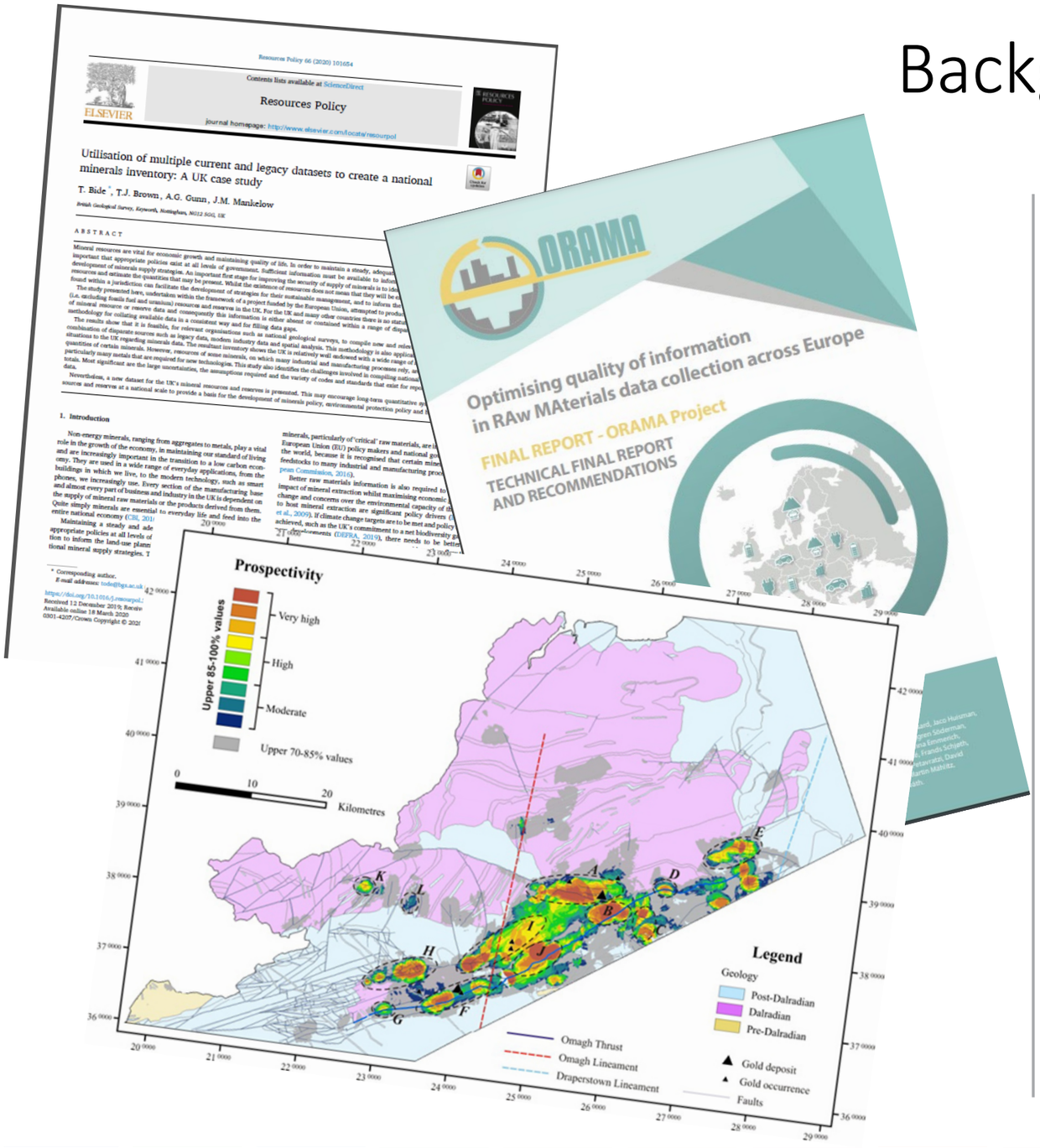
Creating a national resource inventory using UNFC, an example from the UK

