

Optimising an oil & gas development



a wholly owned subsidiary
of Royal Dutch Shell plc

A Decision Risk Analysis case study

Pete Naylor
13 July 2016

OR Society
Decision Analysis
Special Interest Group

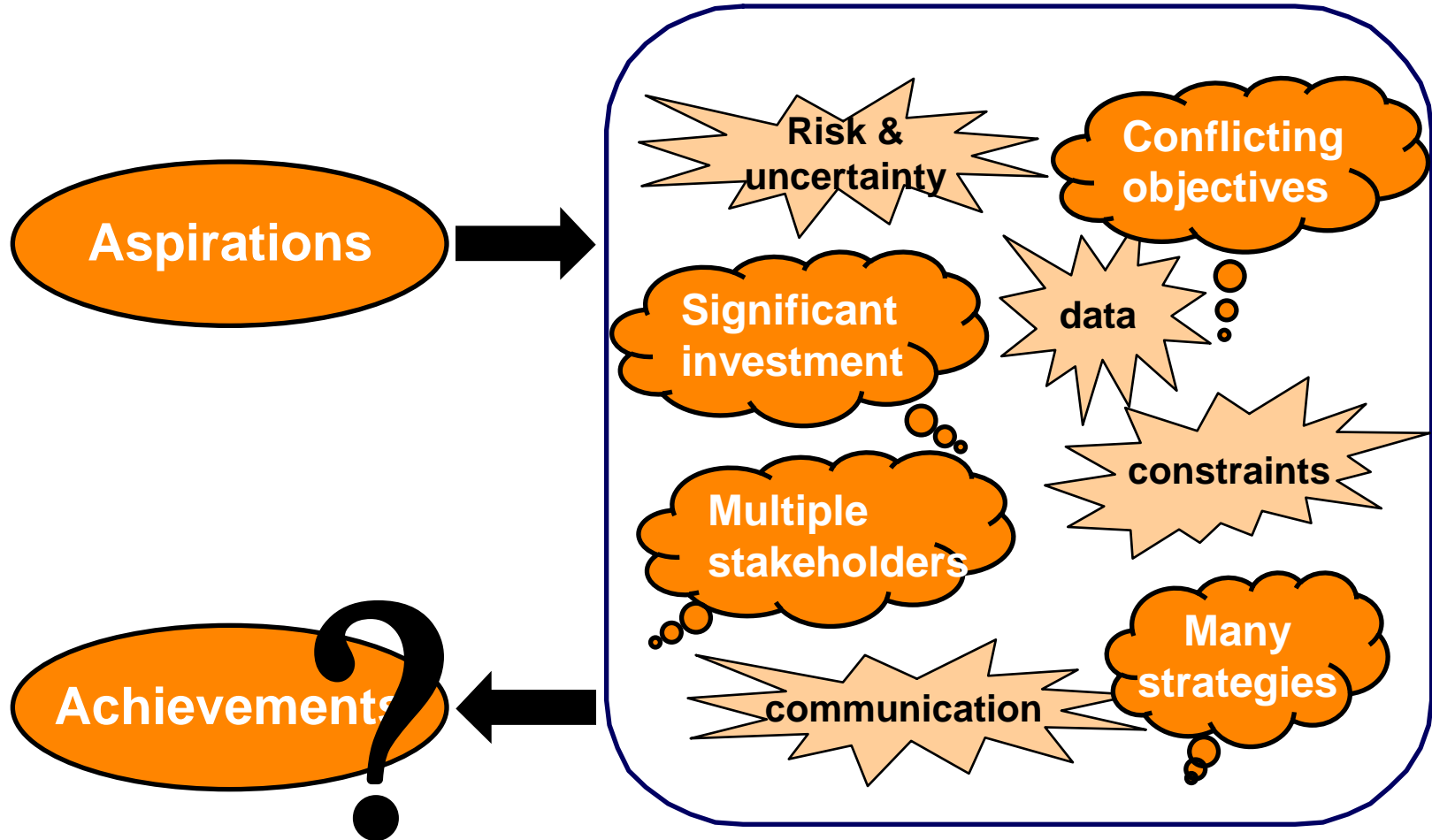


Worker on LNG tank
Elba Island, USA
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Introduction

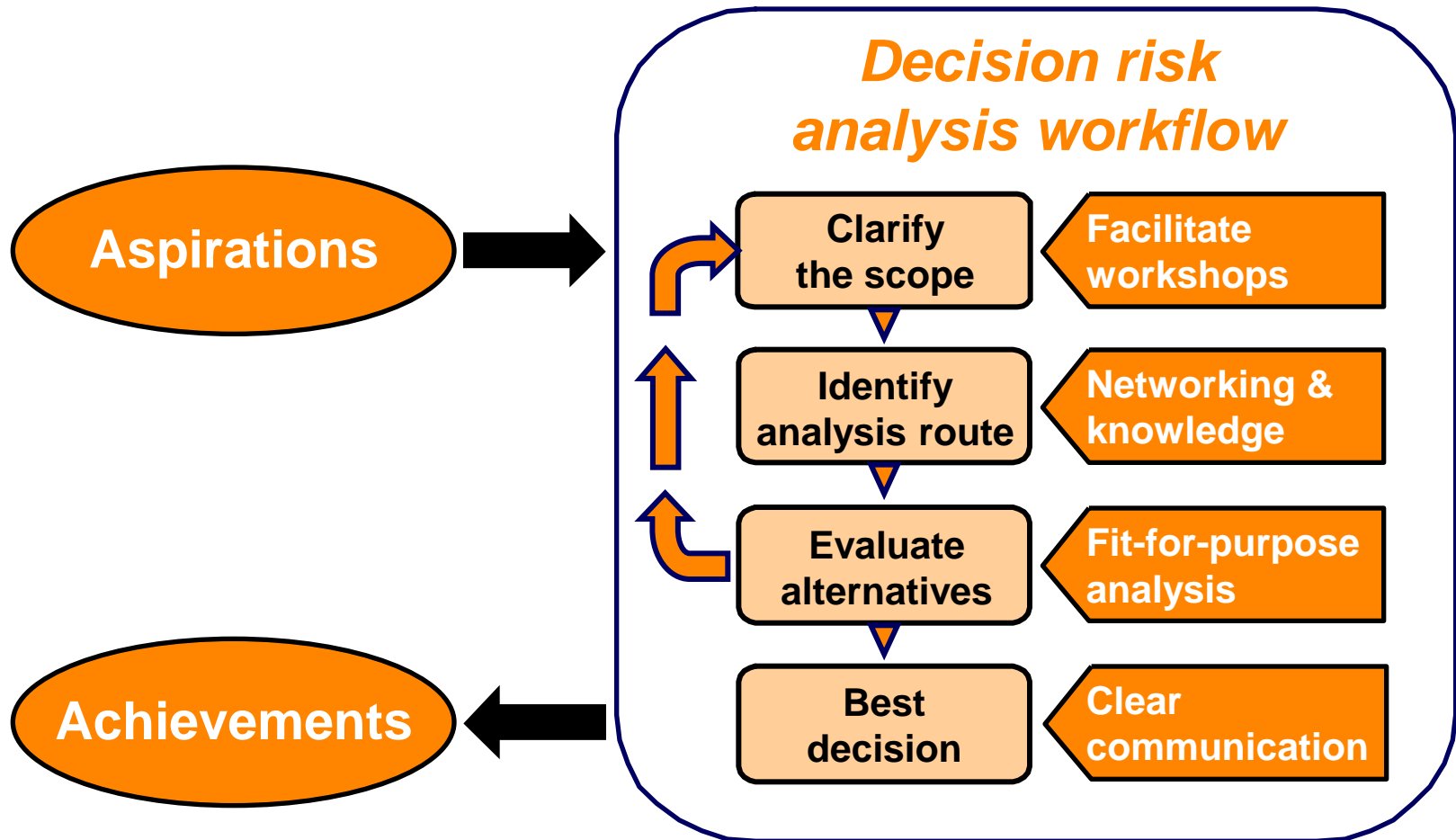
- Decision Risk Analysis (DRA)
 - A structured process to help stakeholders optimise their decision making in the face of risks & uncertainties
 - Employs a combination of facilitation & modelling
 - An effective way of delivering Decision Quality
- Case study
 - Implementation of DRA to an oil & gas development

When is Decision Analysis useful?



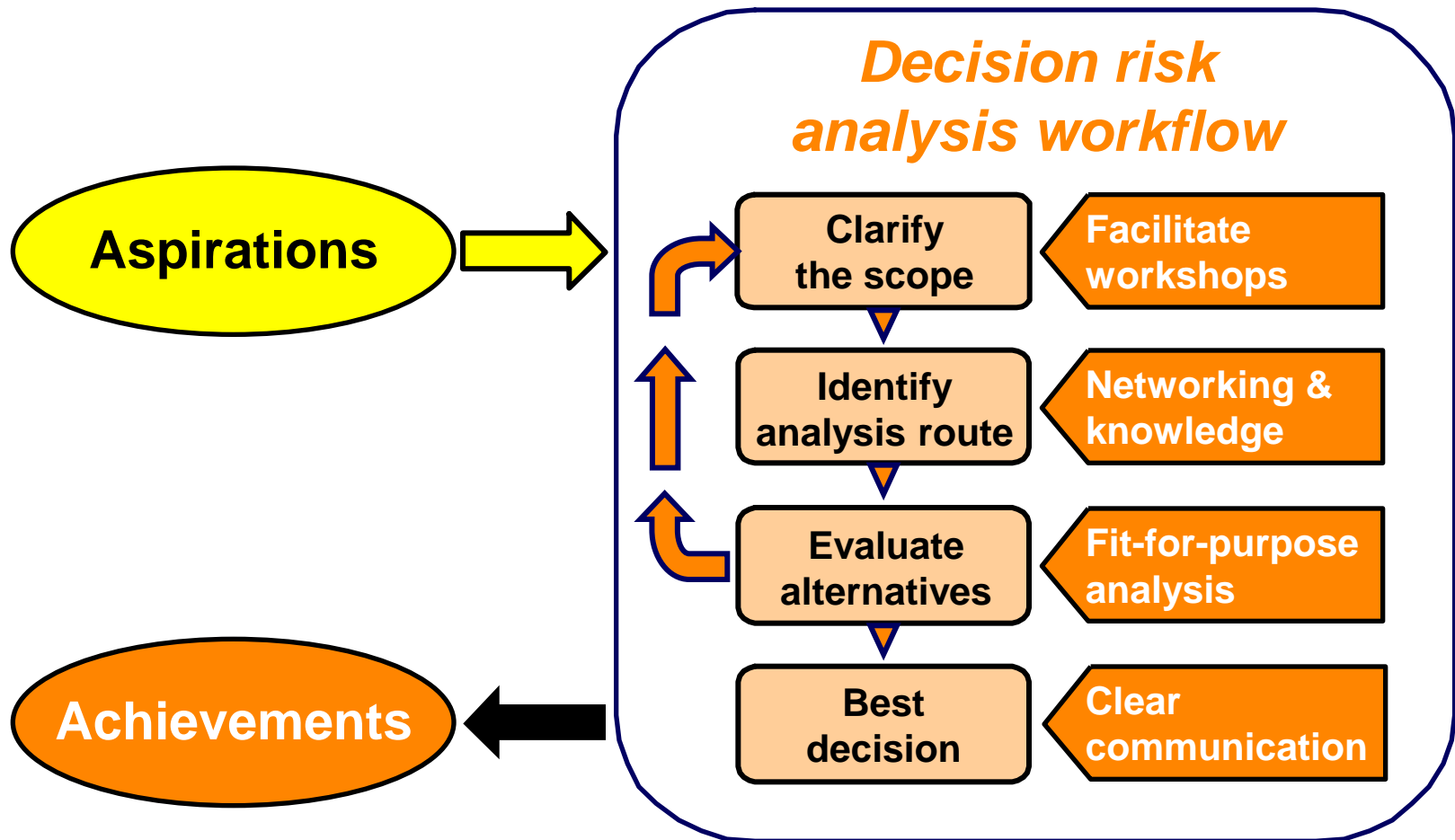
When a complex decision space has to be negotiated

