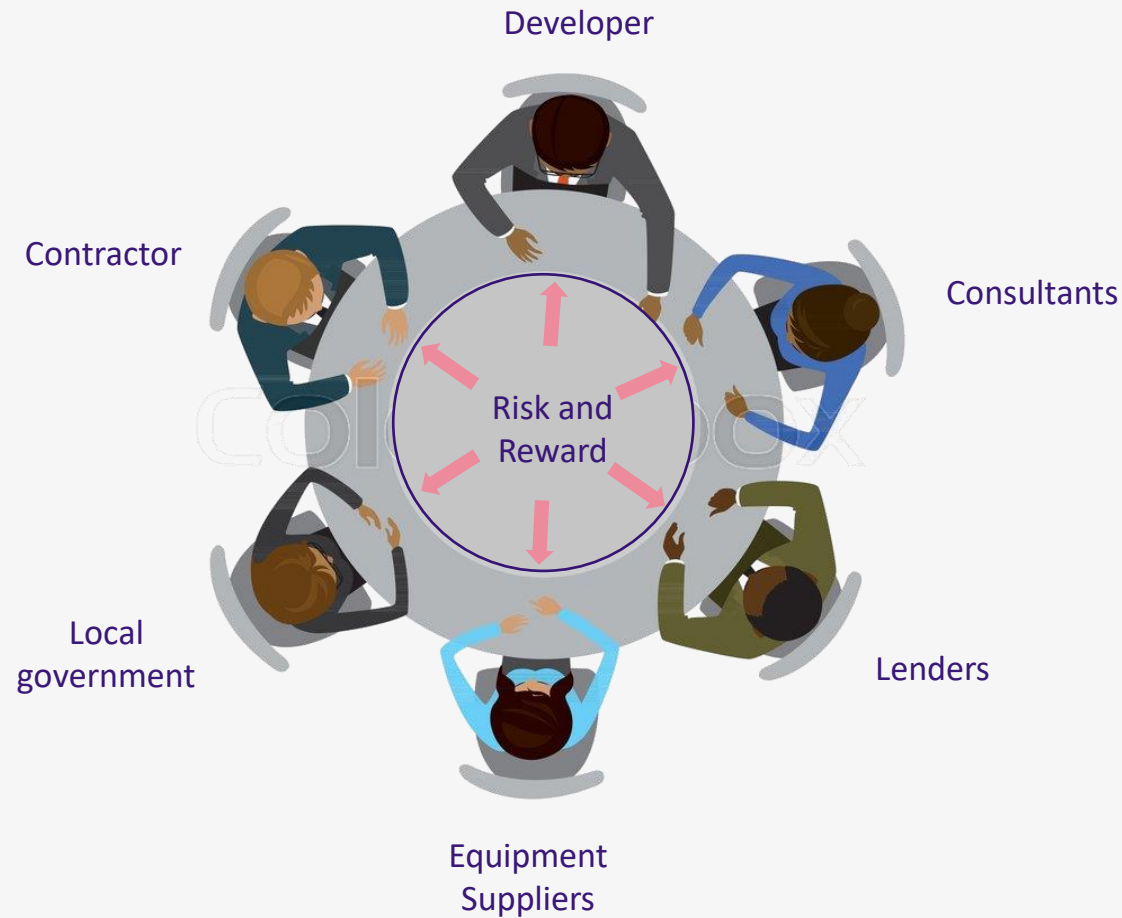
Strategic partnerships – Stakeholder consolidation

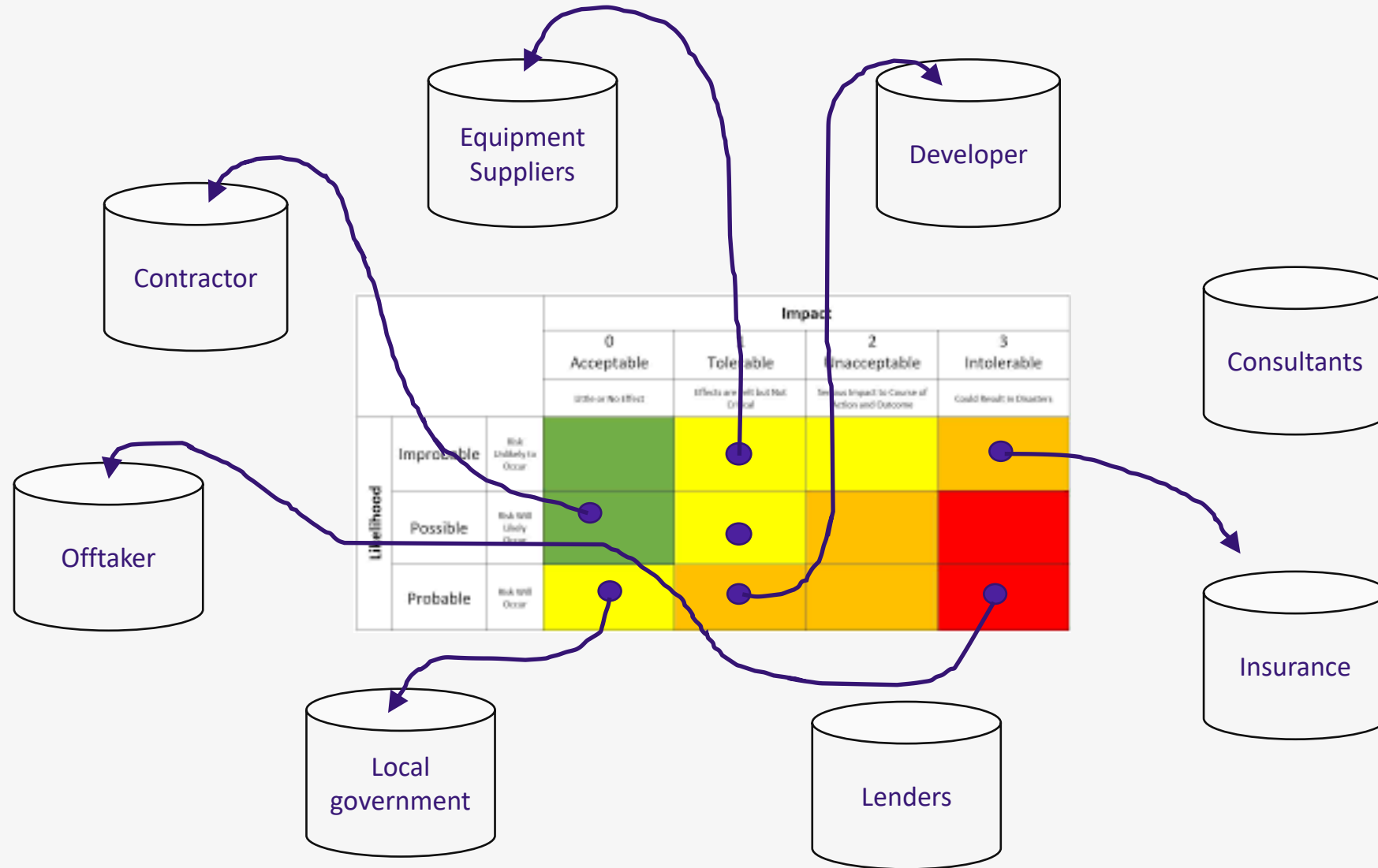
Developer Contractors Equipment Suppliers Local government
Consultants Lenders





Strategic partnerships – Smarter risk and reward allocation







The road to success has many bumps and sharp curves, so drive forward with caution!