Tom Bide
Senior Resource Geologist
British Geological Survey

Background



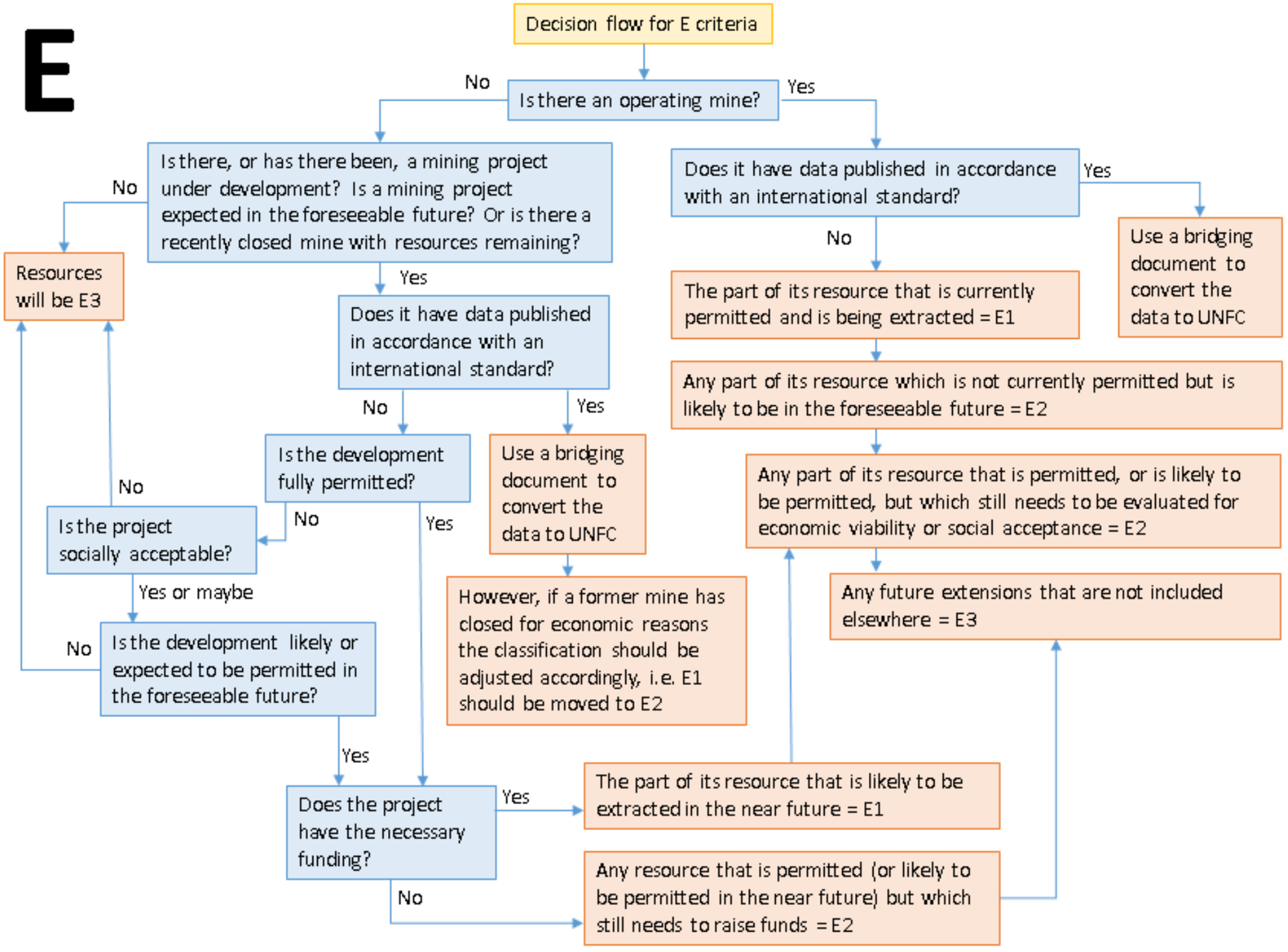
- Provision of mineral resource data for national resource management/planning is often a key role for National Geological Surveys
- In 2019 the UK compiled an inventory of national resource data using UNFC
- Large amounts of data are often available – however it can be complex to classify according to UNFC
- This talk details learnings/insights after undertaking this process

How to classify in UNFC?

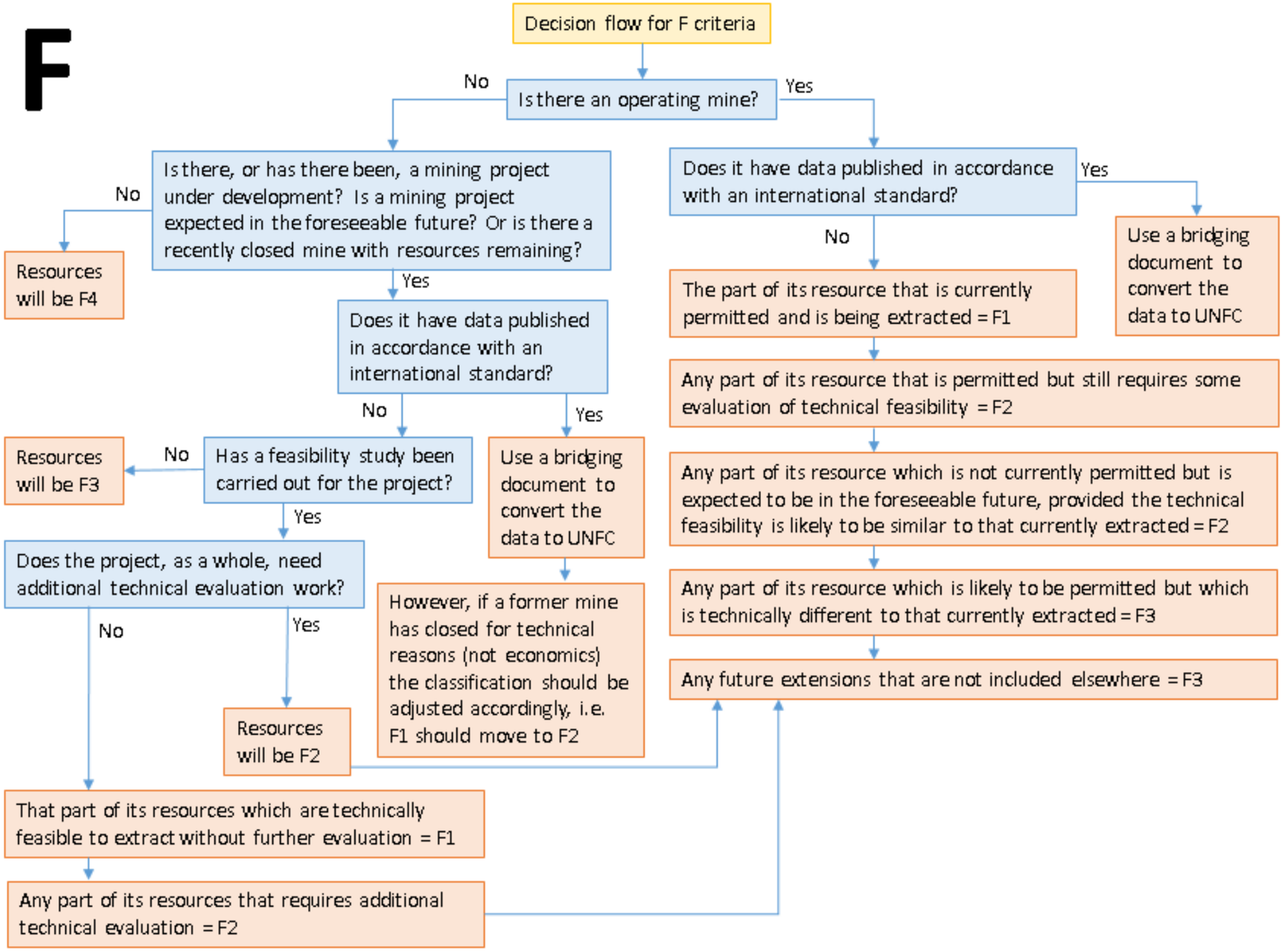
- Decision flow sheets
  - E category
  - F category
  - G category
  - CRIRSCO compliant figures