Decision analysis approach



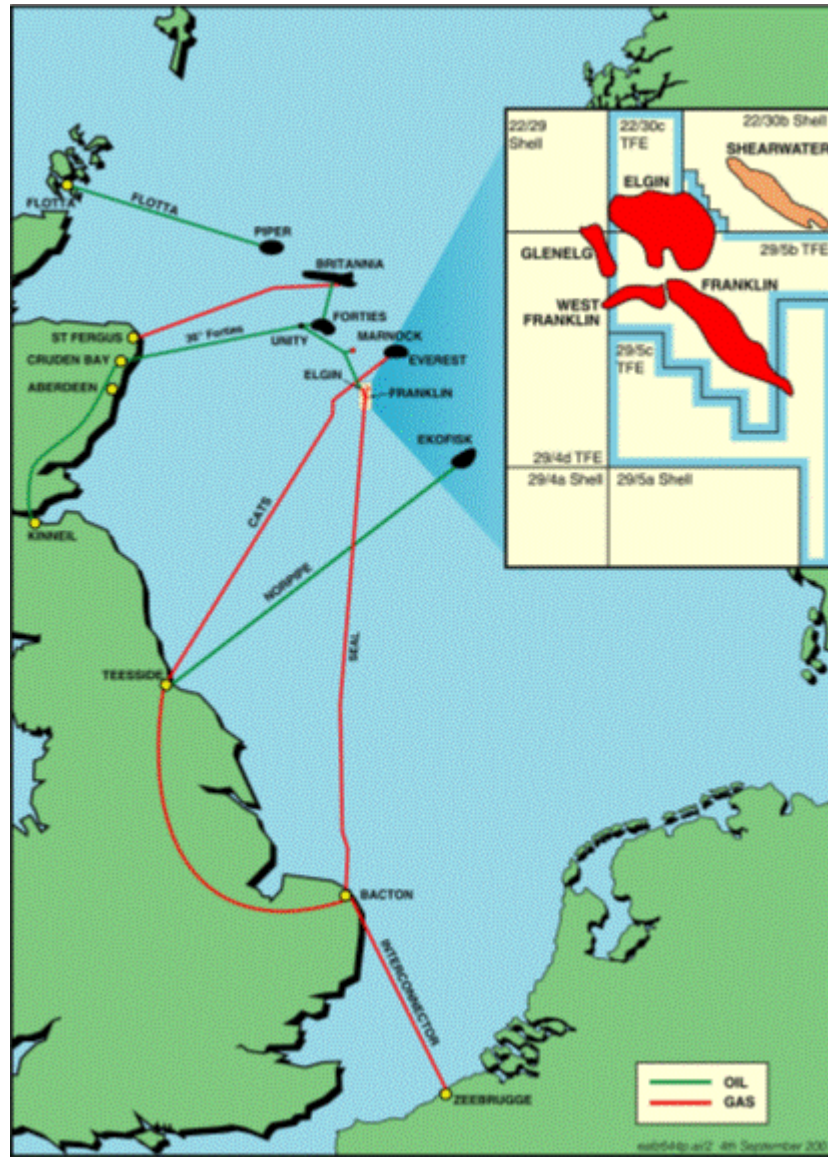
A structured approach to decision making