Total products		Class	Categories		
			E	F	G
	Produced		Sold or used Production		
			Production which is unused or consumed in operations		
	The project's environmental-socio-economic viability and technical feasibility has been confirmed	Viable Projects	1	1	1, 2, 3
	The project's environmental-socio-economic viability and/ or technical feasibility has yet to be confirmed	Potentially viable Projects	2	2	1, 2, 3
		Non-viable Projects	3	2	1, 2, 3
	Remaining products not developed from identified projects		3	4	1, 2, 3
	There is insufficient information on the source to assess the project's environmental-socio-economic viability and technical feasibility	Prospective Projects	3	3	4
	Remaining products not developed from prospective projects		3	4	4

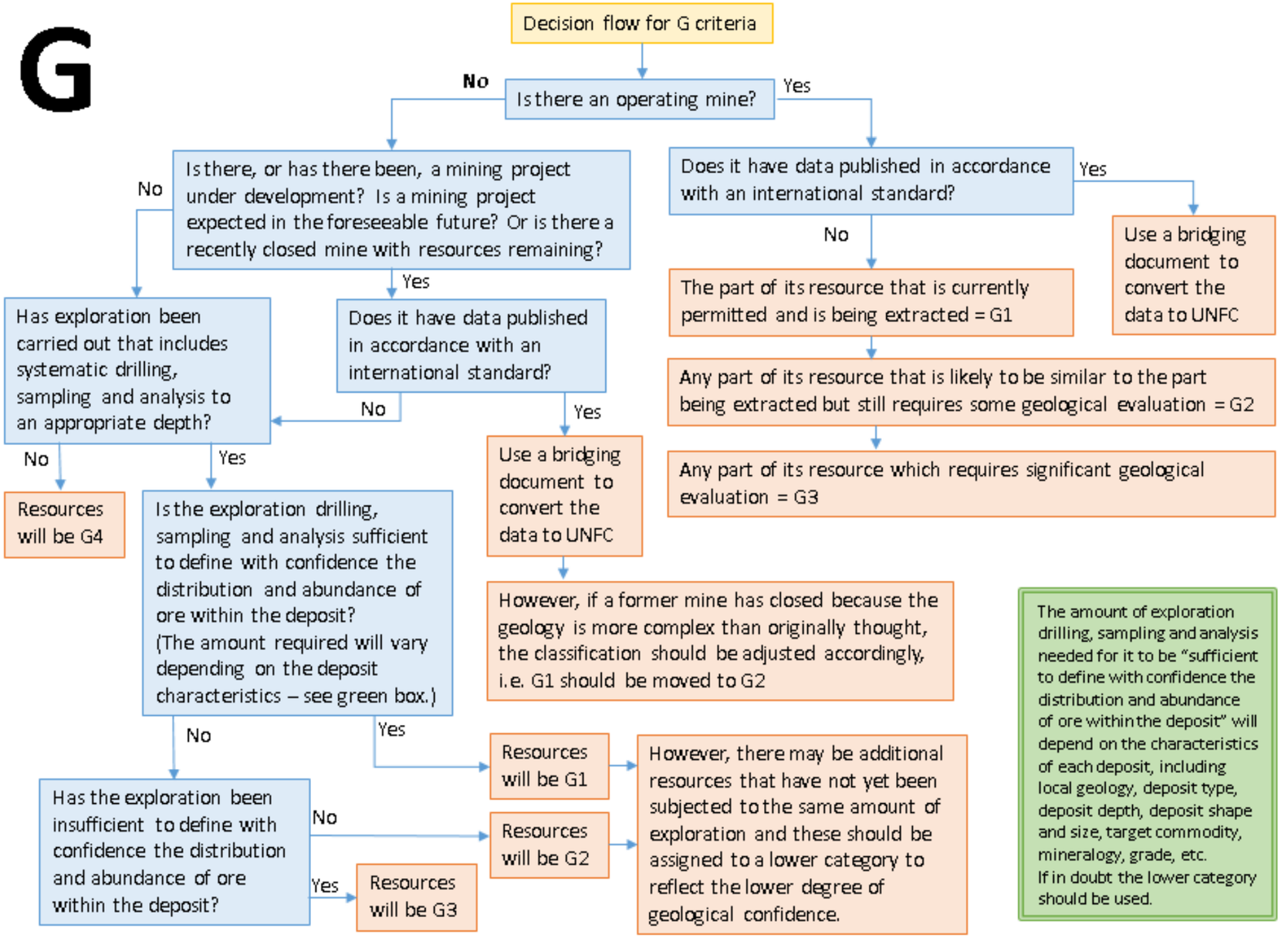
Decision tool for UNFC E axis



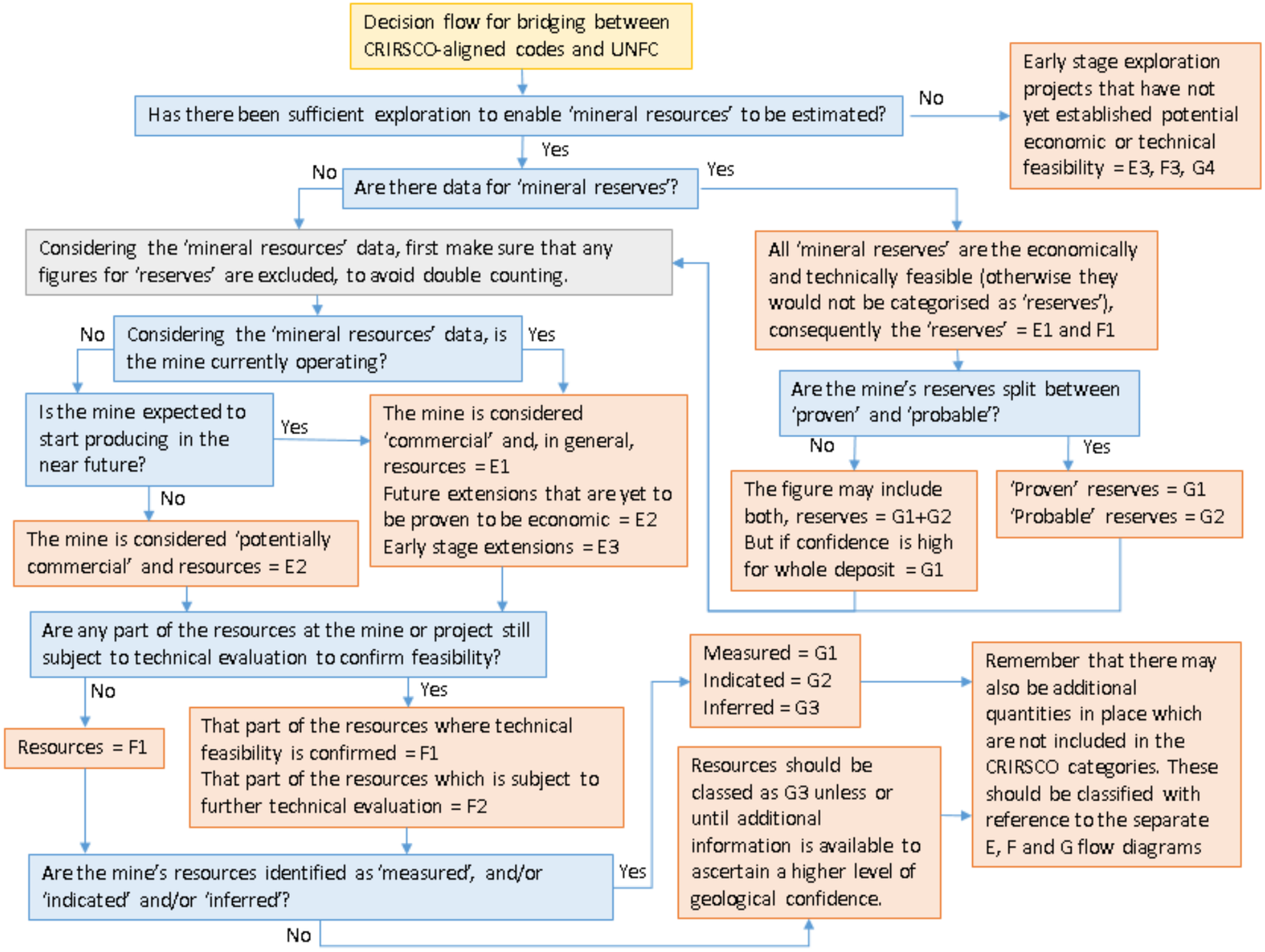
Decision tool for UNFC F axis



Decision tool for UNFC G axis



Decision tool for CRIRISCO compliant data to UNFC



Example 1: Gairloch, Scotland, UK

- A volcanogenic massive sulfide (VMS) deposit in Archaean metamorphic rocks in NW Scotland
- Company exploration for Cu, Zn and Au in 1980s
- 87 boreholes, 9.2 km drillcore
- Stratiform mineralisation, 4 m thick, traced over >1 km
- Resources: 500,000 t @ 1.2% Cu, 0.6% Zn and 1.7 g/t Au
- Data from BGS archives; no information on how the estimate was made, by whom and how many boreholes included

Category	Reporting Code	Year of reporting	Tonnage of ore (million tonnes)	UNFC category			Comments
				E	F	G	
Resource estimate	Unknown	1980	0.5				