Decision analysis approach

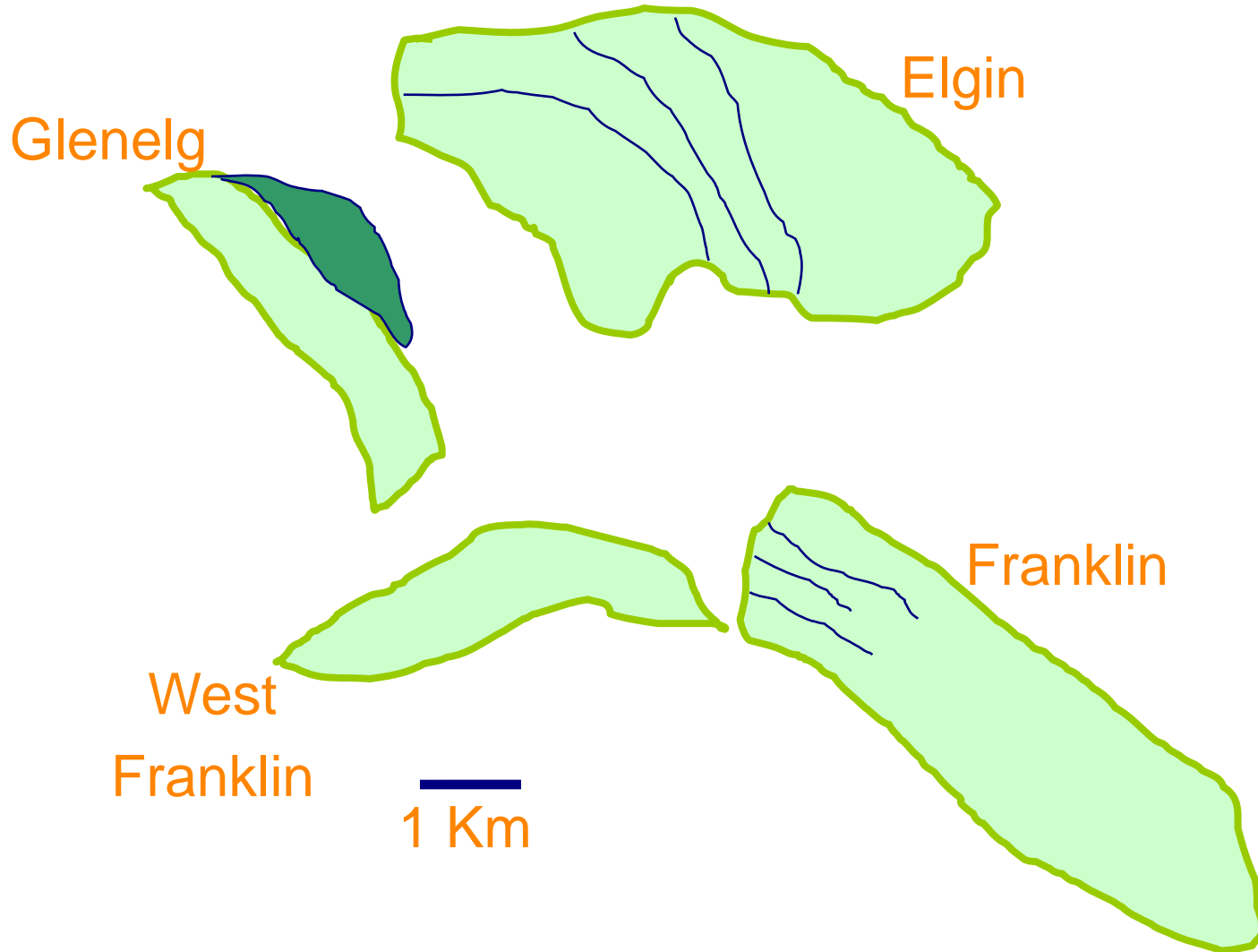


A structured approach to decision making

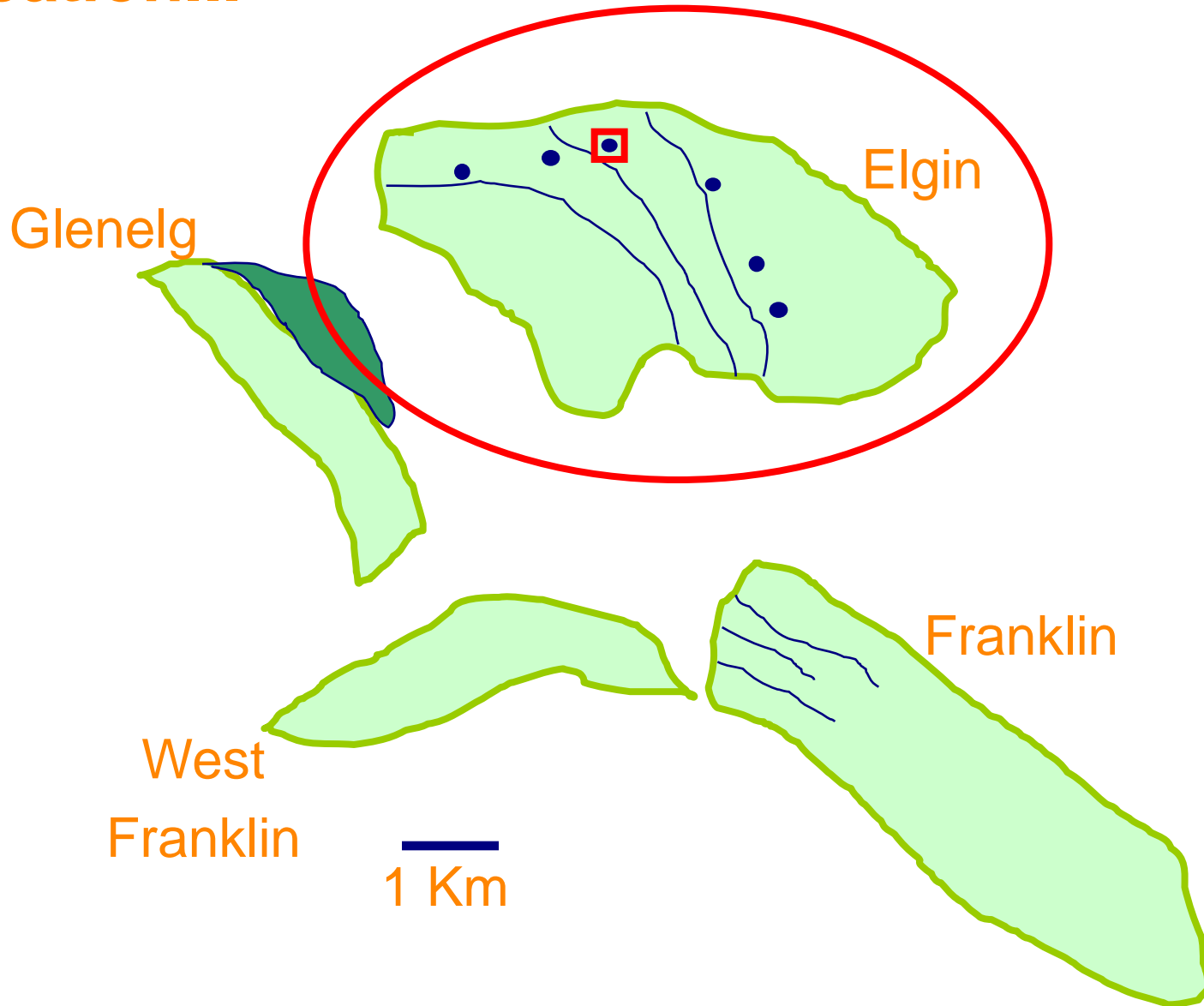
Case study: Glenelg & West Franklin



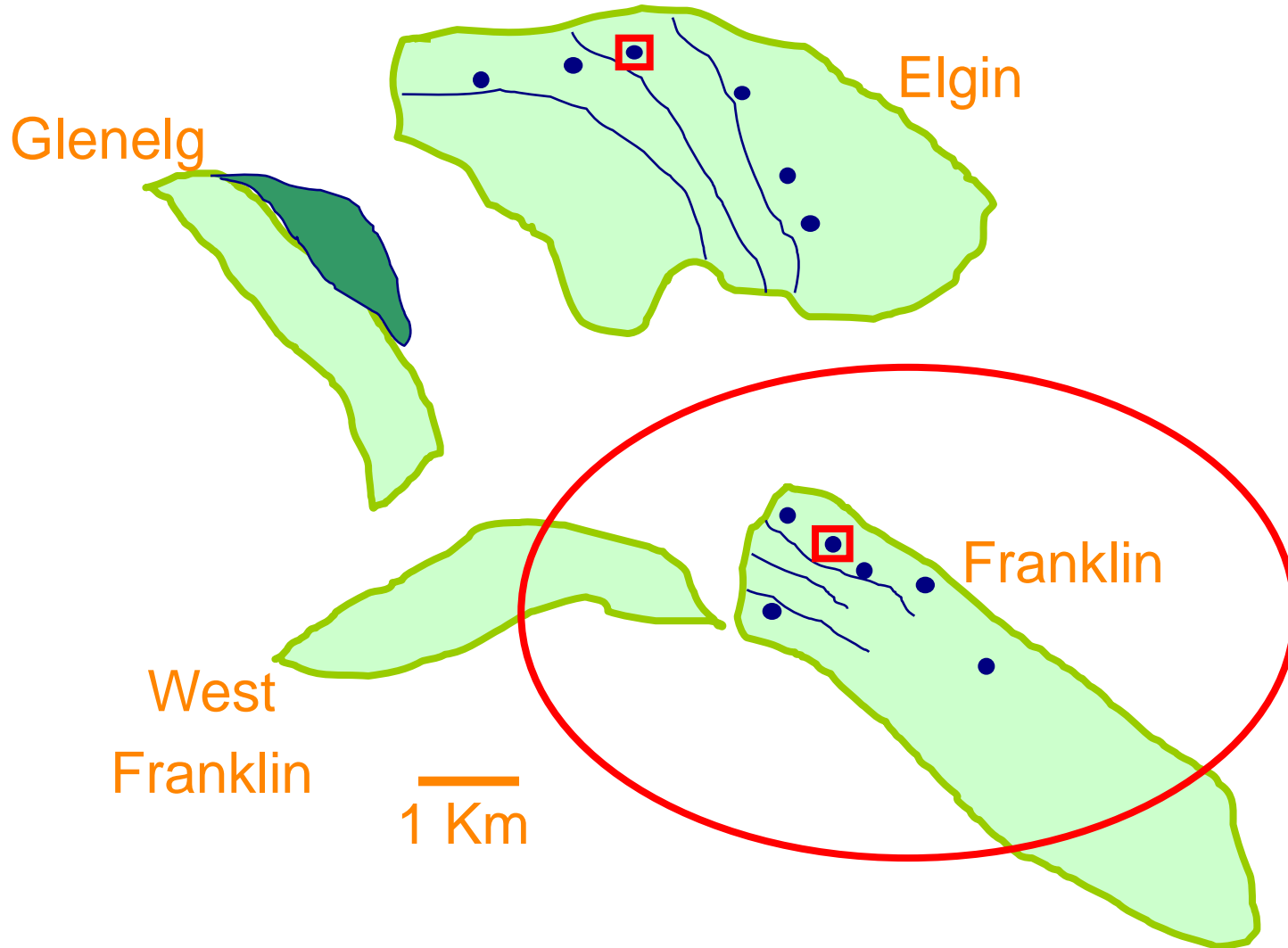
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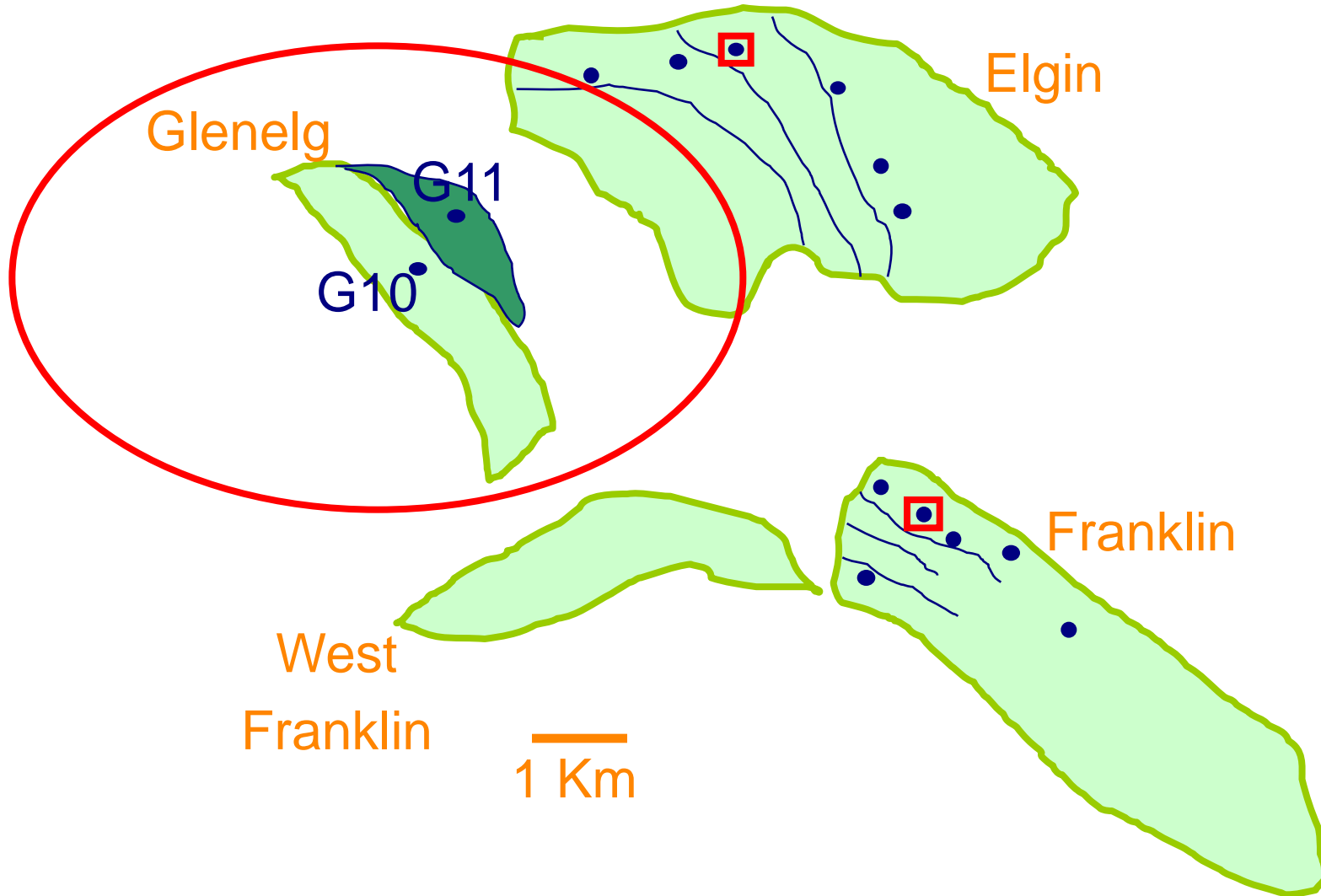