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Category	Reporting Code	Year of reporting	Tonnage of ore (million tonnes)	UNFC category			Comments
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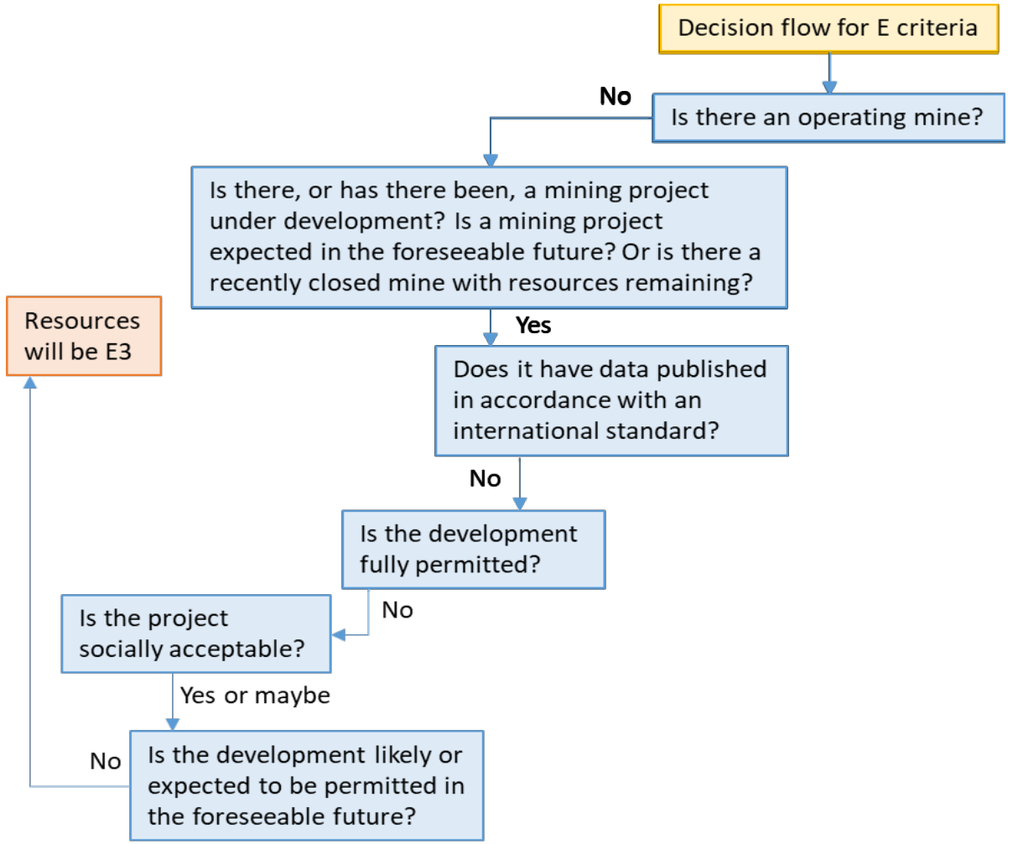
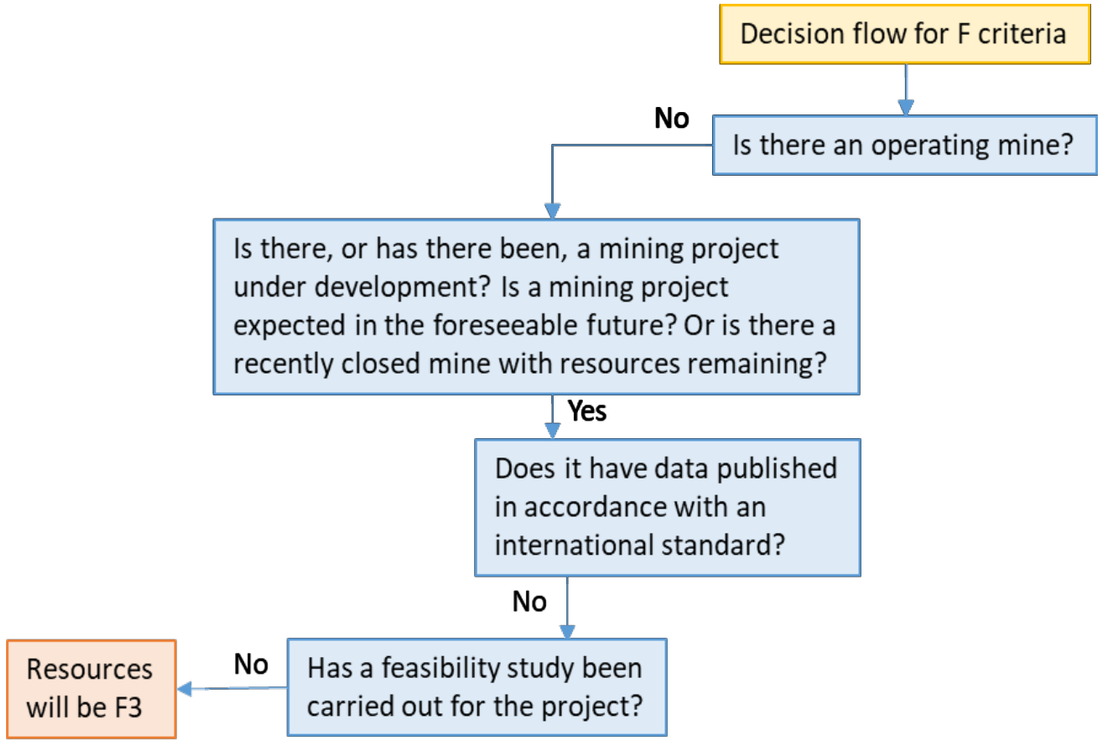
Resource estimate	Unknown	1980	0.5	3	3	3	Moderate amount of drilling and detailed local exploration, BUT no information on how estimate was made.

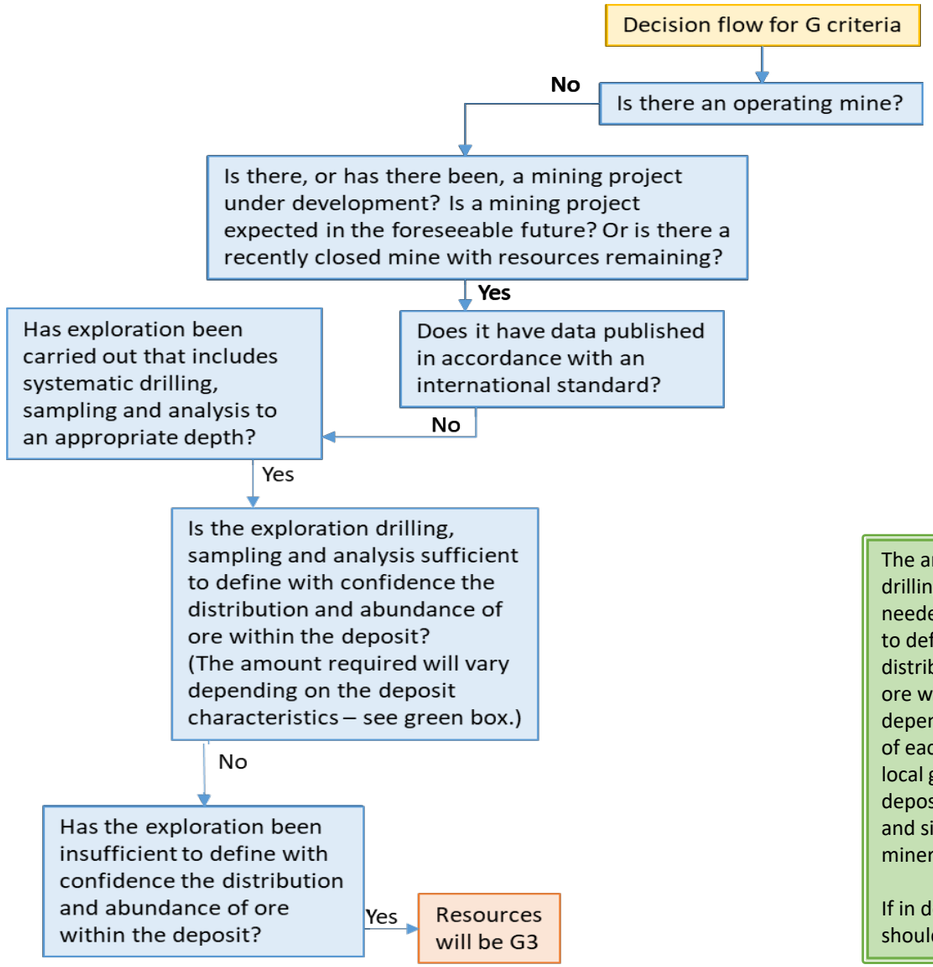
E axis for the Gairloch deposit



F axis for the Gairloch deposit



G axis for the Gairloch deposit



The amount of exploration drilling, sampling and analysis needed for it to be "sufficient to define with confidence the distribution and abundance of ore within the deposit" will depend on the characteristics of each deposit, including local geology, deposit type, deposit depth, deposit shape and size, target commodity, mineralogy, grade, etc.

If in doubt the lower category should be used.

Example 2: Polyhalite resources, NE England, UK

- Two commodities - potash (sylvine, KCl); polyhalite ($K_2SO_4.MgSO_4.2CaSO_4.2H_20$)
- Resources of both are hosted in late Permian evaporite deposits
- Boulby Mine (operated by Cleveland Potash) previously extracted potash, now polyhalite
- Second polyhalite mine (Woodsmith mine) in North Yorkshire under construction, operated by Sirius Minerals
- Probable reserves - Woodsmith only
- Measured resources - Boulby only
- Indicated and inferred resource data aggregated for the two deposits
- Estimate for the total extent of the geologically available resources

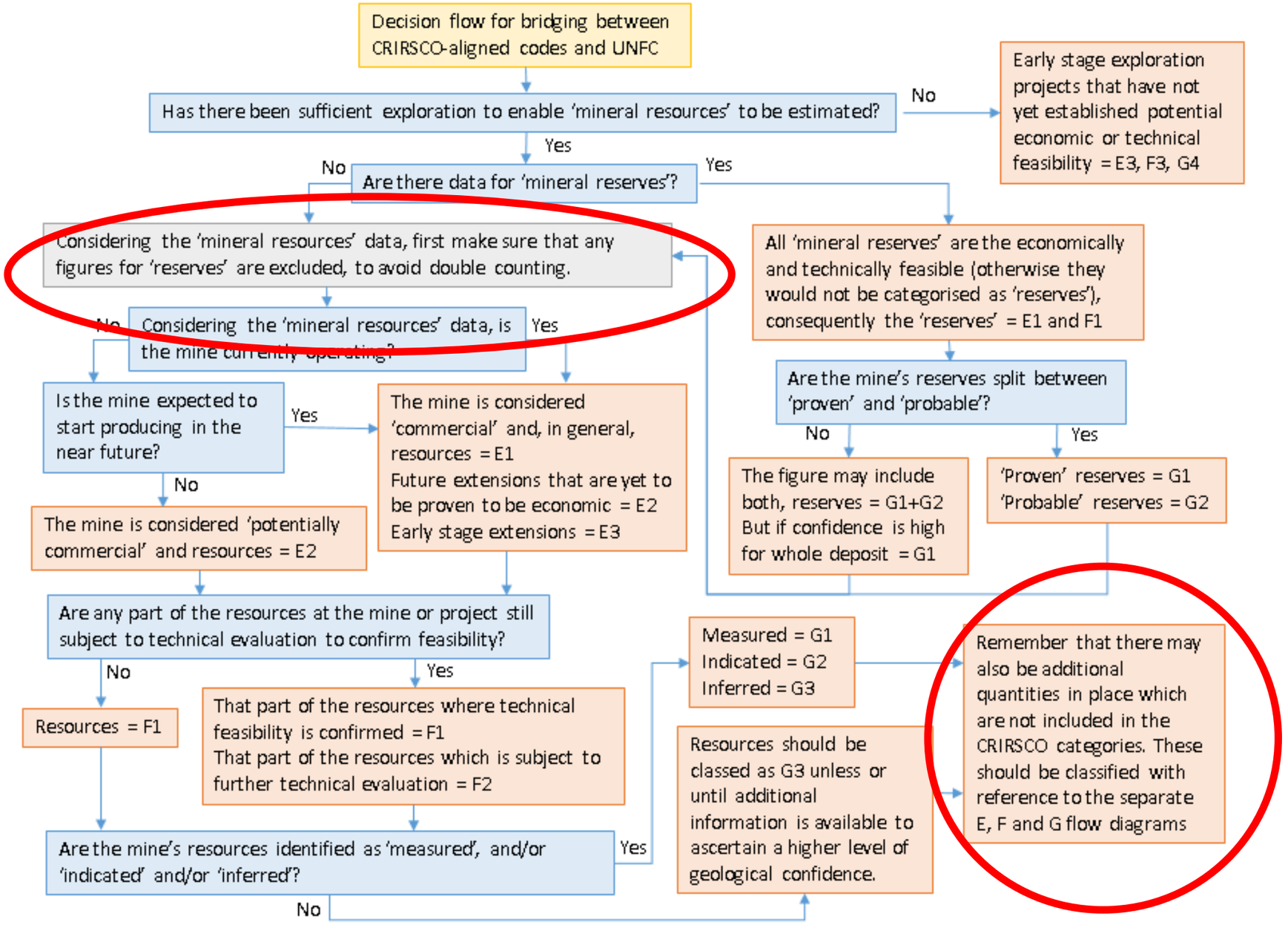
Example 2: Polyhalite resources, NE England, UK

Category	Reporting Code	Year of reporting	Tonnage of ore (million tonnes)	UNFC category E	F	G	Comments
Probable Mineral Reserves	JORC	2016	248				Woodsmith only
Measured Mineral Resource	JORC	2013	39				Boulby only
Indicated Mineral Resource	JORC	2013 and 2016	793				Woodsmith+Boulby
Inferred Mineral Resource	JORC	2013 and 2016	2450				Woodsmith+Boulby
Estimate based on subcrop	None	2017	286200				GIS-based district scale

Example 2: Polyhalite resources, NE England, UK

CRIRSCO Template		UNFC-2009 "minimum" Categories			UNFC-2009 Class
Mineral Reserve	Proved	E1	F1	G1	Commercial Projects
	Probable			G2	
Mineral Resource	Measured	E2	F2	G1	Potentially Commercial Projects
	Indicated			G2	
	Inferred			G3	
Exploration Results		E3	F3	G4	Exploration Projects