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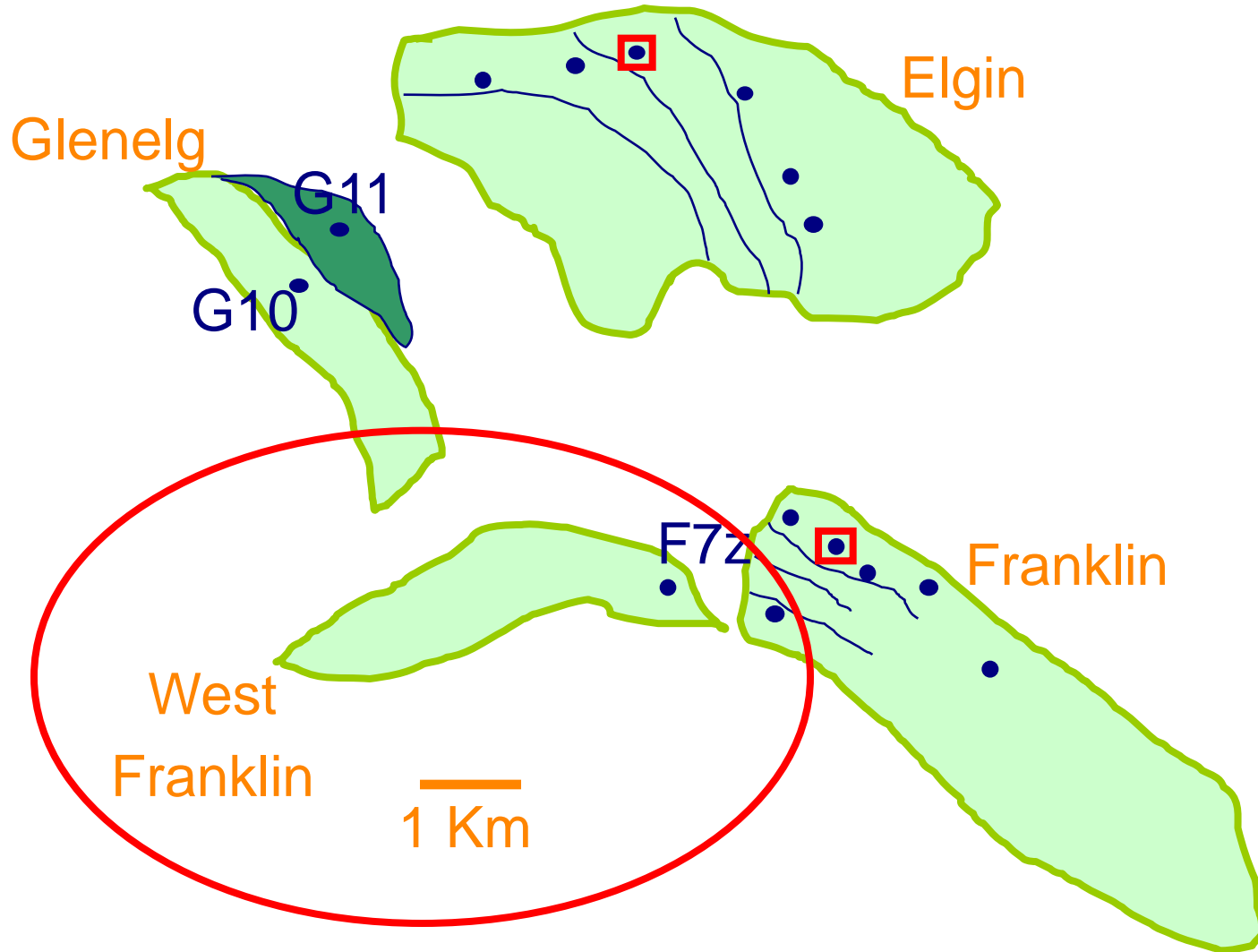
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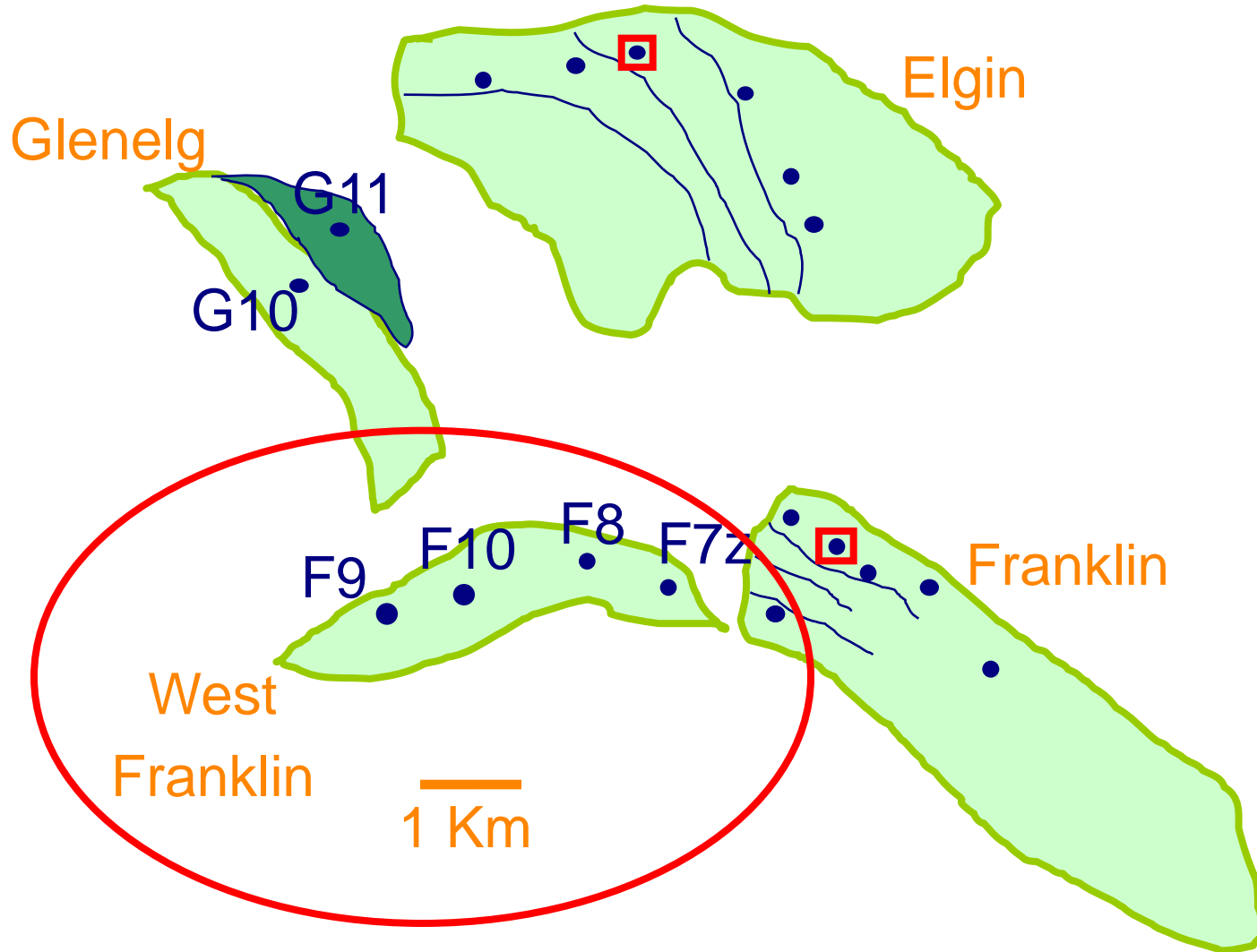
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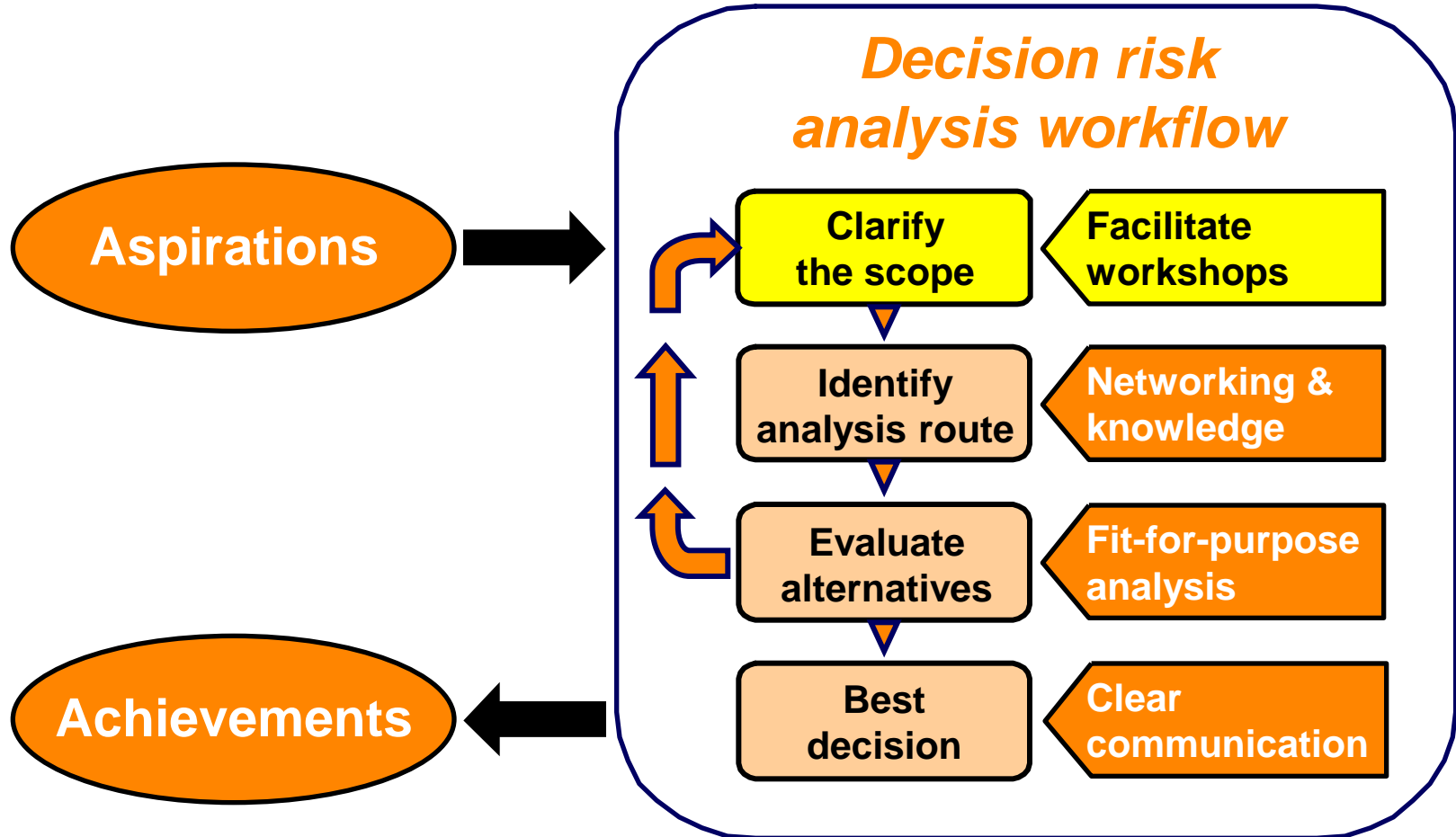
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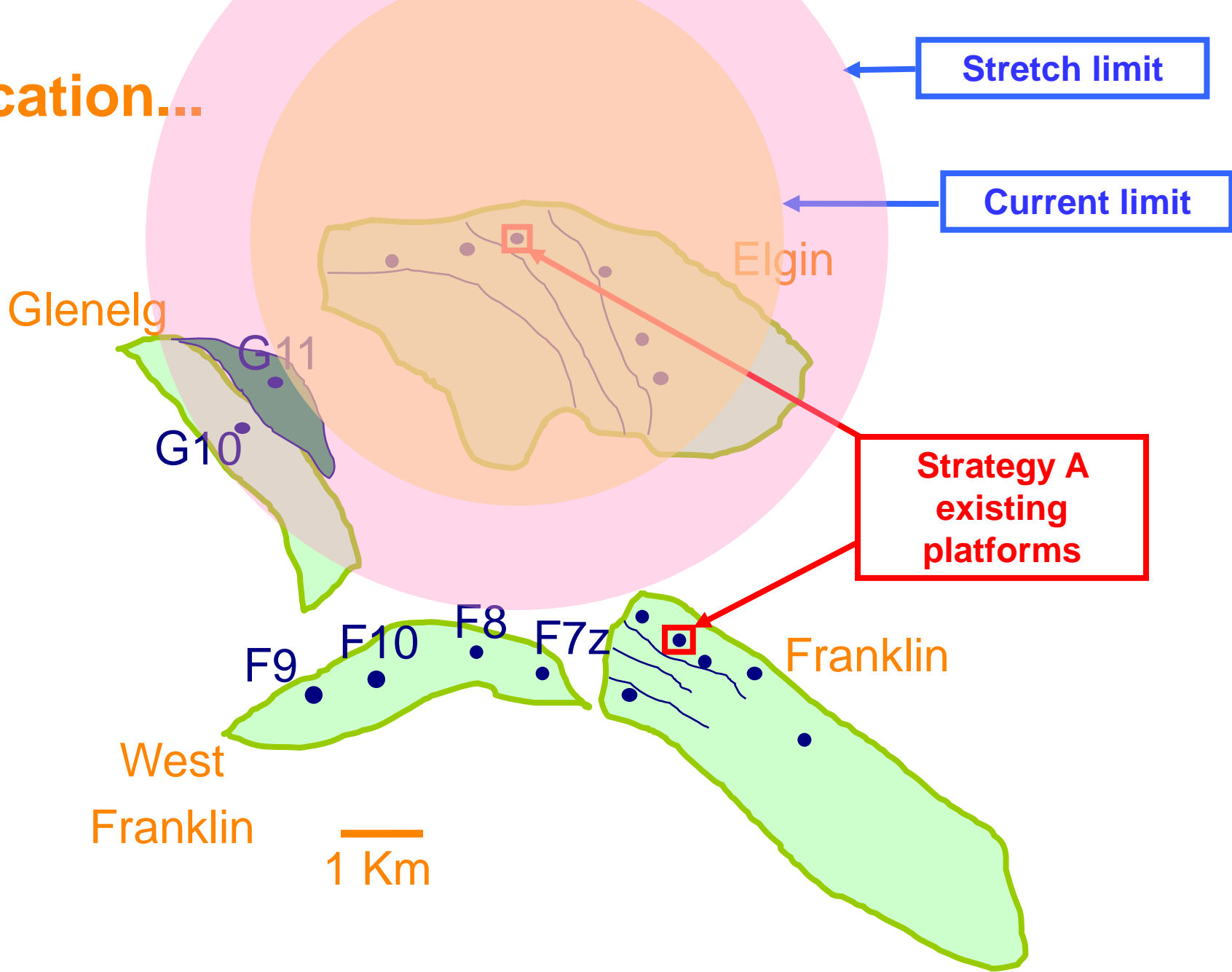


Decision analysis approach

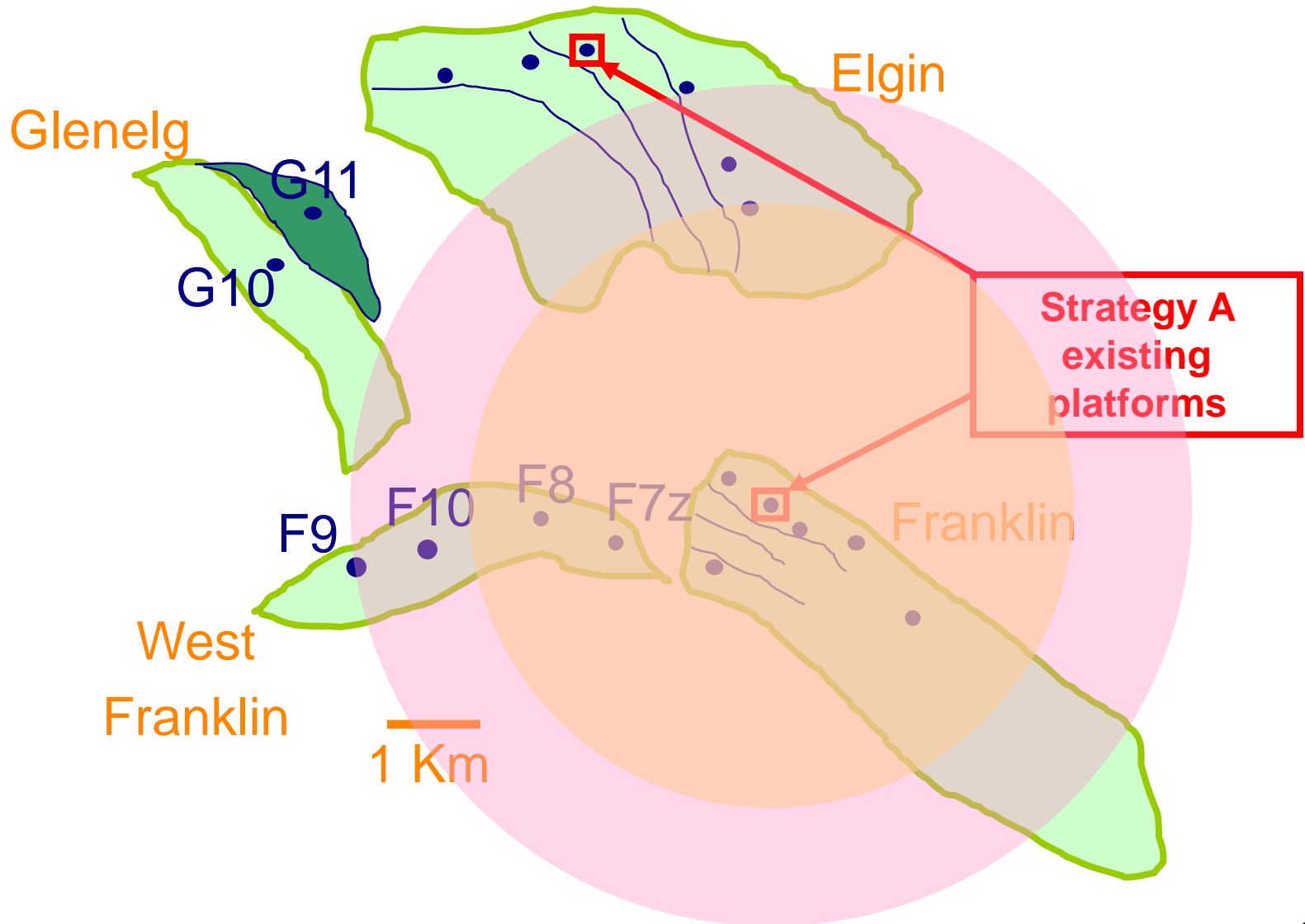


A structured approach to decision making

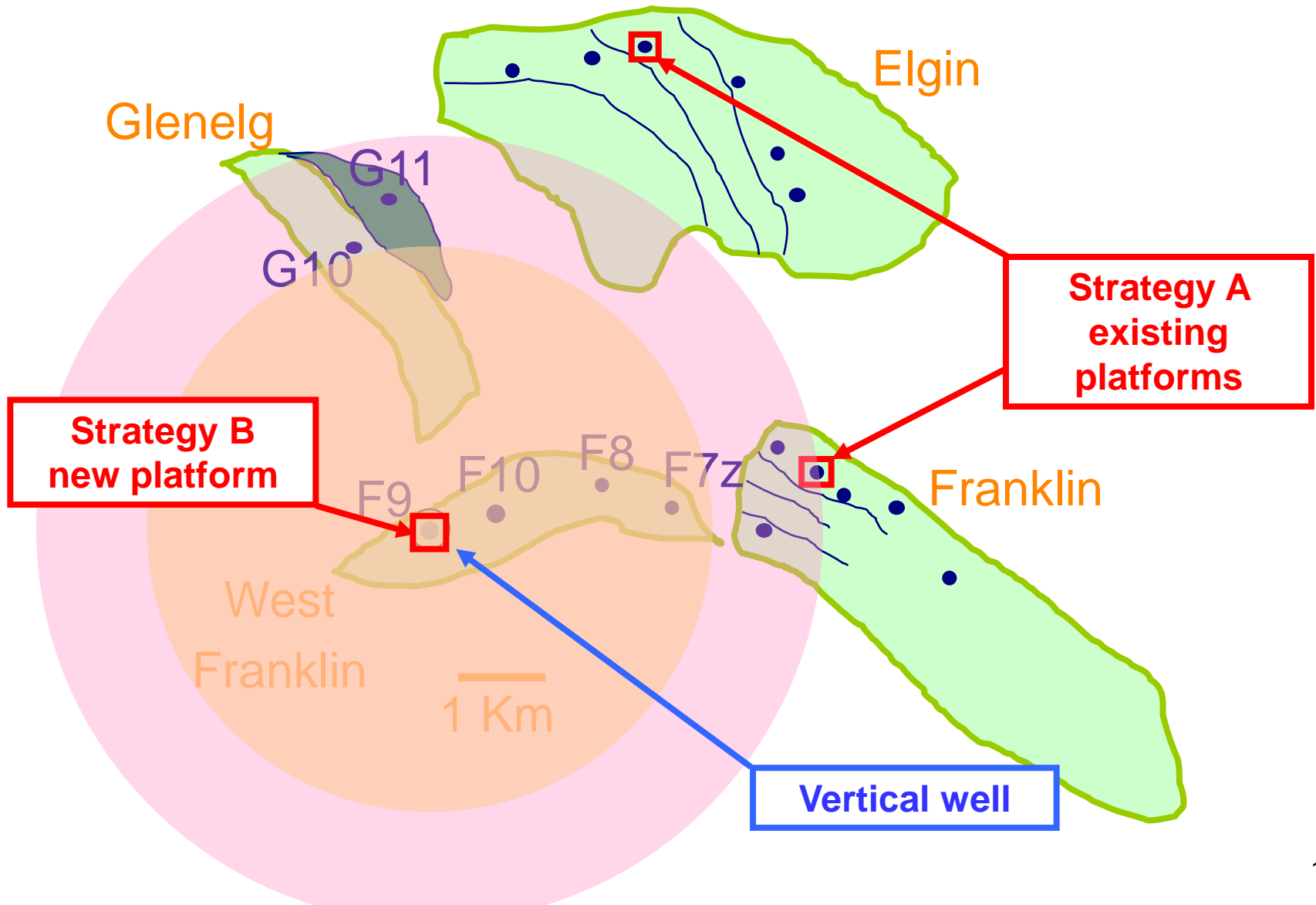
Location...