Decision tool for CRIRISCO compliant data to UNFC



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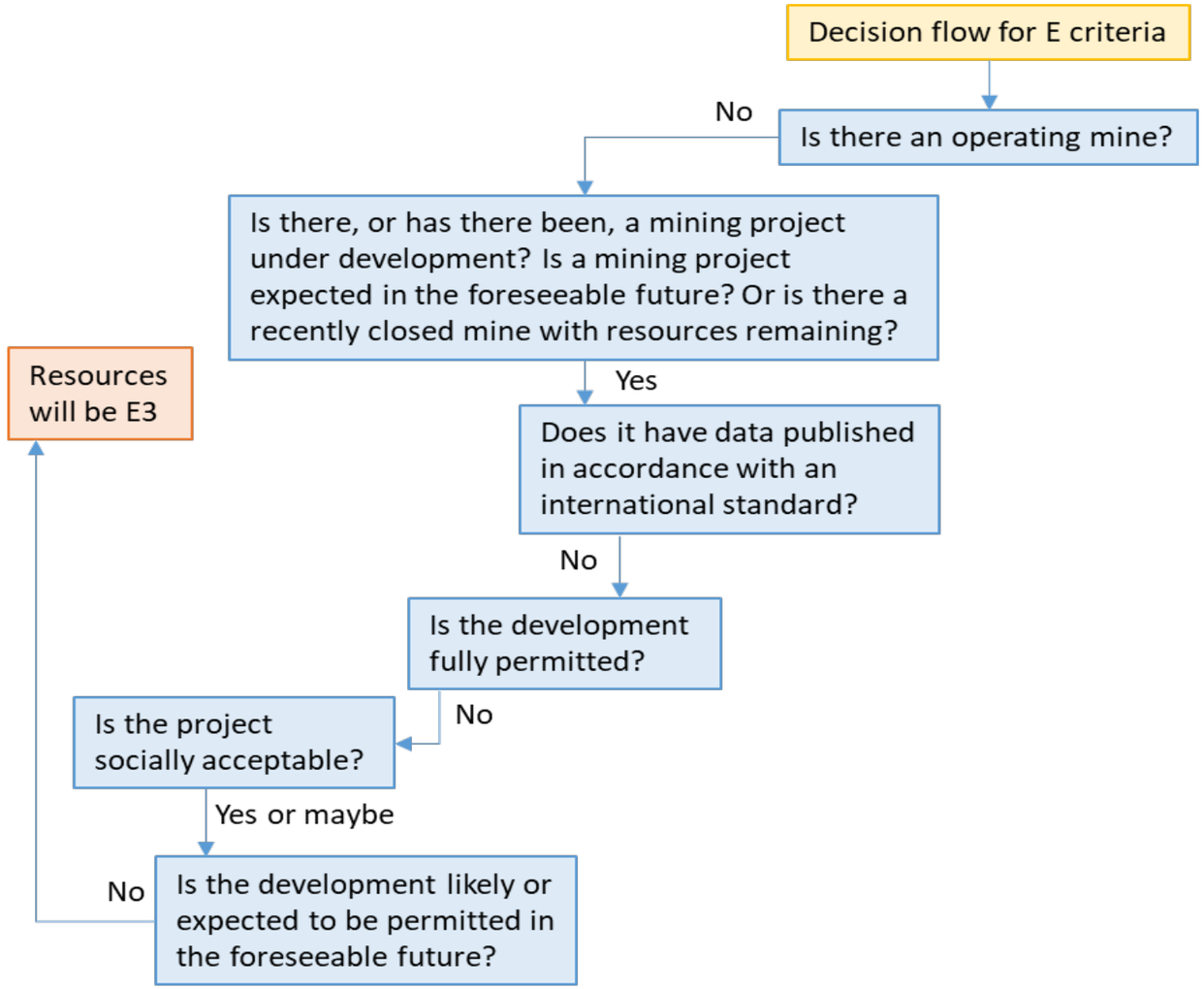

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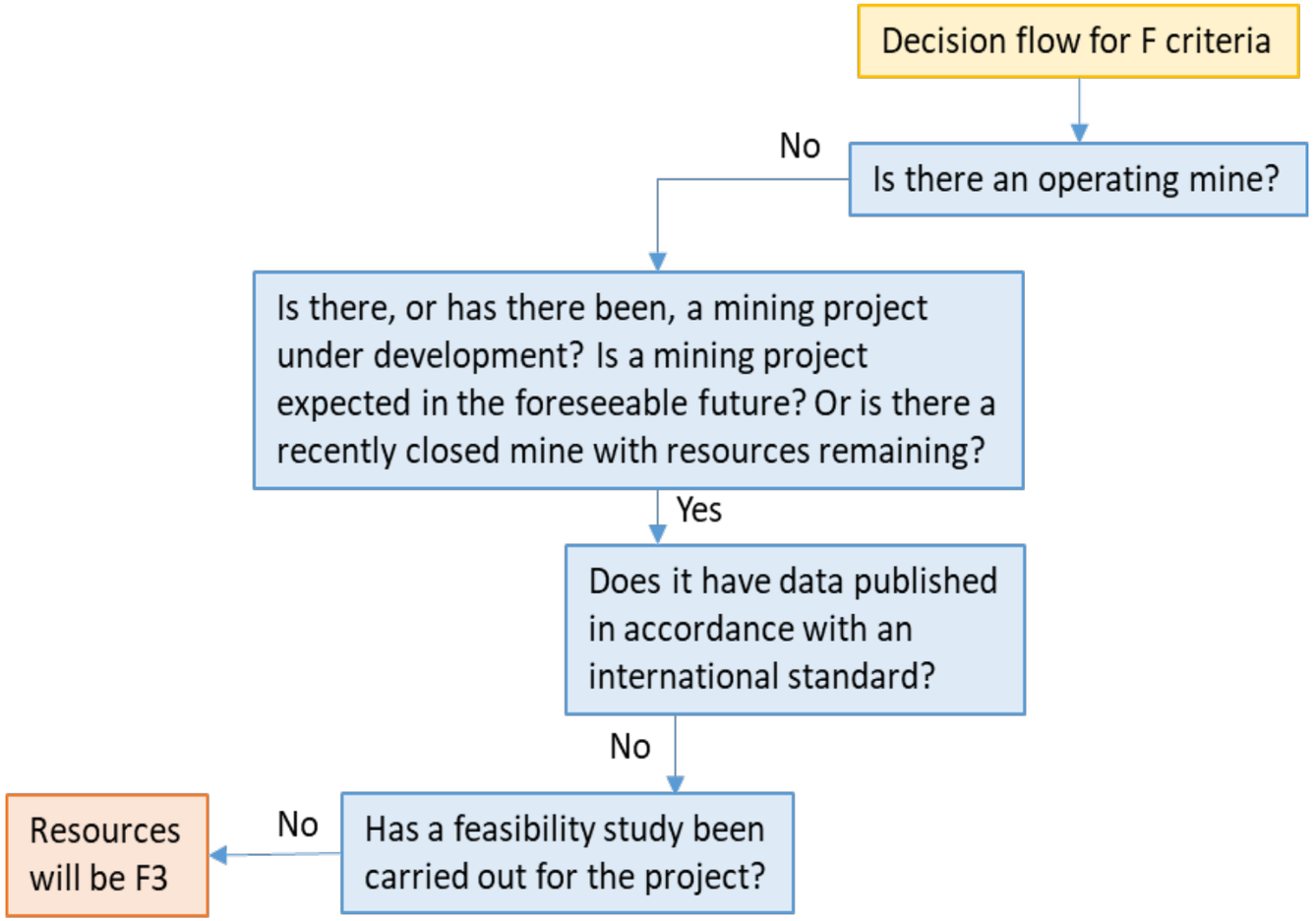