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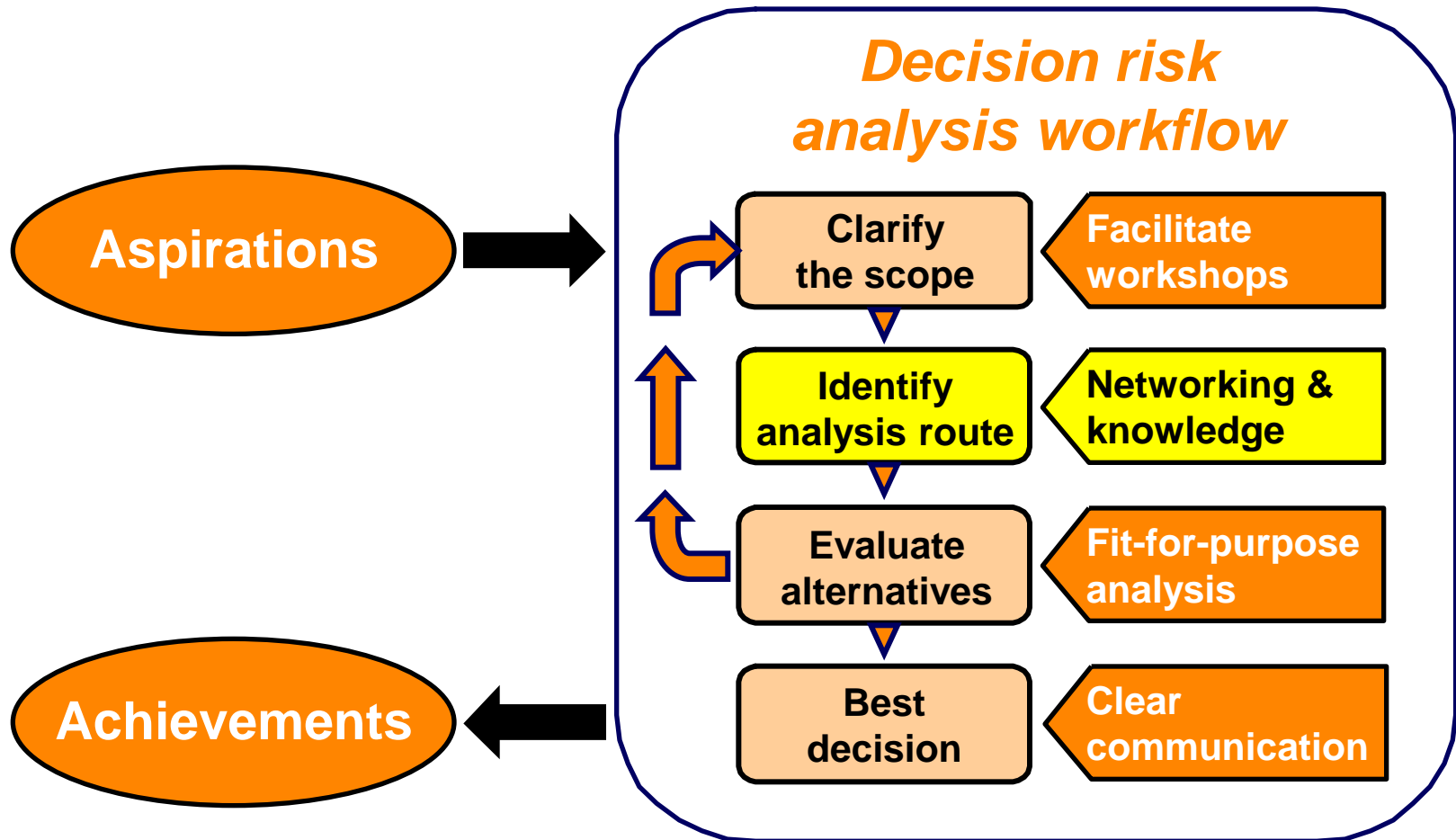
Alternative strategies

- Strategy A: extended reach drilling from existing platforms
 - Significant drilling risks
 - Interruptions to existing operations
- Strategy B: construct a new platform
 - Large capital expenditure
 - Delayed hydrocarbon production

Significant uncertainties

- Different Partner views about the size of the reservoirs
- Different Partner views about the drilling risk
- The number of high risk wells required was unknown

Decision analysis approach



A structured approach to decision making

A range of decision making approaches are available

- Voting
- Threat/benefit log
- Weighted ranking
- Absolute ranking
- Probability x impact ranking
- Cost/schedule risking
- Value of information analysis
- Fully integrated asset modelling

Qualitative



Quantitative

Need to select the appropriate approach for the decision

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Qualitative



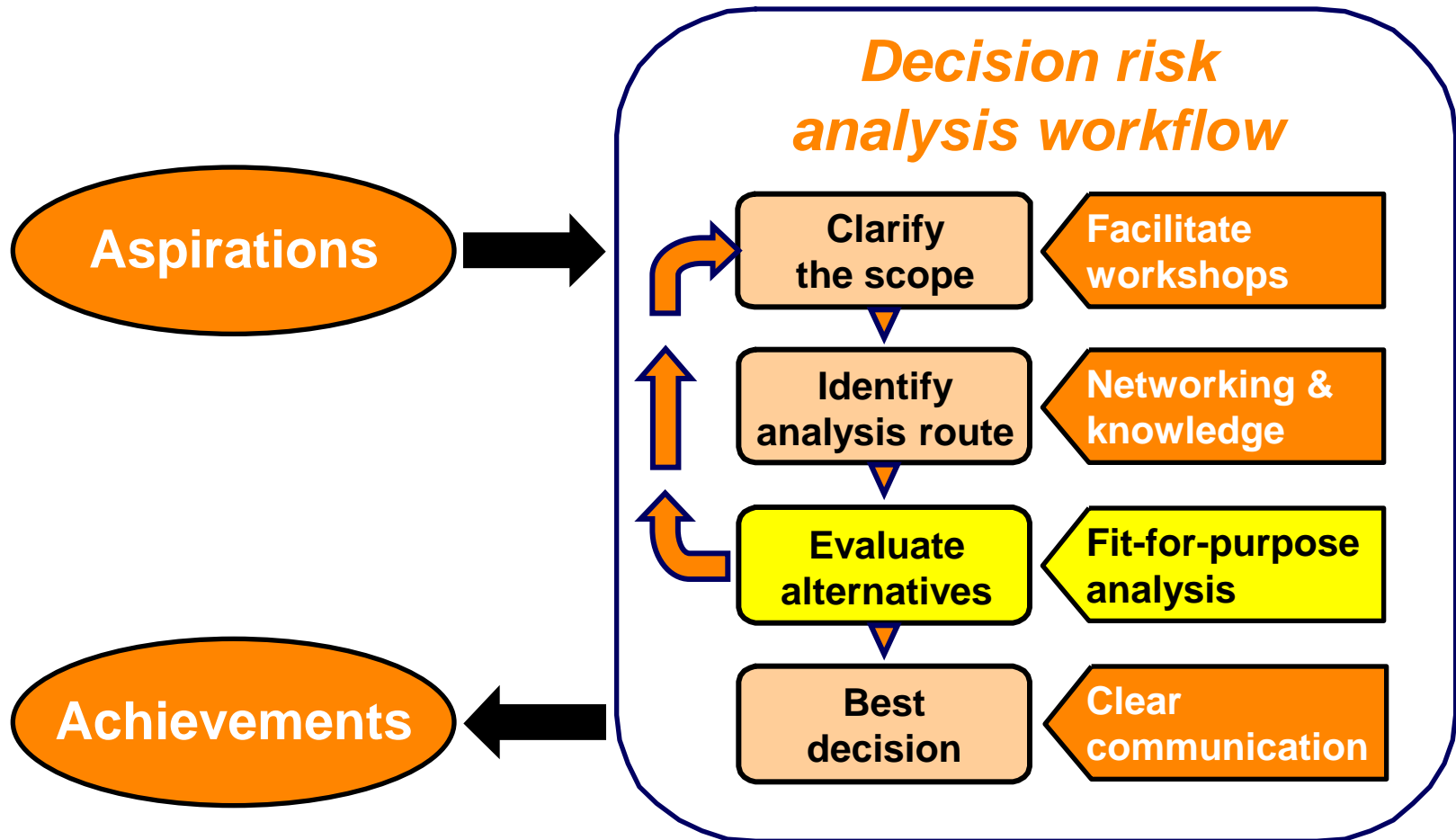
Quantitative

Need to select the appropriate approach for the decision

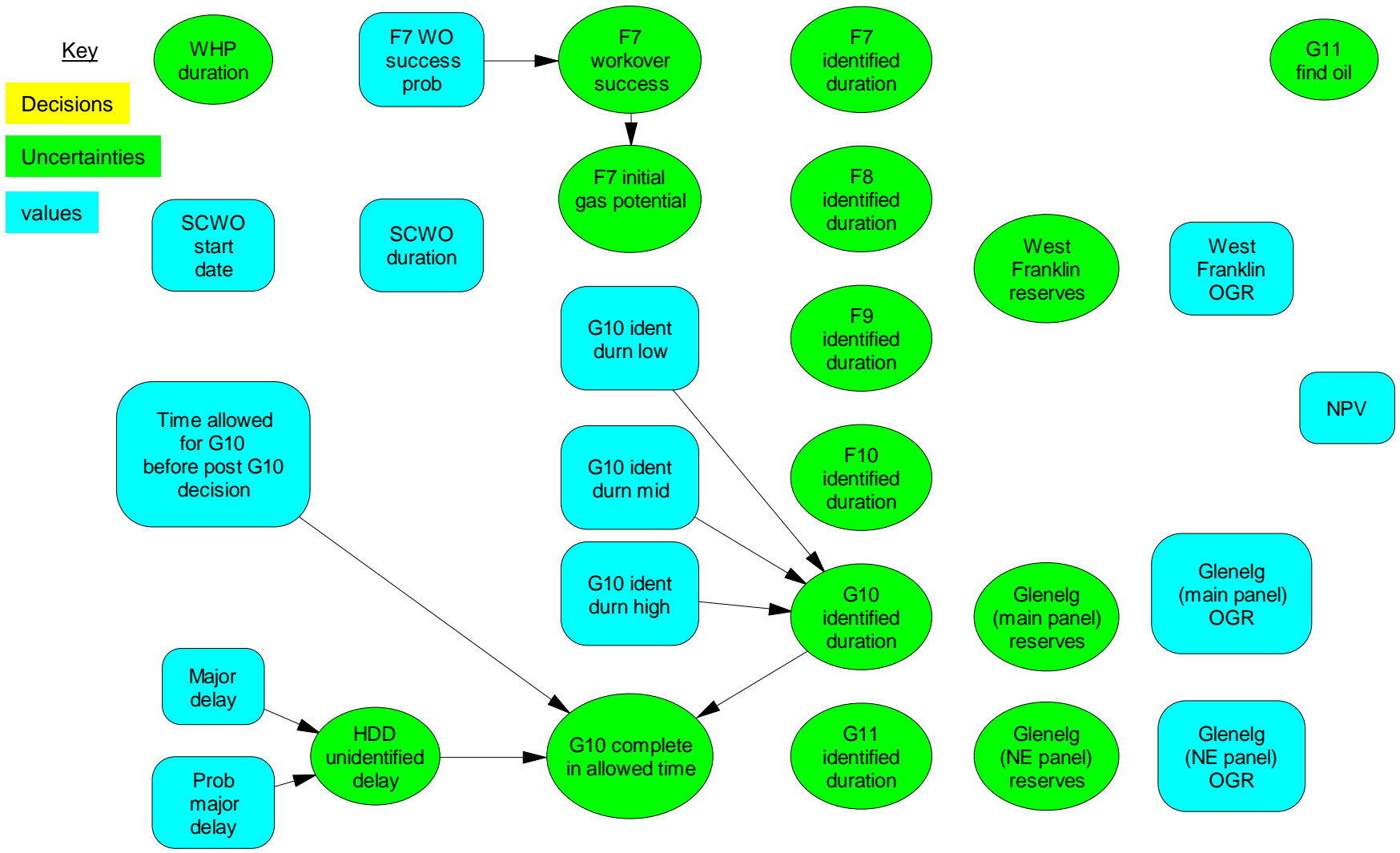
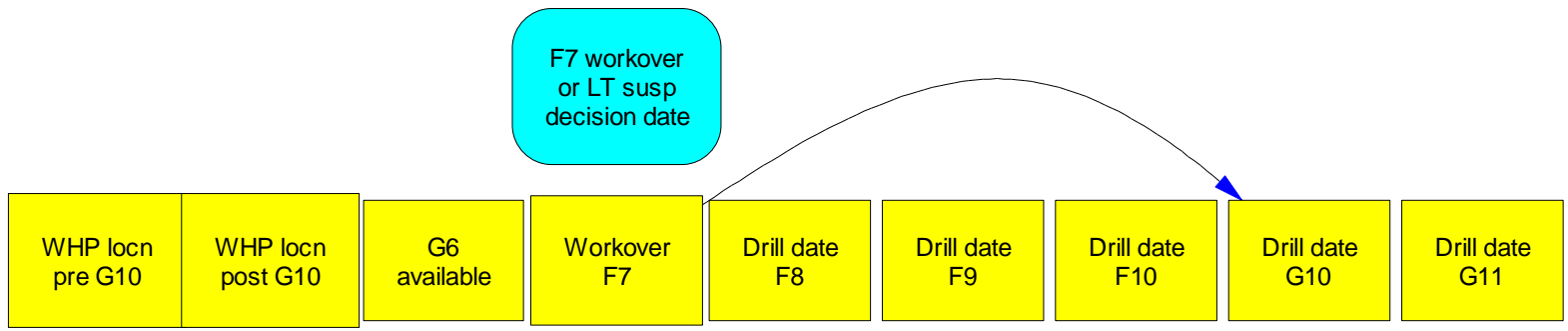
Unknown unknown drilling risks

		Quantified	
		known	unknown
Identified	known	Drill rig cost (£/day)	Drilling duration (days)
	unknown	X	???