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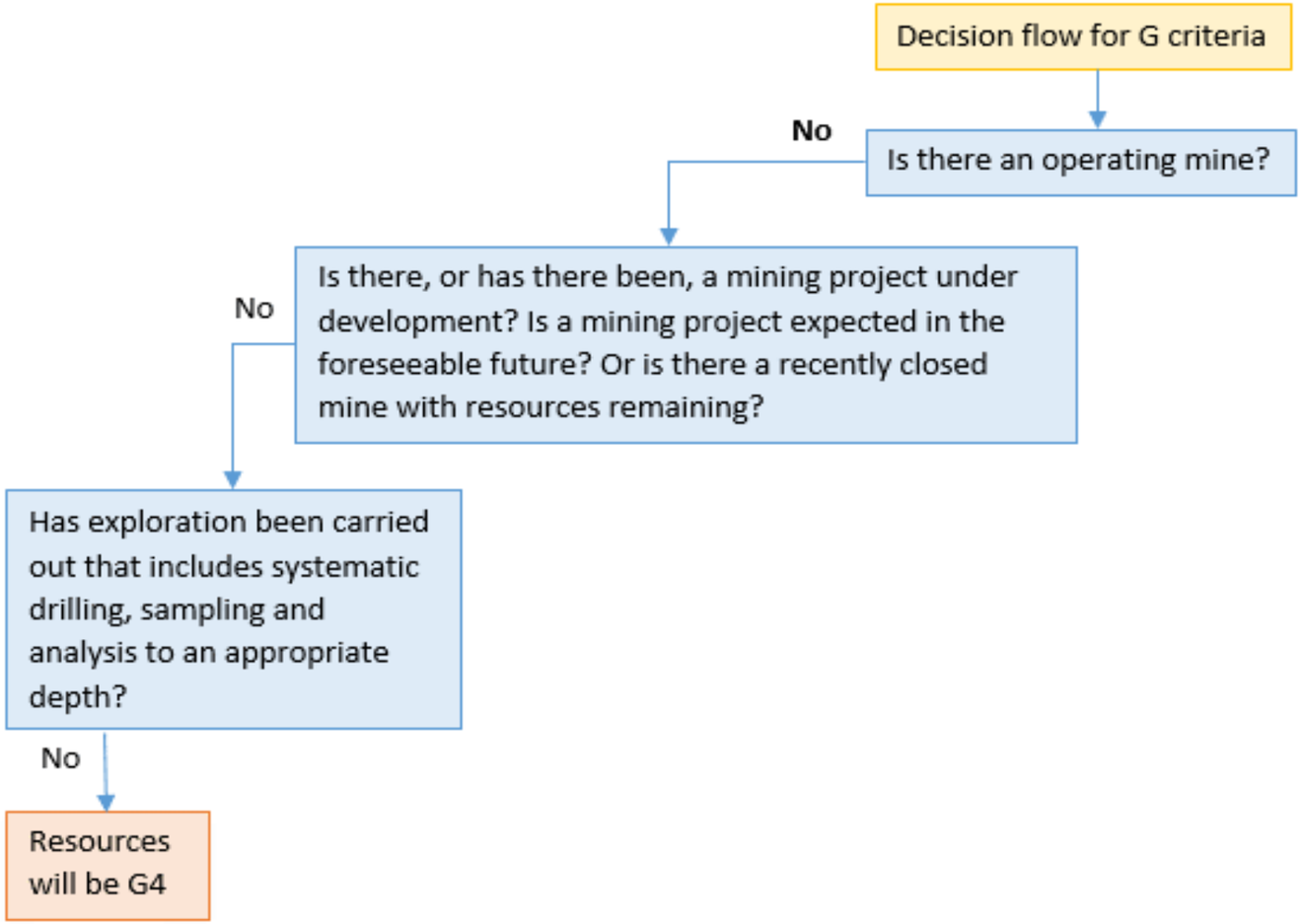

Thank you!

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Further resources:

Development of decision-making tools to create a harmonised UK national mineral resource inventory using the United Nations Framework Classification
https://doi.org/10.1016/j.resourpol.2022.102558

ORAMA project:
https://orama-h2020.eu/downloads/