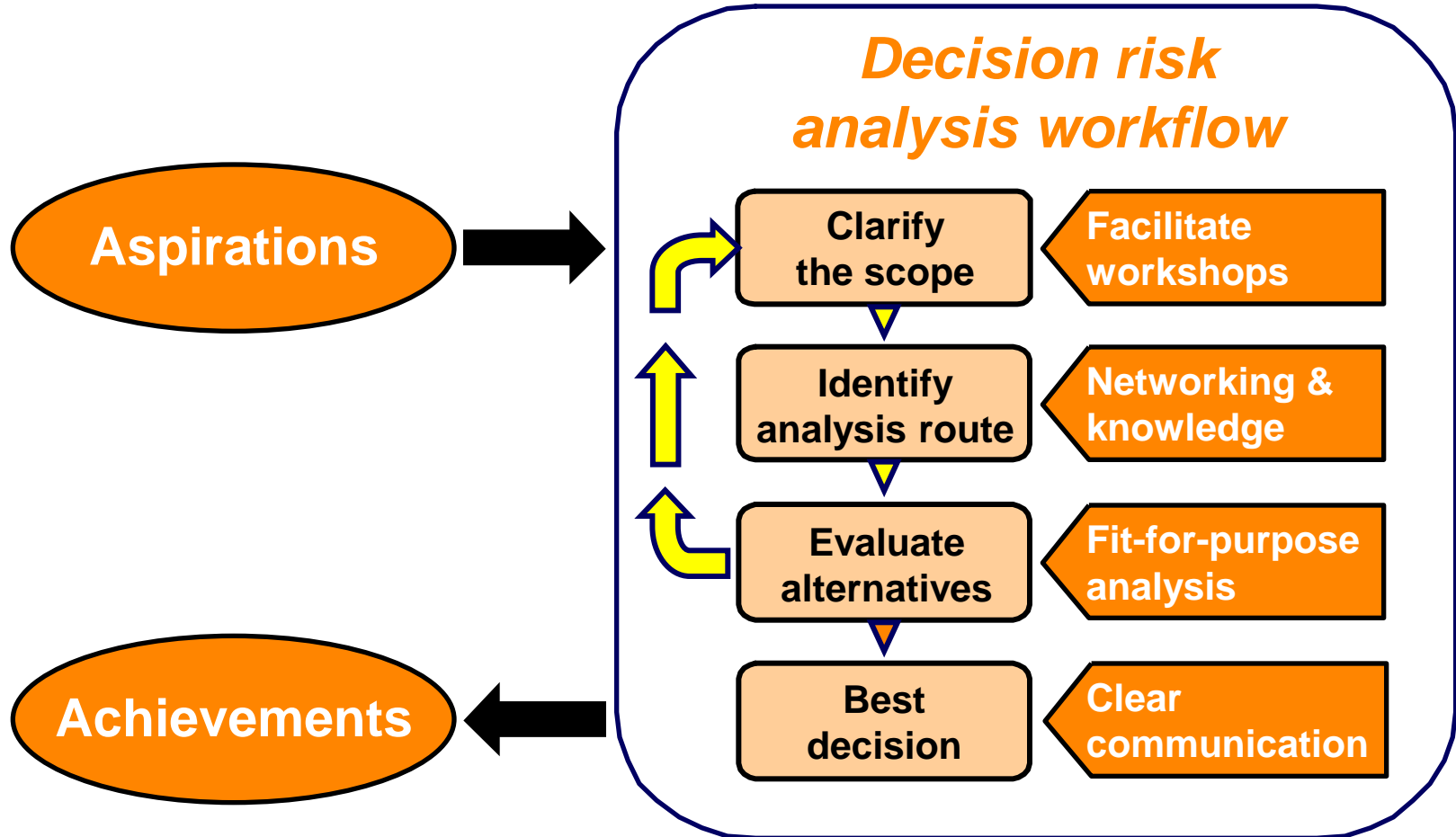
Decision analysis approach



A structured approach to decision making

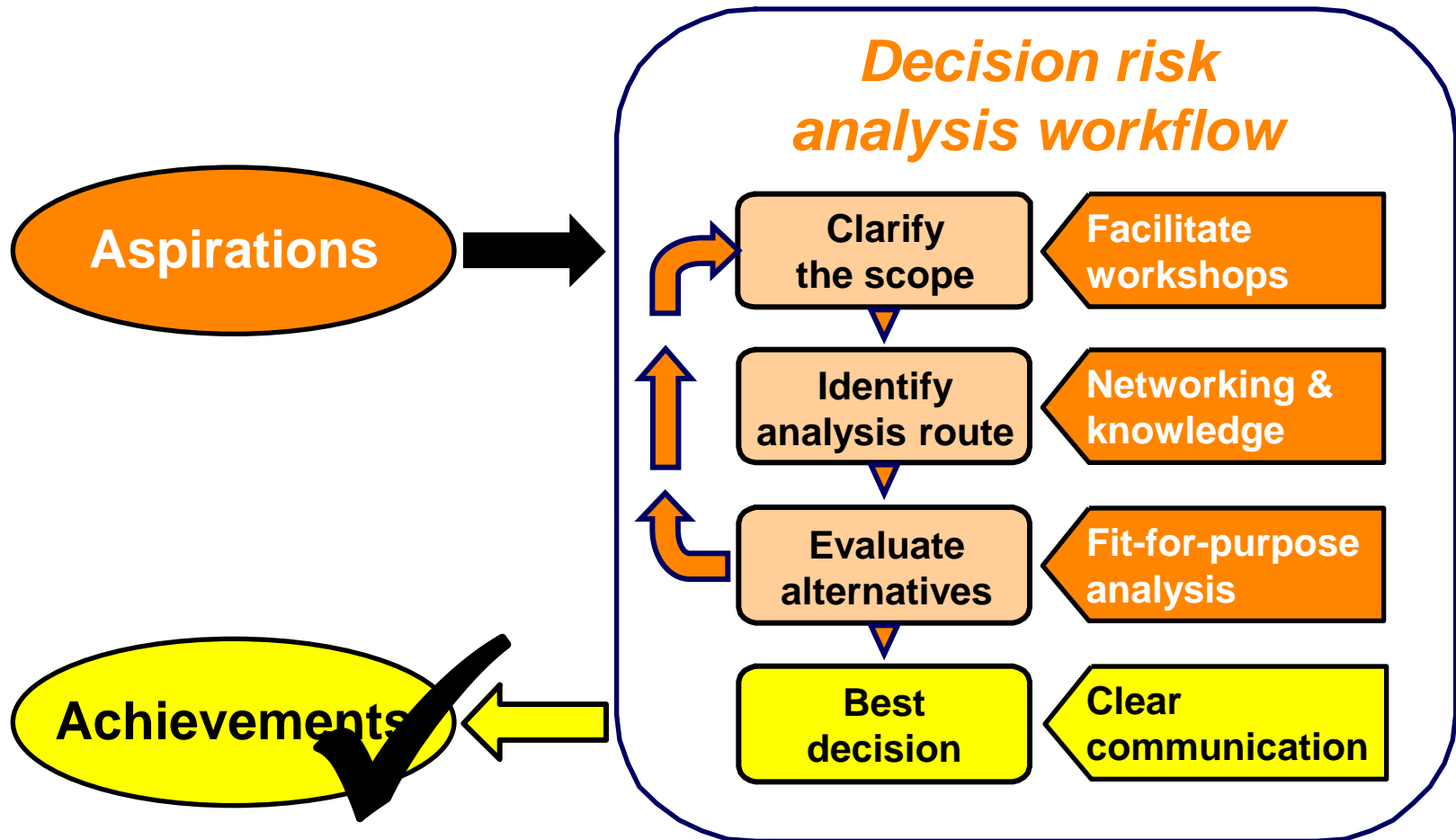


Decision analysis approach



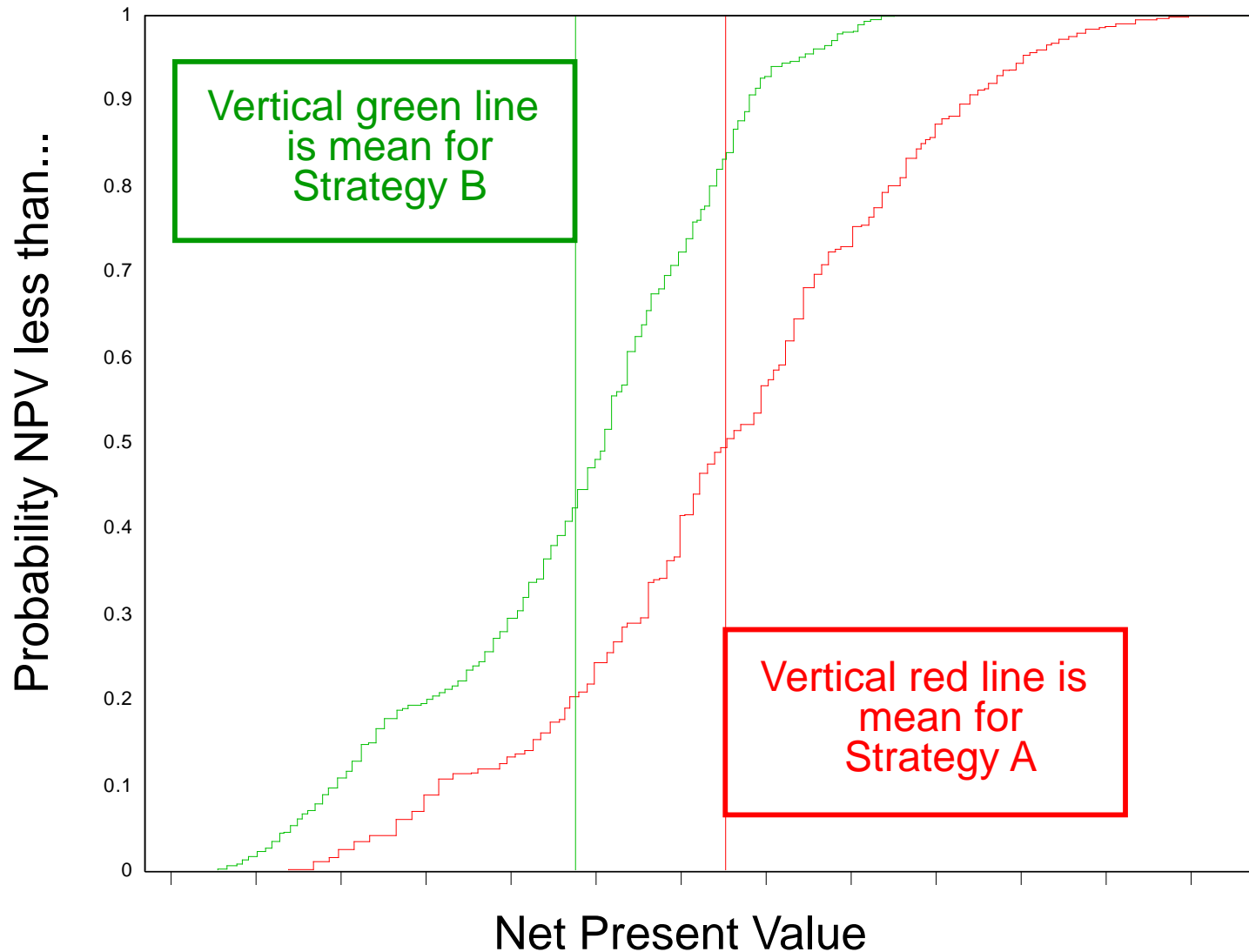
A structured approach to decision making

Decision analysis approach



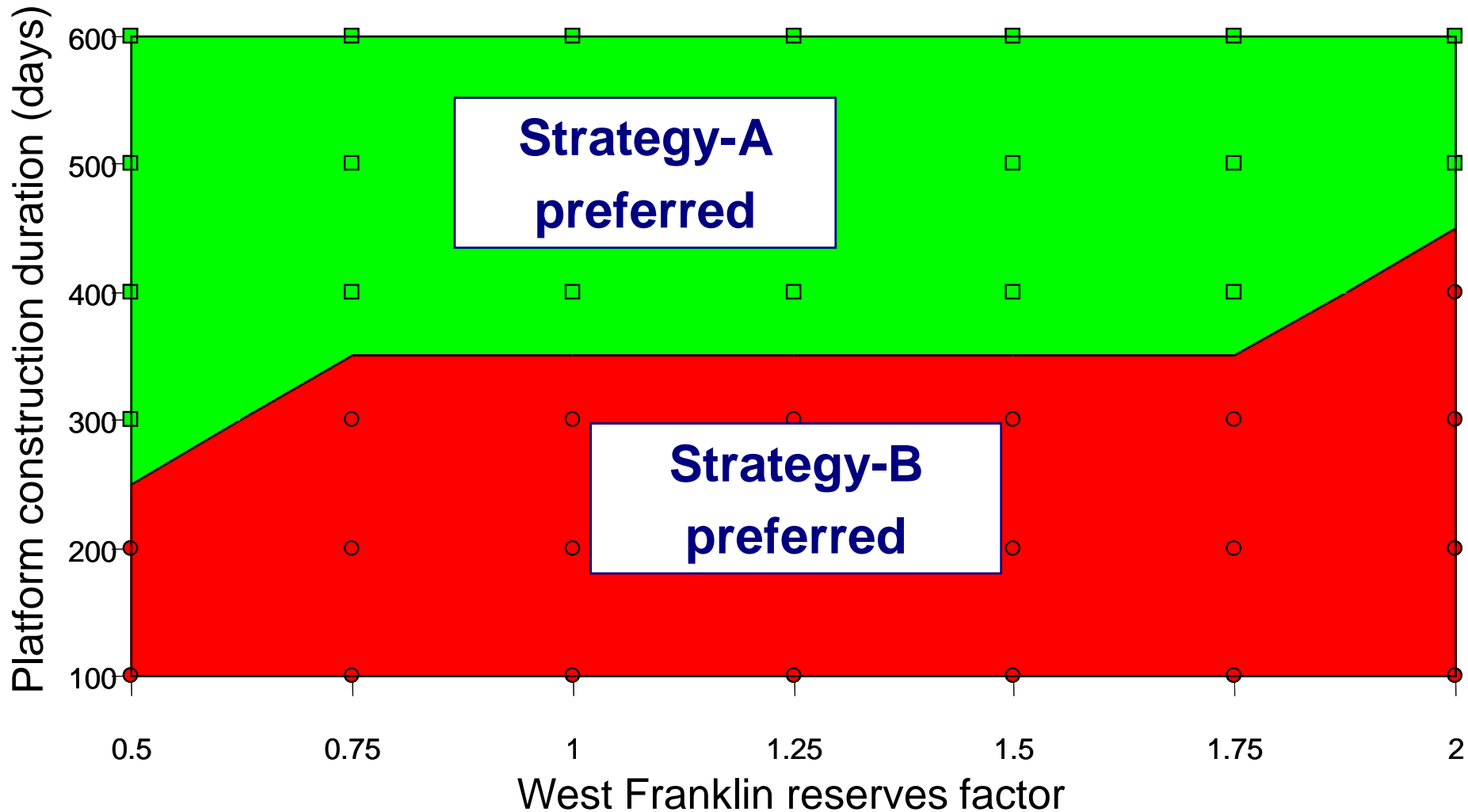
A structured approach to decision making

NPV risk profiles for Strategies A and B



Strategy A was better than Strategy B

2D rainbow plot of reserves vs platform construction duration



Base case was at (1,730) in the Strategy A preferred region²⁸

Partner consensus was achieved

- Strategy A was always better than Strategy B unless
 - Very long drilling delays (eg >80% chance of being 3 x estimate)
 - Platform capex reduced by more than 45%
- Highest NPV was achieved using a three-well option
- Delaying development start date by 3 months decreased the expected NPV by ~4%

DRA enabled Partners to agree on the best strategy and move forwards



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